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Getting under the skin: Maternal social coaching and adolescent peer adjustment

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ABSTRACT

We investigated the independent and interactive associations between mother-reported social coaching suggestions and adolescent skin conductance level reactivity (SCLR) as predictors of teacher-reported adolescent peer adjustment across the middle school transition among 100 youth (53% boys; *M*age = 11.05 years; 43% ethnic minorities). At higher SCLR, maternal engagement suggestions were associated with poorer peer adjustment, whereas self-reliant suggestions were associated with better peer adjustment among youth. Conversely, at lower SCLR, maternal engagement suggestions were associated with better peer adjustment. Higher SCLR among adolescents may reflect greater arousal and anxiety during a peer problem-solving discussion, which may be intensified by mothers' suggestions to engage with the problem, but alleviated by mothers' suggestions for adolescents to handle the challenge in their own way. In contrast, lower SCLR may reflect insensitivity to environmental challenges; thus, mothers' specific engagement suggestions may equip physiologically under-aroused adolescents with the skills to manage peer challenges, promoting peer adjustment.

Introduction

Youth are faced with a number of potential challenges (e.g., social, academic) during early adolescence, and specifically as they transition to middle school. Peer challenges (e.g., peer rejection, bullying, conflict with friends/peers) have emerged as one of the most salient stressors for adolescents (e.g., Pellegrini, 2002; Rubin, Bukowski, & Laursen, 2009). Challenges or problems in peer relationships are frequently associated with concurrent and subsequent socio-emotional, behavioral, and academic maladjustment (e.g., McDougall & Vaillancourt, 2015; Nakamoto & Schwartz, 2010; Reijntjes et al., 2011; Reijntjes, Kamphuis, Prinzie, & Telch, 2010), raising important questions about how to best help adolescents manage peer stress in ways that might protect against or decrease risk of maladjustment.

Parents remain involved and can provide support and advice when youth are faced with peer stress (e.g., Ladd & Pettit, 2002; Mounts, 2008), yet several studies investigating parental advice-giving have revealed a somewhat inconsistent patterns of findings (Abaied & Rudolph, 2010; McDowell & Parke, 2009). These differences in patterns of associations could be explained in part by individual differences in youths' responses to challenges and/or parental involvement. Indeed, a number of studies have documented the moderating role of youth autonomic functioning in the family functioning-youth adjustment link (e.g., Ellis, Boyce, Belsky, Bakermans-Kranenburg, & van Ijzendoorn, 2011; El-Sheikh & Erath, 2011), with several studies specifically identifying the role of skin conductance level reactivity (SCLR), a marker of physiological arousal and inhibition in response to environmental cues (Beauchaine, 2001; Raine, 2002) in the context of parenting (Erath, El-Sheikh, Hinnant, & Cummings, 2011; Erath, El-Sheikh, & Mark Cummings, 2009; Tu, Erath, & El-Sheikh, 2017; Tu, Erath, Pettit, & El-Sheikh, 2014). Thus, applying a biopsychosocial perspective, the present study investigated adolescent SCLR as a moderator of the association linking maternal social coaching and adolescent peer adjustment over time using a sample of typically developing adolescents.

Parental advice during early adolescence

The development of positive peer relationships and friendships is a key developmental task during early adolescence and around the transition to middle school (Duchesne, Ratelle, & Roy, 2012; Rubin et al., 2009). The middle school transition, coupled with developmental changes, may create new (or exacerbate existing) peer challenges, such as disruptions to previously established social hierarchies, social networks, and friendships (e.g., Lessard & Juvonen, 2018; Pellegrini,

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2002), and greater concerns about social evaluation (e.g., Rudolph & Conley, 2005; Somerville, 2013; Westenberg, Gullone, Bokhorst, Heyne, & King, 2007), contributing to the salience of peer relationships. Parents typically recognize the importance of peer relationships for youth and can play a critical role in shaping how adolescents manage experiences of peer problems or challenges, which may have broader effects on adolescents' overall peer adjustment (Kliewer, Fearnow, & Miller, 1996; Ladd & Pettit, 2002; Mounts, 2008; Tu, Gregson, Erath, & Pettit, 2017).

Our conceptualization of parental social coaching reflects two overlapping frameworks that can be applied to the peer domain. First, based on the parenting and peer relationships conceptual framework (Ladd & Pettit, 2002; Mounts, 2008), parents may serve as an advisor or consultant to youth regarding peer relationships. Second, the socialization of coping framework (Abaied & Rudolph, 2011; Kliewer et al., 1996) proposes that parents can socialize youth coping in response to stress (including peer stress). Informed by these two perspectives, we conceptualized parental social coaching as parents' suggestions for how to cope with peer stress. As social coaches, parents can provide advice or assist youth in problem-solving challenging peer experiences, which may involve behavioral (e.g., problem-solving, help-seeking) and/or cognitive framing (e.g., reappraisal) suggestions (Gregson, Tu, Erath, & Pettit, 2017; Mize & Pettit, 1997; Tu, Gregson, et al., 2017).

