

**Person by Environment in the Peer Domain: Parenting Strategies and Preadolescent
Physiological Responses in the Context of Peer Stress**

by

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Abstract

During preadolescence, concerns about maintaining and developing friendships, gaining peer acceptance, and avoiding peer victimization become central concerns. The transition to middle school can create or exacerbate these concerns. Parents may be in a position to help preadolescents navigate these developmental and ecological challenges, promote positive peer relationships, and help with peer problems. Yet the effectiveness of parental involvement might depend on preadolescents' physiological responses to peer stress. The present study investigated whether parenting in the peer domain (facilitation, directing, problem-solving) predicted preadolescent peer adjustment (peer victimization, friendship support, peer acceptance) across the transition to middle school and whether preadolescents' physiological responses to peer stress, including respiratory sinus arrhythmia (RSA), RSA reactivity (RSAR), skin conductance level (SCL), and SCL reactivity (SCLR), moderated the association between parenting and peer adjustment. Participants included 123 preadolescents and one parent and teacher per preadolescent. At Time 1 (summer before middle school transition), preadolescents and parents participated in a laboratory visit, during which preadolescents' physiological responses to lab-based peer stress were assessed. Preadolescents completed questionnaires about friendship support and peer victimization; parents completed questionnaires about peer-related parenting behaviors. The spring before the laboratory visit, teachers completed questionnaires about preadolescents' peer acceptance and peer victimization. At Time 2 (nine months after participants began middle school), preadolescents and teachers completed the same peer

adjustment questionnaires. Analyses revealed that peer-related parenting behaviors were mostly uncorrelated with each other. Results also suggested few direct effects of peer-related parenting on peer adjustment across the middle school transition. However, interactions between parenting and preadolescents' physiological responses to peer stress predicted peer adjustment in several cases. As anticipated, facilitation and problem-solving predicted better peer adjustment among preadolescents with low RSA and high SCL/R, respectively; directing predicted better peer adjustment among preadolescents with low RSAR and low SCLR and poorer peer adjustment among preadolescents with high RSAR and high SCLR. Unexpectedly, directing predicted better peer adjustment among preadolescents with high SCL. Thus, optimal peer-related parenting behaviors may depend on compatibility with preadolescents' physiological responses to peer stress. Findings and implications for peer-related parenting behaviors, preadolescents' physiological responses, and preadolescents' peer adjustment are discussed.

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List of Abbreviations

ANS	Autonomic nervous system
PNS	Parasympathetic nervous system
PR	Preadolescent report
RSA	Respiratory sinus arrhythmia
RSAR	Respiratory sinus arrhythmia reactivity
RSA/R	Respiratory sinus arrhythmia and/or respiratory sinus arrhythmia reactivity
SCL	Skin conductance level
SCLR	Skin conductance level reactivity
SCL/R	Skin conductance level and/or skin conductance level reactivity
SNS	Sympathetic nervous system
T1	Time 1
T2	Time 2
TR	Teacher report

I. INTRODUCTION

Many preadolescents experience elevated stress due to developmental and ecological transitions that complicate peer interactions and relationships. Developmental changes, such as puberty and emerging abstract thinking capabilities, fuel concerns about appearance, behavior, and peer evaluation (Darling, Dowdy, Lee Van Horn, & Baldwin, 1999; Simmons & Blyth, 1987). In particular, worries about peer exclusion and teasing are among the most frequent and intense worries reported by children (Silverman, La Greca, & Wasserstein, 1995), and these worries increase from childhood to adolescence (Westenberg, Drewes, Goesdhart, Siebelink, & Treggers, 2004). Many preadolescents actually experience occasional exclusion or victimization from peers (Sandstrom, 2004; Wang, Iannotti, & Nansel, 2009). In addition, ecological changes further contribute to challenges in the peer domain across the transition to middle or junior high school. Preadolescents may encounter changes in their social environment, such as a larger, more diverse peer group, when multiple elementary schools feed into a single middle school, as well as disruptions in established friendships when classes are separated by subject and ability. Due to the dynamic nature of the peer group in middle school, building friendships, gaining peer group acceptance, and avoiding peer victimization are key developmental tasks and central concerns at this age. Parents typically recognize the significance of peer relationships and wish to help their children navigate these social challenges. Despite the trend of preadolescents spending less time with parents, most parents remain involved and retain considerable influence (Engles, Dekovic, & Meeus, 2002; Galambos, Barker, & Almeida, 2003; Larson & Richards, 1991). Yet, parents commonly report uncertainty about how to help their children with peer

relationship problems (Rigby, 2007), and parenting that is specifically geared toward peer relationships is surprisingly understudied. In fact, research on any specific domain of parenting (e.g., parenting about youths' social lives, academics, etc.) is relatively scarce compared to research on general parenting, although parenting beliefs, values, and behaviors may vary across different domains of child development (Costanzo & Woody, 1985; Parke & Ladd, 1992). Disaggregating parenting typologies and examining specific domains of parenting may allow researchers to better predict child outcomes in specific domains, such as the domain of peer relationships (Coleman & Karraker, 2000; Costanzo & Woody, 1985; Smetana & Daddis, 2002), and provide more specific recommendations for intervention.

Only a handful of studies have examined domain-specific parenting in the peer domain, and these studies have found some support for associations between peer-related parenting behaviors and peer adjustment in childhood and adolescence. Specifically, *parental facilitation* of peer interactions (e.g., providing opportunities and permission to spend time with or participate in activities peers) predicted youths' friendship intimacy, companionship (Vernberg, Beery, Ewell, & Abwender, 1993), and peer acceptance (McDowell & Parke, 2009; Mikami, Jack, Emeh, & Stephens, 2010a) over time. Yet, not all facilitation strategies (e.g., meeting parents of adolescents' peers, encouraging activities, talking to adolescents about peers) were as strongly associated with or predictive of peer adjustment (e.g., McDowell & Parke, 2009; Vernberg et al., 1993). *Parental directing* of adolescents towards positive peers and away from negative peers was associated with having fewer deviant, substance-using friends (Mounts, 2000; 2002). Yet, parents may attempt to direct peer relationships in response to existing problem behaviors (Tilton-Weaver & Galambos, 2003), and directing may be viewed as intrusive by adolescents, yielding more deviant peer affiliation and delinquency (Soenens, Vansteenkiste, &

Niemiec, 2009; Soenens, Vansteenkiste, Smits, Lowet, & Goossens, 2007). Similarly, *parental problem-solving* or coaching about social challenges predicted peer acceptance and social skills among preschool children (Finnie & Russell, 1988; Mize & Pettit, 1997) and school-aged children with attention deficit hyperactivity disorder (ADHD; Mikami et al., 2010a; Mikami, Lerner, Griggs, McGrath, & Calhoun, 2010b), but parents may also engage in reactive problem-solving when their children have peer problems, potentially explaining the unexpected negative association between problem-solving and peer adjustment in some studies (Laird, Pettit, Mize, Brown, & Lindsey, 1994; McDowell, Parke, & Wang, 2003). Thus, although the existing literature provides some support for associations between peer-related parenting and peer adjustment, results are not always strong or entirely consistent.

Given the number of challenges in the peer domain during preadolescence, individual differences in preadolescents' physiological responses to peer challenge may also shape social outcomes. Negative peer experiences evoke physiological responses indicative of stress (Erath, Tu, & El-Sheikh, 2012; Gazelle & Druhen, 2009; Hessler & Katz, 2007; Stroud et al., 2009), and there is some evidence that physiological measures of stress reactivity and regulation are associated with children's peer adjustment (e.g., Calkins & Keane, 2004; Graziano, Keane, & Calkins, 2007). For example, higher skin conductance level (SCL), an index of sympathetic nervous system (SNS) arousal (Beauchaine, 2001; El-Sheikh & Erath, 2011; Fowles, Kochanska, & Murray, 2000), was associated with social anxiety, specifically among peer victimized preadolescents (Erath et al., 2012). In addition, higher respiratory sinus arrhythmia (RSA) and reductions in RSA (RSAR or vagal withdrawal), which are physiological markers of emotion regulation (Beauchaine, 2001; El-Sheikh & Erath, 2011; Porges, 2007), have been linked with

higher peer acceptance among preschool children (Graziano et al., 2007) and prosocial skills among preadolescents (Erath et al., 2012).

Beyond main effects, preadolescents' physiological responses to peer stress experiences may shape the effectiveness (or ineffectiveness) of parental attempts to support their peer relationships. That is, like research documenting person by environment interactions (e.g., Bates & Pettit, 2007; Ellis, Boyce, Belsky, Bakermans-Kranenburg, & Van Ijzendoorn, 2011; Rothbart & Bates, 2006), the association between parenting in the peer domain and preadolescents' peer adjustment may vary depending on preadolescents' physiological responses to peer stress, such that certain forms of parental involvement in preadolescents' peer relationships may be particularly well (or poorly) suited to preadolescents with certain characteristics. For instance, children with lower parasympathetic regulation (lower RSAR) had better peer relationships in the context of higher-quality parent emotion coaching (compared to lower-quality parent emotion coaching), whereas children without vulnerabilities had generally positive peer relationships across the range of parents' emotion coaching quality (Hastings & De, 2008; Katz & Windecker-Nelson, 2004).

Using the person by environment framework (e.g., Bates & Pettit, 2007; Ellis, et al., 2011), as well as the developmental psychopathology framework (Cicchetti, 2006) more generally, the present study integrated knowledge about parenting (Ladd & Pettit, 2002), psychophysiology (Beauchaine, 2001; Porges, 2007), and peer relationships (Rubin, Bukowski, & Parker, 2006). The specific aims of the present study were to examine (1) whether parenting in the peer domain (facilitation, directing, problem-solving), assessed before the transition to middle school, predicted positive peer adjustment (friendship support, peer acceptance, peer victimization) across the transition to middle school, (2) whether preadolescents' physiological

responses, specifically RSA or RSAR (i.e., RSA/R) and SCL or SCLR (i.e., SCL/R), before and during lab-based peer-evaluative stress predicted positive peer adjustment across the transition to middle school, and (3) whether preadolescents' physiological responses to peer stress moderated the association between parenting in the peer domain and peer adjustment. Additionally, exploratory analyses were conducted to examine sex differences in the association between parenting in the peer domain and peer adjustment.

Although some studies have examined associations linking parenting in the peer domain or children's physiological responses with children's behavioral or peer adjustment, the present study includes several features that overcome limitations of prior research and advance the existing literature. First, the present study focused on preadolescence, a time when developmental and ecological transitions contribute to heightened challenges in the peer domain. Additionally, the longitudinal design allowed for the investigation of change in preadolescent peer adjustment across the transition to middle school. The present study also assessed parenting behaviors in the peer domain (facilitation, directing, problem-solving) that are well-matched with the peer challenges of the preadolescent developmental period. In addition, preadolescents' physiological responses were examined, taking advantage of the opportunity to examine context-specific responses to stress in the peer domain. Multiple dimensions (and multiple informants) of peer adjustment before and after the middle school transition were examined as outcomes. Moreover, the present study investigated the fit between parenting behaviors and preadolescents' physiological responses to peer stress to determine which preadolescents may benefit the most from peer-related parental involvement. The primary innovation of the present study was that parenting, physiological responses, and adjustment were all assessed in the peer domain.

II. LITERATURE REVIEW

Peer Relationships in Preadolescence

During preadolescence, social development is particularly critical, as preadolescents begin to spend more (unsupervised) time with peers and less time with parents (Larson & Richards, 1991). Preadolescents increasingly value positive peer relationships, but also report concerns about social evaluation and peer rejection (Westenberg et al., 2004). Rates of social anxiety peak in middle school (Beidel & Turner, 2007), and 10% to 15% of preadolescents actually experience frequent peer harassment, with more than 50% reporting at least occasional exclusion or maltreatment (Nansel et al., 2001; Sandstrom, 2004; Williams & Guerra, 2007). In addition, coinciding with puberty and concerns about appearance and behaviors, mixed-sex peer interactions become more normative and important, and constitute another source of stress in peer relationships during preadolescence (Connolly, Craig, Goldberg, & Pepler, 2004; Dunphy, 1963). Thus, developing and maintaining friendships, gaining peer acceptance, and avoiding peer victimization become key concerns for preadolescents.

From childhood to adolescence, friendships are increasingly characterized by reciprocity, similarity, and intimacy rather than just proximity (Parker, Rubin, Erath, Wojslawowicz, & Buskirk, 2006). Friendships provide youths with social and emotional skill building opportunities and relationship experiences that support concurrent adjustment and future relationships (Bagwell, Schmidt, Newcomb, & Bukowski, 2001; Hodges, Boivin, Vitaro, & Bukowski, 1999; Parker et al., 2006). Particularly around preadolescence, friendships may also

provide protection against adversity, including peer problems such as victimization (Hodges et al., 1999; Sullivan, 1953; Tu, Erath, & Flanagan, 2012).

In addition to the importance of friendships, preadolescents are highly motivated to gain broader peer group acceptance and avoid peer rejection (Silverman et al., 1995; Westenberg et al., 2004). Rising concerns with peer acceptance may be related to advances in abstract thinking capabilities that foster social comparisons, as well as the development of more exclusive peer cliques and hierarchies of social power and popularity in middle school (Adler & Adler, 1995; LaFontana & Cillessen, 2010; Lease, Musgrove, & Axelrod, 2002; Parker et al., 2006). Youths who are rejected by their peers often suffer from psychological maladjustment, including depressed feelings, educational underachievement, and antisocial behavior problems (Parker & Asher, 1987; Parker et al., 2006).

Another major concern around preadolescence is victimization by peers, which peaks in middle school (Nansel et al., 2001; Wang et al., 2009; Williams & Guerra, 2007). In particular, preadolescents often report concerns about being bullied by older students at school (e.g., Anderson, Jacobs, Schramm, & Splittgerber, 2000; Duchesne, Ratelle, & Roy, 2012). Preadolescents actually experience higher levels of peer victimization, compared to early and middle childhood (Nansel et al., 2001; Wang et al., 2009), although not all studies find that peer victimization increases across the transition to middle school (Pellegrini & Long, 2002). Furthermore, peer victimization is associated concurrently and prospectively with a host of adjustment problems, including internalizing problems, such as anxiety, depression, and loneliness (see Hawker & Boulton, 2000 for meta-analysis), externalizing problems, such as aggression (Hanish & Guerra, 2002), as well as declines in academic achievement (see Nakamoto & Schwartz, 2010 for meta-analysis).

Concerns about developing and maintaining positive peer relationships may be further intensified by the transition to middle school. As noted, the size and diversity of the peer network expands when multiple elementary schools feed into one middle school, which also increases the risk for negative peer influence (Barber & Olson, 2004; Eccles, Lord, & Buchanan, 1996). Additionally, with the departmentalization of classes by subject and ability, preadolescents' existing friendships may be disrupted, as they may not share classes and unstructured periods with their existing friends (e.g., Eccles et al., 1993; 1996). Thus, preadolescents are challenged to maintain existing friendships and establish new friendships. Indeed, youths who make the transition to middle school often report concerns about losing touch with friends and having difficulty making new friends (Anderson et al., 2000; Duchesne et al., 2012). Transition-related challenges in peer relationships are also accompanied by other ecological changes and challenges, such as increasing academic expectations and declining support and supervision from teachers (e.g., Eccles et al., 1993; 1996). Thus, ecological changes across the transition to middle school, coupled with developmental changes in preadolescence (e.g., physical, psychological, social), could potentially exacerbate the social challenges preadolescents encounter and contribute to socio-emotional and academic declines (Eccles et al., 1996).

Several longitudinal studies have found significant differences in social, psychological, and academic adjustment for preadolescents who changed schools from elementary to middle school (Eccles et al., 1996; Barber & Olson, 2004; Midgley, Feldlaufer, & Eccles, 1989; Simmons & Blyth, 1987), compared to preadolescents who did not change schools (Simmons & Blyth, 1987). However, a number of other longitudinal studies did not find differences in preadolescents' well-being (e.g., no change in peer relationship quality, peer victimization, self-esteem, or behavior problems) across the middle school transition (e.g., Cantin & Boivin, 2004;

Eccles, Lord, Roeser, Barber, & Jozefowicz, 1999; Hirsch & Rapkin, 1987; Lohaus, Elben, Ball & Klein-Hessling, 2004; Pellegrini & Long, 2002). Inconsistencies in the literature on children's adjustment across the transition to middle school may be related to variations among children (e.g., differences in samples or individual responses to transition), the school environment or other environmental factors (e.g., peer relationships; Kingery & Erdley, 2007), or varying methodological techniques (Eccles et al., 1996).

The effects of developmental and ecological changes on preadolescents' peer adjustment may depend, in part, on parental involvement in peer relationships (e.g., efforts to promote positive peer relationships and advice about resolving peer challenges), preadolescents' responses to stressful or challenging peer situations, or both. The present study examined whether peer-related parenting behaviors and preadolescents' physiological responses to peer stress independently and interactively predicted preadolescents' peer adjustment across the middle school transition.

Parenting and Peer Adjustment

Two types of parental influence have been associated with children's peer relationships, including indirect and direct parental influences (see Ladd & Pettit, 2002 for a review). Parenting style, or indirect parenting, refers to the emotional and interactive climate (e.g., warmth) that parents establish across contexts (Darling & Steinberg, 1993; Mize & Pettit, 1997). In contrast, direct parental involvement refers to parenting behaviors or practices intended to achieve goals in some domain of child development (Mize & Pettit, 1997), such as managing (e.g., selecting, modifying, structuring) social environments (see Ladd & Pettit, 2002). Within the scope of direct parental involvement, domain-specific parenting refers to the idea that parenting behaviors or practices may vary across different domains of youth development (e.g., behavioral, emotional,

social, academic; Costanzo & Woody, 1985; Grusec & Davidov, 2010; Mize & Pettit, 1997).

Studies examining both indirect parenting (style) and direct parenting (behaviors, practices) have found relatively modest associations between the two (Darling & Steinberg, 1993; Mize & Pettit, 1997). Thus, it appears that parenting style and parenting practices are related, yet somewhat independent predictors of youths' outcomes.

Parenting style, the parent-child relationship, and general (cross-domain) parenting practices have been linked with children's social development and adjustment. For example, research suggests that authoritative (e.g., demanding, yet responsive), warm, and nurturing parenting supports children's social competence, whereas harsh discipline, coercion, and unresponsiveness predict peer problems, such as lower levels of peer acceptance and social skills, and behavior problems, such as aggression (see Ladd & Pettit, 2002 for review). However, indirect parental influence and general parenting practices do not necessarily provide information about how parents specifically shape children's peer relationships. Examining direct parental involvement in preadolescents' peer relationships may yield more precise predictions of peer adjustment, yet research on domain-specific parenting is relatively scarce compared to research on general parenting practices.

Parenting in the peer domain. Ladd and Pettit (2002) proposed that parents' direct involvement with their children's peer relationships takes form in four roles: parent as a designer, mediator, supervisor, and advisor or consultant. Mounts (2008) considered an adolescent perspective on these four roles by reviewing literature on parents' direct involvement with adolescents' peer relationships. Parents' role as a *designer* involves parents influence on children's access to peers based on the settings they choose (e.g., choice of neighborhood, child care, after-school programs). In the *mediator* role, parents serve as the link between family and

peers, facilitating children's peer relationships by arranging activities, managing opportunities for interaction with peers (Mounts, 2008), and by providing transportation to activities with peers. During peer interactions, parents may serve as a *supervisor* in which they can take either a proactive (e.g., directly involved in play activity, providing guidelines and rules for peer interactions), reactive (e.g., only becoming involved if conflict or problem arises), or monitoring (e.g., knowledge or awareness of children's peer activities) role. Lastly, parents can be directly involved in children's peer relationships by serving as an *advisor or consultant* outside the context of peer interactions. Parents may take a proactive or reactive role as an advisor or consultant by discussing with their children how to develop friendships, manage conflict, or deal with teasing or bullying. How parents manage these roles and their level of involvement in these roles may influence children's peer relationships (see Ladd & Pettit, 2002).

