ann. behav. med. (2015) 49:522–531
DOI 10.1007/s12160-014-9680-1

ORIGINAL ARTICLE

Physiological Reactivity During Parent-Adolescent Discussions: Associations with Scaffolding Behaviors and Relationship Quality

Erika M. Manczak, M.S · Kate C. McLean, Ph.D · Dan P. McAdams, Ph.D · Edith Chen, Ph.D

Published online: 13 January 2015

Abstract
Background Parents and adolescents commonly discuss stressful experiences. However, little is known about the features of these conversations that may have implications for health.
Methods One hundred five adolescents and their parents engaged in conversations about two challenging events, with parental contributions to the discussions coded for four scaffolding behaviors (reiterations, negations, move alongs, and new interpretations). Systolic blood pressure, diastolic blood pressure, and heart rate were measured in both participants at baseline and throughout the conversation. Parent-reported relationship quality was also assessed.
Results For both parents and adolescents, negative scaffolding behaviors were associated with increased physiological reactivity, whereas positive scaffolding behaviors were associated with decreased reactivity. Furthermore, children in higher quality parent-child relationships showed greater reactivity to reiterations and lower reactivity to new interpretations, but those in lower quality relationships demonstrated the opposite patterns.
Conclusions Specific aspects of parent-child interactions appear to contribute to physiological responses to challenging events, which in turn may have implications for health.

Keywords Cardiovascular reactivity · Parent-child conversations · Relationship quality · Adolescents

The disclosure of emotional information—typically assessed in research studies through experimental laboratory writing paradigms—has demonstrated robust associations with health (e.g., [1, 2]). However, disclosures in the real world often occur in the context of interactions with others [3]. One issue that remains unclear is the characteristics of such disclosure interactions that have implications for health-relevant outcomes. The current study seeks to address this gap by exploring aspects of parent-adolescent interaction patterns during discussions of challenging life experiences as they relate to physiological reactivity during these tasks.

Emotional Disclosure Interventions and Health

Emotional disclosure interventions improve an array of health outcomes by asking participants to write or talk about an emotionally evocative experience, typically for 15–30 min at a time across several days. This type of disclosure has been found to alter immune functioning, such as antibody response to vaccinations [4], physiological measures, including skin conductance [5], and clinical outcomes, such as reduced physical symptoms in patients with asthma or rheumatoid arthritis [6]. Improvements occur through the process of using language to construct a coherent narrative acknowledging distress while emphasizing positive aspects [1, 7]. Here, the best outcomes are found in individuals who use a high number of positive emotion words, a moderate amount of negative emotion words, and increasing use of causal and insight words [8, 9].

Support for this project was provided by the Canadian Institutes of Health Research, grant funding reference number 97872. We wish to thank the individuals who participated in this research, as well as Sarah Morrison-Cohen for her help with coding.

E. M. Manczak (✉) · D. P. McAdams · E. Chen
Department of Psychology, Northwestern University, Swift Hall Suite 102, 2029 Sheridan Road, Evanston, IL 60208-0001, USA
e-mail: emanczak@u.northwestern.edu

K. C. McLean
Department of Psychology, Western Washington University, Bellingham, WA, USA

Emotional Disclosure with Children

Surprisingly, emotional disclosure interventions do not appear to work in the same way with youths as they do with adults. An expressive writing intervention with 9–13-year olds by Reynolds et al. [10] revealed no specific effects of the emotional disclosure condition on health or school performance. However, a reanalysis by Fivush and colleagues [11] found that participants who used more negative evaluations and explanations in their writing showed *increases* in levels of anxiety, depression, and somatic difficulties. Children at this age may not yet have the advanced narrative and emotion regulation skills necessary for telling stories in ways that can have benefits for health and instead reactivate anxiety through their narratives.

In discussing their findings, Fivush et al. [11] speculated that children may be able to benefit from emotional expressivity if assisted by a more skilled individual, such as their parent. This process, known as scaffolding, is a foundational theoretical model for how parents participate in and contribute to child outcomes within socioemotional development research. By scaffolding children's contributions through commenting, reflecting, reframing, and assisting in discussions of events, parents can help construct more integrated narratives, in turn shaping how these events affect children. Moreover, certain types of responses to children's narratives may be more helpful than others. For example, new interpretations of children's experiences as well as positive responsiveness during conversations (such as when parents helped move discussions along) have been associated with greater meaning-making by adolescents [12]. Thus, positive scaffolding behaviors may facilitate better outcomes in children and adolescents. This possibility is also supported by meta-analytic work demonstrating robust associations between families' "conversation-oriented" communication style (marked by mutual discovery and elaboration, contrasted with "conformity" orientation) and a range of psychosocial, behavioral, and cognitive child outcomes [13]. However, the included studies relied on self-report ratings, rather than coding of conversational behaviors like scaffolding.

Interpersonal Interactions and Contributors to Health

Family relationship characteristics have implications not only for narrative abilities and mental health but also for the physical health of children. For example, Repetti et al. [14] describe a model in which conflictual, nonsupportive families contribute to poor health outcomes in children through effects on physiological systems responsive to stress. In contrast, close, nurturing families can confer protection and resilience in the context of otherwise difficult environments (e.g., [15]). However, these studies refer to global family relationship qualities, whereas investigating specific parenting behaviors occurring during family interactions may better reveal how this risk or resilience is transmitted to health outcomes.