Further, consistent with the socialization of coping framework and coping literature (Abaied & Rudolph, 2011; Compas et al., 2017; Kliewer et al., 1996), parents' behavioral and/or cognitive framing suggestions can be further classified into broader categories, including engagement coping suggestions. Engagement coping suggestions refer to the extent to which parents encourage adolescents to directly manage the problem (i.e., problem-solving), seek help (e.g., from adults at school), and/or manage their thoughts (and feelings) about the problem via cognitive reappraisal (e.g., Compas et al., 2017; Kliewer et al., 1996). In the literature, parental engagement coping suggestions have been linked with more engagement coping behaviors among youth (Abaied & Rudolph, 2011; Kliewer et al., 1996). There is also some evidence to suggest that parental social coaching that orients youth to engage with peer problems (e.g., problem-focused, prosocial approaches) is associated with more positive adolescent adjustment (e.g., friendship quality; peer acceptance, engagement coping, lower depression risk), with associations varying by youth social skills, peer status, or peer stress (Abaied & Rudolph, 2010, 2011; Tu, Gregson, et al., 2017). However, a few studies that examined the amount or quality (low-to-high) of parental suggestions more generally in the context of a peer problem discussion revealed links with poorer peer adjustment among youth, potentially reflecting parents' reactions to youths' existing peer problems (McDowell & Parke, 2009; McDowell, Parke, & Wang, 2003).

Additionally, self-reliant coaching suggestions were examined in the present study given increases in autonomy during adolescence (Zimmer-Gembeck & Collins, 2006) and the need to consider developmentally appropriate parental suggestions. However, parental self-reliant suggestions for managing stressors have not been thoroughly examined in the literature and warrant investigation to understand the implications for youth adjustment in the context of stress. Whereas engagement suggestions refer to parents' provisions of specific suggestions to youth for how to manage or think about the situation, self-reliant suggestions refer to parents' encouragement of adolescent autonomy by letting adolescents handle the situation in their own way.

Collectively, the direct effects of parental social coaching (namely engagement suggestions) on youth peer adjustment is somewhat inconsistent or limited, with some evidence to suggest that the effects of social coaching may depend on other factors. Thus, parental social coaching may not confer benefits for all youth; individual differences or characteristics could play a potential role.

The role of skin conductance level reactivity

Indeed, biopsychosocial perspectives (Ellis et al., 2011; El-Sheikh & Erath, 2011) propose that youths' autonomic nervous system activity may interact with family processes (as well as other environmental factors) to predict youth adjustment. Thus, applying this perspective to the present study, we examined the role of adolescent skin conductance level reactivity (SCLR), a marker of the sympathetic branch of the autonomic nervous system, in the context of maternal social coaching behaviors.

SCLR reflects awareness and responsiveness to the environment and serves as an indicator of the behavioral inhibition or caution system, such that under conditions of threat or stress, higher SCLR reflects behavioral inhibition or inhibition of approach behaviors (Beauchaine, 2001). Higher SCLR has been linked with shyness, inhibition, and fearfulness (Beauchaine, 2001; El-Sheikh, 2007). In contrast to higher SCLR, lower SCLR is conceptualized as an indicator of impulsivity or insensitivity to threat or punishment (i.e., fearlessness; Raine, 2002), and has been linked with behavior problems and delinquency (for a reviews see Murray-Close, 2012; Raine, 2002). In the context of an ongoing problem-solving discussion with parents, adolescents' higher SCLR may reflect greater arousal and threat sensitivity to the topic of discussion, whereas lower SCLR potentially reflects insensitivity to the topic being discussed.

In a few prior studies, SCLR has been found to moderate the association between parenting and adolescent adjustment. For instance, in a study investigating observed parental socialization of coping among school-aged children, parental disengagement suggestions (e.g., orienting away from the stressor or stressful emotions and thoughts) reduced problem behaviors six months later among youth exhibiting higher SCLR in response to a frustration task (e.g., star tracer; Stanger, Abaied, Wagner, & Sanders, 2018). Stanger et al. (2018) contended that parental encouragement to disengage or take a break from the situation may help to lessen arousal and anxiety among physiologically reactive youth.

In contrast to the findings with higher SCLR, other studies have found that parental behavioral control over adolescent peer relationships was associated with better peer adjustment for youth exhibiting lower SCLR in response to a peer and cognitive challenge tasks (Tu et al., 2014; Tu, Erath, & El-Sheikh, 2017). Because lower SCLR may reflect insensitivity to threat or social cues, parenting behaviors that provide boundaries (e.g., directing adolescents toward certain peers and away from others) may help to facilitate a more suitable context for these youth to develop positive peer relationships (Tu et al., 2014; Tu, Erath, & El-Sheikh, 2017). Relatedly, in a study of parental emotion socialization, youth with lower SCLR were more negatively affected by parents' non-supportive emotion socialization (e.g., poorer behavioral and social adjustment; McQuade & Breaux, 2017). Collectively, findings provide evidence that the effects of different types of parenting on youth adjustment may depend on youths' physiological functioning. Extending this literature, a novel contribution of the present study is the use of a domain-specific task to elicit SCLR (i.e., mother-adolescent peer problem-solving discussion) in investigating the effects of maternal social coaching.