However, little is known about the specific roles or influence that parents have on children's peer adjustment as they transition from childhood to adolescence, with much of the existing research having focused on early to middle childhood (Ladd & Pettit, 2002) or adolescence (Mounts, 2008). In preadolescence, parents' roles as mediators (facilitation in the present study) and advisors (directing and problem-solving in the present study) may be particularly relevant. The mediator role (e.g., facilitating opportunities for peer interaction, providing transportation) may become especially important in preadolescence because peer relationships tend to be less localized, or less convenience-based (e.g., friends who live within walking distance). Peer interactions occur across a number of different contexts (e.g., school, friend's homes, etc.), and preadolescents often desire more autonomy from parents, particularly with regards to interactions with friends (Smetana & Asquith, 1994). The advisor or consulting role may be critical in preadolescence because preadolescents encounter more complicated social

situations, such as exclusionary peer group dynamics, bullying and victimization, deviant peer influences, and other-sex interactions and relationships.

The mediator and consulting roles are examples of domain-specific parenting in the peer domain. The importance of studying parenting in the peer domain is dependent, in part, on evidence that parenting in the peer domain is not redundant with more general parenting across other domains of development. Costanzo and Woody (1985) proposed that some domains of development (e.g., moral, behavioral, emotional, social, academic, athletic, artistic, physical health) are socialized differently from other domains because parenting behaviors may be driven by parents' unique values or concerns in a particular domain (independent of the child; based on their own predisposition or experiences) or by children's pre-existing strengths or problems in a particular domain (actual or perceived). Parents' values or concerns may drive them to engage in behaviors that enhance or support child development (Mounts, 2011) or constrain self-discovery and hinder autonomy and self-efficacy in a particular domain (Colwell, Mize, Pettit, & Laird, 2002; Coplan, Arbeau, & Armur, 2008; Costanzo & Woody, 1985; Tilton-Weaver & Galambos, 2003).

Several studies have shown that parents' own beliefs about children's peer relationships influence parenting strategies and children's social adjustment. For example, research with adolescents found that parents' goal to help improve adolescents' peer relationships, as well as their beliefs about their authority over peers, were related to greater parental peer management behaviors, such as consulting and guiding (Mounts, 2008; 2011). Parental beliefs about peer victimization have been found to predict both adaptive and maladaptive child outcomes (Troop-Gordon & Gerardy, 2012). Specifically, among children who were highly victimized, parents who reported higher levels of normative beliefs about peer victimization (e.g., peer harassment

as normal and common, no significant negative effects) had children who were rated by teachers as more withdrawn, whereas parents who reported higher levels of assertive beliefs (e.g., standing up for self) had children with higher levels of teacher-reported prosocial behaviors (Troop-Gordon & Gerardy, 2012).

In addition to the potential positive effects of parental involvement in a particular domain of child development, Costanzo and Woody (1985) explained that high-involvement parenting may yield unintended and counter-productive effects in children (e.g., interference with children's optimal development). Specifically, Costanzo and Woody (1985) proposed that high-involvement parenting within specific domains of development that involve excessive constraints (e.g., frequent control and monitoring) may limit the child's opportunities for self-discovery and naturally-occurring learning, interfering with the development of internalized self-controls and intrinsic motivation. High-constraint parenting strategies can be problematic because the child may not be able to develop strategies for dealing with the problem area himself/herself. Another potential disadvantage of high parental involvement in one particular domain of child development is that other domains of development may be underappreciated (e.g., Reiss, Levitan, & Szyszko, 1982)

Prior studies have also provided evidence that child behaviors or characteristics may influence parental beliefs and practices in the peer domain. For example, among preschool-aged children, Colwell et al. (2002) found that parental involvement, such as use of high power assertion (punishment or prohibition), was particularly high in hypothetical peer provocation scenarios when their child was the aggressor rather than the victim (a possible cause for parental sense of responsibility). Among adolescents, Tilton-Weaver and Galambos (2003) found that when adolescents exhibited problem behaviors (e.g., drug use, doing something they were told

not to do) and had deviant friends, parents were more likely to become involved in their peer relationships (e.g., communicating disapproval, seeking information about peers). These studies suggest that peer-related problems or concerns may attract parental attention to children's peer relationships, resulting in parenting in the peer domain that may be different from parenting in other domains of development. Indeed, children as individuals have different strengths and weaknesses, and parenting behaviors and strategies may differ in the domain in which children have strengths or weakness. Examining parenting specifically in the peer domain may, therefore, be especially important as it may not be redundant with more global or general parenting.

Despite the salience of peer relationships during preadolescence and some evidence for domain-specificity in parenting, investigations of parenting in the peer domain in preadolescence are relatively scarce. The proposed study focuses on direct parental involvement in the domain of preadolescent peer relationships, specifically on three dimensions of parenting in the peer domain—facilitation, directing, and problem-solving.

Parental facilitation. In the current study, parental facilitation is conceptualized as active parental attempts to promote preadolescents' positive peer interactions and relationships, such as providing access and opportunities to spend time and interact with peers more generally and with those who have similar interests (e.g., allowing friends to come over, driving child to activities with friends and peers). As noted, the transition to middle school typically involves a number of changes in the peer group, such as a more diverse student population, changes to the peer network, and potential disruptions to existing friendships. Moreover, preadolescents' desires to establish autonomy and identity also contribute to the dynamic structure of social networks in preadolescence (see Brown, 1990; Eccles et al., 1996). As preadolescents begin to explore their identity, they may use their peers to try out different roles (e.g., Parker et al., 2006). During this

time, parental facilitation of peer relationships may be especially important in helping preadolescents maintain old friendships, build new friendships, and gain peer group acceptance (Aikins, Bierman, & Parker, 2005; Brown, 1990).

A study with seventh graders found that approximately 54% of parents and caregivers reported encouraging their children to participate in activities (e.g., youth organizations, arts, sports, school clubs, etc.) so that they could meet other children (Mounts, 2008). Active parental efforts to foster positive peer interactions may support preadolescents' social adjustment, especially since friendships at this age are grounded in interests and personalities, more than simple proximity (e.g., Parker et al., 2006; Furman & Bierman, 1984), and may depend on opportunities for peer interaction that parents can provide (e.g., transportation, invitations). Indeed, in a sample of fourth graders, McDowell and Parke (2009) found that parents who provided opportunities for peer interactions and involvement in extracurricular activities had children with higher levels of teacher-reported social competence and sociometric ratings of peer acceptance one year later. Moreover, in a sample of relocated adolescents (starting seventh or eighth grade in a new community), Vernberg et al. (1993; 2006) found that adolescent and parent reports of parental facilitation (e.g., enabling proximity to peers) predicted greater adolescent-reported companionship and intimacy in adolescents' new friendships over an eight-month period. Vernberg et al. (1993) concluded that strategies requiring active parental engagement in adolescents' social domain (e.g., allowing or taking them to spend time with peers) were particularly helpful. Additionally, in a friendship coaching intervention for children (6-10 years old) with attention-deficit hyperactivity disorder (ADHD), parents who learned how to facilitate and provide opportunities for peer interactions had children who were rated by teachers as having fewer negative peer nominations (Mikami et al., 2010a)

Parental directing. Parental directing is defined in the current study as parental efforts to direct preadolescents toward peers who have characteristics or behaviors consistent with parental values (e.g., prosocial, positive peers) and away from peers that the parent views as a negative influence (e.g., deviant peers). Directing may be particularly important around the transition to middle school because of the expansion of the peer network, general declines in adult supervision, and increases in risky and deviant behaviors in middle school (Barber & Olson, 2004; Eccles et al., 1996). Directing may foster prosocial interactions and peer acceptance and steer preadolescents away from deviant peers who are generally less well-accepted by peers (Coie, Dodge, & Kupersmidt, 1990; La Greca, Prinstein, & Fetter, 2001).

Mounts (2000; 2002) reported that parental directing in adolescence was associated with adolescents' having friends with lower levels of drug use and antisocial behavior over time. Additionally, parents' involvement in peer-oriented activities (e.g., talking with adolescent about his/her friends) predicted adolescent-reported intimacy in best friendships, peer group involvement (e.g., time spent in activities with group of peers), and perceived social competence (Updegraff, McHale, Crouter, & Kupanoff, 2001). Of course, parental directing may be conducted in an intrusive manner (Soenens et al., 2007), or may reflect parental responses to pre-existing behavior problems (Tilton-Weaver & Galambos, 2003). Research suggests that autonomy-supporting styles (e.g., adolescent choice) of prohibiting certain friendships may serve a protective function, whereas psychologically-controlling styles of prohibiting certain friendships may predict more deviant peer affiliation and delinquency (Soenens et al., 2009). Specifically, when perceived as intrusive by adolescents, parental guiding and prohibiting predicted lower levels of group belongingness, higher levels of best friend deviant behavior (Soenens et al., 2007), as well as more deviant peer affiliation (Soenens et al., 2009). Moreover,

when adolescents reported having more deviant friends or problem behaviors, parents were more likely to become involved in managing adolescents' peer relationships by communicating disapproval about peers (Tilton-Weaver & Galambos, 2003). Thus, it may be important to consider child effects in the examination of these associations.

Parental problem-solving. In the current study, parental problem-solving refers to parental attempts to help preadolescents manage challenging peer situations, such as peer exclusion. Concerns about social evaluation and rates of social anxiety are particularly high in preadolescence (Beidel & Turner, 2007; Westenberg et al., 2004), and peer exclusion or victimization affects most preadolescents at least occasionally (Nansel et al., 2001; Wang et al., 2009). Many parents recognize the significance of these peer stressors and wish to help their children.

Existing research, although conducted with young children, demonstrates the potential positive effects of parental problem-solving or social coaching. For example, Finnie and Russell (1988) found that preschool children who were rated high on social status by teachers had mothers who used more skillful and positive behaviors in response to hypothetical peer situations and laboratory tasks involving unfamiliar peers, such as encouraging their child to enter the play group without disrupting the ongoing interaction. In contrast, mothers of low social status preschoolers were more likely to use less skillful and negative behaviors, such as avoiding the tasks or using hostile and intrusive methods to help their child gain group entry. Another study with preschool children and their mothers found that mothers use of prosocial strategies and elaboration (i.e., attention to relevant social cues) in video-taped peer problem vignettes predicted higher teacher-reported social skills and peer acceptance among preschool children (Mize & Pettit, 1997).

Research examining links between parental social coaching and preadolescents' voluntary coping responses found that parents who provided more engagement suggestions (e.g., problem-solving, emotion regulation, positive thinking) had preadolescents who reported fewer disengaged responses to peer stress situations, whereas parents who gave more disengaged suggestions (e.g., deny or avoid peer problems) had preadolescents who reported more disengaged responses to peer stress situations (Abaied & Rudolph, 2011). Interestingly, parental social coaching also predicted physiological regulation among 8- to 10-year old children (Hane & Barrios, 2011). Specifically, maternal minimization of threat-induction during parent-child discussion about ambiguous situations (e.g., physical and social "threats") was associated with increases in children's respiratory sinus arrhythmia (RSA), a marker of emotion regulation.

Intervention research also suggests that parental social coaching, or problem-solving, may support children's peer adjustment (Mikami et al., 2010a; 2010b). Specifically, in a friendship coaching intervention for children with ADHD, parents who learned how to instruct their children in social skills rated their children higher in social skills and lower in conflict during peer play after training (Mikami et al., 2010a). Moreover, children of parents who received training had higher teacher ratings on peer liking and acceptance and lower teacher ratings on peer rejection, compared to children of parents who did not receive training (Mikami et al., 2010b). Thus, parental social coaching may improve peer adjustment in both clinical and community populations.

However, research also suggests that children's social problems may evoke parental problem-solving, perhaps explaining unexpected associations between parental problem-solving and peer maladjustment in some studies. For example, in a sample of preschool children, Laird et al. (1994) found that mothers who provided more encouragement for peer involvement (perhaps

due to concerns) during an observational play session had children who were rated by teachers as having lower social competence. Among older children, McDowell and colleagues found that parents who offered more advice during a parent-child discussion about peer situations had children who were rated as less socially competent (McDowell et al., 2003) and less accepted by peers (McDowell & Parke, 2009). Parents may be more likely to intervene and give advice when they perceive that their children are having peer problems (McDowell et al., 2003; McDowell & Parke, 2009). Thus, it may be important to consider child effects in examining the association between parental-problem solving and peer adjustment.

Parental problem-solving strategies range from prosocial to defensive, and research suggests that parental advice influences children's social cognitions and behaviors. However, it is not a foregone conclusion that parental problem-solving necessarily influences preadolescents' peer relationships because parents are less involved in *ongoing* peer activities at this age. The trend in bullying prevention programs towards targeting the school context (e.g., teachers and peer responses) is consistent with the idea that parents may have limited control over peer interactions that occur outside of their "sphere of influence," such as contexts outside the home and during times when parents are not present (Karna et al., 2011).

The literature on peer-related parenting is relatively limited. Specifically, most prior studies focused on single dimensions of peer-related parenting in samples of preschool-aged children or older adolescents. The first aim of the present study was to build on the existing literature by examining multiple dimensions of peer-related parenting, including parental facilitation, directing, and problem-solving as predictors of multiple indices of peer adjustment (friendship support, peer acceptance, peer victimization) across the transition to middle school.

Preadolescents' Physiological Responses to Peer Stress

In addition to environmental (i.e., parental) influences, peer adjustment in preadolescence may be affected by individual preadolescent characteristics, such as physiological responses to peer stress. Autonomic nervous system (ANS) activity reflects awareness and responsiveness to the environment and supports behavioral and emotional regulation (Beauchaine, 2001; Porges, 2007; Porges & Doussard-Roosevelt, 1997). ANS parameters (e.g., respiratory sinus arrhythmia, skin conductance level) are responsive to stress experiences, including peer stress, and (modestly) predict social adjustment in some studies (Erath et al., 2012; Gazelle & Druhen, 2009; Hessler & Katz, 2007; Williams et al., 2003). Thus, ANS parameters were examined as predictors of preadolescents' peer adjustment in the present study.

Theoretical framework. Polyvagal Theory explains how autonomic functioning may be linked to social behavior (Porges, 2007). According to Polyvagal Theory, the ANS helps individuals adapt to changes in the environment and adjust or modify behaviors in response to stress. The ANS is divided into two systems, the parasympathetic nervous system (PNS) and the sympathetic nervous system (SNS). The PNS helps to maintain homeostasis under non-threatening conditions and is often referred to as the “rest and digest” system, whereas the SNS mobilizes the body's resources under stress to induce “fight or flight” responses to stressful circumstance (Porges, 2007).

Porges (2007) proposed a hierarchy of responses, in which the most contemporary subsystems of the ANS are activated first in response to stress, followed by activation of more primitive subsystems if the contemporary systems are not sufficient. The myelinated ventral vagal complex (part of the PNS) is the most contemporary ANS subsystem to evolve in humans and serves a calming function (e.g., decelerates heart rate), promoting growth and restoration.

Under normal, non-threatening conditions, the PNS influence on the heart via the vagus nerve is relatively high. Vagal influence on the heart can be conceptualized as a brake, such that application of the vagal brake slows heart rate and facilitates calmness. Conversely, heart rate increases when vagal tone to the heart is low, or when the vagal brake is released. In addition to its calming function, the ventral vagal complex is linked with social affiliation behaviors because overlapping neural networks control the vagus nerve and the social engagement muscles of the face and head involved in speaking, listening, and orienting (Porges, 2007).

Under conditions of mild to moderate stress, PNS activation can be withdrawn (i.e., vagal withdrawal), yielding a moderate increase in arousal and metabolic output (e.g., heart rate and blood flow throughout the body) to allow engagement with environmental stress or active coping (Porges, 2007). Vagal withdrawal has lower biological costs than more extreme SNS activation and is a more adaptive response to moderately stressful circumstances. An objective measure of vagal or PNS influence is respiratory sinus arrhythmia (RSA), which was measured in the current study (see below).

In high stress circumstances, the next most contemporary ANS subsystem, the SNS, may be activated, mobilizing the body's resources to respond (e.g., "fight or flight"), yielding high metabolic output (Porges, 2007). The behavioral inhibition system (BIS; Gray, 1987) is one dimension of the SNS that is activated under threatening circumstances and serves to inhibit approach behaviors and promote avoidance behaviors (Beauchaine, 2001). Behavioral inhibition is reflected in electrodermal responding (Fowles, 1980, 1988), or skin conductance level (SCL), a marker of sensitivity to negative or threatening circumstances, which was also assessed in the current study (see below). In contrast to the PNS, the SNS is less compatible with social

affiliative behaviors because SNS responses enable defensive responses like avoidance or aggression.

Respiratory sinus arrhythmia (RSA). In the current study, high RSA at baseline and greater reductions in RSA from baseline to peer stress situations (e.g., RSAR or vagal withdrawal) are conceptualized as markers of adaptive parasympathetic regulation. RSA is measured as variation in heart rate across the breathing cycle and is an objective and well-validated measure of vagal tone (Beauchaine et al., 2007; Eccles, Lord, Roeser, Barber, & Jozefowicz, 1999; Porges, 2007) that is relatively stable over time in children (El-Sheikh, 2005a; Hinnant et al., 2010). High RSA indicates high vagal tone and reductions in RSA indicate vagal withdrawal. Higher baseline RSA is reliably associated with indices of social competence; conversely, lower baseline RSA is associated with internalizing and externalizing behavior problems, such as depression and aggression (Beauchaine, 2001; Porges, 2007). As noted, the cardiovascular regulation function and overlap with neural systems that control muscles of the face may explain the connection between higher RSA and social engagement (Porges, 2007).

Moderate RSAR may reflect or contribute to active and modulated responses to stress, which, in turn, may promote positive adjustment (Porges, 2007), although excessive RSAR has been linked with maladjustment, such as anxiety, in some studies (e.g., Beauchaine, 2001; Gazelle & Druhen, 2009). In a sample of kindergarten children, Graziano et al. (2007) found that greater RSAR during cognitive tasks (e.g., problem-solving, effortful control, attention/persistence) was associated with higher social preference scores (but not peer nominations of "sharing" and "fighting" behaviors). This association was mediated by higher social skills (for girls and boys) and lower behavior problems (for boys only). Additionally, preschool children who exhibited patterns of stable and high RSAR to emotionally and

behaviorally challenging lab tasks across a two year period were rated by their mothers as more socially skilled and having fewer behavior problems (Calkins & Keane, 2004). In a study assessing RSAR in the context of peer provocation (e.g., game with confederate child who won and made bragging and teasing comments), Hessler and Katz (2007) found that greater self-reported dysregulation was associated with lower RSAR (i.e., less vagal withdrawal) during provocation. These findings are consistent with the propositions of Polyvagal Theory (Porges, 2007), such that vagal withdrawal in the context of stress or challenge is associated with positive emotion regulation, less emotional negativity, fewer behavioral problems, and better social skills (e.g., Beauchaine, 2001), although it is important to note that these associations tended to be modest in magnitude.