One pathway by which specific behaviors may impact health-relevant processes is via cardiovascular reactivity associated with parent-child interactions. Previous work has suggested that greater reactivity to acute stressors in adolescents predicts future blood pressure increases [16] and exaggerated, repeated reactivity to psychological stress in adults has been linked to important clinical outcomes, such as hypertension and mortality [17]. In adolescents, levels of secure base seeking during interactions with parents related to both sympathetic and parasympathetic reactivity and recovery in response to a stress task [18]. Although acute cardiovascular responses to conversational scaffolding, specifically, have not previously been investigated, numerous studies on other types of interpersonal behaviors in adults have documented the effects of interactions between close others on heart rate (HR), systolic blood pressure (SBP), and diastolic blood pressure (DBP) reactivity (e.g., [19–22]). Here, specific types of interaction behaviors have unique associations with reactivity. Broadly, negative or hostile behaviors in married couples produce acute increases in blood pressure [23–25], whereas the use of positive emotion words during conversations has been associated with lower HR reactivity [26]. Although these studies examined marital relationships (and not parent-child relationships), they suggest possible patterns of reactivity to examine in adolescents and parents. Specifically, combining the parent scaffolding and child outcome literature with the marital behaviors and physiological reactivity literature, we expect that positive parent scaffolding behaviors that encourage the conversation ("move alongs"), reiterate the speaker's point of view ("reiterations"), and allow youth to reinterpret past events ("new interpretations") will be associated with reduced reactivity during a discussion task, particularly in contrast to behaviors like negations. Furthermore, given that providing social support, as well as receiving it, has been shown to relate to decreased ambulatory blood pressure [27], it is possible that parents who offer these scaffolding behaviors will exhibit similar patterns of reactivity as we hypothesize for the children.

Furthermore, associations between scaffolding behaviors and physiological reactivity may not only depend on the type of acute response offered by one's partner, but may also hinge on more stable features of the relationship. For example, previous research has demonstrated that adolescents with dismissing attachment representations had greater physiological reactivity when engaged in a conflict interaction task with their parent than non-dismissing individuals [28] and that adolescents higher in anxious attachment evinced augmented ambulatory blood pressure when engaged in social interactions [29]. With regard to the impact of specific conversational behaviors, relationship effects might operate in two ways. On the one hand, positive behaviors might be most beneficial in

high-quality dyads. In adults, for example, the effect of emotional support on cardiovascular reactivity was moderated by perceived arrogance and cynicism in one's partner [30] and friendship quality [31], such that receiving support was related to lowered reactivity in positive dyads, but to greater reactivity in negative dyads. On the other hand, positive behaviors might be most helpful in low-quality dyads because it involves the provision of support where there is usually little. Here, Kamarck et al. [32] found that only adults high in hostility benefited physiologically from the presence of a friend during a stressor task.

The current study aimed to examine how different types of parental scaffolding during discussions of challenges—along with relationship quality—were associated with cardiovascular reactivity in parents and adolescents. We used scaffolding to focalize our work because it allows us to examine specific parenting behaviors believed to affect child outcomes, namely, how children understand difficult experiences. We also hoped to bridge developmental and health psychological areas by incorporating health-relevant measurements and theory with traditional developmental coding approaches. To that end, we investigated four distinct types of scaffolding behavior previously identified in research with adolescents [33], predicting that negative scaffolding (negations of children's comments) would be associated with higher SBP, DBP, and HR reactivity across both participants, whereas parental efforts to facilitate discussion (through reiterations of children's statements, efforts to move the conversation along, and new interpretations of events) would relate to lower reactivity. Moreover, we explored whether the quality of the relationship moderated the effects of these behaviors.

Method

Participants

Data from 105 parent-child dyads were considered for the present study. Families of 13–16-year-old children were recruited into a larger longitudinal study examining socioeconomic status and cardiovascular disease through advertisements in local media. Each family selected one parent and one child to participate, resulting in a sample of 82 mothers and 23 fathers in dyads with 56 female and 49 male children. All participants gave their informed consent prior to their inclusion in the study. Participants had to be free of any chronic medical illness and speakers of English. At the time of testing approximately 1.5 years after the baseline visit, children were on average 16.0 years old (SD=1.2), and parents were on average 46.5 years old (SD=7.2). Fifty percent of families identified as being primarily of European descent, 39 % were Asian, 4 % were First Nation, 4 % were African, and 3 % were Hispanic. The average family income was between $50,000 and $75,000, and average parental education was some college, with a range of having a high school diploma to attending graduate school. As part of the larger project, parents and adolescents each received $100 for completing a laboratory visit.

Procedure

Parents and children came to the lab and individually completed a series of self-report questionnaires. They were then brought to a quiet room together, and baseline SBP, DBP, and HR readings were taken. A trained research assistant gave instructions for the discussion task and then left the room, and the dyad engaged in their conversation. SBP, DBP, and HR were monitored during the task. Participants were instructed to remain seated throughout the assessments, thus minimizing extraneous movements.

Measures

Relationship Quality

Parents completed a series of self-report items about their relationship with their child, capturing parental nurturance and parental harshness. For the nurturance subscale, parents rated the frequency with which they engage in seven caregiving behaviors, such as listening to their children's perspective during arguments, on a 4-point scale. The parental harshness scale assessed use of severe disciplinary practices, such as shouting and hitting, using 11 items. Item responses were summed on each scale. This collection of items has previously been used in several studies examining parents and adolescents (e.g., [34–36]), and this combination of constructs has emerged as an important taxonomy of parental behaviors (see [37]). Cronbach's alpha for the nurturance scale was .77 and was .67 for the harshness scale in this sample.

BP and Heart Rate

Resting BP and HR were recorded using the VSM-100 BpTRU automatic BP monitor, through a standard occluding cuff on the participant's nondominant arm. Studies indicate that measurements on this device are comparable to manual sphygmomanometer readings and within 5 mm Hg of the gold standard auscultatory mercury sphygmomanometer measurements 89.2 % of the time, and within 10 mm Hg 96.4 % of the time [38, 39]. After a 5-min period of acclimation to the device, three BP and HR readings were taken 2 min apart and then averaged to establish a baseline. During the discussion task, HR and BP were taken every minute for the first 5 min of the conversation. Because conversations varied in length across dyads (from approximately 5–30 min), discussion task physiology was measured for a period of time that covered even the shortest of conversations. Due to technical error, the

BP monitor did not work for two families. To assess reactivity, a residualized change score was created by covarying baseline physiology. This approach takes into account possible correlation between baseline and amount of change and is consistent with previous work (e.g., [32, 40, 41]).