The present study

Toward extending the literature, the present study utilized a multi-method, multi-informant longitudinal design to investigate adolescent SCLR during a mother-adolescent peer problem-solving discussion as a moderator the association linking different types of mother-reported social coaching (i.e., engagement and self-reliant suggestions) with teacher-reported adolescent peer adjustment (i.e., peer victimization, social status) across the transition to middle school. Based on biopsychosocial perspectives (e.g., Ellis et al., 2011; El-Sheikh & Erath, 2011) and growing evidence of the benefits of parental involvement for

potentially at-risk youth characterized by lower SCLR (Tu et al., 2014; Tu, Erath, & El-Sheikh, 2017), we hypothesized that the associations linking mother's engagement suggestions with better peer adjustment would be stronger for adolescents who displayed lower levels of SCLR. We reasoned that youth exhibiting lower SCLR during mother-adolescent peer problem-solving discussions may be more insensitive to the challenge being discussed, which might reflect, to some degree, their under-responsiveness when they experience a peer challenge and potentially result in displays of inappropriate behaviors or responses. We contend that physiological under-arousal could place youth at risk for greater maladjustment compared with their higher SCLR counterparts. Thus, physiologically under-aroused youth may require specific coaching suggestions from parents about how to respond in challenging peer situations. In contrast, adolescents who exhibit higher SCLR during mother-adolescent peer problem-solving discussions may be more physiologically aroused and anxious in response to the challenge being discussed; thus, it is possible that these youth may experience more distress and/or poorer peer adjustment when mothers encourage youth to engage with the challenge (e.g., Stanger et al., 2018).

Less is known about the effects of maternal responses in the form of self-reliant suggestions. Self-reliance, or the ability to select and implement a given coping strategy, is a key process in becoming more independent during adolescence (Zimmer-Gembeck & Skinner, 2011), and maternal encouragement of youth to handle the problem on their own may help to promote adolescent autonomy and communicate trust in the youth to manage their problems. At the same time, mothers who provide youth greater control, as compared to parents engaging in overcontrolling or restrictive behaviors (Borelli, Margolin, & Rasmussen, 2015; Festa & Ginsburg, 2011), could also help to alleviate stress for youth who are more anxious or aroused when they are faced with challenges (e.g., Stanger et al., 2018) and may yield more positive outcomes. Given limited knowledge about mothers' self-reliant suggestions, no a priori hypotheses were made.

Method

Participants

Youth and their mothers were followed across the youths' transition to middle school. At Time 1 (T1; spring), all youth were in their last year of elementary school (5th grade). At Time 2 (T2; fall), all youth had transitioned to middle school (6th grade). At T1, participants included 100 youth (53% boys; *M* age = 11.05 years, *SD* = 0.33; ages ranged from 10.08 to 12.17 years) and their mothers (96% biological; *M* age = 41.25 years, SD = 6.22), and 78 teachers (80% participation of those with permission) from a Midwestern county in the United States. At T2, approximately 7.40 months later (*SD* = 0.88), 89 youth (45% boys; *M* age = 11.65 years, *SD* = 0.34) and their mothers (97% biological; *M* age = 41.65 years, *SD* = 5.68) returned. Approximately 76 teachers participated (85% participation of those with permission) at T2. Results from *t*-tests revealed no significant differences for youth with or without T1 or T2 teacher reports on primary study variables.

The sample of youth was comprised of 57% European Americans, 11% African Americans, 6% Asians, 12% mixed race youth, and 14% Hispanic/Latino youth. The racial/ethnic composition of mothers included 63% European Americans, 8% African Americans, 9% Asians, 3% other or mixed race, and 17% Hispanic/Latino. Among mothers, 75% had a Bachelor's degree or higher, 79% were employed, and 85.4% were married. Approximately 4.1% of the mothers reported a total annual income < $25,000, 33.0% reported annual income between $25,000 and $75,000, and 62.9% > $75,000. Family demographics reflected the community from which participants were recruited (U.S. Census Bureau, 2017).

Procedures

All study procedures and instruments in the current study were reviewed and approved by the university's institutional review board. Pertinent procedures are discussed below. Participants were recruited from surrounding school districts across two consecutive cohorts, spaced one year apart (Cohort 1 data collected in 2017, Cohort 2 data collected in 2018). Results from *t*-tests revealed that compared with participants in Cohort 2, participants in Cohort 1 exhibited lower SCLR [$M_{Cohort1} = -0.40$, $SD = 1.67$; $M_{Cohort2} = 0.43$, $SD = 1.61$, $t(91) = -2.42$, $p = .02$].

Informational letters were sent home with all fifth-grade students at participating elementary schools or distributed via email directly to parents of fifth-grade students. Informational flyers were also distributed in the local community (e.g., hardcopies, electronically). At T1, parents who responded to the letters/flyers were provided with information about the study procedures and scheduled for a research visit over the phone. Youth and mothers visited the research laboratory during the spring (approximately 2.5 h visit). Consent and assent were obtained separately from mothers and youth, respectively; permission to contact youths' teacher to complete surveys was also obtained from mothers. Mothers and youth participated in lab activities, where youths' physiological activity was recorded. Following the lab activities, youth and mothers were asked to complete questionnaires (separately). At T2, after youth had transitioned to middle school, families were re-contacted to participate in a follow-up; parental permission to contact teachers was obtained. At T1 and T2, teachers were contacted to participate after the family's lab visit. Teachers completed surveys approximately 25–28 days (*SDs* = 20.10–21.51, respectively) after the family's lab visit. The average reflects, in part, our approach of contacting the teachers around the same time during the school year to ensure a similar length of time in which teachers had contact with participating students as well as teacher availability to complete surveys at their convenience. Families and teachers were compensated for their time at each wave.