A potentially important difference between most prior research and the current study's assessment of RSAR is that RSAR has generally been assessed during cognitive, emotional, or behavioral tasks, but not ongoing social interaction challenges. The present study builds upon prior studies by assessing preadolescents' RSA before and during a peer challenge task (e.g., peer-evaluative conversation) as a predictor of peer adjustment across the transition to middle school. RSA was examined before peer stress, an indicator of general emotion regulation capacity and readiness to respond to peer stress, and as reactivity (vagal withdrawal) from pre-task to the peer stress task (RSAR), which provided information about the degree of physiological engagement or mobilization in response to peer stress.

Skin conductance level (SCL). In the current study, SCL, or electrodermal activity, is conceptualized as a marker of anxious discomfort in peer stress situations. SCL is a product of the SNS and a well-validated and objective marker of the behavioral inhibition system (BIS; Gray, 1987) that is relatively stable over time in children (El-Sheikh, 2007). In stressful or

threatening circumstances, high SCL or high SCL reactivity (SCLR; change from baseline to stress) may indicate anxiety or fearfulness at the physiological level (Beauchaine, 2001). Indeed, SCL is linked with neural structures involved in fear and anxiety (e.g., amygdala; Beauchaine, 2001), and SCL increases in response to anxiety-provoking situations (e.g., Erath et al., 2012). Moreover, SCL is correlated with anxiety in both community (e.g., El-Sheikh, Keller & Erath, 2007; Weems et al., 2005) and clinical samples (Schmitz, Kramer, Tuschen-Caffier, Heinrichs, & Blechert, 2001).

SCL can be examined during resting or baseline conditions (SCL) or as reactivity from baseline to stressful conditions (SCLR). High SCL and SCLR have been linked with shyness, inhibition, and internalizing symptoms in children (e.g., Beauchaine, 2001; El-Sheikh et al., 2007; Schmitz et al., 2001; Weems et al., 2005). Higher SCL was correlated with fearfulness and inhibitory control (based on observations) among preschool children (Fowles et al., 2000). In contrast, low SCL has been associated with fearlessness and poor inhibitory control (Fowles et al., 2000). Furthermore, higher SCLR among youths assessed during exposure to mildly phobic stimuli (e.g., video of large dog) was associated with self-reports of anxiety (Weems et al., 2005). Conversely, lower SCLR (in response to challenging tasks) has been linked with externalizing behavior in middle childhood, as well as punishment insensitivity and fearlessness (Erath et al., 2009; Lorber, 2004; Matthys, van Goozen, Snoek, & van Engeland, 2004; Raine, 2002). Some studies, however, have linked children's higher SCLR (e.g., in response to a peer provocation situation) with externalizing behaviors, such as reactive aggression (but not proactive aggression; Hubbard et al., 2002). Inconsistencies suggest that associations between SCL/R and children's adjustment may vary depending on factors such as level of sample risk (e.g., clinical versus community), age of sample (e.g., younger or older children), or context in

which SCL/R is assessed (e.g., cognitive, emotion, or social tasks). Additionally, the effect of SCL/R may vary by outcomes of interest (e.g., proactive versus reactive aggression, externalizing or internalizing problems).

Very little is known about the link between SCL and SCLR and specific dimensions of peer relationships, particularly in preadolescence. One recent study found that social anxiety was associated with higher SCL (pre-task), but only among preadolescents who were peer victimized (Erath et al., 2012). Consistent with this finding, high SCL or SCLR in peer stress situations may reflect fear, discomfort, or anxious inhibition that may increase preadolescents' susceptibility to social avoidance and peer maltreatment (Rubin & Burgess, 2001). The present study builds on prior research by assessing SCL before and during a peer challenge task and examining SCL as a predictor of peer adjustment across the transition to middle school. SCL was examined before the peer stress task, serving as an indicator of preadolescents' general level of arousal or anxiety, and as reactivity from baseline to peer stress (SCLR), which provided information about the degree of change in SCL (low or high) from the pre-task period to the peer stress period.

Thus, prior studies have provided some evidence of the association between physiological responses (i.e., RSA/R, SCL/R) and children's adjustment. However, many of these studies have focused on younger children and behavioral or psychological outcomes. Additionally, fewer studies have examined physiological responses to peer stress. Thus, the second aim of the present study was to expand on existing research by examining the links between physiological responses to peer stress and peer adjustment in preadolescence.

Person x Environment Interactions Predicting Peer Adjustment

From the aforementioned studies on parenting in the peer domain and children's physiological responses, there is evidence to suggest that parenting behaviors and children's

physiological responses are predictive of youth social adjustment. However, the effects of one may be conditional upon the other. Hypotheses regarding parenting by preadolescent physiological responses to peer stress were informed by the person by environment framework, as well as the developmental psychopathology framework (Cicchetti, 2006), more generally. These frameworks propose that individuals experience risk and protective factors that may interact with their environment to predict adjustment, such that certain individual characteristics may differentially predict adjustment depending on environmental factors, and vice versa. With a focus on the fit between parenting and preadolescents' physiological responses, a related person by environment framework, the goodness-of-fit model, was also informative. This model proposes that adjustment depends on the match between child temperament and their environment (Lerner & Lerner, 1994; Thomas & Chess, 1977), such that optimal adjustment occurs when environmental conditions are compatible with the child's temperament, but maladjustment occurs when environmental conditions are mismatched with child's temperament (e.g., among temperamentally fearful children, gentle rather than harsh discipline was associated with conscience development; Kochanska; 1991; 1995).

Within the scope of the person by environmental framework, the diathesis stress (Sameroff, 1983), differential susceptibility (Belsky & Pleuss, 2009), and biological sensitivity (Boyce & Ellis, 2005; Ellis & Boyce, 2008) models propose different patterns of associations that may emerge in person by environment interactions. The diathesis-stress model, also referred to as the dual-risk model (Sameroff, 1983), posits that some individuals may have a specific "vulnerability" (e.g., behavioral, physiological) that increases their risk in the context of an environmental stressor (Gottesman & Shields, 1967; Monroe & Simons, 1991; Zuckerman, 1999). In contrast, other individuals may be protected or resilient in the context of environmental

stress because they do not have a specific vulnerability (or have an individual characteristic that provides protection). This model proposes that both vulnerable and resilient individuals respond similarly in contexts characterized as non-adverse, supportive, and enriching, but that vulnerable and resilient individuals respond differently under conditions of environmental stress (e.g., Ellis, et al., 2011), such that individuals with vulnerabilities have worse outcomes than individuals without vulnerabilities. Indeed, findings from number of studies examining parenting by child temperament (see Rothbart & Bates, 2006 for a review) and some parenting by child physiology studies (e.g., El-Sheikh & Whitson, 2006; Hastings & De, 2008) are consistent with this framework.

Differential susceptibility (Belsky & Pluess, 2009) and biological sensitivity to context (Boyce & Ellis, 2005; Ellis & Boyce, 2008) models propose that some individuals are more susceptible than others to both *negative* and *positive* environmental conditions. Specifically, these models propose that susceptible individuals have the worst outcomes in stressful, adverse environments, but the best outcomes in supportive, non-adverse environments because these individuals are considered to be more reactive, sensitive, and engaged with their environments in general. Differential susceptibility refers to temperamental vulnerabilities as *susceptibility* factors, whereas biological sensitivity to context refers to biological reactivity as *sensitivity* factors. Several studies examining parenting by child temperament (e.g., Belsky, 2005; Pluess & Belsky, 2010) and parenting by child physiology (e.g., Obradović, Bush, Stamperhal, Adler, & Boyce, 2010; Obradović et al., 2011) have provided some support for these frameworks. Although the biological sensitivity and differential susceptibility models may inform the interpretation of results of the present study, these theoretical models were not tested directly because the full range of negative to positive parenting behaviors were not examined.

Based on these conceptual frameworks, it is reasonable to hypothesize that preadolescents' physiological responses to peer stress experiences may serve as risk or protective factors that may influence the effectiveness of peer-related parenting behaviors on preadolescent peer adjustment across the transition to middle school.

Parenting x child physiology. Although relatively few studies have examined interactions between parenting and children's physiological responses, these existing studies suggest that the effects of parenting on behavioral and social adjustment depend on children's physiological responses (baseline, reactivity; El-Sheikh & Erath, 2011; Hastings & De, 2008; Hastings et al., 2008). Specifically, harsh parenting predicted high and stable levels of externalizing behaviors in middle and late childhood among children who exhibited low SCLR, which was conceptualized as a marker of disinhibition and threat insensitivity (Erath et al., 2009; Erath, El-Sheikh, Hinnant, & Cummings, 2011). Additionally, Hastings et al. (2008) found that negative parenting, such as overcontrol, was associated with higher levels of social wariness among children who exhibited lower levels of RSA (Hastings et al., 2008). Conversely, higher levels of RSA protected children against social wariness in the context of maternal overcontrol (Hastings et al., 2008). These findings are consistent with prior research that has documented the vulnerability function of lower RSA in the context of family conflict across a number of youth outcomes, including externalizing, internalizing, social, and physical health (see El-Sheikh & Erath, 2011 for a review). Examining positive parenting, Hastings and De (2008) found that parents' emotion socialization strategies (e.g., ranging from support to neglect) about negative emotions (e.g., fear, sadness, anger) were more strongly associated with social adjustment among preschool children with low RSA compared to children with high RSA. Specifically, children with low RSA, which may reflect emotion disengagement or dysregulation, had higher levels of

teacher-reported social competence when fathers responded in warm, supporting ways to their negative emotions (Hastings & De, 2008).

These studies suggest that children exhibiting physiological vulnerabilities (e.g., low RSA) may be more susceptible to the influence of both *positive* and *negative* dimensions of parenting. However, few person by environment studies have focused on domain-specific parenting (e.g., peer-related parenting behaviors) and preadolescents' physiological responses to peer stress experiences. Parental efforts to support preadolescents' peer relationships may be more or less effective in promoting positive peer adjustment depending on preadolescents' physiological responses in peer stress situations. The present study examined whether preadolescents' physiological responses to peer stress moderated the association between parenting in the peer domain and peer adjustment across the transition to middle school.

Parental facilitation. Active parental efforts to facilitate positive peer interactions may support positive peer adjustment across the middle school transition, especially as friendships grounded in interests and personalities (more than simple proximity) may depend on opportunities for peer interactions that parents can provide (e.g., transportation, invitations; McDowell & Parke, 2009; Vernberg et al., 1993; 2006). Parental facilitation may be most strongly linked with positive peer adjustment among preadolescents with heightened SCL/R or low RSA/R in the context of peer stress. High SCL/R may reflect physiological distress, discomfort, or inhibition and low RSA/R may reflect emotion dysregulation as well as a lack of social responsiveness or engagement in peer stress situations. Without parental offers or attempts to facilitate peer interactions, physiologically inhibited or disengaged preadolescents may experience more negative peer interactions or choose to avoid developmentally-important social interactions. Avoiding social interactions may, in turn, exacerbate these preadolescents' social

vulnerabilities by limiting social skill development, drawing peers' attention to their non-normative behavior, and fueling feelings of anxiety and loneliness (Rubin & Burgess, 2001). Furthermore, parental attempts to (over) protect inhibited and dysregulated children from social situations, by limiting their facilitation of peer interactions and allowing them to avoid these interactions, may inadvertently reinforce their avoidant behavior and diminish their ability to self-regulate in these circumstances (Coplan et al., 2008; Dadds & Roth, 2001; Rubin & Burgess, 2001). Thus, parental efforts to engage these preadolescents in positive peer interactions may prevent social withdrawal and peer maltreatment.

Parental directing. With the expansion of the peer network, general declines in adult supervision, and increases in risky and deviant behavior in middle school (Arnett, 1999; Barber & Olson, 2004; Eccles et al., 1996; Patterson, Dishion, & Yoerger, 2000), preadolescents exhibiting low SCL/R and low RSA/R in the context of peer stress may particularly benefit from parents directing them toward peers with positive behavioral characteristics and away from deviant peers. Low SCL/R and low RSA/R may reflect physiological disinhibition or disengagement, respectively; thus, these preadolescents may be less likely to place limits on risky behaviors and deviant peer interactions themselves, as compared to physiologically inhibited or well-regulated preadolescents. Thus, parental directing may be most strongly associated with positive peer adjustment among preadolescents with low SCL/R and low RSA/R in the context of peer stress. Generally consistent with this perspective, Bates et al. (1998) reported that children with a temperament characterized by resistance to control (e.g., impulsivity, unmanageability) were given lower mother and teacher ratings of externalizing behavior when mothers demonstrated relatively high levels of restrictive control, compared to mothers who engaged in lower levels of restrictive control. In another study, Stice and Gonzales

(1998) found that parental behavioral control predicted lower delinquency among adolescents who were high on behavioral disinhibition.

Parental problem-solving. How parents help preadolescents manage social challenges may also predict preadolescents' peer adjustment across the middle school transition. Evidence from the social coaching (Finnie & Russell, 1988; Mize & Pettit, 1997) and child coping (Compas et al., 2001; Sandstrom, 2004) literatures suggest that prosocial or positive problem-solving strategies predict positive social and peer outcomes, as compared to avoidant or negative strategies. Yet, the effectiveness of parental problem-solving about peer stress situations may depend on preadolescents' physiological responses to the same situations. A growing body of research has documented that children with physiological (e.g., low RSA/R) or temperamental vulnerabilities (e.g., fearfulness, negative emotionality, impulsivity) are at risk for social problems or maladjustment (Beauchaine, 2001; Porges, 2007; Rothbart & Bates, 2006), but these youths may particularly benefit from positive parenting (Kochanska, 1991; 1995; Sentse, Veenstra, Lindenberg, Verhulst, & Ormel, 2009). That is, the association between parental prosocial and benign problem-solving advice and positive peer adjustment may be stronger among preadolescents with low RSA/R, an indicator of disengagement and emotion dysregulation, or high SCL/R, a marker of anxious sensitivity. Related research on children with problem behaviors has shown that parental emotion coaching reduced the risk of poorer peer relations (Katz & Windecker-Nelson, 2004). Additionally, Hastings and De (2008) found a stronger association between parental emotion coaching and social and emotional adjustment among preschool children with lower RSA, compared to children with higher RSA, suggesting that children with lower RSA may have more to gain from positive parental emotion coaching.

Generally, the findings from the existing literature suggest that children with a variety of vulnerabilities (e.g., physiological, temperamental, behavioral) are more susceptible or receptive to parental influence. Alternatively, it is possible that children's dysregulated, inhibited, or impulsive physiological vulnerabilities may limit the influence of positive parental involvement (e.g., unable to put parental advice into practice, unwilling to heed parental attempts to promote positive peer interactions) and instead, positive parenting may be more beneficial for physiologically well-regulated and non-anxious preadolescents. In line with this idea, a recent study found that children with high RSAR had the best outcomes (e.g., low externalizing behaviors, high prosocial behaviors, high school engagement) in low adverse environments, as compared to children with low RSAR (Obradović et al., 2010).

Although some studies have examined general parenting by child physiology interactions, specifically with younger children, no known studies have examined domain-specific parenting by child physiology interactions. The primary aim of the present study was to examine whether preadolescents' physiological responses to peer stress (RSA/R, SCL/R) moderated the association between parenting in the peer domain (facilitation, directing, problem-solving) and peer adjustment (friendship support, peer acceptance, peer victimization).

Sex Differences in Peer Relationships and Parenting in the Peer Domain

Peer relationships, peer problems, and responses to peer problems may differ among boys and girls (Rose & Rudolph, 2006). For example, some studies finding that girls report more self-disclosure and intimacy in their friendship than boys, whereas other do not find such differences (e.g., Parker et al., 2006). Studies on peer victimization tend to find that boys are more likely to be victims of overt, physical victimization than girls, but the findings of sex differences in relational aggression are mixed (e.g., Card, Stuckey, Sawalani, & Little, 2008; Crick &

Grottpeter, 1995; Nansel et al., 2001; for review see Rose & Rudolph, 2006). Studies examining coping with peer stress have found that girls tend to seek support and ruminate about problems, whereas boys are more likely to use distraction strategies (Rose & Rudolph, 2006). The mixed findings in the literature may be related to the variability in the assessments of peer relationships, peer stress, and coping (Rose & Rudolph, 2006).

The nature of parental involvement in preadolescents' peer relationships may also differ by sex. For example, Vernberg et al. (1993) found that among relocated adolescents, parents reported using more friendship facilitation strategies (e.g., encouraging activities with others, enabling proximity to peers) with girls than boys. Some research has shown that parents are more likely to use directing or guiding behaviors, such as communicating their preference about friends, with girls than boys (e.g., Tilton-Weaver & Galamos, 2003; Way & Greene, 2005), but other studies find that boys report higher levels of guiding (e.g., talking about pros and cons of hanging out with certain peers) from parents than girls (e.g., Soenens et al., 2007).

The effects of parental involvement in peer relationship may also differ across boys and girls. Among preschool children, mothers' social coaching appeared to have a stronger effect for girls than boys, such that social coaching predicted girls' teacher-reported social skills, but not boys' social skills in one sample, but no sex differences emerged in another sample (Mize & Pettit, 1997). In a sample of adolescents, Updegraff et al. (2001) found that the effect of mothers and fathers involvement, including engaging in peer-oriented activities, knowledge of peer experiences, and time spent with adolescents, contributed significantly to boys' positive friendship experiences (e.g., intimacy, involvement) and peer group involvement. For girls, only mothers' provision of opportunities for peer contact predicted greater involvement with friends (Updegraff et al., 2001). In contrast, although parental facilitation was higher for girls than boys,

the predictive association between facilitation and peer adjustment (e.g., companionship, intimacy) did not differ by adolescents' sex (Vernberg et al., 1993). Thus, existing research yields limited and inconsistent results about whether the effects of parenting in the peer domain may differ depending on children's sex. Inconsistencies across studies may be due to differences in the parenting constructs of interest (e.g., directing versus problem-solving), informants of parenting behavior (e.g., parent, child, observation), developmental period (e.g., early childhood, middle childhood, adolescence), or sex of the parent (e.g., same-sex or cross-sex with child). An exploratory aim of the present study examined whether preadolescent sex moderated the association between peer-related parenting behaviors and peer adjustment.

The Present Study

Peer relationships become especially salient in preadolescence as youths begin to spend more time with peers and seek to gain peer approval and acceptance, maintain and build friendships, and avoid peer problems. The transition to middle school may disrupt established peer networks and friendships, creating or exacerbating existing peer challenges (e.g., Anderson et al., 2000; Duchesne et al., 2012; Eccles et al., 1993; 1996). Parents are in a position to help children navigate peer challenges and support positive peer relationships. Yet the effectiveness of parental involvement might depend on preadolescents' physiological responses to peer challenges.

The present study aimed to examine strategies for parenting in the peer domain (e.g., facilitating and directing peer interactions, problem-solving about peer problems) that predict preadolescents' peer adjustment across the transition to middle school. Moreover, consistent with the person by environment and goodness-of-fit (Lerner & Lerner, 1994; Thomas & Chess, 1977) perspectives, the present study sought to elucidate peer-related parenting behaviors that may be

particularly well-suited (or poorly-suited) to certain preadolescents, depending on their physiological responses to peer stress. Specifically, the present study examined the independent and interactive effects of peer-related parenting behaviors and preadolescent physiological responses to peer stress as predictors of preadolescents' peer adjustment across the transition to middle school. Innovative aspects of the present study included the focus on positive parenting behaviors (e.g., behaviors that are intended to support and promote positive adjustment), as well as context-specific measures of parenting, physiological responses, and preadolescent adjustment in the peer domain.