Discussion Task

Parents and children were seated in a quiet room and asked to select and discuss three experiences that were challenging: (1) an experience shared by both the parent and child, (2) a challenge the child experienced alone in his or her past, and (3) a challenge the parent had experienced during his or her own childhood. For each experience, the dyads were instructed to pick a specific event together and have as natural a conversation as possible while discussing what happened, how they dealt with the experience, and anything else that made the challenge important. All conversations were video and audio recorded then transcribed.

Scaffolding Coding

Conversations were transcribed in full, but given that the current study primarily concerns the supportive behavior of parents during conversations; only the discussion of shared challenges and the child's challenging experience were analyzed, and only parents' contributions were coded.

Each conversation was divided into conversational turns, and then, each turn by the parent was coded for the presence or absence of a variety of scaffolding behaviors using the system developed by McLean and Mansfield [33] and adapted from Haden [42]. Four of these scaffolding behaviors were hypothesized to be theoretically relevant to physiological reactivity: negations, move alongs, reiterative statements, and new interpretations. Previous research has shown that these behaviors can be reliably coded in conversations between adolescents and their parents and can predict adolescent meaning-making processes [12, 33, 43] (other codes, such as neutral statements and yes/no questions were not considered to be positively or negatively valenced. These types of codes were not expected to evoke a physiological response and hence not included in this study). Reliability coding was done by the second author and a graduate student on 724 turns, reflecting approximately 12 % of all turns (κ=.90). After reliability was reached, the student coded the rest of the conversations, meeting with the second author to discuss difficult cases, and every 5th case, to prevent coder drift.

Scaffolding Behavior Types

Negations Negations were coded any time a parent disagreed or denied some comment proposed by their child ("*No, it didn't happen like that*." κ=1.00).

Move Alongs This dimension included efforts by the parents to keep the conversation moving but did not require a response from the child. These could include further details about the experience. For utterances with this code, parents were not explicitly asking for any additional information about the event, but rather were continuing the discussion ("*That was a very challenging time.*" κ=.86).

Reiterative Statements Turns counting on this dimension included ones in which the parent reiterated a statement made by the child or asked the child to repeat what he or she said ("*So you said you struggled with that?"* κ=1.00).

New Interpretations Turns were coded as new interpretations when parents offered a different interpretation or perspective on the topic of discussion, which was not factual, and were statements ("*Yeah, that [class] was hard, but it was fun, too.*" κ=.80).

Counts on each dimension were summed across turns. To adjust for the verbosity of dyads, these frequencies were then divided by the dyad's total number of conversational turns to yield indices of the proportion of turns containing each type of behavior. Following McDemott and Sales [44], this approach allows for a comparison of the relative emphasis on types of conversational behaviors, even when conversations among some dyads may be longer. Furthermore, given that greater length of conflict discussions affords more chances to impact physiology [45], adjusting for the length of the conversation increases confidence that associations are due to different *types* of talk, rather than more opportunities for talk, broadly.

Demographic Covariates

Information was also collected on participant age, gender, gender congruence of dyad, body mass index (BMI), and family income (an index of socioeconomic status; SES).

Statistical Analyses

Data analysis proceeded in several steps. First, descriptive statistics of means, standard deviations, and ranges were computed. Next, partial correlations were run to examine associations between SBP, DBP, and HR during the discussion task to scaffolding behaviors while controlling for baseline physiology. Following this, multiple regressions were conducted to test for possible moderation by relationship quality by modeling SBP, DBP, and HR by each scaffolding variable (centered at its mean), relationship quality subscale (centered at its mean), and their interaction, including baseline physiology as a covariate. Last, secondary analyses were conducted to ensure that results were not accounted for by demographic variables.

Table 1 Means, standard deviations, and ranges of study variables

	Baseline			Task		
	Mean	SD	Range	Mean	SD	Range
Child SBP	102.9	11.0	73.0–131.0	108.5**	11.4	79.7–146.5
Child DBP	60.8	7.5	42.5–81.7	71.6**	10.3	54.7–105.3
Child HR	73.5	12.6	47.3–109.0	75.2	11.1	45.0–101.8
Parent SBP	111.6	13.4	86.0–147.0	108.5*	11.3	79.7–134.5
Parent DBP	72.3	9.6	51.5–100.7	71.9	10.2	52.0–105.3
Parent HR	71.5	11.6	38.0–100.7	69.2**	8.8	48.8–93.4
Parental nurturance	22.7	3.2	13–28			
Parental harshness	21.5	3.7	13–33			
Reiterations shared Memory	15.2 %					
Move alongs shared memory	97.1 %					
New interpretations shared memory	10.5 %					
Negations shared memory	22.9 %					
Reiterations child memory	21.9 %					
Move alongs child memory	89.5 %					
New interpretations child memory	13.3 %					
Negations child memory	23.8 %					

*$p<.05$, **$p<.01$

SBP systolic blood pressure, *DBP* diastolic blood pressure, *HR* heart rate

Significant differences between baseline and task physiology are noted above. Scaffolding behaviors are represented as the percentage of families who demonstrated each behavior per memory

Results

Descriptive Statistics Means, standard deviations, and ranges of unadjusted study variables are provided in Table 1. For the shared memory, there were no significant correlations between the four proportional scaffolding behaviors, with the exception of a trend-level correlation between move alongs and new interpretations ($r=-.19$, $p=.06$). Within the child memory, only a correlation between new interpretations and negations ($r=.40$, $p<.01$) was significant. As a whole, the discussion task elicited significant increases in children's average SBP ($t=4.20$, $p<.01$, $\Delta=5.20$) and DBP ($t=8.43$, $p<.01$, $\Delta=10.57$), as well as a marginally significant increase in HR ($t=1.89$, $p=.06$, $\Delta=1.72$). In contrast, parents showed significant decreases in average SBP ($t=2.18$, $p<.05$, $\Delta=-3.97$) and HR ($t=-4.23$, $p<.01$, $\Delta=-2.73$); change in average DBP was not significant ($t=.75$, *ns*, $\Delta=-1.19$).[1]