The laboratory protocol included a mother-adolescent interaction task designed for mothers and youth to discuss a recent peer problem that the youth had experienced, during which youths' physiological activity was recorded. Well-trained graduate and undergraduate research assistants (RAs) carried out the study procedures, having undergone extensive training for approximately 2 months. First, mothers and youth were separately asked to complete a checklist of common social challenges that the youth had faced since the start of the school year (Connor-Smith, Compas, Wadsworth, Thomsen, & Saltzman, 2000), and included ratings of stress associated with the challenges (1 = *not at all* to 4 = *very much*). Based on overlap across mothers and youths' checklists and ratings of stress, two to four topic options were then provided for the conversation activity. Following the checklist of common social problems, trained undergraduate RAs placed electrodes on the palm of participant's non-dominant hand to assess youth skin conductance level (SCL) continuously throughout the protocol. Excess wires were looped and taped on participant's wrists to reduce movement artifacts. After a 5-min acclimation period, mothers and youth participated in a 3-min resting baseline period (i.e., watching a slide show of nature pictures on a laptop), and then a 5-min peer problem-solving conversation task. For the conversation task, mothers and youth were instructed to work together and select one topic (from the two to four choices provided) to discuss for 5 min. Participants were instructed to approach the conversation as they normally would. This protocol was modeled after established procedures in the literature (e.g., family interaction tasks, Parent-Adolescent Interaction Task; e.g., Rueter & Conger, 1995). The three most common topics discussed were: being around kids who are rude, having problems with a friend, and being bullied, teased, or hassled by other kids. On average, youth reported moderate levels of stress about the selected peer problem topic (*M* = 2.42, *SD* = 0.94; scale 1–4).

Measures

Maternal social coaching (T1)

Mothers were given the following three hypothetical peer challenge scenarios developed by the first author to assess parental social coaching behaviors: (1) Let's say that some kids at school planned a weekend activity for a few weeks from now, and your child has not been invited; (2) Let's say that another child has been bullying (e.g., teasing, hitting) your child at school; and (3) Let's say that your child was in a situation where he/she felt anxious or nervous about meeting and talking with new kids. For each scenario, mothers were provided with a set of responses and asked to rate the likelihood that they would respond in that manner on a 4-point scale (0 = *not at all* to 3 = *very much*). Response items included problem-solving, help-seeking, reappraisal, and self-reliant suggestions.

Based on conceptualizations in the literature (e.g., Abaied & Rudolph, 2011; Connor-Smith et al., 2000), the *Engagement Suggestions* scale was a composite of problem-solving (e.g., encourage child to deal with the situation—talk with peers about being excluded, stand up for self against bullies, find peers with similar interests or join an activity; 6 items), help-seeking (e.g., encourage child to get help from others-teachers, other children; 3 items), and reappraisal (e.g., consider variety of potential reasons for experience, other perspectives, reasons for experiences; 10 items) across all three scenarios (19-items; $\alpha = 0.68$). Higher scores reflected higher levels of engagement coping suggestions. Of note, for each scenario, internal consistency ranged from 0.41 to 0.62. It is possible that for a given scenario, mothers who endorsed one type of engagement strategy (e.g., help-seeking) were less likely to endorse another type of strategy (e.g., reappraisal; e.g., see Tu, Gregson, et al., 2017).

The *Self-Reliant Suggestions* scale was a composite of items about the adolescent managing problems on his/her own (i.e., let child handle situation in his/her own way), across all three scenarios (3-items; $\alpha = 0.72$). Higher scores reflected higher levels of self-reliant suggestions.

In addressing the validity of our measures, on average, 73–90% of mothers reported that their child had experienced these types of challenging peer situations, ranging from *once* to *often*. Further, 87–94% of mothers reported that their responses were similar to responses they had previously given their child when the child experienced similar challenges, ranging from *somewhat* to *very much*.

Adolescent SCLR (T1)

Adolescent SCL was assessed during a 3 min baseline and a 5 min peer problem conversation with their mothers. SCL data was acquired using MindWare data acquisition system (MindWare Technologies, Inc., Gahanna, OH) through two disposable Ag-AgCl electrodes (1 ½" x 1" foam, 0% chloride gel) placed on the palms of the non-dominant hand. SCL scores (units = microsiemens or μS) were quantified with MindWare EDA analysis software (MindWare Technologies, Inc.). Reactivity was computed as a residualized change score such that higher scores reflected higher arousal/activity from baseline to conversation.