In particular, the current study advanced prior work by examining responses specifically to *peer* stress, using objective physiological assessments. Indeed, researchers have emphasized the importance of considering the nature of the stimuli used to evoke reactivity as it may affect the association between responses to stress and adjustment (Obradović, Bush, & Boyce, 2011; see also El-Sheikh & Erath, 2011). Studies have found null to moderate correlations between physiological responses across a variety of different laboratory tasks (e.g., social-emotional, cognitive). For example, El-Sheikh (2007) found that SCLR to social (e.g., exposure to inter-adult argument) and non-social (e.g., star tracing, cognitive challenge) tasks were moderately correlated in late childhood. Analyses with RSAR have yielded mixed findings, such that RSAR to social and non-social tasks were modestly correlated in one study (El-Sheikh, 2005a), whereas other studies have found no associations across social and non-social tasks (Hinnant & El-Sheikh, 2009; Obradović et al., 2011). The modest to moderate associations between physiological responses across different tasks suggest that it may be useful to consider context-relevant or task-specific assessments of physiological parameters in the same domain as the predictors and outcomes of interest.

In the present study, it was hypothesized that positive peer-related parenting behaviors would predict better preadolescent peer adjustment across the transition to middle school. It was also expected that preadolescents without physiological vulnerabilities, as compared to preadolescents with physiological vulnerabilities, would have more positive peer adjustment across the transition to middle school. However, interactions were anticipated, such that preadolescents who appear vulnerable on the basis of physiological responses to peer stress that reflect anxious sensitivity (high SCL/R; in most cases, but see parental directing below) or emotion dysregulation (low RSA/R) were expected to gain the most from positive parental involvement, as compared to preadolescents who do not exhibit physiological vulnerabilities. In other words, positive peer-related parenting behaviors may compensate for preadolescents' physiological vulnerabilities. Hypotheses are described below.

Parental facilitation. Peer adjustment in preadolescence may be supported by active parental efforts to facilitate positive peer interactions, such as providing opportunities and permission to spend time with peers (e.g., transportation, accepting invitations). Thus, it was hypothesized that parental facilitation would predict positive peer adjustment across the transition to middle school.

However, some preadolescents may benefit more from parental facilitation than others, such as preadolescents who exhibit high SCL/R or low RSA/R in the context of peer stress. Preadolescents with high SCL/R, which may reflect anxious arousal, and low RSA/R, which may reflect disengagement and emotion dysregulation, might avoid social interactions or become involved in more negative peer interactions without parental facilitation of positive peer interactions. Thus, it was anticipated that the association between parental facilitation and peer

adjustment across the transition to middle school would be stronger among preadolescents with high SCL/R or low RSA/R in the context of peer stress.

Parental directing. Parental directing of preadolescents' peer relationships may help steer preadolescents away from deviant peers, who may provide less support and experience peer rejection (Coie et al., 1990; La Greca et al., 2001), and towards more prosocial, well-adjusted peers during a time when risky and deviant behaviors normatively increase and adult supervision declines (Barber & Olson, 2004; Eccles et al., 1996). Prosocial peer affiliations are strongly associated with positive adjustment (Barry & Wentzel, 2006; Berndt, 2002; Tu et al., 2012) and may promote peer adjustment across the transition to middle school. Yet, parental directing may be conducted in an intrusive manner, yielding unintended effects (Soenens et al., 2007; 2009). Thus, main effects of parental directing were not expected to emerge across all preadolescents.

However, it was expected that parental directing would be particularly beneficial in reducing the risk of negative outcomes by setting limits on peer interactions among preadolescents with low SCL/R or low RSA/R in the context of peer stress. Preadolescents with low SCL/R, which may reflect physiological disinhibition or impulsivity, and low RSA/R, which may reflect disengagement or emotion dysregulation, might be at higher risk for antisocial behaviors because they may be less likely than physiologically inhibited or well-regulated preadolescents to place their own limits and restrictions on risky peer interactions. Thus, it was anticipated that the association between directing and positive peer adjustment across the transition to middle school would be strongest among preadolescents with low SCL/R or low RSA/R in the context of peer stress.

Parental problem-solving. Prosocial parental problem-solving, or social coaching, may promote children's peer adjustment, compared to avoidant or negative strategies (Finnie &

Russell, 1988; Mize & Pettit, 1997). Consistent with prior research, it was anticipated that prosocial parental problem-solving strategies about peer exclusion would predict positive peer adjustment across the transition to middle school.

However, some preadolescents, but not others, may benefit more from parental problem-solving, such as those who exhibit low RSA/R or high SCL/R in the context of peer stress. Preadolescents with low RSA/R, which may reflect disengagement or emotion dysregulation, and high SCL/R, which may reflect anxious arousal, might have more difficulties managing peer stress situations and need more specific parental advice about how to handle peer problems. Indeed, Hastings and De (2008) found that parental social-emotion coaching predicted better social adjustment among preschool children with low RSA, but not among children with high RSA. Thus, it was anticipated that the association between parental problem-solving and positive peer adjustment across the transition to middle school would be stronger among preadolescents who exhibited low RSA/R and high SCL/R in the context of peer stress.

Exploratory Analyses

Sex differences in the association between parenting in the peer domain and preadolescents' peer adjustment across the transition to middle school were also examined. Given the mixed findings in the literature on sex differences in peer adjustment and the limited literature on sex differences in peer-related parenting behaviors, specific hypotheses were not made.

III. METHOD

Participants

At Time 1 (T1; before the middle school transition) participants included 123 fifth and sixth grade students (M age = 12.03 years, SD = .64) and one parent (82% biological mothers, 67% married) and teacher (81% of teacher reports obtained at T1) per preadolescent. The sample of preadolescents included 50% males and 58.5% Caucasian, 35% African American, and 6.5% other races/ethnicities, consistent with demographics of the communities from which participants were recruited. Approximately 10% of participants had no siblings, 44% had one sibling, 26% had two siblings, and 20% had three or more (up to six) siblings. The average family household income was between \$35,001 and \$50,000; 21% of families reported an income of less than \$20,000; and 24% of families reported an income greater than \$75,000.

At Time 2 (T2; after the middle school transition), participants included 100 preadolescents (M age = 12.78, SD = .63) and one parent (81% biological mothers) and teacher (87% of teacher reports obtained at T2) per preadolescent. The sample of preadolescents included 48% males and 58.6% Caucasian, 34.4% African American, and 7% other races/ethnicities. The average family household income was between \$35,001 and \$50,000; 17% of families reported an income of less than \$20,000; and 29% of families reported an income greater than \$75,000.

Individual t-tests were conducted to test differences between (1) participants with and without T2 data, (2) participants with and without teacher reports at T1, and (3) participants with and without teacher reports at T2. Analyses revealed that there were no significant differences

between participants with and without T2 data or between participants with and without T2 teacher reports on demographics, parenting, physiology, or peer adjustment variables. Compared to participants without teacher reports at T1, participants with teacher reports at T1 were more likely to be Caucasian (90% of Caucasians had T1 teacher reports; 67% of minorities had T1 teacher reports; $\chi^2 = 9.21, p < .01$) and from higher income households ($M = 4.30, SD = 1.56$ vs. $M = 3.33, SD = 1.32; t = -2.64, p < .01$). Participants with teacher reports at T1 also reported lower levels of peer victimization ($M = 1.83, SD = .73$) than participants without teacher reports at T1 ($M = 2.19, SD = .96; t = 2.01, p < .05$).

Procedures

The short-term longitudinal design involved two waves of data collection approximately nine months apart. At T1, participants were recruited via flyers sent home with fifth and sixth grade students at five elementary schools in the southeastern United States. Parents who responded to the school flyers were given information about the study and were scheduled for a research visit over the phone during the spring. Permission to contact the participants' teachers (elementary school) was obtained via mail and teachers were contacted in the spring to participate. Teacher consent was obtained and teachers completed questionnaires about participants' school and peer adjustment and behaviors; teachers were compensated monetarily. Preadolescents and their parents visited the research lab during the summer before preadolescents transitioned to middle school; consent to participate was obtained and preadolescents and parents were compensated monetarily. Preadolescents participated in lab activities while their physiological activity was recorded, and preadolescents and parents completed questionnaires about preadolescents' peer and school adjustment, behaviors, and health. Parents also completed questionnaires about parenting behaviors.

The lab protocol included *peer evaluation* and *peer rebuff* components. The peer evaluation component was adapted from a conversation task used in prior research with preadolescents (Erath, Flanagan, & Bierman, 2007). Following *acclimation* and *baseline* periods, preadolescents were asked to act as if an adult research assistant (RA; same-sex) was someone about their age and to lead a three-minute conversation to get to know the RA. To lead the conversation, preadolescents were told that they could tell about themselves, ask questions about the RA, or talk about anything they wanted. They were told that the conversation would be viewed via one-way Skype (an internet-based video-chat program) by three same-age, same-sex peer judges, who were actually fictitious. Preadolescent participants were told that the peer judges would decide how well they performed in the conversation activity compared to two other participants the peer judges had watched on video. The *peer evaluation* period refers to the three-minute conversation activity. Three minutes after post-conversation interview questions, participants received a text message via Skype, ostensibly from the peer judges, indicating that the peer judges chose the other two participants as the better performers in the conversation activity. Participants were then told that they may have a chance to change the peer judges' minds by speaking directly to the peer judges through Skype. The *peer rebuff* period refers to the three minutes following the feedback from the peer judges, during which participants considered their potential response to the peer judges. Following the peer rebuff period and several interview questions, the task was ended and participants were carefully debriefed using a process debriefing procedure described by Underwood (2005) and Hubbard (2005). Specifically, participants were led to their own conclusion that the peer judges were not real, and the rationale for deception and purpose of the study were discussed with participants. Physiological data from the pre-task/baseline and peer evaluation periods were used in the present study.

At T2, parents and preadolescents were re-contacted during the spring of preadolescents' first year in middle school for a follow-up visit. Preadolescents and their parents visited the research lab in the spring and completed questionnaires. Parents and preadolescents were asked to select teachers who knew the preadolescent best to complete the teacher reports. Preadolescents' teachers (middle school) were also contacted to participate and compensated using the same procedures as T1. All study procedures were approved by the University Institutional Review Board.

Measures

Predictor Variables at T1

Control variables. Child sex (coded 0 = male, 1 = female), age (in years), and ethnicity (coded 0 = Caucasian, 1 = minority) were collected via parent/guardian report. Annual household income was reported by the parent/guardian on a 6-point scale (1 = *less than \$10,000* to 6 = *more than \$75,000*).

Parental facilitation. Parents completed a 10-item scale adapted from the Child Development Project (CDP; Dodge, Bates, & Pettit, 1990) and Friendship Facilitation Questionnaire (FFQ; Vernberg et al., 1993), including three items created for the present study. Items assess the extent to which parents actively facilitate and allow permission for peer interaction opportunities (e.g., "Do you drive your child to friends' homes?") and actively promote peer interactions with similar peers (e.g., "How much do you make extra efforts to help your child find or spend time with peers who are a good match with your child's interests/hobbies?"). Items were rated on a 5-point scale (0 = *never* to 4 = *very often*). The reliability and validity of the items from the FFQ have been established (Vernberg et al., 1993; 2006). This measure was internally consistent ($\alpha = .84$).

Parental directing. Parental directing was assessed using a 10-item scale adapted from the guiding and prohibiting subscales of Mounst's (2002) Parental Management of Peers Inventory (PMPI). Items assess the extent to which parents promote or prohibit peer relationships based on their preferences about peers' characteristics (e.g., "I let my child know who he/she should be friends with" or "I influence my child's selection of friends"). Items were rated on a 6-point scale (1 = *strongly disagree* to 6 = *strongly agree*). Reliability of the PMPI scales has been established (Mounst, 2004; 2007; 2011). Internal consistency was high ($\alpha = .85$).

Parental problem-solving. Problem-solving was coded based on parents' open-ended responses to a hypothetical situation about peer exclusion. The peer exclusion hypothetical scenario was used because it is closely matched with the lab-based peer evaluation task, which created the prospect of negative peer evaluation. Parents were presented with the following situation: "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." Parents were asked to read the situation and provide a written response to the following question: "What are one or two specific ways in which you would advise your child to deal with this situation?" The question was framed in an open-ended manner so that parents' responses were not biased by the availability of forced-choice items. Parents could provide responses about behavioral strategies or cognitive interpretations, or provide both types of advice. Approximately half (49%) of parents responded with both behavioral *and* interpretative advice, 28% of parents provided only behavioral advice, and 23% of parents provided only interpretive advice about the hypothetical peer exclusion scenario. Based on the content of parents' open-ended responses, and coding schemes in the social coaching (Finnie & Russell, 1988; McDowell & Parke, 2009; Mize & Pettit, 1997) and coping (Compas, Conner-Smith, Saltzman, Thomsen, & Wadsworth, 2001) literatures, a new coding

scheme was developed to capture the degree to which parents described prosocial problem-solving. Parents behavioral and/or interpretive advice were coded together on a continuous 4-point scale from low to high prosocial/benign advice (1 = *avoidant/negative* to 4 = *prosocial/benign*). Parental behavioral advice and interpretive advice were not coded separately because 51% of the same did not report both forms of advice.

Higher scores were given when parents reported *specific* prosocial/benign behavioral advice (e.g., “I would tell him/her to ask some other kids to do an activity”) and/or *specific* prosocial/benign interpretive advice (e.g., “I would tell him/her that maybe there was a limited number of invitations and remind him that he has been included in activities with friends before”) about the situations. Parents who reported non-negative, *vague* behavioral advice (e.g., “I would tell him/her to do something else”) or interpretive advice (e.g., “I would tell him/her it’s ok to not be invited” or “I would tell him/her that there will be other opportunities”) about the situation were given moderate scores (higher than avoidant/negative but lower than prosocial/benign). Parents who provided less prosocial or more negative (e.g., avoidant, insulting, dismissive) behavioral advice (e.g., "I would tell him/her not to be friends with those kids anymore") or interpretive advice (e.g., "I would tell him/her that those kids must not have been his real friends" or "I would tell him/her that it doesn't matter") were given the lowest scores. Three researchers were trained in the coding system. One researcher coded all responses, and the other two researchers each coded half of the responses. Researchers were trained on responses for which they did not provide official codes and were required to reach an inter-rater reliability of .80 (or above) during training. Inter-rater reliability for the peer exclusion scenario was high (intra-class correlation = .87).

Preadolescent physiological assessments. RSA and SCL were measured during acclimation (5 minutes), baseline A (resting state; 3 minutes), baseline B (reading aloud with RA; 3 minutes), conversation activity (3 minutes), waiting (for response from peer judges; 3 minute), rebuffer (3 minutes), and recovery (3 minutes) periods. To ensure clean physiological data acquisition, electrode sites were prepared and cleaned, and cloth tape was used to loop and secure excess electrode leads to reduce movement artifacts. In the present study, baseline A (referred to as the *pre-task* period) was used. RSA and SCL refer to mean levels of the respective physiological parameters during baseline A. Because the assent process included a description of the peer stress protocol, baseline (baseline A) measurements of physiological parameters may be conceptualized more accurately as pre-task levels, which were influenced by some level of anticipatory stress. Physiological reactivity to the peer evaluation period was used in the present study because the peer evaluation period was a more standardized stress experience for all participants, compared to the peer rebuffer period during which some participants planned to reconnect with the peer judges and some did not (participants were given the choice for ethical reasons). Peer-stress levels of physiological parameters were not collected for three participants because they chose not to participate in the peer stress procedures or their uncomfortable appearance led us to forego the peer stress period.

RSA. Data acquisition followed standard guidelines (Bernston et al., 1997) using a Bioamp data acquisition system (MindWare Technologies, Inc., Gahanna, OH). Heart rate variability was collected through disposable silver/silver-chloride (Ag-AgCl) electrodes (1 ½” foam sensor, 7% chloride gel) placed on participants’ right clavicle and left and right rib by a same-sex RA. RSA scores (units = natural log of milliseconds, squared or $\ln(\text{ms}^2)$) were quantified using the spectral analysis method (Berntson et al., 1997) with MindWare HRV

analysis software (MindWare Technologies, Inc.). The very few artifacts that were detected were corrected manually using standard procedures (Berntson et al., 1997). RSAR refers to the residualized change score from the pre-task period to the peer evaluation period. The residualized change score is the residual of the regression of RSA-evaluation on pre-task RSA (Burt & Obradović, in press). In the present study, residualized change scores were multiplied by -1, such that higher RSAR scores indicate greater reductions in RSA (i.e., greater vagal withdrawal) from the pre-task period to the peer evaluation period (Eisenberg et al., 2012). RSA and RSAR were examined in the current study.

SCL. Data acquisition followed standard procedures (MindWare Technologies, Inc.). SCL was also measured continuously throughout the lab protocol 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.). SCLR data were not included for 12 participants due to measurement artifacts. SCLR refers to the residualized change score from the pre-task period to the peer evaluation period. The residualized change score is the residual of the regression of SCL-evaluation on pre-task SCL (Burt & Obradović, in press). SCL and SCLR were examined in the current study.

Outcome Variables at T1 and T2

Friendship support. Preadolescents completed 8-items adapted from the widely used and well-validated Friendship Quality Questionnaire (Parker & Asher, 1993), which assesses friendship support (e.g., “My friends care about me;” “I can count on my friends when I need them”) on a 5-point scale (1= *not at all true* to 5 = *very true*). This measure was internally consistent at T1 ($\alpha = .79$) and T2 ($\alpha = .81$).

Peer group acceptance. Teachers reported on preadolescents' peer acceptance. Teachers completed the 2-item Peer Acceptance subscale of the Social Behavior Rating Scale (SBRS; Schwartz et al., 2002), which assesses how well-liked and accepted preadolescents are by their peers (e.g., "This child is well-liked by peers") on a 5-point scale (0 = *almost never true* to 5 = *almost always true*). Reliability and validity of the SBRS subscales have been established (Schwartz et al., 2002); specifically, teacher reports of peer acceptance are moderately to strongly correlated with peer nominations of acceptance and liking (Schwartz, Chang, & Farver, 2001; Schwartz et al., 2002). The measure was reliable for teachers at T1 ($\alpha = .79$) and T2 ($\alpha = .79$). Validity is well-established for teacher reports of peer adjustment, at least in part because teachers commonly observe children in peer contexts (Bierman, 2004).

Peer victimization. Teachers and preadolescents reported on preadolescents' peer victimization. Teachers completed the 6-item Peer Victimization subscale of the SBRS (Schwartz et al. 2002), which assesses how often preadolescents are victimized by their peers (e.g., "Other children hit or push this child," "Other children tease or make fun of this child"). Items were rated on a 5-point scale (1 = *almost never true* to 5 = *almost always true*). Reliability and validity of the SBRS subscales have been established (Schwartz et al., 2002); specifically, teacher reports of peer victimization are moderately correlated with peer nominations of peer victimization (Schwartz, Gorman, Nakamoto, & Toblin, 2005). This subscale was internally consistent at T1 ($\alpha = .91$) and T2 ($\alpha = .94$). Preadolescents completed 11-items adapted from the Social Experiences Questionnaire (Crick & Grotpeter, 1996; Cullerton-Sen & Crick, 2005) and SBRS (Schwartz et al., 2002) to assess peer victimization (e.g., "How often have other kids said mean things about you to keep other people from liking you?" "How often do you get hit by another kid at school?"). Items were rated on a 5-point scale (1 = *almost never* to 5 = *almost*

always). Reliability and validity have been established in samples with preadolescents (Crick & Grotpeter, 1996) and adolescents (Storch, Crisp, Roberti, Bagner, & Masia-Warner, 2005). In the present study, this measure was internally consistent at T1 ($\alpha = .87$) and T2 ($\alpha = .89$).

The full set of parent, preadolescent, and teacher reports can be found in Appendix A.