Physiological Reactivity and Scaffolding As displayed in Table 2, partial correlations between scaffolding and task physiology, controlling for baseline physiology, revealed several significant associations. For parents, greater use of new interpretations in the shared memory was related to lower SBP reactivity ($pr=-.23$, $p<.05$). A similar association was found at the trend level for child's SBP—that is, when parents provided more new interpretations in the shared memory, children displayed lower SBP reactivity ($pr=-.21$, $p<.10$). Similarly, when parents used more move alongs in the child memory, parents showed lower DBP reactivity at a trend level ($pr=-.22$, $p<.10$), and children displayed significantly lower DBP reactivity ($pr=-.22$, $p<.05$). In contrast, when parents provided more negations in the child memory, they showed greater DBP reactivity ($pr=-.22$, $p<.05$). Children also displayed greater reactivity, specifically, greater HR reactivity with use of negations in the shared memory ($pr=.23$, $p<.05$) and a trend toward greater DBP reactivity ($pr=.21$, $p<.10$) with use of negations in the child memory.

Last, parents' use of reiterations was similarly associated with greater task reactivity, with reiterations during the child memory relating to parents' greater SBP reactivity ($pr=.30$, $p<.01$). Children, too, displayed greater SBP reactivity with use of reiterations in the child memory ($pr=.23$, $p<.05$), as well as greater HR reactivity ($pr=.29$, $p<.01$) with use of reiterations during the shared memory.

[1] One reason why parents may not have shown significant increases in cardiovascular reactivity is that the discussion task is not a traditional conflict task as used in many reactivity tasks with family members (e.g., [63]), but rather a discussion of challenging life events. Significant decreases in reactivity, however, are consistent with work suggesting that providing social support is associated with lower ambulatory blood pressure [26].

Table 2 Partial correlations between average task physiology and scaffolding, controlling for baseline physiology in shared memory and child memory

	Shared memory			Child memory		
	Child task physiology					
	SBP	DBP	HR	SBP	DBP	HR
New interpretations	−.21	−-.02	.12	−.03	−.02	−.04
Move alongs	.01	−.06	−.02	−.08	−.22*	−.04
Negations	.00	.07	.23*	.16	.21	.12
Reiterations	−.05	.08	.29**	.23*	.18	−.04
	Parent task physiology					
	SBP	DBP	HR	SBP	DBP	HR
New interpretations	−.23*	.02	−.16	−.03	−.02	.04
Move alongs	.03	−.03	.11	−.09	−.22	.03
Negations	−.02	.05	.02	.12	.22*	−.10
Reiterations	.11	.16	−.11	.30**	.18	.03

*$p<.05$, **$p<.01$

SBP systolic blood pressure, *DBP* diastolic blood pressure, *HR* heart rate

Interactions with Relationship Quality Multiple regressions were conducted to test whether parent-reported relationship quality interacted with scaffolding behaviors to predict parent or child cardiovascular response during each memory, including baseline physiology as a covariate. Relationship quality did not interact with scaffolding behavior to predict parent reactivity but did interact with scaffolding behaviors to predict child reactivity. Reiterations during the shared memory significantly interacted with parental nurturance ($\Delta R^2=.04$, $\beta=.20$, $p<.05$), such that the lower dyads were in parental nurturance, the more strongly greater parental use of reiterations was associated with lower SBP reactivity in children. Or conversely, the higher dyads were in parental nurturance, the more strongly greater parental use of reiterations was associated with greater SBP reactivity in children (see Fig. 1). Additionally, there were several significant interactions between new interpretations and parental harshness in predicting child BP reactivity. New interpretations during the shared memory significantly interacted with harshness to predict both child SBP reactivity ($\Delta R^2=.08$, $\beta=.40$, $p>.01$; see Fig. 2) and child DBP reactivity ($\Delta R^2=.12$, $\beta=.51$, $p<.01$). New interpretations during the child memory also interacted with harshness to predict child DBP reactivity ($\Delta R^2=.08$, $\beta=.33$, $p>.01$). Across each interaction, the lower dyads were on parental harshness, the more strongly greater use of new interpretations by parents was associated with lower child BP reactivity. Or conversely, the higher dyads were on harshness, the more new interpretations were linked to greater child BP reactivity.

Possible Confounding Variables Last, all trend level and significant associations were followed up with analyses controlling for participant gender, gender congruence, age, SES, and

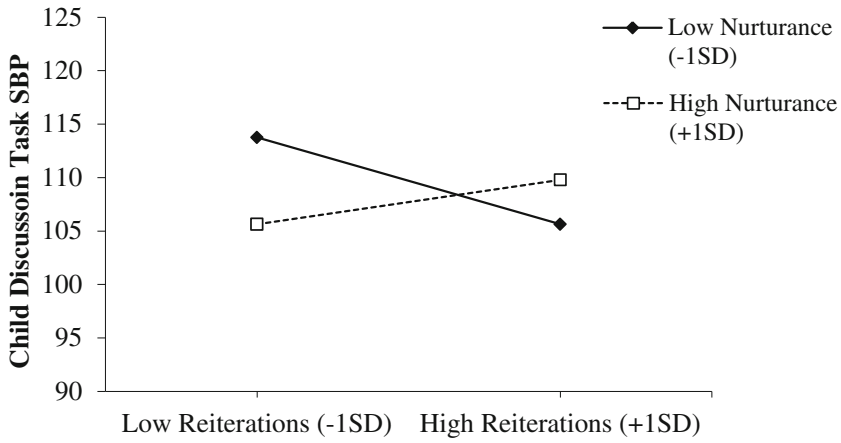

Fig. 1 Interaction of parental nurturance and reiterations during shared memory in predicting child systolic blood pressure (SBP) reactivity, controlling for baseline SBP. As nurturance increased, the association between reiterations and SBP during the discussion became more positive