Teacher-reported negative peer adjustment (T1 and T2)

Adolescent peer victimization was assessed using the 6-item subscale of the Social Behavior Rating Scale (e.g., "Other children tease or make fun of this child." Schwartz, Farver, Chang, & Lee-Shin, 2002). Items were rated on a 5-point scale (1 = *almost never true of the child* to 5 = *almost always true of the child*). This measure was reliable at T1 and T2 (αs = 0.89 and 0.92, respectively). Adolescent social status was assessed using 3 items (e.g., "popular"- reverse scored, "neglected," and "rejected;" Rudolph & Clark, 2001). Items were rated on a 7-point scale (1 = *not at all* to 7 = *extremely*). Higher scores on social status reflect lower social status. This measure was reliable at T1 and T2 (αs = 0.81 and 0.77, respectively). Teacher reports of peer victimization and social status were positively correlated at T1 and T2 (*r*s = 0.42 and 0.58, respectively). The two measures were therefore standardized and averaged to obtain a measure of negative peer adjustment, with higher scores indicating poorer peer adjustment.

Covariates

Adolescent gender (coded 0 = girls, 1 = boys), cohort (coded 0 = Cohort 1, 1 = Cohort 2), and mothers' education (from 1 = grade school to 9 = doctorate degree), were included as covariates in our main models. These covariates were included based on associations with primary study constructs in prior studies and the current study's preliminary findings.

Plan of analysis

Data were checked for outliers and skewed distributions; T1 composite of teacher-reported negative peer adjustment was positively skewed. All other skewness statistics were within the acceptable range (absolute value of 1.63). Preliminary analyses examining descriptive statistics and correlations were conducted for all study variables. To address our research questions, a series of path models were tested in Mplus version 8.2 (Muthén & Muthén, 2017) to separately examine maternal engagement suggestions and maternal self-reliant suggestions. Each set of models examined T1 maternal social coaching as a predictor of T2 adolescent peer adjustment at T2, controlling for T1 peer adjustment as well as covariates (i.e., adolescent gender, mother education, cohort). Additionally, adolescent SCLR and the interaction between maternal social coaching and adolescent SCLR were also entered as predictors of T2 adolescent peer adjustment.

Tests of simple slopes were conducted for significant interactions and plotted to clarify the associations among variables (Preacher, Curran, & Bauer, 2006). Simple slopes represent the association between the predictor (maternal social coaching) and outcome (teacher-reported peer adjustment) at +/− 1.5 *SD* of the moderator (adolescent SCLR). We probed significant interactions at 1.5 *SD* in order to capture the associations at lower and higher levels of SCLR that could be more indicative of potentially problematic physiological reactivity. Regions of significance tests were also conducted to determine the point at the moderator (adolescent SCLR) in which the association between the predictor and outcome became significant. Illustrative plots of significant interactions are presented in Figs. 1 and 2 and depict associations at +/− 2 *SD*s across all study variables in order to depict the full range of the regions of significance.

Teacher reports of peer adjustment were missing for 22 youth at T1 and 25 youth at T2. Additionally, at T1, SCLR data were missing for six youth because of technical issues, and maternal reports of social coaching were missing for one participant. To account for both missingness and non-normality of the data, a robust full-wise maximum likelihood estimator (FIML) was used. The robust estimator produces standard errors and chi-square test statistics that are robust to non-normal distributions. FIML uses all data available and ensures that estimates are less biased compared to other approaches for dealing with missingness (Schafer & Graham, 2002). Because FIML was used, the *N* was 100 for both models.

Results

Preliminary analyses

Descriptive statistics and correlations among study variables are presented in Table 1. Indices of maternal social coaching were not correlated with one another. T1 maternal engagement and self-reliant suggestions were unrelated to T1 and T2 indices of negative peer adjustment, but higher adolescent SCLR was correlated with more negative peer adjustment at T2. Indices of adolescent peer adjustment were

Table 1
Descriptive statistics and correlations among study variables.

	1	2	3	4	5	6	7
1. T1 Maternal engagement suggestions	–						
2. T1 Maternal self-reliant suggestions	0.06	–					
3. T1 Adolescent SCLR	−0.02	0.03	–				
4. T1 Teacher-reported peer victimization	0.18	0.15	0.17	–			
5. T1 Teacher-reported social status	−0.05	−0.01	0.16	0.42***	–		
6. T2 Teacher-reported peer victimization	0.12	−0.19	0.23*	0.41**	0.38**	–	
7. T2 Teacher-reported social status	0.07	−0.22+	0.23*	0.38**	0.41***	0.58***	–
Mean (*SD*)	2.11 (0.30)	1.92 (0.60)	0.00 (1.69)	1.29 (0.43)	2.04 (1.07)	1.16 (0.39)	2.18 (1.10)
Range	1.21–2.79	0.33–3.00	−3.36-4.81	1.00–3.00	1.00–5.67	1.00–2.83	1.00–6.00

Note. T1 = data collected at Time 1, T2 = data collected at Time 2, SCLR = skin conductance level reactivity. Social status is scored so that higher scores = lower social status. At Times 1 and 2, teacher reports of peer victimization and social status were standardized and composited to create a single score for teacher-reported negative peer adjustment (Time 1: $M = 0.00$, $SD = 0.85$, range = −0.88–3.05; Time 2: $M = 0.00$, $SD = 0.86$, range = −0.87–3.06).
+ $p < .10$.
* $p < .05$.
** $p < .01$.
*** $p < .001$.

stable over time. Among covariates, mothers' education was negatively correlated with adolescents' T2 negative peer adjustment.