Plan of Analysis

Preliminary analyses examining descriptive statistics (Table 1) and correlations (Table 2) among all study variables were conducted. Variables were checked for outliers, skewed distributions, and other non-standard conditions. Regression analyses (Tables 3 to 6) were then conducted in Amos (Arbuckle, 2012) to take advantage of full information maximum likelihood (FIML) estimation to handle missing data. Separate models for pre-task physiology and physiological reactivity were fitted for each of the four peer adjustment outcomes (preadolescent-and teacher-reported peer victimization, preadolescent-reported friendship support, teacher-reported peer acceptance), resulting in a total of eight full models. Pre-task and reactivity physiological measures were examined in separate models because pre-task and reactivity measures were conceptualized as markers of similar constructs (e.g., high RSA and high RSAR were conceptualized as physiological indicators of social engagement and emotion regulation).

Each model included several steps and predictor variables were centered for all regression analyses. In Step 1, control variables were entered: preadolescent sex, age, race/ethnicity, and household income, as well as the T1 measure of the corresponding peer adjustment outcome. In Step 2, to address Aim 1, the three peer-related parenting variables (facilitation, directing, and problem-solving) were added, such that control variables and peer-related parenting variables were included. In Step 3, either RSA and SCL (pre-task model) or

RSAR and SCLR (reactivity model) were added. Lastly, in Step 4, to address Aim 3, the interactions between each parenting variable and either RSA and SCL or RSAR and SCLR were added. Additionally, to address Aim 2 regarding the main effects of physiological parameters (without controlling for parenting), separate models were fitted that included control variables and either RSA and SCL or RSAR and SCLR. Regression coefficients are presented in Tables 3 through 6 with the exception of the regression coefficients for the main effect of physiological parameters (without controlling for parenting), which are presented in the text.

Simple slopes of significant interactions were estimated and plotted to clarify the associations among variables according to standard procedures (Aiken & West, 1991; Dearing & Hamilton, 2006; Holmbeck, 2002; Preacher, Curran & Baurer, 2006). Simple slopes represent the association between the predictor (T1 peer-related parenting) and outcome (T2 peer adjustment) at lower ($-1 SD$) and higher ($+ 1 SD$) levels of the continuous moderator variable (T1 preadolescent physiological response). In other words, simple slopes analysis indicates whether the predictor is significantly associated with the outcome at a specific level of the moderator. Illustrative plots of significant interactions are presented in Figures 1 - 8.

Exploratory analyses to examine sex differences in the effects of parenting behaviors were also conducted. Separate models were fitted for each outcome and each model included the control variables, the three peer-related parenting variables, and the interaction between each parenting variable and sex. Only one significant interaction emerged out of 12 possible interactions, and follow-up analyses revealed no significant slopes for boys or girls; therefore, the results for parenting by sex interactions are not presented.

IV. RESULTS

Preliminary Analyses

Means and standard deviations are presented in Table 1. All variables were within the commonly accepted range of skewness (absolute values ≤ 1.83) (e.g., Kline, 2005). One outlier (exceeding 4 *SDs*) was found for T2 teacher-reported peer victimization. The value was re-coded with the highest observed value below 4 *SDs*, and a sensitivity analysis was conducted to determine whether the outlier changed the results of the models. Results from the original analyses and sensitivity analyses were nearly identical. Thus, to preserve the participant's actual score, we presented the findings of the original analyses.

On average, preadolescents' peer adjustment was moderately stable across T1 and T2, with correlations ranging from .26 to .68 (Table 2). Paired samples t-test were conducted and revealed that there were no significant differences between mean levels of T1 and T2 preadolescent-reported peer victimization ($t = 1.53, p = .13$), preadolescent-reported friendship support ($t = .14, p = .89$), teacher-reported peer victimization ($t = 1.06, p = .29$), and teacher-reported peer acceptance ($t = 1.12, p = .27$). See Table 1 for means and standard deviations.

Bivariate analyses were conducted to examine the associations between all study variables (Table 2). Correlations with demographic variables revealed that girls experienced higher levels of parental facilitation, T2 preadolescent-reported friendship support, T2 teacher-reported peer acceptance and lower levels of T2 teacher-reported peer victimization than boys. Caucasians had higher levels of household income, parental facilitation, SCL, and SCLR compared to minorities. Participants from higher income households experienced higher levels of

parental problem-solving, T1 and T2 teacher-reported peer acceptance, and lower levels of T1 preadolescent-reported peer victimization.

Across the parenting variables, facilitation was correlated with higher levels of parental problem-solving, but no other associations emerged. RSA at pre-task was moderately correlated with change in RSA (pre-task period minus peer evaluation period; $r = .38, p < .001$), such that higher RSA at pre-task was associated with higher vagal withdrawal to the peer evaluation period. RSA at pre-task was not correlated with the residualized change score of RSA (i.e., RSAR). SCL at pre-task was not correlated with change in SCL (pre-task period minus peer evaluation period; $r = .11, p = .25$) or with the residualized change score of SCL (i.e., SCLR). SCL and SCLR were not correlated with RSA or RSAR. Stability correlations between peer adjustment measures at T1 and T2 were in the expected direction and moderate in magnitude (r s ranged from .26 to .68, p s $< .05$). Friendship support, peer acceptance, and peer victimization (across T1 and T2) were modestly to moderately correlated in the expected directions, such that friendship support was positively correlated with peer acceptance, and both were negatively correlated with peer victimization with several exceptions. Lastly, correlations linking predictor variables with outcome variables revealed that facilitation was associated with higher T2 preadolescent-reported friendship support, problem-solving was correlated with lower T2 teacher-reported peer victimization, and RSAR was associated with higher T2 preadolescent-reported friendship support.

Table 1.

Descriptive Statistics of Study Variables

Variable	N	Mean (SD)/%
Sex (1 = female)	123	49.6%
Age	121	12.03 (.64)
Minority (1 = minority)	123	41.5%
Income	119	4.13 (1.55)
T1 Parental facilitation	123	2.47 (.75)
T1 Parental directing	123	3.86 (.83)
T1 Parental problem-solving	118	2.39 (.72)
T1 RSA	123	6.80 (1.00)
T1 RSAR	120	.00 (.73)
T1 SCL	111	6.23 (4.07)
T1 SCLR	108	.00 (3.09)
T1 PR Peer victimization	122	1.89 (.78)
T1 PR Friendship support	122	4.07 (.74)
T1 TR Peer victimization	101	1.54 (.67)
T1 TR Peer acceptance	101	4.05 (.75)
T2 PR Peer victimization	100	1.83 (.92)
T2 PR Friendship support	99	4.08 (.69)
T2 TR Peer victimization	88	1.50 (.75)
T2 TR Peer acceptance	88	4.13 (.93)

Note. T1 = Time 1, T2 = Time 2, RSA = respiratory sinus arrhythmia (units = $\ln(\text{ms}^2)$), SCL = skin conductance level (units = μS), RSAR = respiratory sinus arrhythmia reactivity (units = $\ln(\text{ms}^2)$), SCLR = skin conductance level reactivity (units = μS), PR = preadolescent report, TR = teacher report.

Table 2.

Correlations among Study Variables

	1	2	3	4	5	6	7	8	9
1. Sex (1 = female)	-								
2. Age	-.24**	-							
3. Ethnicity (1 = minority)	.06	-.33***	-						
4. Income	.02	.12	-.51***	-					
5. T1 Parental Facilitation	.18*	.05	-.19*	.10	-				
6. T1 Parental Directing	.01	-.08	-.16	.08	.04	-			
7. T1 Parental Problem-solving	-.06	-.02	-.19*	.33***	.20*	.03	-		
8. T1 RSA	.07	-.10	.05	.08	.06	.06	.18*	-	
9. T1 SCL	-.09	.16	-.27**	.00	.13	-.08	-.01	-.09	-
10. T1 RSAR	.13	.01	.08	.15	.09	-.10	.12	.00	.00
11. T1 SCLR	-.17	.07	-.27**	.18	.18	.12	.19*	.04	.00
12. T1 PR Peer victimization	.05	-.06	.08	-.21*	.04	-.07	-.05	-.04	.00
13. T1 PR Friend support	.17	.05	-.07	.10	.09	-.06	-.04	-.04	.02
14. T1 TR Peer victimization	-.06	-.08	.05	-.19	-.09	.07	-.03	.04	.02
15. T1 TR Peer acceptance	.13	.02	-.08	.27**	.16	.04	.17	-.04	-.02
16. T2 PR Peer victimization	.06	-.07	.05	.04	.07	-.09	.15	.03	.06
17. T2 PR Friend support	.31**	.21*	-.09	.22*	.21*	.08	-.01	.14	.16
18. T2 TR Peer victimization	-.25*	-.04	.10	-.16	-.12	.09	-.26*	-.02	.07
19. T2 TR Peer acceptance	.19*	.12	-.01	.23*	.16	-.13	.20	.06	-.08

Note. T1 = Time 1, T2 = Time 2, RSA = respiratory sinus arrhythmia (units = $\ln(\text{ms}^2)$), SCL = skin conductance level (units = μS), RSAR = respiratory sinus arrhythmia reactivity (units = $\ln(\text{ms}^2)$), SCLR = skin conductance level reactivity (units = μS), PR = preadolescent report, TR = teacher report.

* $p < .05$, ** $p < .01$, *** $p < .001$

Table 2 (continued)

Correlations among Study Variables

	10	11	12	13	14	15	16	17	18	19
10. T1 RSAR	-									
11. T1 SCLR	-.15	-								
12. T1 PR Peer victimization	-.15	-.03	-							
13. T1 PR Friend support	.12	.01	-.27**	-						
14. T1 TR Peer victimization	-.10	-.12	.22*	-.28**	-					
15. T1 TR Peer acceptance	.05	.20	-.27**	.33**	-.70***	-				
16. T2 PR Peer victimization	-.04	-.02	.68***	-.33**	.28*	-.36**	-			
17. T2 PR Friend support	.23*	.02	-.18	.54***	-.37**	.49***	-.26**	-		
18. T2 TR Peer victimization	.02	-.13	.20	-.03	.26*	-.47***	.13	-.08	-	
19. T2 TR Peer acceptance	.06	.01	-.33**	.17	-.27*	.42***	-.19*	.21*	-.82***	-

Note. T1 = Time 1, T2 = Time 2, RSAR = respiratory sinus arrhythmia reactivity (units = $\ln(\text{ms}^2)$), SCLR = skin conductance level reactivity (units = μS), PR = preadolescent report, TR = teacher report.

* $p < .05$, ** $p < .01$, *** $p < .001$

Aim 1: Parenting in the Peer Domain Predicting Peer Adjustment

Parental directing predicted higher levels of preadolescent-reported friendship support from T1 to T2, controlling for demographic variables and other peer-related parenting variables. This main effect was qualified by a significant two-way interaction (see below). As expected, parental prosocial problem-solving predicted lower levels of teacher-reported peer victimization from T1 to T2, controlling for demographic variables and other peer-related parenting variables. This main effect was qualified by a significant two-way interaction (see below). Contrary to expectations, parental facilitation did not predict any T2 peer adjustment indices and directing and problem-solving did not predict any other T2 peer adjustment indices (refer to Tables 3 and 4, Step 2 in the Step of Entry column).

The purpose of this aim was to determine whether parenting in the peer domain predicted positive peer adjustment across the transition to middle school. Few main effects of parenting on peer adjustment were significant. More specifically, two out of 12 possible associations between peer-related parenting and peer adjustment emerged. Thus, peer-related parenting behaviors were less robust predictors of peer adjustment across the middle school transition than anticipated.

Aim 2: Preadolescent Physiological Responses Predicting Peer Adjustment

Neither RSA nor RSAR predicted T2 preadolescent-reported peer victimization ($B = .04$, $SE = .05$, $\beta = .05$, $p = .45$; $B = .02$, $SE = .07$, $\beta = .02$, $p = .75$, respectively), T2 preadolescent-reported friendship support ($B = .08$, $SE = .05$, $\beta = .12$, $p = .11$; $B = .08$, $SE = .07$, $\beta = .10$, $p = .23$, respectively), T2 teacher-reported peer victimization ($B = .01$, $SE = .08$, $\beta = .01$, $p = .90$; $B = .12$, $SE = .10$, $\beta = .12$, $p = .22$, respectively), or T2 teacher-reported peer acceptance ($B = .01$, $SE = .09$, $\beta = .01$, $p = .94$; $B = -.12$, $SE = .11$, $\beta = -.09$, $p = .31$, respectively), controlling for demographic variables, T1 peer adjustment, and other physiological parameters.

SCL predicted higher levels of preadolescent-reported friendship support from T1 to T2, controlling for demographic variables and other physiological parameters ($B = .03$, $SE = .01$, $\beta = .20$, $p < .05$). SCLR did not predict T2 friendship support ($B = .02$, $SE = .02$, $\beta = .07$, $p = .40$), and SCL and SCLR did not predict T2 preadolescent-reported peer victimization ($B = .02$, $SE = .01$, $\beta = .11$, $p = .14$; $B = -.01$, $SE = .02$, $\beta = -.02$, $p = .78$, respectively), T2 teacher-reported peer victimization ($B = .01$, $SE = .02$, $\beta = .06$, $p = .55$; $B = -.04$, $SE = .03$, $\beta = -.14$, $p = .17$, respectively), or T2 teacher-reported peer acceptance ($B = -.01$, $SE = .02$, $\beta = -.03$, $p = .73$; $B = -.01$, $SE = .03$, $\beta = -.04$, $p = .69$, respectively).

The purpose of this aim was to examine whether preadolescents' physiological responses to peer stress predicted peer adjustment across the transition to middle school. Contrary to expectations, high RSA/R did not predict positive peer adjustment in middle school. For SCL/R, one association emerged with SCL predicting peer adjustment (i.e., friendship support), although the direction of association was unexpected.

Aim 3: Parenting in the Peer Domain x Preadolescent Physiological Responses

Facilitation x RSA/R. RSA moderated the association between facilitation and T2 preadolescent-reported peer adjustment, controlling for demographic variables, T1 peer victimization, other peer-related parenting variables, other physiological parameters, and other parenting by physiology interactions (Table 3, Step 4). As anticipated, simple slopes analyses revealed that parental facilitation predicted lower levels of peer victimization from T1 to T2 among preadolescents with lower RSA ($B = -.18$, $SE = .07$, $\beta = -.17$, $p < .01$), but not among preadolescents with higher RSA ($B = .11$, $SE = .07$, $\beta = .11$, $p = .09$; Figure 1). Preadolescents with high RSA had similar levels of T2 peer victimization across lower and higher levels of parental facilitation (Figure 1). RSA did not moderate the association between facilitation and

other T2 peer adjustment indices (Tables 3 and 4, Step 4). RSAR did not moderate the association between parental facilitation and T2 peer adjustment indices (Tables 5 and 6, Step 4).

Facilitation x SCL/R. Contrary to expectations, SCL and SCLR did not moderate the association between parental facilitation and T2 peer adjustment indices (Tables 3 to 6, Step 4).

Directing x RSA/R. RSA did not moderate the association between directing and T2 peer adjustment indices (Tables 3 and 4, Step 4).

RSAR moderated the association between directing and T2 preadolescent-reported friendship support, controlling for demographic variables, T1 friendship support, other peer-related parenting variables, other physiological parameters, and other parenting by physiology interactions (Table 5, Step 4). Simple slopes analyses revealed that directing predicted higher levels of friendship support from T1 to T2 among preadolescents with low RSAR ($B = .32, SE = .06, \beta = .36, p < .001$); directing predicted lower levels of friendship support from T1 to T2 among preadolescents with high RSAR ($B = -.14, SE = .06, \beta = -.15, p < .05$; Figure 2). At low levels of parental directing, preadolescents with low RSAR had lower levels of T2 friendship support than preadolescents with high RSAR (Figure 2), as expected. RSAR did not moderate the association between directing and other T2 peer adjustment indices (Tables 5 and 6, Step 4).

Directing x SCL/R. SCL moderated the association between directing and T2 preadolescent-reported peer victimization and T2 preadolescent-reported friendship support (Table 3, Step 4). Simple slopes analyses revealed that parental directing predicted lower levels of preadolescent-reported peer victimization from T1 to T2 among preadolescents with higher SCL ($B = -.16, SE = .06, \beta = -.16, p < .01$), but not among preadolescents with lower SCL ($B = .06, SE = .06, \beta = .06, p = .34$; Figure 3). Preadolescents with low SCL had similar levels of T2 peer victimization across lower and higher levels of parental directing (Figure 3). Additionally,

simple slopes analyses revealed that directing predicted higher levels of preadolescent-reported friendship support from T1 to T2 among preadolescents with higher SCL ($B = .39, SE = .06, \beta = .40, p < .001$), but not among preadolescents with lower SCL ($B = .01, SE = .06, \beta = .01, p = .92$; Figure 4). At high levels of directing, preadolescents with high SCL had higher levels of T2 friendship support than preadolescents with low SCL (Figure 4). These results, however, were contrary to expectations. SCL did not moderate the association between directing and other T2 peer adjustment indices (Table 4, Step 4).

SCLR also moderated the association between directing and T2 preadolescent-reported friendship support (Table 5, Step 4). Simple slopes analyses revealed that directing predicted higher levels of friendship support from T1 to T2 among preadolescents with lower SCLR ($B = .30, SE = .06, \beta = .34, p < .001$), but not among preadolescents with higher SCLR ($B = -.03, SE = .06, \beta = -.04, p = .62$; Figure 5), as anticipated. Preadolescents with high SCLR had similar levels of T2 friendship support at lower and higher levels of parental directing, but preadolescents with low SCLR had relatively lower levels of T2 friendship support at low levels of directing and relatively higher levels of T2 friendship support at high levels of directing (Figure 5).

Lastly, SCLR moderated the association between directing and T2 teacher-reported peer acceptance (Table 6, Step 4). Consistent with expectations, simple slopes analyses revealed that directing predicted lower levels of peer acceptance from T1 to T2 among preadolescents with high SCLR ($B = -.23, SE = .10, \beta = -.20, p < .05$), but not among preadolescents with lower SCLR ($B = .08, SE = .10, \beta = .07, p = .40$; Figure 6). At high levels of directing, preadolescents with high SCLR had lower levels of T2 peer acceptance than preadolescents with low SCLR (Figure 6). SCLR did not moderate the association between directing and T2 preadolescent- and teacher-reported peer victimization (Tables 5 and 6, Step 4).

Problem-solving x RSA/R. RSA and RSAR did not moderate the association between problem-solving and T2 peer adjustment indices (Tables 3 to 6, Step 4).

Problem-solving x SCL/R. SCL moderated the association between problem-solving and T2 teacher-reported peer acceptance, controlling for demographic variables, T1 peer acceptance, other peer-related parenting variables, other physiological parameters, and other parenting by physiology interactions (Table 4, Step 4). As expected, simple slopes analyses revealed that parental problem-solving predicted higher levels of peer acceptance from T1 to T2 among preadolescents with high SCL ($B = .41, SE = .11, \beta = .30, p < .001$), but not among preadolescents with low SCL ($B = -.01, SE = .11, \beta = -.01, p = .96$; Figure 7). Preadolescents with low SCL had similar levels of T2 peer acceptance across higher and lower levels of parental problem-solving, whereas preadolescents with high SCL had lower levels of peer acceptance at low levels of prosocial problem-solving and higher levels of peer acceptance at high levels of prosocial problem-solving (Figure 7). SCL did not moderate the association between problem-solving and other T2 peer adjustment indices (Tables 3 and 4, Step 4).