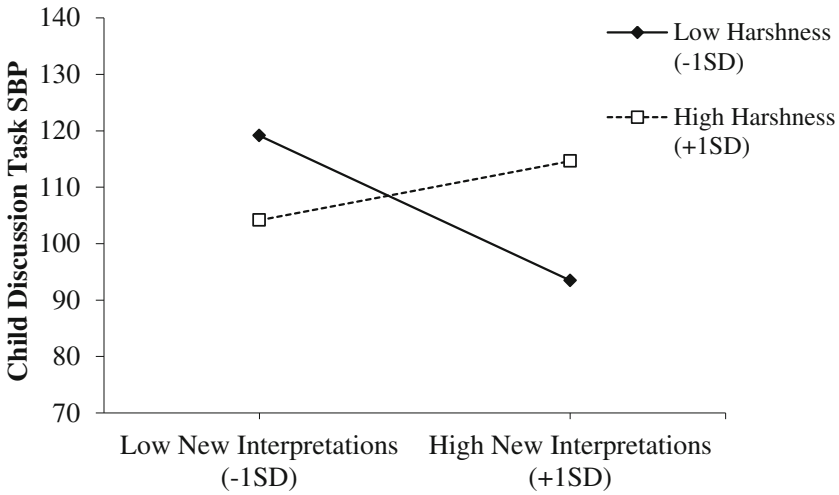

Fig. 2 Interaction of parental harshness and new interpretations during the shared memory in predicting child systolic blood pressure (SBP) reactivity, controlling for baseline SBP. As harshness declined, the relationship between new interpretations and SBP during the discussion became more negative. Similar patterns of reactivity were found for child diastolic blood pressure (DBP) in the shared memory and for child DBP in the child memory

BMI. All were robust to these covariates, with the exception of the interaction between reiterations in the shared memory and nurturance predicting child SBP, which shifted to a trend (β=.20, p=.06).[2]

Discussion

To our knowledge, the current study is the first to link parent-adolescent scaffolding behaviors to indices of physiological reactivity. Broadly, we found that parental scaffolding behaviors that facilitated adolescents' discussions of challenging experiences were associated with lower physiological reactivity in both speakers, whereas scaffolding behaviors that undermined adolescents' stories were associated with greater reactivity. Moreover, relationship quality moderated several associations between scaffolding and reactivity in children, suggesting that the effects of parental scaffolding may depend on the relational context.

Consistent with previous research examining conversational behaviors and reactivity investigated in the context of marital discord (e.g., [24]), scaffolding in which parents disagreed with or negated something their children had contributed was associated with increased physiological reactivity. Specifically, negations related to greater HR reactivity in children during the shared memory and to higher DBP reactivity during the child memory for both children and their parents (however, this was at trend-level for children). Although it was predicted that reiterations would be a positive form of scaffolding, they were instead associated with *increased* reactivity, specifically, with increased child HR reactivity in the shared memory and with increased parent and child SBP reactivity in the child memory. While reiterations can, on the one hand, signal active listening, other research has treated repetitions as a less desirable and less sophisticated form of parental response than more elaborative contributions [46–48]. Our findings similarly suggest that reiterations of children's contributions may be a less optimal type of scaffolding, resulting in heightened momentary stressfulness.

In contrast, parents' efforts to maintain a fluid conversation during the discussion of the challenging child event (assessed through move alongs) were associated with decreased DBP reactivity for both partners (although this was marginally significant for parents). By facilitating a smooth discussion, parents may be signaling their investment in the conversation and setting a tone of collaboration. Parents' attempts to offer alternative perspectives through new interpretations were associated with decreased SBP reactivity in both parents and children within the shared memory. That supportive scaffolding behaviors were associated with lower BP reactivity is consistent with recent research suggesting that positive conversational features may buffer cardiovascular responses [26].

Interestingly, several associations between scaffolding and child physiological reactivity indices were moderated by relationship quality. Specifically, reiterations during the shared memory interacted with nurturance to predict child SBP reactivity, such that reiterations resulted in greater BP reactivity within higher-nurturance dyads but lower reactivity within lower-nurturance dyads. Researchers examining parental reminiscing styles have often contrasted elaborative scaffolding with repetitive scaffolding, noting that less skilled conversational partners are more likely to use reiteration than other

[2] Due to the low base rate frequency of three of the scaffolding behaviors in each memory, secondary analyses were also conducted examining the associations between the simple presence/absence of those behaviors with physiological reactivity during the discussion task, using univariate ANCOVAs. The reactivity patterns relating to reiterations and move alongs remained significant; however, use of new interpretations during the shared memory and use of negations during the child memory were no longer significantly associated with parent reactivity when examining presence/absence. All interactions with relationship quality remained significant.

scaffolding approaches during conversations with children [47] and that less securely attached parents use greater proportions of repetitive scaffolding [49]. It is possible that children who are accustomed to high levels of caregiving behaviors may interpret repetition as departures from more sophisticated scaffolding. Within low nurturance dyads, however, these reiterations may be interpreted as a sign of attention or interest. Indeed, other researchers have maintained that reiterating a partner's contributions is a form of responsive listening that conveys understanding and is related to better processing of conversational content [50, 51]. In the absence of other forms of nurturance or affection, reiterations may exist as a positive way to communicate connection within these dyads.