The moderating role of adolescent SCLR

Maternal engagement suggestions

The final model for maternal engagement suggestions (i.e., covariates, main effects, and interaction effects) indicated adequate fit [χ^2 (12) = 12.83, $p = .38$; RMSEA = 0.03 (*ns*), CFI = 0.98, SRMR = 0.08]. As shown in Table 2, neither engagement suggestions nor adolescent SCLR significantly predicted adolescent peer adjustment over time. However, adolescent SCLR moderated the prospective association between maternal engagement suggestions and adolescent peer adjustment, explaining 2% of the unique variance. When probed at +/− 1.5 *SD,* tests of simple slopes revealed that mothers' engagement suggestions predicted poorer peer adjustment at higher levels of SCLR ($B = 1.24$, $SE = 0.57$, $p = .03$), but better peer adjustment at lower levels of SCLR ($B = -1.13$, $SE = 0.58$, $p = .049$). Further, a test of the regions of significance revealed that the association between mothers' engagement suggestions and poorer peer adjustment became significant at 1.10 *SD*s above the mean of SCLR (e.g., higher SCLR; 14% of participants). Conversely, at 1.48 *SD*s below the mean of SCLR (e.g., very low levels of SCLR; 7% of participants), maternal engagement suggestions were associated with better peer adjustment. Thus, as depicted in Fig. 1, mothers who reported more engagement suggestions had adolescents who experienced poorer peer adjustment when adolescents displayed higher SCLR during the mother-adolescent peer problem conversation. In contrast, higher levels of maternal engagement suggestions were associated with better peer adjustment among adolescents who exhibited very low SCLR. Of note, analyses conducted separately by engagement suggestions for each hypothetical scenario revealed nearly identical findings as the composite of engagement suggestions.

Maternal self-reliant suggestions

The final model of maternal self-reliant suggestions (i.e., covariates, main effects, and interaction effects) also indicated good fit [χ^2 (12) = 14.68, $p = .30$; RMSEA = 0.05 (*ns*), CFI = 0.95, SRMR = 0.08]. A main effect emerged such that mothers' higher self-reliant suggestions at T1 were related to better peer adjustment at T2, and adolescent SCLR also moderated this association (see Table 2). The interaction between mothers' self-reliant suggestions and adolescent SCLR explained 6% of the unique variance in adolescent peer adjustment. When probed at +/− 1.5 *SD,* tests of simple slopes revealed that mothers' self-reliant suggestions were associated with better peer adjustment at higher levels of SCLR ($B = -1.02$, $SE = 0.32$, $p = .001$), but not at lower levels of SCLR ($B = -0.04$, $SE = 0.15$, $p = .78$). A regions of significance test indicated that the association between mothers' self-reliant suggestions

Table 2
Interactive contributions of maternal social coaching and adolescent SCLR to youth negative peer adjustment at Time 2.

	T2 Adolescent negative peer adjustment					
	Model 1			Model 2		
	Maternal engagement suggestions			Maternal self-reliant suggestions		
	B (*SE*)	β	*p*	*B* (*SE*)	β	*p*
Covariates	$R^2 = 0.31$			$R^2 = 0.31$		
Intercept	0.62 (0.51)	0.71	0.22	0.62 (0.51)	0.71	0.22
T1 Adolescent negative peer adjustment	0.54 (0.15)	0.52	< 0.001	0.54 (0.15)	0.52	< 0.001
Adolescent gender (1 = boys)	0.09 (0.18)	0.05	0.63	0.09 (0.18)	0.05	0.63
Mothers' education	−0.10 (0.07)	−0.18	0.16	−0.10 (0.07)	−0.18	0.16
Cohort (1 = Cohort 2)	0.08(0.17)	0.05	0.64	0.08(0.17)	0.05	0.64
Main Effects	$R^2 =. 30$			$R^2 = 0.41$		
T1 Maternal social coaching	0.16 (0.36)	0.05	0.66	−0.32 (0.08)	−0.32	< 0.001
T1 Adolescent SCLR	0.05 (0.05)	0.09	0.37	0.11 (0.09)	0.11	0.22
Interaction	$R^2 = 0.32$			$R^2 = 0.47$		
T1 Maternal Social Coaching x Adolescent SCLR	0.47 (0.19)	0.28	0.01	−0.19 (0.08)	−0.21	0.02

Note. T1 = data collected at Time 1, T2 = data collected at Time 2, SCLR = skin conductance level reactivity. Multi-group analyses were conducted for Models 1 and 2 to examine adolescent gender differences and no significant gender differences emerged.

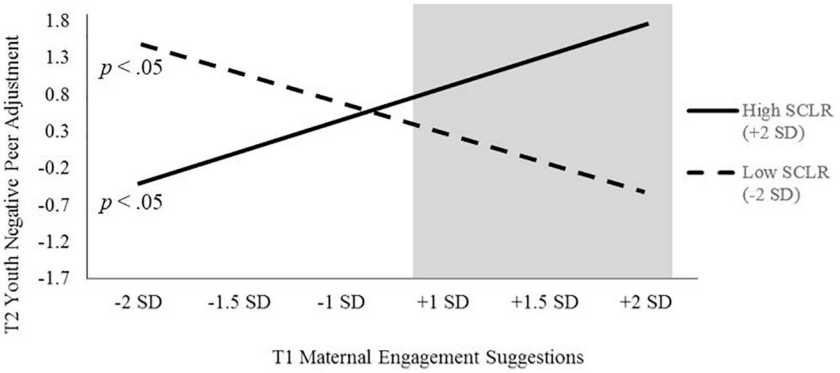

Fig. 1. The association between T1 maternal engagement suggestions and T2 teacher-reported negative peer adjustment at higher and lower levels of SCLR. *Note.* T1 = data collected at Time 1, T2 = data collected at Time 2, SCLR = skin conductance level reactivity. Shaded areas correspond with the point at which the association between maternal engagement suggestions and youth negative peer adjustment becomes significant.