SCLR moderated the association between problem-solving and T2 teacher-reported peer victimization (Table 6, Step 4). As hypothesized, simple slopes analyses revealed that problem-solving predicted lower levels of peer victimization from T1 to T2 among preadolescents with high SCLR ($B = -.45, SE = .10, \beta = -.39, p < .001$), but not among preadolescents with low SCLR ($B = -.12, SE = .10, \beta = -.11, p = .21$; Figure 8). At high levels of parental problem-solving, preadolescents with high SCLR had lower levels of T2 peer victimization compared to preadolescents with low SCLR (Figure 8). SCLR did not moderate the association between problem-solving and other T2 peer adjustment indices (Tables 5 and 6, Step 4).

The purpose of this aim was to determine whether preadolescents' physiological responses to peer stress moderated the association between parenting and peer adjustment. Eight (17%) parenting by physiology interactions were significant in the present study. Results were mostly consistent with hypotheses.

Table 3.

Predicting T2 Preadolescent-reported Peer Adjustment from Parenting, Pre-task Physiology, and Parenting x Pre-task Physiology

	T2 Preadolescent-reported peer victimization				T2 Preadolescent-reported friend support			
	Step of entry		Final model		Step of entry		Final model	
	B (SE)	β	B (SE)	β	B (SE)	β	B (SE)	β
Step : Controls								
Sex (1 = female)	-.04 (.11)	-.03	-.02 (.10)	-.01	.37 (.11)	.27***	.37 (.10)	.25***
Age	-.00 (.08)	-.00	.05 (.08)	.04	.24 (.09)	.23**	.26 (.07)	.23***
Race/ethnicity (1 = minority)	.20 (.11)	.13	.30 (.10)	.19**	.09 (.11)	.07	.25 (.10)	.17**
Income	.11 (.04)	.23**	.10 (.03)	.19**	.08 (.04)	.18*	.12 (.03)	.25***
T1 Peer adjustment	.68 (.07)	.68***	.68 (.06)	.68***	.43 (.07)	.47***	.43 (.06)	.44***
R ²	53.7%				38.2%			
Step 2: Parenting								
T1 Facilitation	-.03 (.07)	-.02	-.03 (.07)	-.03	.13 (.07)	.14	.11 (.06)	.12
T1 Directing	-.02 (.06)	-.02	-.05 (.06)	-.05	.13 (.06)	.16*	.20 (.06)	.23***
T1 Problem-solving	.11 (.08)	.11	.10 (.07)	.09	.01 (.08)	.10	.03 (.07)	.03
ΔR^2	.00				.05			
Step 3: Pre-task physiology								
RSA	.03 (.05)	.03	.03 (.05)	.04	.09 (.05)	.12	.08 (.05)	.11
SCL	.02 (.01)	.12	.03 (.01)	.13*	.03 (.01)	.19*	.03 (.01)	.18**
ΔR^2	.03				.06			
Step 4: 2-way Interactions								
Facilitation x RSA			.15 (.06)	.14*			-.03 (.06)	-.03
Facilitation x SCL			-.01 (.02)	-.02			.00 (.02)	.01
Directing x RSA			.01 (.06)	.01			-.02 (.06)	-.03
Directing x SCL			-.04 (.02)	-.14*			.07 (.02)	.26***
Problem-solving x RSA			-.03 (.08)	-.03			-.04 (.08)	-.04
Problem-solving x SCL			-.01 (.02)	-.03			.01 (.02)	.02
ΔR^2 /Total R ²	.04/60.6%				.12/41.7%			

Note. T1 = Time 1, T2 = Time 2, RSA = respiratory sinus arrhythmia (units = ln(ms²)), SCL = skin conductance level (units = μ S).

* $p < .05$, ** $p < .01$, *** $p < .001$.

Table 4.

Predicting T2 Teacher-reported Peer Adjustment from Parenting, Pre-task Physiology, and Parenting x Pre-task Physiology

	T2 Teacher-reported peer victimization				T2 Teacher-reported peer acceptance			
	Step of entry		Final model		Step of entry		Final model	
	B (SE)	β	B (SE)	β	B (SE)	β	B (SE)	β
Step : Controls								
Sex (1 = female)	-.40 (.15)	-.27**	-.43 (.14)	-.28**	.35 (.17)	.18*	.31 (.16)	.16
Age	-.08 (.12)	-.07	-.06 (.11)	-.05	.27 (.14)	.18*	.21 (.12)	.14
Race/ethnicity (1 = minority)	.10 (.15)	.06	.11 (.14)	.07	.35 (.18)	.18	.31 (.16)	.16
Income	-.04 (.05)	-.09	.00 (.05)	.00	.15 (.06)	.24**	.13 (.05)	.21*
T1 Peer adjustment	.25 (.12)	.22*	.27 (.11)	.24*	.38 (.10)	.37***	.40 (.09)	.39***
R ²	13.7%				29.1%			
Step 2: Parenting								
T1 Facilitation	.02 (.10)	.02	-.02 (.09)	-.02	.08 (.11)	.06	.16 (.11)	.13
T1 Directing	.04 (.09)	.04	.06 (.08)	.07	-.14 (.10)	-.12	-.12 (.10)	-.11
T1 Problem-solving	-.26 (.10)	-.25*	-.28 (.10)	-.27**	.15 (.12)	.11	.19 (.11)	.15
ΔR^2	.07				.01			
Step 3: Pre-task physiology								
RSA	.04 (.07)	.05	.01 (.07)	.01	-.02 (.09)	-.02	.03 (.08)	.03
SCL	.01 (.02)	.05	.00 (.02)	.02	-.01 (.02)	-.04	-.00 (.02)	-.01
ΔR^2	.01				.00			
Step 4: 2-way Interactions								
Facilitation x RSA			-.06 (.09)	-.06			.17 (.10)	.14
Facilitation x SCL			-.01 (.02)	-.06			.05 (.03)	.16
Directing x RSA			.07 (.09)	.08			-.11 (.10)	-.09
Directing x SCL			.03 (.03)	.11			-.02 (.03)	-.07
Problem-solving x RSA			-.14 (.12)	-.11			.07 (.13)	.05
Problem-solving x SCL			-.04 (.02)	-.16			.06 (.03)	.19*
ΔR^2 /Total R ²	.07/28.7%				.12/41.7%			

Note. T1 = Time 1, T2 = Time 2, RSA = respiratory sinus arrhythmia (units = $\ln(\text{ms}^2)$), SCL = skin conductance level (units = μS).

* $p < .05$, ** $p < .01$, *** $p < .001$.

Table 5.

Predicting T2 Preadolescent-reported Peer Adjustment from Parenting, Reactivity Physiology, and Parenting x Reactivity Physiology

	T2 Preadolescent-reported peer victimization				T2 Preadolescent-reported friend support			
	Step of entry		Final model		Step of entry		Final model	
	B (SE)	β	B (SE)	β	B (SE)	β	B (SE)	β
Step : Controls								
Sex (1 = female)	-.04 (.11)	-.03	-.06 (.10)	-.04	.37 (.11)	.27***	.32 (.10)	.23***
Age	-.00 (.08)	-.00	.01 (.08)	.01	.24 (.09)	.23**	.21 (.08)	.19**
Race/ethnicity (1 = minority)	.20 (.11)	.13	.18 (.10)	.11	.09 (.11)	.07	.11 (.10)	.08
Income	.11 (.04)	.23**	.11 (.03)	.21**	.08 (.04)	.18*	.07 (.03)	.16*
T1 Peer adjustment	.68 (.07)	.68***	.71 (.07)	.70***	.43 (.07)	.47***	.46 (.07)	.49***
R ²	53.7%				38.2%			
Step 2: Parenting								
T1 Facilitation	-.03 (.07)	-.02	-.03 (.07)	-.03	.13 (.07)	.14	.08 (.07)	.09
T1 Directing	-.02 (.06)	-.02	-.02 (.06)	-.02	.13 (.06)	.16*	.11 (.06)	.12
T1 Problem-solving	.11 (.08)	.11	.10 (.07)	.10	.01 (.08)	.10	-.02 (.07)	-.02
ΔR^2	.01				.05			
Step 3: Reactivity physiology								
RSAR	.01 (.07)	.01	.06 (.07)	.05	.08 (.07)	.09	.09 (.07)	.10
SCLR	-.01 (.02)	-.03	-.01 (.02)	-.03	.01 (.02)	.05	.01 (.02)	.05
ΔR^2	.00				.00			
Step 4: 2-way Interactions								
Facilitation x RSAR			.12 (.09)	.09			-.03 (.08)	-.03
Facilitation x SCLR			.01 (.03)	.02			-.02 (.03)	-.06
Directing x RSAR			-.17 (.11)	-.10			-.34 (.11)	-.22**
Directing x SCLR			.02 (.02)	.04			-.08 (.02)	-.26***
Problem-solving x RSAR			-.07 (.11)	-.05			-.00 (.10)	-.00
Problem-solving x SCLR			-.04 (.02)	-.10			-.00 (.02)	-.01
ΔR^2 /Total R ²	.06/59.5%				.09/51.8%			

Note. T1 = Time 1, T2 = Time 2, RSAR = respiratory sinus arrhythmia reactivity (units = $\ln(\text{ms}^2)$), SCLR = skin conductance level reactivity (units = μS). * $p < .05$, ** $p < .01$, *** $p < .001$.

Table 6.

Predicting T2 Teacher-reported Peer Adjustment from Parenting, Reactivity Physiology, and Parenting x Reactivity Physiology

	T2 Teacher-reported peer victimization				T2 Teacher-reported peer acceptance			
	Step of entry		Final model		Step of entry		Final model	
	B (SE)	β	B (SE)	β	B (SE)	β	B (SE)	β
Step : Controls								
Sex (1 = female)	-.40 (.15)	-.27**	-.52 (.14)	-.33***	.35 (.17)	.18*	.32 (.16)	.17*
Age	-.08 (.12)	-.07	-.10 (.11)	-.09	.27 (.14)	.18*	.17 (.13)	.11
Race/ethnicity (1 = minority)	.10 (.15)	.06	-.05 (.14)	-.03	.35 (.18)	.18	.33 (.16)	.17*
Income	-.04 (.05)	-.09	-.07 (.04)	-.14	.15 (.06)	.24**	.18 (.05)	.30***
T1 Peer adjustment	.25 (.12)	.22*	.21 (.11)	.18	.38 (.10)	.37***	.36 (.09)	.35***
R ²	13.7%				29.1%			
Step 2: Parenting								
T1 Facilitation	.02 (.10)	.02	.01 (.09)	.01	.08 (.11)	.06	.08 (.11)	.06
T1 Directing	.04 (.09)	.04	.05 (.08)	.05	-.14 (.10)	-.12	-.16 (.10)	-.14
T1 Problem-solving	-.26 (.10)	-.25*	-.28 (.10)	-.26**	.15 (.12)	.11	-.15 (.11)	.08
ΔR^2	.07				.01			
Step 3: Reactivity physiology								
RSAR	.15 (.10)	.14	.17 (.09)	.16	-.15 (.12)	-.12	-.15 (.110)	-.11
SCLR	-.03 (.02)	-.10	-.03 (.02)	-.11	-.02 (.03)	-.06	-.01 (.03)	-.04
ΔR^2	.05				.05			
Step 4: 2-way Interactions								
Facilitation x RSAR			-.12 (.110)	-.09			.14 (.14)	.09
Facilitation x SCLR			.06 (.04)	.15			.02 (.04)	.04
Directing x RSAR			-.03 (.15)	-.02			-.19 (.18)	-.09
Directing x SCLR			-.01 (.03)	-.04			-.08 (.04)	-.20*
Problem-solving x RSAR			-.19 (.14)	-.12			.19 (.17)	.10
Problem-solving x SCLR			-.07 (.03)	-.19*			.02 (.04)	.04
ΔR^2 /Total R ²	.10/36%				.05/39.4%			

Note. T1 = Time 1, T2 = Time 2, RSAR = respiratory sinus arrhythmia reactivity (units = $\ln(\text{ms}^2)$), SCLR = skin conductance level reactivity (units = μS). * $p < .05$, ** $p < .01$, *** $p < .001$.

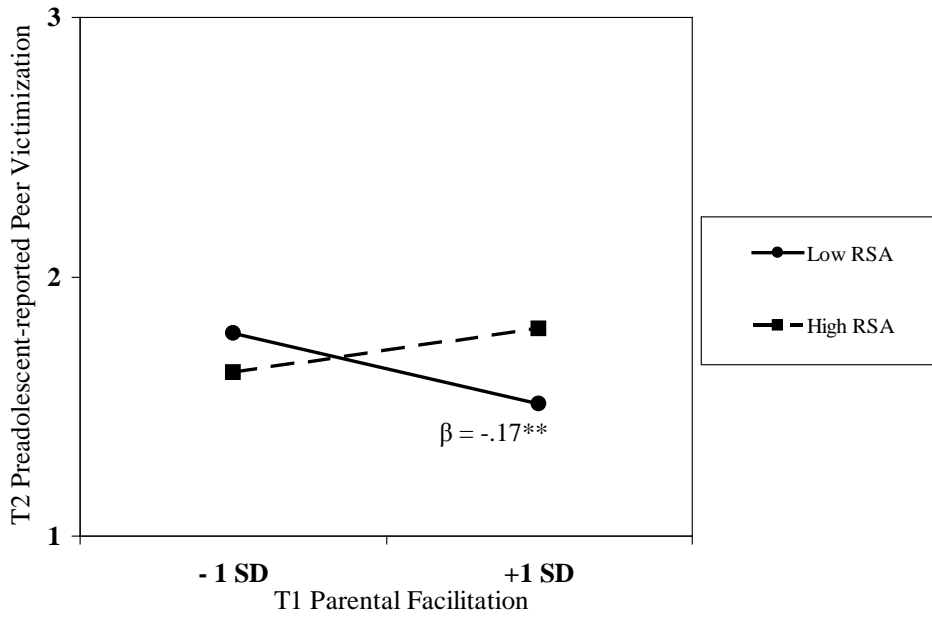


Figure 1. Parental facilitation predicting T2 preadolescent-reported peer victimization at low and high levels of RSA.

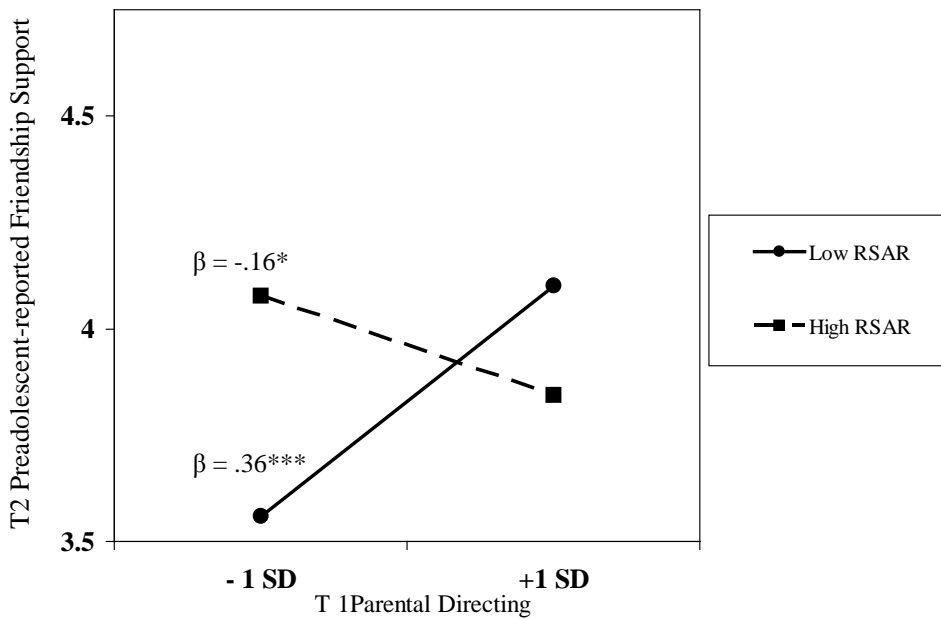


Figure 2. Parental directing predicting T2 preadolescent-reported friendship support at low and high levels of RSAR.

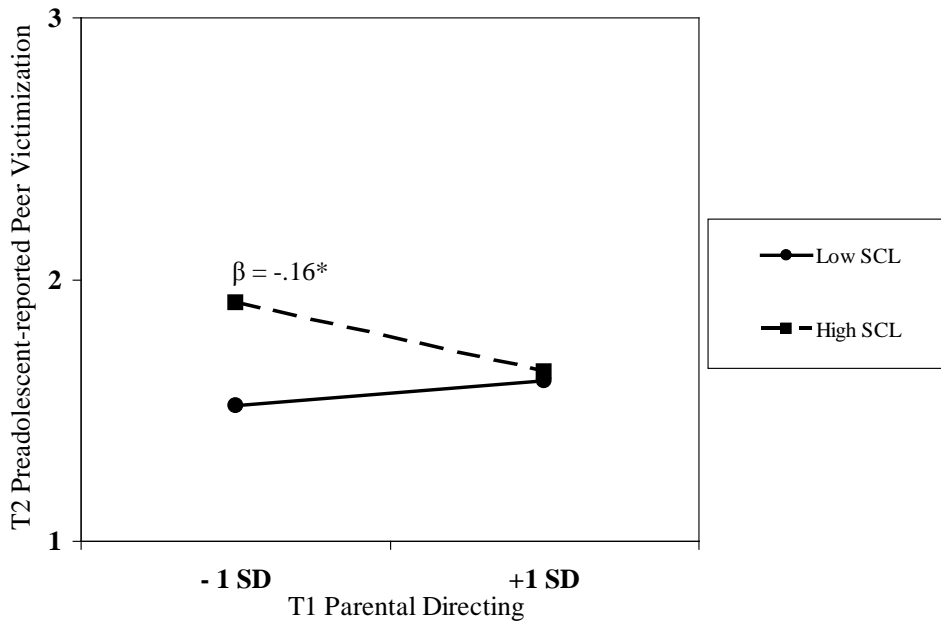


Figure 3. Parental directing predicting T2 preadolescent-reported peer victimization at low and high levels of SCL.

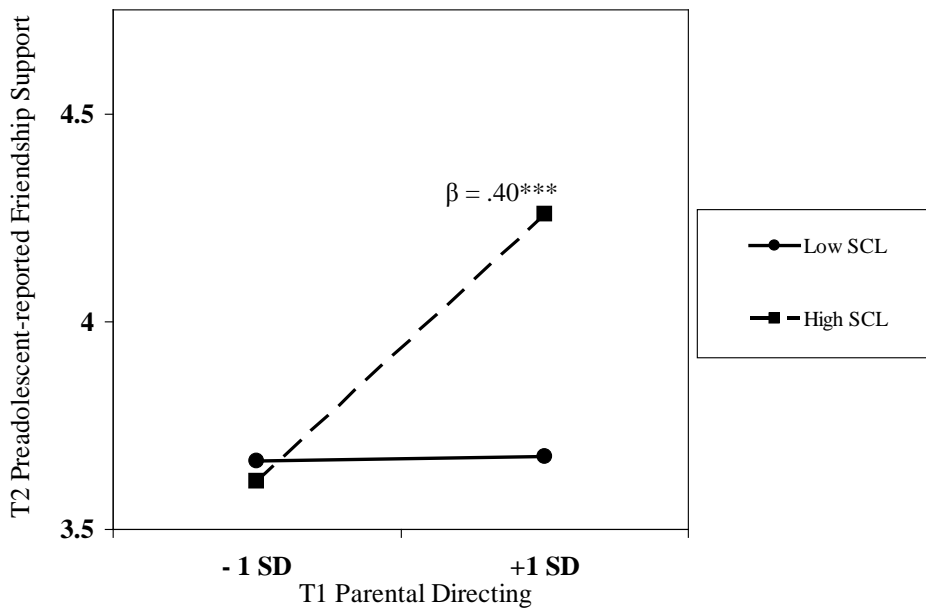


Figure 4. Parental directing predicting T2 preadolescent-reported friendship support at low and high levels of SCL.