In a complementary manner, associations between new interpretations and child BP reactivity were moderated by parental harshness. Across both shared and child memories and both SBP and DBP reactivity, new interpretations were associated with lowered reactivity in dyads with lower parental harshness, but with greater reactivity in dyads characterized by higher levels of harshness. Here, it may be that dissimilar relationship contexts led to differing perceptions of parents' scaffolding behaviors. For children with a history of being criticized or punished, their parents' suggestion that an experience could be interpreted differently may feel invalidating. Research on the most extreme form of parental harshness—child maltreatment—has shown that maltreating mothers often invalidate children's emotions during discussions [52]. Even in much milder forms, children may come to expect this from parents' ambiguous comments. When delivered in the context of a more positive parent-child relationship, however, new interpretations may represent thoughtfulness or engagement.

That several forms of parental scaffolding were associated with reduced physiological reactivity provide some indirect evidence that children may be able to gain physiological benefits from emotional disclosure with the assistance of more skilled speakers. Fivush et al. [11] speculated that children failed to benefit from expressive writing because they were not yet able to create explanatory narratives. Our findings that when parents provide new interpretations for challenging events (in the context of high-quality relationships), children exhibited lowered BP and HR reactivity are consistent with this proposal. Correspondingly, however, repeated interactions between parents and children that *raise* BP and HR may exist as a mechanism that, if experienced repeatedly over time, could heighten risk for cardiovascular problems across both parents and children. As previously noted, cardiovascular reactivity to stressors has been shown to prospectively predict preclinical and clinical outcomes, including hypertension and myocardial infarction (e.g., [17, 53–55]). In this way, for children and parents who commonly experience (and expect) interactions fraught with behaviors that convey a lack of validation and that regularly activate their stress systems, these communications may come at a more substantial physical toll.

Across scenes and speakers, several types of parental scaffolding behaviors were associated with only one form of BP reactivity, such as reiterations relating primarily to SBP and negations relating only to DBP. These findings are congruent, however, with research suggesting unique connections between psychological phenomena and cardiac and vascular processes. Generally, cardiac reactivity (reflected primarily in SBP) has been linked to appraisals of stressful situations as challenging, in which individuals perceive themselves as having sufficient personal or environmental resources to cope with the stressor [56–58]. In contrast, vascular reactivity (indexed by DBP) is associated with appraisals of threat, wherein individuals do not perceive sufficient resources [59]. Extending these patterns, our findings suggest speculatively that reiterations may be appraised as challenging, with participants ultimately feeling capable of responding to the stressors. Negations, instead, appear to elicit evaluations of threat as speakers take opposing views on an experience, perhaps without a clear path to compromise. Move alongs, then, may mollify perceptions of threat by creating a shared perspective.

In the present study, our primary interest was in the ways that parents use conversations to help shape how their children understand challenging life events (through scaffolding behaviors). Because of this interest, we focused on the content of parents' speech during conversations and coded for scaffolding behaviors. Entirely different research questions could be to investigate how the reciprocal behaviors that parents and adolescents engage in have implications for physiological reactivity or how different *types* of conversations, like neutral versus challenge-focused discussions, may relate to reactivity. Future work should address these possibilities.

Limitations and Conclusions

It is important to acknowledge some limitations of the present work. Given the number of analyses performed and the trend-level significance of several of our findings, one must be cautious about drawing firm conclusions from this preliminary work. We did not have continuous measures of physiological reactivity that would have allowed us to link reactivity to specific utterances in the conversation. Moreover, we assessed only BP and HR and were therefore unable to examine more in-depth psychophysiological parameters. Our findings would also be improved by the use of more naturalistic investigations, such as those utilizing ambulatory BP while recording conversation in daily life. An additional limitation is that we only assessed adolescents. It is possible that parental scaffolding behaviors would have different connotations and, consequently, different associations with reactivity during other developmental periods. Last, we were not able to employ longer-term measures of health to better understand what these acute

effects mean for health down the line. For example, it is possible that there is a minor short-term physiological cost to emotional disclosure in service of the longer-term, more substantial gains shown in previous work [5]. Conversely, repeated momentary reactivity may presage later negative health outcomes, such as heart disease or hypertension [53, 60]. The participants in the current study were all healthy with blood pressures within the normal range, and thus, clinical significance is difficult to determine. However, future studies should address these questions longitudinally in clinical and nonclinical samples.

Despite these limitations, the present work employs an examination of common conversational dynamics, establishing links between parental scaffolding behaviors and parent and child physiological reactivity. Results suggest that different types of parental responses evoke unique patterns of BP and HR reactivity. Moreover, through interaction effects with relationship quality, our work indicates that trait-like features of the dyad likely impact how children interpret specific behaviors in ways that affect BP reactivity. In this way, not only does this work highlight differences between *types* of scaffolding behaviors, but also it emphasizes the role that interpretation of these behaviors likely plays in child outcomes, such that the same behavior may mean different things to different children. Last, given that exaggerated and repeated cardiovascular reactivity has been hypothesized to be implicated in the development of later life disease [17, 61, 62], our work suggests a starting place for future research examining parent-child interactions as a possible mechanism linking family environments to risk for poorer health outcomes.

Authors' Statement of Conflict of Interest and Adherence to Ethical Standards The procedures followed in the present study were in accordance with the ethical standards of the American Psychological Association and Northwestern University, as well as with the Helsinki Declaration of 1975, including (but not limited to) oversight by the Institutional Review Board. All participants provided written informed consent prior to inclusion in the study. Ms. Manczak, Dr. McLean, Dr. McAdams, and Dr. Chen declare that they have no conflict of interest.