Fig. 2. The association between T1 maternal self-reliant suggestions and T2 teacher-reported negative peer adjustment at higher and lower levels of SCLR. *Note.* T1 = data collected at Time 1, T2 = data collected at Time 2, SCLR = skin conductance level reactivity. Shaded area corresponds with the point at which the association between maternal self-reliant suggestions and youth negative peer adjustment becomes significant.

and better peer adjustment became significant at 0.96 *SD* below the mean of SCLR (17% of participants). As depicted in Fig. 2, compared to lower levels of mothers' self-reliant suggestions, higher levels of mothers' self-reliant suggestions were associated with better peer adjustment at higher levels of SCLR. Additionally, lower levels of maternal self-reliant suggestions yielded poorer peer adjustment at higher but not lower SCLR.

Discussion

Early adolescence is a period where youth begin to gain greater autonomy from parents (e.g., Zimmer-Gembeck & Collins, 2006), yet the changes and challenges that often accompany the transition to middle school (as well as other developmental changes) may create circumstances in which youth may benefit from parental guidance and support. However, the extent to which parental support may be helpful likely depends on youth characteristics, such as their responses to challenges and parental involvement. The present study utilized a multi-method, multi-informant longitudinal design to examine adolescent SCLR (to a peer problem discussion) as a moderator of the association between mother-reported maternal social coaching and teacher reports of adolescent peer adjustment across the transition to middle school. In response to hypothetical peer challenges, maternal self-reliant suggestions, but not engagement suggestions, were associated with better peer adjustment (i.e., less peer victimization, higher social status) across the middle school transition. Further, supportive of hypotheses, SCLR moderated the association linking both types of maternal suggestions with adolescent peer adjustment. Specifically, maternal engagement suggestions were associated with poorer peer adjustment over time at high levels of SCLR, but better peer adjustment over time at low levels of SCLR. In contrast, maternal self-reliant suggestions were associated with better peer adjustment at higher levels of SCLR.

Findings regarding SCLR as a moderator were mostly consistent with our hypotheses and prior research. Specifically, youth exhibiting higher levels of physiological arousal (i.e., higher SCLR) experienced poorer peer adjustment over time when mothers reported more engagement or less self-reliant suggestions. Yet, these same youth experienced better peer adjustment in response to higher levels of maternal self-reliant suggestions. Higher SCLR in response to mother-adolescent peer problem discussions could potentially reflect more arousal and anxiety about peer problems (e.g., Beauchaine, 2001). Whereas maternal engagement suggestions could exacerbate youths' physiological arousal or anxiety or encourage youth to engage in behaviors beyond their skill level, resulting in poorer peer adjustment, maternal self-reliant suggestions may help to reduce youths' physiological arousal and anxiety (e.g., Stanger et al., 2018).

Findings are consistent with a prior study in which parental disengagement suggestions reduced problem behaviors for children who exhibited higher SCLR (Stanger et al., 2018). Youth exhibiting higher arousal may need time and/or assistance to “calm down” or regulate their physiological arousal before attempting to engage with the problem or challenge. This could be supported through disengagement (Stanger et al., 2018) and self-reliant coping suggestions, as compared to encouragement to engage with the problem. Self-reliant suggestions in particular may place greater autonomy and control with the adolescent (Zimmer-Gembeck & Skinner, 2011) to manage the problem in a way that best suits their disposition and yield more positive outcomes when they exhibit greater physiological arousal in response to challenge.

In addition to our finding that higher levels of maternal self-reliant suggestions were associated with better peer adjustment over time at higher levels of SCLR, we want to recognize that our findings also revealed that lower levels of maternal self-reliant suggestions were associated with *poorer* peer adjustment over time at higher levels of SCLR. Some degree of encouragement from mothers to think about how to manage peer problems, without encouraging youth to specifically engage with the problem or telling them what to do, may be more helpful for physiologically aroused youth. In support of the potential benefits of more self-reliant and less engagement suggestions for physiologically aroused youth, in the anxiety literature, parental overcontrol has been

consistently documented to contribute to more anxiety among youth (e.g., Borelli et al., 2015; Festa & Ginsburg, 2011). Parental overcontrol may yield poorer adjustment by hindering anxious youths' skill development and opportunities to process and manage challenging experiences on their own (Becker, Ginsburg, Domingues, & Tein, 2010). The findings from our study focusing on physiological arousal, a proposed correlate but not direct measure of anxiety and internalizing symptomatology more broadly (e.g., Beauchaine, 2001; El-Sheikh, 2007), appears to be consistent with the general premise of the aforementioned findings in the anxiety literature. Thus, providing space and opportunities for physiologically aroused youth to work through peer challenges at their own pace or in a way that fits within their repertoire of skills may facilitate better peer adjustment.