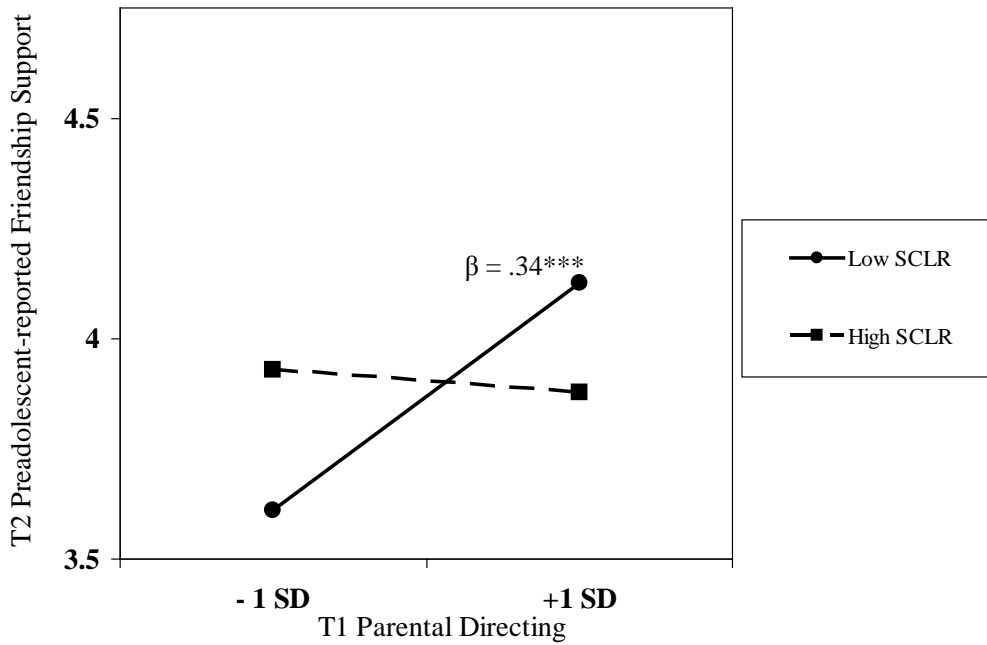


Figure 5. Parental directing predicting T2 preadolescent-reported friendship support at low and high levels of SCLR.

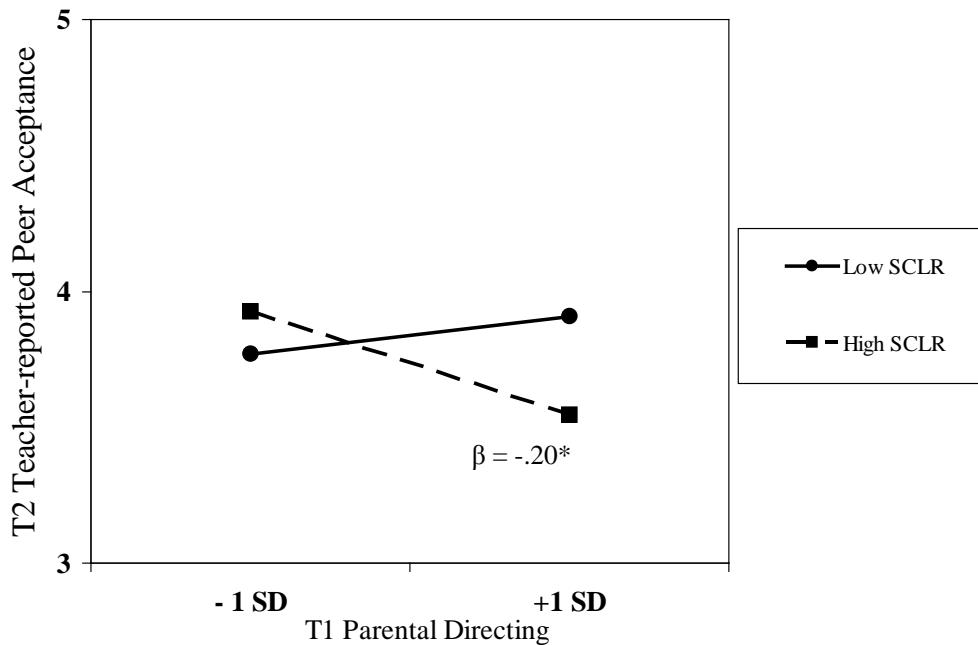


Figure 6. Parental directing predicting T2 teacher-reported peer acceptance at low and high levels of SCLR.

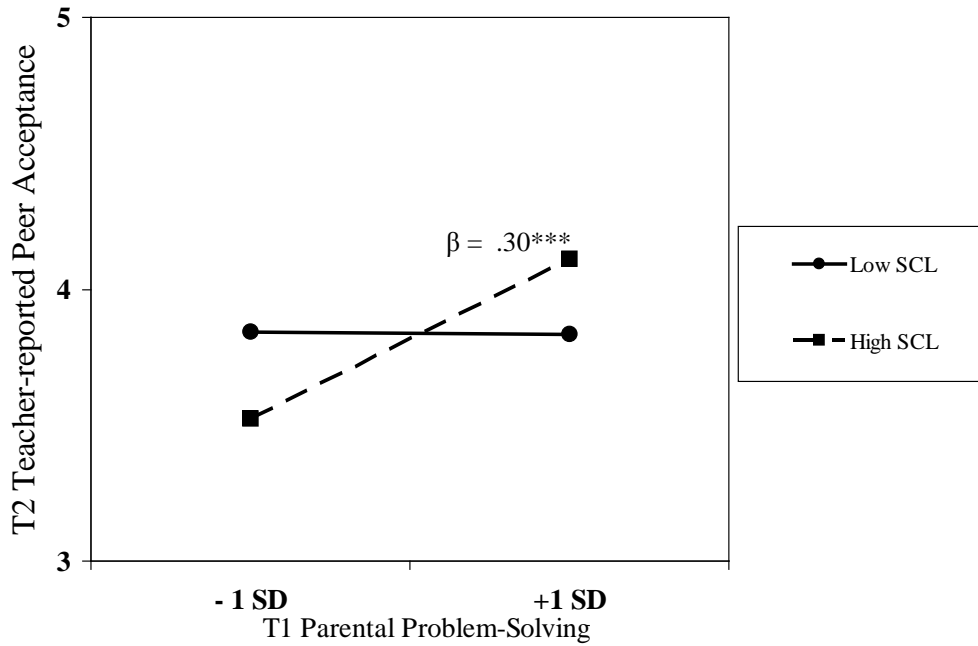


Figure 7. Parental problem-solving predicting T2 teacher-reported peer acceptance at low and high levels of SCL.

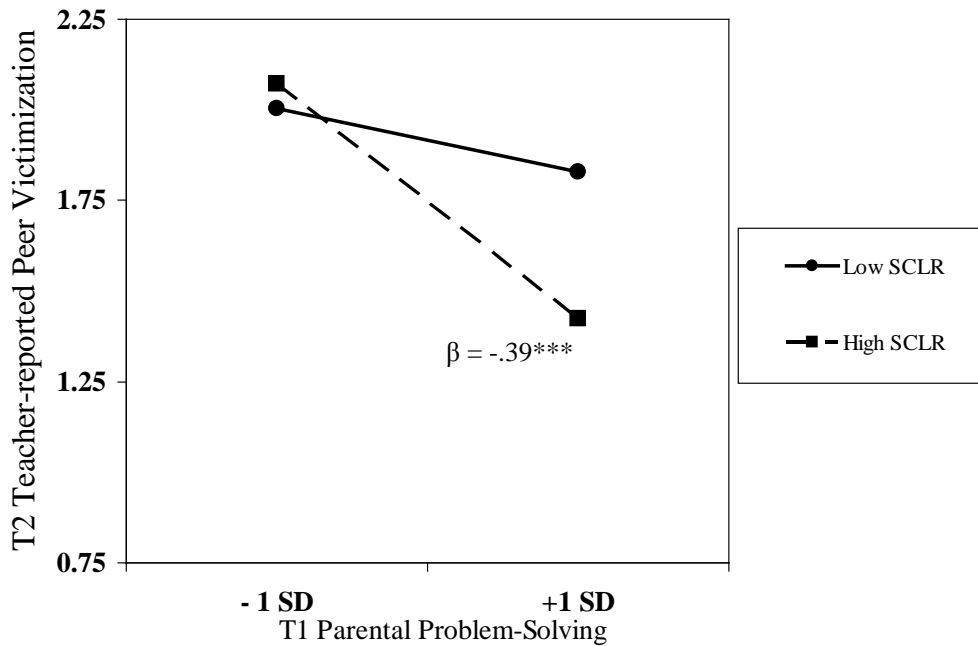


Figure 8. Parental problem-solving predicting T2 teacher-reported peer victimization at low and high levels of SCLR.

V. DISCUSSION

The present study investigated whether parenting in the peer domain (e.g., facilitation, directing, problem-solving) predicted preadolescents' peer adjustment across the transition to middle school and whether preadolescents' physiological responses to peer stress moderated the association between parenting and peer adjustment. Hypotheses were tested with a multi-method, multi-informant longitudinal study design that allowed for the examination of change in peer adjustment before and after the transition to middle school using a diverse community sample of preadolescents. Analyses revealed few and modest associations across the three dimensions of parenting. There was also little evidence for direct predictive associations between parenting and peer adjustment. However, consistent with a growing body of research documenting person by environment interactions, some analyses revealed interactions between parenting and preadolescents' physiological responses to peer stress as predictors of peer adjustment.

In particular, parental facilitation and problem-solving predicted better peer adjustment across the transition to middle school among preadolescents with low RSA and high SCL/R, respectively. These findings supported the hypothesis that preadolescents with physiological responses to peer stress that reflect anxious sensitivity (high SCL/R) or emotion dysregulation and disengagement (low RSA/R) would stand to gain the most from parental involvement in their peer relationships. Additionally, these findings were consistent with prior studies in which positive parenting (e.g., warmth, support) predicted higher social competence and lower antisocial behavior among physiologically vulnerable (e.g., low RSA; Hastings & De 2008) and temperamentally difficult (e.g., high frustration) children (Veenstra et al., 2006), respectively.

Moreover, parental directing predicted better peer adjustment among preadolescents with low RSAR and low SCLR. These findings were consistent with the expectation that preadolescents who do not exhibit normal physiological engagement or arousal in the context of stress may require more parental control over their peer interactions. Specifically, findings were similar to studies in which temperamentally impulsive (Bates et al., 1998) and behaviorally disinhibited (Stice & Gonzales, 1998) children had fewer behavior problems when parental control was higher.

Parenting that was not well-matched with preadolescents' physiological responses, however, predicted poorer peer adjustment across the transition to middle school. Specifically, directing predicted poorer peer adjustment among preadolescents with high RSAR and high SCLR. Preadolescents' adaptive regulation (reflected in high RSAR) or even moderate anxiety (reflected in high SCLR) during peer stress may indicate less need for parental involvement in the form of control and cautions against problematic peer affiliations. Directing may actually be counterproductive for these preadolescents as it may interfere with their autonomy over the peer domain (e.g., Costanzo & Woody, 1985; Smetana & Asquith, 1994) and undermine their sense of security within their peer relationships (Nelson & Crick, 2002; Soenens et al., 2007; 2009).

Contrary to expectations, directing predicted better peer adjustment among preadolescents with high SCL, which was inconsistent with the hypothesis that directing would predict better peer adjustment for preadolescents with low SCL/R. One possible explanation is that physiologically anxious preadolescents need more parental involvement in general and can experience directing as encouraging or supportive of their peer relationships. Thus, analyses with physiological reactivity (i.e., SCLR, RSAR), but not analyses with pre-task measures (i.e., SCL, RSA), supported the hypothesis that directing would promote peer adjustment for underaroused

and disengaged preadolescents and undermine peer adjustment among overaroused and engaged preadolescents. Below, the results of the present study are discussed in greater detail.

Peer Relationships in Preadolescence

Maintaining and developing positive peer relationships can be particularly challenging during preadolescence with concurrent developmental and ecological changes. Several studies find declines in preadolescents' well-being (e.g., socio-emotional adjustment, academic performance) across the transition to middle school (Barber & Olson, 2004; Eccles et al., 1996; Simmons & Blyth, 1987). However, some studies find no differences in peer relationship quality (Cantin & Boivin, 2004) or peer victimization (Pellegrini & Long, 2002) across the transition to middle school. Although a number of studies document increasing preadolescent concerns about changes to friendships and peer problems at the transition to middle school (Anderson et al., 2000; Duchesne et al., 2012), these concerns may not match preadolescents actual peer experiences of friendship support, peer victimization, or peer acceptance in middle school. For example, preadolescents may report concerns about losing touch with friends, yet have multiple classes with friends in middle school.

In the present study, peer adjustment was moderately stable across the transition to middle school, consistent with a number of studies that find moderate stability in peer adjustment across childhood and adolescence (e.g., Ladd, 2006; Obradović, van Dulmen, Yates, Carlson, & Egland, 2006; for reviews see Ladd, 1999; Parker et al., 2006) and across the transition to middle school (Kingery & Erdley, 2007). For example, peer nominations of peer acceptance and number of friends and self-reports of friendship quality were moderately stable (r s ranged from .33 to .59, p s < .01) over a six month period across the transition to middle school (Kingery & Erdley, 2007). Other studies demonstrate even higher year-to-year stability in peer rejection (Ladd,

2006) and social competence (e.g., peer relationship quality, social skills; Obradović et al., 2006).

Peer adjustment may be stable over the course of one year for several reasons. First, stable temperament and genetic factors contribute to individual differences in social development, such as social skills and social competence (e.g., Plomin, 1994; Rothbart & Bates, 2006; Sanson & Smart, 2004), which may shape peer adjustment. Additionally, peer reputations (positive or negative), once established, are resistant to change even when interventions result in improved social skills (e.g., Bierman, 2004; La Greca & Santogrossi, 1980; Mrug, Hoza, & Gerdes, 2001). The stability of peer reputations may be due in part to children's circumstantial explanations for disliked children's positive social behaviors (e.g., "He/she only acted nice because the teacher was watching"), and trait-like explanations for disliked children's negative social behaviors (e.g., "He/she hit another kid because he/she is a mean person") (Dodge, 1980; Hymel, 1986).

When children transition from elementary to middle school with the same group of peers, they may be even less likely to experience improvements or declines in their peer adjustment. In the present study, although all preadolescents experienced changes in the school and classroom environments, 60% of the participants transitioned to a middle school in which only one elementary school fed into one middle school, essentially preserving the composition of the peer group. Thus, the stability of temperamental contributions to social skills, persistence of peer reputations, as well as continued involvement with the same peer group among many of the preadolescents in the present study may have limited change in peer adjustment across the transition to middle school, leaving a relatively narrow window of influence for peer-related

parental involvement. Nonetheless, some main and interactive effects of parenting and preadolescent physiological responses emerged.

Parenting in the Peer Domain: Links across Dimensions and with Peer Adjustment

Associations among dimensions of parenting. One bivariate association emerged among the three dimensions of parenting in the present study. Parents who engaged in facilitation (e.g., provided opportunities and permission for peer interactions) also provided more prosocial problem-solving advice about peer exclusion. Parents who are more proactive in promoting peer relationships may likely value peer relationships and provide more prosocial advice about how to resolve peer problems. Aside from this association, failure to find high convergence across positive, peer-related parenting variables is consistent with the modest to moderate associations across dimensions of parenting in other studies examining positive parenting (e.g., warmth, responsiveness, involvement, calm discussion, advice-giving) (McDowell & Parke, 2009; Pettit, Bates, & Dodge, 1997), as well as peer-related parenting (e.g., problem-solving, social coaching, guiding or directing, encouragement or facilitation of peer relationships) (Mize & Pettit, 1997; Mounts, 2002; 2007; 2011; Soenens et al., 2007; Vernberg et al., 1993). For example, McDowell and Parke (2009) reported no association between parental advice-giving and encouragement of peer activities.

These results lend support to Parke's (1992) "cafeteria model" of parenting, which proposes that different parenting behaviors may be uncorrelated because parents can choose different strategies to promote development and adjustment within a given domain. In the peer domain, parents may use some, but not other, strategies for supporting preadolescents' peer relationships, such as providing opportunities or permission to participate in activities with peers, guidance about friendship choices, or advice about peer problems. The limited convergence

among parenting behaviors within a domain may be partially due to differences in parents' priorities or goals for their child (Costanzo & Woody, 1985; Parke & Ladd, 1992). For example, some parents may be more concerned about helping their child avoid or resolve peer problems than encouraging positive peer relationships. Differences in parents' skill level and parenting self-efficacy may also contribute to the variability among parenting behaviors within a domain (Coleman & Karraker, 2000). For example, some parents may feel more competent with arranging activities with peers than giving advice about how to resolve peer problems. Additionally, preadolescents' peer experiences (e.g., access to peers, occurrence of peer problems) and skills (e.g., ability to handle peer problem situations) may contribute to the varied use of parenting strategies within the peer domain because these experiences and skills shape the opportunities parents have to provide different types of support (e.g., Bates & Pettit, 2007; Grusec & Davidoff, 2010; Tilton-Weaver & Galambos, 2004).

Associations between parenting and peer adjustment. Few bivariate and predictive associations between parenting and middle school peer adjustment emerged. Specifically, facilitation was modestly correlated with higher preadolescent-reported friendship support, consistent with one prior study (Vernberg et al., 1993). Directing predicted higher levels of friendship support and problem-solving predicted lower levels of teacher-reported peer victimization, controlling for earlier levels of friendship support and peer victimization, respectively. The predictive effects of directing and problem-solving (although qualified by two-way interactions with physiological parameters) were consistent with prior research. Parenting strategies that direct preadolescents away from deviant peers, whose friendships are often characterized by poorer quality (Dishion, Andrews, & Crosby, 1995), and towards more prosocial peers may provide preadolescents with opportunities to develop better quality

friendships (e.g., Mounts, 2000). Another study has shown that parental directive discussions about adolescents' friendships predicted greater friendship intimacy (Updegraff et al., 2001). Additionally, parents who provide more prosocial problem-solving advice about peer problems may reduce the risk of negative peer experiences by teaching preadolescents how to resolve problems in a positive manner (e.g., Kochenderfer-Ladd, 2004).

Compared to the vast literature on more global parenting and child adjustment, which provides ample evidence that positive parenting (e.g., warmth, support, involvement) is associated with a range of positive social and psychological outcomes (e.g., Domitrovich & Bierman, 2001; Pettit et al., 1997; Steinberg, Lamborn, Darling, Mounts, & Dornbusch, 1994), studies examining parenting behaviors in the peer domain are much more limited and the pattern of association is less clear. For example, parental prosocial coaching about hypothetical peer problem situations was positively associated with preschoolers' concurrent teacher-rated social skills and peer-rated peer acceptance in one sample, but not in another sample (Mize & Pettit, 1997). Other research by Vernberg et al. (1993) found that parent and adolescent reports of enabling proximity to peers was mostly strongly associated with adolescent-reported companionship and intimacy with friends eight months later, compared to parents talking with adolescents about peer relationships or encouraging participation in activities. Research by Mounts (2007) revealed that adolescent and parent reports of parental consulting about peer problems, but not parents' general involvement in peer relationships, was associated concurrently with adolescents' lower delinquent behavior. Thus, the mixed pattern of associations between parenting and peer adjustment in the present study reflects some inconsistencies in prior studies on peer-related parenting behaviors.