References

1. Pennebaker J. *Opening up: the healing power of expressing emotions*. New York: Guilford Press; 1997.
2. Pennebaker JW, Seagal J. Forming a story: The health benefits of narrative. *J Clin Psychol*. 1999; 55: 1243-1254.
3. Pasupathi M. The social construction of the personal past and its implications for adult developmnet. *Psychol Bull*. 2001; 127(5): 651-672.
4. Esterling B, Antoni M, Fletcher MA, Margulies S, Schneiderman N. Emotional disclosure through writing or speaking modulates latent Epstein-Barr virus antibody titers. *J Consult Clin Psychol*. 1994; 62(1): 130-140.
5. Pennebaker JW, Hughes CF, O'Heeron RC. The psychophysiology of confession: Linking inhibitory and psychosomatic processes. *J Pers Soc Psychol*. 1987; 52(4): 781-793.
6. Smyth JM, Stone AA, Hurewitz A, Kaell A. Effects of writing about stressful experiences on symptom reduction in patients with asthma or rheumatoid arthritis: A randomized trial. *J Am Med Acad*. 1999; 281(14): 1304-1309.
7. Lyubomirsky S, Sousa L, Dickerhoof R. The costs and benefits of writing, talking, and thinking about life's triumphs and defeats. *J Pers Soc Psychol*. 2006; 90(4): 692-708.
8. Pennebaker JW. Writing about emotional experiences as a therapeutic process. *Psychol Sci*. 1997; 8(3): 162-166.
9. Pennebaker J, Mayne TJ, de Waal FBM. Linguistic predictors of adaptive bereavement. *J Pers Soc Psychol*. 1997; 72(4): 863-871.
10. Reynolds M, Brewin CR, Saxton M. Emotional disclosure in school children. *J Child Psychol Psychiatry*. 2000; 41(2): 141-159.
11. Fivush R, Marin K, Crawford M, Reynolds M, Brewin CR. Children's narratives and well-being. *Cogn Emot*. 2007; 21(7): 1414-1434.
12. McLean KC, Jennings LE. Teens telling tales: How maternal and peer audiences support narrative identity development. *J Adolesc*. 2011; 35(6): 1455-1469.
13. Schrodt P, Witt PL, Messersmith AS. A meta-analytical review of family communication patterns and their associations with information processing, behavioral, and psychosocial outcomes. *Commun Monogr*. 2008; 75(3): 248-269.
14. Repetti RL, Taylor SE, Seeman T. Risky families: Family social environments and mental and physical health of offspring. *Psychol Bull*. 2002; 128(2): 330-366.
15. Chen E, Miller GE. "Shift-and-persist" strategies: Why low socioeconomic status isn't always bad for health. *Perspect Psychol Sci*. 2012; 7(2): 135-158.
16. Salomon AMK, Brady SS, Allen MT. Cardiovascular reactivity to stress predicts future blood pressure in adolescence. *Psychosom Med*. 2003; 65(3): 410-415.
17. Treiber FA, Kamarck T, Schneiderman N, Sheffield D, Kapuku G, Taylor T. Cardiovascular reactivity and development of preclinical and clinical disease states. *Psychosom Med*. 2003; 65(1): 46-62.
18. Willemen AM, Schuengel C, Koot HM. Physiological regulation of stress in referred adolescents: The role of the parent-adolescent relationship. *J Child Psychol Psychiatry*. 2009; 50(4): 482-490.
19. Broadwell SD, Light KC. Family support and cardiovascular responses in married couples during conflict and other interactions. *Int J Behav Med*. 1999; 6(1): 40-63.
20. Morell MA, Apple RF. Affect expression, marital satisfaction, and stress reactivity among premenopausal women during a conflictual marital discussion. *Psychol Women Q*. 1990; 14: 387-402.
21. Nealey-Moore JB, Smith TW, Uchino BN, Hawkins MW, Olson-Cerny C. Cardiovascular reactivity during positive and negative marital interactions. *J Behav Med*. 2007; 30(6): 505-519.
22. Smith TW, Gallo LC. Hostility and cardiovascular reactivity during marital interaction. *Psychosom Med*. 1999; 61: 436-445.
23. Ewart CK, Burnett KF, Taylor CB. Communication behaviors that affect blood pressure: An A-B-A-B snalysis of marital interaction. *Behav Modif*. 1983; 7(3): 331-344.
24. Ewart C, Taylor CB, Kraemer H, Agras WS. High blood pressure and marital discord: Not being nasty matters more than being nice. *Health Psychol*. 1991; 10(3): 144-163.
25. Kiecolt-Glaser J, Malarkey WB, Chee M, et al. Negative behavior during marital conflict is associated with immunological down-regulation. *Psychosom Med*. 1993; 55: 395-409.
26. Monin JK, Schulz R, Lemay EP, Cook TB. Linguistic markers of emotion regulation and cardiovascular reactivity among older caregiving spouses. *Psychol Health*. 2012; 27(4): 903-911.