In contrast, physiologically under-aroused youth (i.e., exhibiting low SCLR) appeared to experience better peer adjustment when mothers reported more engagement suggestions for managing peer problems. Adolescents' physiological under-responsiveness during a peer problem conversation may reflect their insensitivity to the social challenge (e.g., Raine, 2002; Tu et al., 2014; Tu, Erath, & El-Sheikh, 2017). Mother's suggestions to engage with and attempt to resolve or reappraise peer problems may help to equip under-aroused youth with specific strategies or approaches for managing peer challenges, potentially fostering social skill development, resulting in better peer adjustment over time. These findings highlight the benefits of more hands-on parenting for youth exhibiting lower SCLR. This pattern of association is consistent with prior studies documenting the positive association between parental management of adolescent peer relationships and adolescent peer adjustment for youth exhibiting physiological under-arousal (Tu et al., 2014; Tu, Erath, & El-Sheikh, 2017).

In applying and translating findings into practice, collectively, our results highlight the importance of parental attentiveness to adolescent cues (e.g., physiological arousal or under-arousal) in order to adjust their parenting approaches to enhance, rather than hinder, adolescents' peer adjustment when faced with peer stress. Specifically, for youth who are physiologically aroused, a multi-step process may facilitate better peer adjustment. For instance, it may be especially important for physiologically aroused youth to first focus on regulating and managing their physiological arousal, which could then enable them to better process and enact specific suggestions from mothers about how to manage the situation. In contrast, if youth are experiencing physiological under-arousal in the context of a peer problem-solving discussion, this might indicate that youth are not processing social cues in a normative or appropriate way, which could contribute to inappropriate behaviors or responses. Our findings suggest that parents can help youth learn how to understand, frame, and process information about a peer problem in a way that promotes more socially skillful behaviors and responses, reducing the likelihood of peer maladjustment. An important consideration for future research would be to examine links between physiological arousal/under-arousal and observable emotions and behaviors to better apply the findings from our study. Additionally, the findings that self-reliant suggestions were associated with better peer adjustment, particularly for physiologically aroused youth, highlight the transition to middle school and early adolescence more generally as an important period of autonomy development for youth. Based on these findings, we might suggest that parents' not only consider a multi-step approach (as mentioned above) to managing peer problems, but also consider the need for adolescents to develop and exercise autonomy in relation to negative peer experiences, which may be especially important for youth experiencing greater physiological arousal.

In continuing to move this line of research forward, there are several limitations of the present study and considerations for future work. The study included a community sample that was relatively well-adjusted and comprised of well-educated, higher income European American families. Thus, findings cannot be generalized to at-risk or more diverse racial/ethnic or socioeconomic populations. Further, the examination of parents' suggestions to adolescents' *actual* versus hypothetical challenging peer experiences and adolescents' interpretation of challenging situations would help to better determine the influence of parents' suggestions and could also address the reliability of mother-reported coping suggestions. This study also focused on mothers, but the inclusion of fathers would be important in future work as fathers also continue to be involved in adolescents' lives (e.g., Day & Padilla-Walker, 2009). In addition to SCLR, other physiological responses to stress (e.g., cortisol), as well as youths' responses to a real-time or ongoing peer challenge, would provide a more comprehensive picture of the role of adolescent physiological and biological regulation in response to stress. Future research should also consider other types of parental support in the context of peer problems (e.g., providing comfort, process of brainstorming solutions) and the extent to which youth may implement suggestions their parents provide.

Despite these limitations, the present study provides new evidence of how certain types of maternal social coaching approaches (e.g., engagement vs self-reliant suggestions) may be better suited for adolescents exhibiting different physiological responses to peer problem-solving discussions. The examination of different types of maternal social coaching, and specifically the focus on maternal self-reliant suggestions advances the literature. Additionally, assessing physiological responses during a peer problem-solving discussion is a notable strength as it aligned with the maternal social coaching construct and allowed for a test of domain-specific processes. Further, the examination and findings with teacher reports of adolescent peer adjustment are noteworthy because teachers have a unique perspective as they are able to observe youth behaviors and their interactions with peers in a different context (i.e., schools) compared with parents. Findings from our multi-informant, multi-method investigation revealed that maternal self-reliant suggestions as compared to engagement suggestions were associated with better peer adjustment for physiologically aroused youth, whereas maternal engagement suggestions were associated with better peer adjustment for physiologically under-aroused youth.

Overall, these findings have broader implications for how parents may attempt to help when youth are faced with peer challenges. Consistent with some prior evidence in which the association between parental suggestions to engage with peer problems and youth adjustment varied by youth peer experiences (e.g., level of peer stress, peer status; Abaied & Rudolph, 2010, 2011; Tu, Gregson, et al., 2017), findings from the current study further contribute to the idea that parents' suggestions to engage with the peer stressor may only be helpful for certain youth. Indeed, our findings highlight the need to consider the extent to which parents' suggestions are well-suited for youth with different physiological responses in response to discussions about peer challenges.

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Declaration of Competing Interest

The authors have no conflict of interest to report.

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