27. Piferi RL, Lawler KA. Social support and ambulatory blood pressure: An examination of both receiving and giving. *Int J Psychophysiol*. 2006; 62(2): 328-336.
28. Beijersbergen M, Bakersmans-Kranenburg M, van IJzendoorn MH, Juffer F. Stress regulation in adolescents: Physiological reactivity during the Adult Attachment Interview and conflict interaction. *Child Dev*. 2008; 79: 1707-1720.
29. Gallo LC, Matthews KA. Adolescents attachment orientation influences ambulatory blood pressure responses to everyday social interactions. *Psychosom Med*. 2006; 68(2): 253-261.
30. Fritz HL, Nagurney AJ, Helegeson V. Social interactions and cardiovascular reactivity during problem disclosure among friends. *Personal Soc Psychol Bull*. 2003; 29(6): 713-725.
31. Uno D, Uchino BN, Smith TW. Relationship quality moderates the effect of social support given by close friends on cardiovascular reactivity in women. *Int J Behav Med*. 2002; 9(3): 243-262.
32. Kamarck TW, Annunziato B, Amateau LM. Affiliation moderates the effects of social threat on stress-related cardiovascular responses: Boundary conditions for a laboratory model of social support. *Psychosom Med*. 1995; 57: 183-194.
33. McLean KC, Mansfield CD. The co-construction of adolescent narrative identity: Narrative processing as a function of adolescent age, gender, and maternal scaffolding. *Dev Psychol*. 2011; 48(2): 436-447.
34. Brody G, Ge X, Conger R, et al. The influence of neighborhood disadvantage, collective socialization, and parenting on African American children's affiliation with deviant peers. *Child Dev*. 2001; 72(4): 1231-1246.
35. Conger RD, Conger KJ, Elder GH, Lorenz FO, Simons RL, Whitbeck LB. A family process model of economic hardship and adjustment of early adolescent boys. *Child Dev*. 1992; 63(3): 526-541.
36. Ge X, Conger RD, Lorenz FO, Simmons RL. Parents' stressful life events and adolescent depressed mood. *J Health Soc Behav*. 1994; 35(1): 28-44.
37. Locke LM, Prinz RJ. Measurement of parental discipline and nurturance. *Clin Psychol Rev*. 2002; 22: 895-929.
38. Myers MG, McInnis NH, Fodor GJ, Leenen FHH. Comparison between an automated and manual sphygmomanometer in a population survey. *Am J Hypertens*. 2008; 21(3): 280-283. doi:10.1038/ajh.2007.54.
39. Mattu GS, Panagiotides H, Wright JM. Comparison of the automated non-invasive oscillometric blood pressure monitor (BpTRU) with the auscultatory mercury sphygmomanometer in a paediatric population. *Blood Press Monit*. 2004; 9: 39-45.
40. Chen E, Langer DA, Raphaelson YE, Matthews KA. Socioeconomic status and health in adolescents: The role of stress interpretations. *Child Dev*. 2004; 75(4): 1039-1052.
41. Smith TW, Gallo LC, Goble L, Ngu LQ, Stark KA. Agency, communion, and cardiovascular reactivity during marital interaction. *Health Psychol*. 1998; 17(6): 537-545.
42. Haden C. Reminiscing with different children: Relating maternal stylistic consistency and sibling similarity in talk about the past. *Dev Psychol*. 1998; 34: 99-114.
43. Jennings L, Pasupathi M, McLean KC. Intricate lettings in and lettings out: Scaffolding of narrative identity in newly-dating romantic partners. *Self Identity*. 2013;1–17.
44. Sales JM, Fivush R, Peterson C. Parental reminiscing about positive and negative events. *J Cogn Dev*. 2003; 4(2): 185-209.
45. Kiecolt-Glaser J, Newton TL. Marriage and health: His and hers. *Psychol Bull*. 2001; 127: 474-503.
46. Reese E, Fivush R. Parental styles of talking about the past. *Dev Psychol*. 1993; 29(3): 596-606.
47. Mannle S, Barton M, Tomasello M. Two-year-olds' conversations with their mothers and preschool-aged siblings. *First Lang*. 1992; 12(34): 57-71.
48. Fivush R, Sales JM. Coping, attachment, and mother-child narratives of stressful events. *Merrill-Palmer Q*. 2006; 52(1): 125-150.
49. Fivush R, Vasudeva A. Remembering to relate: Socioemotional correlates of mother-child reminiscing. *J Cogn Dev*. 2002; 3(1): 73-90.
50. Clark H, Schaefer E. Contributing to discourse. *Cogn Sci*. 1989; 13: 259-294.
51. Kraut RE, Lewis SH, Swezey L. Listener responsiveness and the coordination of conversation. *J Pers Soc Psychol*. 1982; 43(4): 718-731.
52. Shipman KL, Schneider R, Fitzgerald MM, Sims C, Swisher L, Zigler E. Maternal emotion socialization in maltreating and non-maltreating families: Implications for children's emotion regulation. *Soc Dev*. 2007; 16(2): 268-285.
53. Matthews KA, Woodall KL, Allen MT. Cardiovascular reactivity to stress predicts future blood pressure status. *Hypertension*. 1993; 22(4): 479-485.
54. Matthews K, Katholi CR, McCreath H, et al. Blood pressure reactivity to psychological stress predicts hypertension in the CARDIA study. *Circulation*. 2004; 110(1): 74-78.
55. Menkes MS, Matthews KA, Krantz DS, et al. Cardiovascular reactivity to the cold pressor test as a predictor of hypertension. *Hypertension*. 1989; 14(5): 524-530.
56. Chen E, Matthews KA, Salomon K, Ewart CK. Cardiovascular reactivity during social and nonsocial stressors: Do children's personal goals and expressive skills matter? *Health Psychol*. 2002; 21(1): 16-24.
57. Tomaka J, Blascovich J, Kibler J, Ernst JM. Cognitive and physiological antecedents of threat and challenge appraisal. *J Pers Soc Psychol*. 1997; 73(1): 63-72.
58. Tomaka J, Blascovich J, Kelsey RM, Leitten C. Subjective, physiological, and behavioral effects of threat and challenge appraisal. *J Pers Soc Psychol*. 1993; 65(2): 248-260.
59. Blascovich J, Mendes WB. Challenge and threat appraisals. In: Elliot AJ, ed. *Handbook of approach-avoidance motivation*. New York: Taylor & Francis Group; 2008: 432-444.
60. Kamarck T, Everson S, Kaplan G, et al. Exaggerated blood pressure responses during mental stress are associated with enhanced carotid atherosclerosis in middle-aged Finnish men. *Circulation*. 1997; 96(11): 3842-3848.
61. Everson SA, Lynch JW, Kaplan GA, Lakka TA, Sivenius J, Salonen JT. Stress-induced blood pressure reactivity and incident stroke in middle-aged men. *Stroke*. 2001; 32(6): 1263-1270.
62. Manuck SB, Olsson G, Hjemdahl P, Rehnqvist N. Does cardiovascular reactivity to mental stress have prognostic value in postinfarction patients? A pilot study. *Psychosom Med*. 1992; 54: 102-108.
63. Dixon SV, Graber JA, Brooks-Gunn J. The roles of respect for parental authority and parenting practices in parent–child conflict among African American, Latino, and European American families. *J Fam Psychol*. 2008; 22(1): 1-10.