As noted, the moderate stability of peer adjustment across the transition to middle school may have limited the amount of remaining variance in peer adjustment. Additionally, there are fewer opportunities for peer-related parenting behaviors compared to more general parenting behaviors or parenting style, which captures parenting across time and situations and applies to multiple domains of child development (e.g., behavioral, social, emotional, academic) (Amato & Fowler, 2002; Darling & Steinberg, 1993). For example, some children may rarely experience peer exclusion, limiting parental problem-solving opportunities as measured in the present study. In contrast, parents routinely have opportunities for involvement, discipline, and more general support. Although narrowly-defined, context-specific measures of parenting may have less predictive power than more global measures of parenting, more specific assessments of parenting and family processes may have more direct applied implications (Snyder & Stoolmiller, 2002). For example, to reduce the risk of peer victimization, results from the present study suggest that parents can provide more prosocial and benign (rather than dismissive or defensive) advice about common exclusion situations (e.g., plan an activity with other kids). Findings also suggest that parents can encourage their child to seek out more prosocial peers to spend time with in order to promote higher friendship quality.

Although only a few main effects emerged for parenting in the peer domain, these findings were consistent with the literature on peer-related parenting. Furthermore, the present study provided evidence that these parenting behaviors did predict better peer adjustment for some preadolescents. These findings are discussed in the following sections.

Physiological Responses to Peer Stress: Links across Parameters and with Peer Adjustment

Associations among physiological parameters. Consistent with the literature, RSA at pre-task and change in RSA from the pre-task to peer evaluation period were moderately

correlated (e.g., Bornstein & Suess, 2000; El-Sheikh, 2005; Katz & Gottman, 1997), such that high RSA at pre-task was associated with higher vagal withdrawal from the pre-task to peer evaluation period. SCL at pre-task and change in SCL were not correlated. Physiological activity at pre-task (RSA, SCL) and physiological reactivity (RSAR, SCLR) were not correlated because reactivity is calculated as the residual when the shared variance with the pre-task score is removed. Additionally, no associations emerged between RSA/R and SCL/R. RSA/R and SCL/R are objective markers of different branches of the ANS that are generally not correlated (e.g., Diamond, Fagundes, & Cribbet, 2012; El-Sheikh et al., 2009; Gordis, Feres, Olezeski, Rabkin, & Trickett, 2010; Sijtsema et al., 2011). Activity of the SNS and PNS is most commonly reciprocal, such that when SNS activity is high, PNS activity is low; however, co-activation (high SNS and high PNS activity) and co-inhibition (low SNS and low PNS activity) are also possible (e.g., Bernston et al., 1997; El-Sheikh et al., 2009; El-Sheikh, Keiley, Erath, & Dyer, 2013).

Associations between physiology and peer adjustment. Few bivariate and predictive associations between physiological parameters and middle school peer adjustment emerged. First, RSAR, a measure of vagal regulation that may support social engagement (Beauchaine, 2001; Porges, 2007), was positively correlated with friendship support in middle school, but RSA and RSAR did not predict peer adjustment, controlling for demographic and autoregressive effects. Other studies also provide mixed evidence for links between ANS physiology and peer adjustment. For example, Graziano et al., (2007) found that RSAR was associated with higher teacher-reported social skills and peer-nominated social preference, but not associated with peer nominations of sharing or fighting. Calkins and Keane (2004) found that, cross-sectionally, high RSA suppression (vagal withdrawal) was not correlated with social skills, but stable high RSA suppression over two years was associated with higher mother ratings of social skills. In the

present study, no significant associations emerged between baseline RSA and peer adjustment, consistent with prior studies on RSA and peer adjustment (Calkins & Keane, 2004; Graziano et al., 2007).

SCL predicted higher levels of friendship support, which was unexpected because high SCL is considered a marker of behavioral inhibition (Fowles et al., 2000; Weems et al., 2005) and has been linked with anxiety (Fowles et al., 2000; Weems et al., 2005). To our knowledge, only one study has examined the association between SCL and peer adjustment; Erath et al., (2012) found that socially anxious and victimized preadolescents had higher baseline SCL. However, some studies with adults have proposed that high SCL/R may reflect inhibitory self-control because adults exhibit higher SCL in negative emotion-inducing situations requiring cognitive reappraisal (Sheppes, Catran, & Meiran, 2009), expressive suppression (Gross, 1998), or thought suppression (Wegner & Gold, 1995). Thus, it is possible that moderate SCL reflects cognitive engagement with peer stress experiences that may support prosocial problem-solving and, in turn, promote friendship support.

Given that peers cannot observe or experience preadolescents' physiological responses directly, strong, direct associations between physiological responses to peer stress and peer adjustment were not expected. The actual social behaviors observed by peers may be influenced by a wide variety of other child or environmental factors that may interact with physiological responses to predict child adjustment. For example, physiologically dysregulated preadolescents may be able to manage peer stress situations through coping strategies, such that peers are not aware of dysregulated physiological responses. Indeed, in a recent study, lower RSAR was associated with lower social competence among preadolescents who reported disengaged coping responses to peer stress, but not among preadolescents who reported more engaged coping

responses (Erath & Tu, under review). Moreover, environmental factors, such as parenting, may also interact with physiological responses to predict adjustment (e.g., El-Sheikh & Erath, 2011; Ellis et al., 2011).

Parenting in the Peer Domain x Preadolescents' Physiological Responses to Peer Stress

Although few direct associations emerged between parenting and peer adjustment across the transition to middle school, the present study provided comparatively more support for the hypothesis that the effects of parenting on peer adjustment depend on preadolescents' physiological responses to peer stress, consistent with the developmental psychopathology and person by environment frameworks. Likewise, findings are consistent with the goodness-of-fit perspective, which proposes that adjustment depends on the match between the child's temperament and environment (Lerner & Lerner, 1994; Thomas & Chess, 1977). Analyses revealed that parental facilitation and problem-solving predicted better peer adjustment across the transition to middle school among preadolescents with low RSA or high SCL/R, which may reflect poor emotion regulation or anxious sensitivity, respectively. Additionally, parental directing predicted better peer adjustment among preadolescents with low SCLR or low RSAR, which may reflect disinhibition or emotion disengagement, respectively. In other words, preadolescents who appeared most physiologically vulnerable in the context of peer stress were particularly receptive to parental support for positive peer relationships.

Parental facilitation. A stronger association between parental facilitation and positive peer adjustment across the transition to middle school was hypothesized among preadolescents with low RSA/R or high SCL/R. The effect of facilitation on peer adjustment was moderated by RSA, but not by RSAR or SCL/R. Specifically, facilitation predicted lower preadolescent-reported peer victimization among preadolescents with low RSA, but not among preadolescents

with high RSA. This finding was consistent with prior studies in which positive parenting (e.g., warmth, support) predicted better social and behavioral outcomes among adolescents with low RSA, but not high RSA (Hastings & De, 2008), and among preadolescents with difficult temperaments (Veenestra et al., 2006). There was no effect of parental facilitation for preadolescents with high RSA, perhaps suggesting that these preadolescents may have less (or no) need for parental facilitation of their peer interactions.

Low RSA is a marker of poorer emotion regulation capacity and may undermine social attentiveness in particular (Beauchaine, 2001; Porges, 2007). Parental efforts to provide opportunities for positive peer interactions may help physiologically dysregulated preadolescents develop important social skills and friendships that may reduce the risk of peer victimization (Hodges et al., 1999; Schmidt & Bagwell, 2007). Parental facilitation may also help steer preadolescents with emotional or physiological vulnerabilities away from peer contexts in which victimization is more likely to occur. Thus, although low RSA may increase the risk for social or psychological maladjustment overall (Porges, 2007), low RSA may also confer receptivity to positive parental support. In other words, facilitation of peer interactions may help compensate for preadolescents' poor physiological regulation and social attention in peer situations.

Most preadolescents are naturally inclined and motivated to spend time with peers as they get older (Larson & Richards, 1991), which may explain the limited predictive power of facilitation, particularly among preadolescents with high RSA. However, the lack of moderation by SCL/R was particularly unexpected. Preadolescents who exhibited physiological markers of anxious-discomfort in the context of peer stress were expected to benefit the most from facilitation because these youths may be more likely to avoid peer interactions in general, further exacerbating their social vulnerabilities and peer maladjustment (Rubin & Burgess, 2001).

Perhaps physiologically anxious preadolescents need more than just opportunities for peer interactions, and instead may require parents to tailor peer interactions to better fit their needs, such as arranging activities that fit with their interests or activities with particular types of peers (e.g., prosocial, supportive). In addition, a potential explanation for the failure to find interactions between parental facilitation and physiological reactivity (i.e., RSAR and SCLR) is that RSAR and SCLR are measures of how preadolescents respond and react to stress, whereas parental facilitation occurs under normal circumstances, rather than in stressful situations. Preadolescents' motivations for peer interaction or social skill level are perhaps more likely to moderate the effects of parental facilitation, compared to their stress responses.

Parental directing. A stronger association between parental directing and positive peer adjustment across the transition to middle school was anticipated among preadolescents with low SCLR or low RSA/R. Preadolescents who do not exhibit normal physiological arousal or engagement in the context of stress were considered most likely to need parental constraints on whom they should spend time with. The effect of directing on peer adjustment was moderated by SCL, SCLR, and RSAR, but not RSA.

Directing predicted better friendship support among preadolescents with low SCLR, but not among preadolescents with high SCLR, as expected. Preadolescents with high SCLR reported similar levels of friendship support across lower and higher levels of parental directing, whereas preadolescents with low SCLR reported lower friendship support at low levels of directing and higher levels of friendship support at high levels of directing. Low SCLR is considered a potential marker of threat insensitivity and may indicate that children do not experience internal cues from the body that signal risk or danger (Erath et al., 2009; 2011). Directing may promote friendship support among preadolescents with low SCLR because they

may be less likely than more anxious or inhibited preadolescents to set their own limits or restrictions on risky peer interactions and relationships with deviant peers who tend to provide less support (Dishion et al., 1994). Prior studies found that directing predicted adolescents' friendships with less deviant peers (Mounts, 2000; 2002), and that parental control was particularly helpful in reducing problem behaviors among behaviorally disinhibited adolescents (Stice & Gonzales, 1998). Moreover, temperamentally impulsive children had lower levels of externalizing problem behaviors when mothers were high in restrictive control (Bates et al., 1998). Thus, parents who steer physiologically disinhibited preadolescents towards more positive peers and away from deviant peers, may help them to develop friendships with peers who may be more likely to provide support (Barry & Wentzel, 2006; Berndt, 2002), particularly during a time when the potential for negative peer influences increases (Barber & Olson, 2004; Eccles et al., 1996).

Directing also promoted friendship support among preadolescents with low RSAR. As expected, when parental directing was low, preadolescents with low RSAR had lower levels of friendship support than preadolescents with high RSAR. Preadolescents with low RSAR may not show responsiveness or engagement with peer stress, and may need more guidance from parents about the types of peers to befriend, such as encouragement towards more positive peers who may be able to provide more support (e.g., Barry & Wentzel, 2006; Berndt, 2002) and away from deviant peers who are likely to promote risky or delinquent behaviors (e.g., Brown, 2004; Patterson et al., 2000; Prinstein & Dodge, 2008). In contrast, low parental control may increase risk for physiologically disengaged or dysregulated preadolescents; Xu, Farver, and Zhang (2009) found that indulgent, non-controlling parenting predicted more maladjustment (e.g., aggressive behaviors) among children with low effortful control (which is modestly correlated

with vagal tone and vagal withdrawal; Beauchaine, 2001; Chapman, Woltering, Lamm, & Lewis, 2010; Gentzler, Santucci, Kovacs & Fox, 2009). Thus, youths with poorer emotion regulation or effortful control may benefit more from greater parental control or directing. Again, results suggested that parental involvement in the peer domain that is compatible with preadolescents' physiological vulnerabilities (i.e., more directing for less physiologically aroused or more disengaged preadolescents) may help compensate for their vulnerabilities.

When parenting was less well-matched with preadolescents' physiological responses, parental directing predicted poorer peer adjustment. Specifically, directing predicted poorer friendship support among preadolescents with high RSAR. A typical and adaptive response to stress involves heightened engagement as reflected in higher RSAR. Preadolescents who are adaptively responsive to peer stress may be less likely to need parental involvement in the form of control over their peer relationships, and directing may actually be counterproductive for these preadolescents. Desires for autonomy over peer relationships increase around the transition to adolescence (Smetana & Asquith, 1994; Smetana & Daddis, 2002), and directing may be perceived as intrusive and interfere with peer adjustment by undermining well-regulated preadolescents' sense of security within their friendships (Nelson & Crick, 2002; Soenens et al., 2007), yielding poorer friendship quality.

Likewise, directing predicted lower levels of teacher-reported peer acceptance among preadolescents with high SCLR, but not among preadolescents with low SCLR. Compared to physiologically disinhibited preadolescents, those exhibiting high SCLR, a marker of behavioral inhibition (Beauchaine, 2001), may be less likely to benefit from directing because these preadolescents may be more likely to avoid peer interactions in general and deviant peers in particular. Indeed, prior studies found that parental guiding and prohibiting of peer interactions

predicted lower levels of peer group belongingness (Soenens et al., 2007) and poorer adjustment (e.g., more internalizing, externalizing behaviors), specifically among temperamentally fearful children (e.g., Colder et al., 1997; Kiff et al., 2011; Morris et al., 2002). Thus, the effects of parental directing may be particularly dependent upon preadolescents' responses to peer stress, potentially supporting some preadolescents' peer relationships and undermining other preadolescents' peer relationships.

Contrary to expectations, directing predicted better peer adjustment (lower levels of peer victimization, higher levels of friendship support) among preadolescents with high SCL, but not among preadolescents with low SCL. These findings were inconsistent with the hypothesis that the effects of directing would be most beneficial for preadolescents who did not exhibit normative arousal or engagement in the context of peer stress (e.g., low SCL/R). Directing was not expected to be particularly beneficial for physiologically anxious preadolescents because parents' controlling and restrictive behaviors about peer interactions may limit the number of overall peer interaction opportunities, thereby further exacerbating these preadolescents general tendency to avoid peer interactions (Rubin & Burgess, 2001). Additionally, associations with deviant peers would not typically be expected among preadolescents who show signs of anxiety at the physiological level. It is important to emphasize that the hypothesis that directing would promote peer adjustment among underaroused and disengaged preadolescents and undermine peer adjustment among overaroused and engaged preadolescents was supported in analyses with physiological reactivity (i.e., SCLR, RSAR), but not in analyses with baseline measures (i.e., SCL, RSA). These results suggest that reactivity measures may provide more information about sensitivity to threat or risk, and therefore provide more information about the need for parental control, compared to baseline measures.

The mixed pattern of interactions between directing and SCL compared to SCLR is similar to inconsistencies in the parenting by temperament literature (for reviews see Bates & Pettit, 2007; Kiff et al., 2011). Specifically, among temperamentally fearful children, parental control predicted better adjustment, such as decreased internalizing symptoms (Gillion & Shaw, 2004) and more prosocial behavior (Hastings, Rubin, & DeRose, 2005) in some studies, but poorer adjustment, such as greater social wariness (Rubin, Burgess, & Hastings, 2002) and more internalizing problems (Bates, 2003), in other studies. The mixed pattern of effects in the literature may be due in part to both the positive and the (over)controlling elements of parental control and directing, especially around the transition to adolescence.

Parental problem-solving. A stronger association between parental problem-solving and positive peer adjustment across the transition to middle school was hypothesized among preadolescents with lower RSA/R or higher SCL/R. Surprisingly, RSA/R did not moderate the association between problem-solving and peer adjustment, although prior research has found some evidence that parental coaching predicted better social and emotional adjustment among children with low RSA, but not among children with high RSA (Hastings & De, 2008). The effect of problem-solving on peer adjustment was, however, moderated by SCL and SCLR.

As hypothesized, prosocial parental problem solving predicted lower levels of peer victimization among preadolescents with high SCLR, but not among preadolescents with low SCLR. At high levels of prosocial problem-solving, preadolescents with high SCLR had particularly low levels of peer victimization, compared to preadolescents with low SCLR. Problem-solving also predicted higher levels of teacher-reported peer acceptance among preadolescents with high SCL, but not among preadolescents with low SCL. Preadolescents with low SCL had similar levels of peer acceptance across lower and higher levels of prosocial

problem-solving, whereas preadolescents with high SCL had lower levels of peer acceptance at low levels of prosocial problem-solving and higher levels of peer acceptance at high levels of prosocial problem-solving. Parents who teach children prosocial and benign problem-solving strategies may promote positive peer adjustment (Finnie & Russell, 1988; Mize & Pettit, 1997). These findings are consistent with evidence that prosocial behaviors predict peer acceptance (Wentzel & Erdley, 1993; see Newcomb, Bukowski, & Pattee, 1993 for meta-analysis), and children who use conflict resolution coping strategies in the context of peer stress (e.g., make a plan with the kid to get along) reduce their risk of peer victimization (Kochenderfer-Ladd, 2004). Moreover, findings from the present study are consistent with studies in which positive parenting (e.g., warmth, support) predicted better adjustment, especially among temperamentally fearful and anxious children (Kochanska, 1991; 1995; Sentse et al., 2009). Research on children with behavior problems yield similar results, such that parental social-emotional coaching predicted more positive and less negative peer interactions among children with conduct problems (Katz & Windecker-Nelson, 2004). Additionally, among children with ADHD, parents who received social coaching training had children with higher teacher- and parent-reported peer adjustment, compared to children of parents who did not receive training (Mikami et al., 2010a; 2010b). These findings suggest that parental social coaching or problem-solving can promote peer adjustment among youths with a variety of social vulnerabilities. There was no effect of parental problem-solving on peer adjustment among preadolescents with low SCL/R, perhaps, suggesting that problem-solving may not be particularly helpful for preadolescents whose physiological responses to peer stress are not consistent with anxious arousal.

Prosocial parental advice may equip anxious-sensitive preadolescents with skills and strategies to manage peer problems, helping to compensate for their vulnerabilities, especially

during a time when preadolescents may encounter more peer challenges with changes to their social environment (e.g., Anderson et al., 2000; Eccles et al., 1996; Duchesne et al., 2012). High SCL/R in the context of peer stress may reflect more experiences with peer problems or stress; for example, Erath et al. (2012) found that preadolescents who were socially anxious and peer victimized exhibited higher SCL. Preadolescents with such peer problems may lack prosocial and benign problem-solving skills, and therefore benefit from prosocial parental advice. Moreover, physiological arousal may interfere with social-cognitive processing by drawing attention to these internal cues of threat, rather than the social problem and positive solutions to the problem (e.g., Rapee & Heimberg, 1997; Vasey & Daleiden, 1996). Concrete prosocial advice from parents may limit the cognitive processing load in peer situations and thereby support problem-solving and reduce negative peer experiences among preadolescents who exhibit signs of anxiety at the physiological level.

Summary of Main Results

Analyses of the present study revealed that parental facilitation, directing, and problem-solving were not highly correlated with one another, consistent with the "cafeteria model" of positive parenting (Parke, 1992). The use of specific parenting behaviors (e.g., prosocial problem-solving) may depend on parents' goals and abilities, as well as preadolescents' experiences and skills, all of which influence parents' opportunities to engage in specific behaviors. Analyses also showed that peer adjustment is relatively stable, suggesting limits on the degree of short-term parental influence across the transition to middle school. Despite the few direct effects between parenting and peer adjustment, the present study provided some evidence that the predictive effects of parenting on peer adjustment depend on their compatibility with preadolescents' physiological responses to peer stress. Specifically, when peer-related

parenting behaviors were compatible with preadolescents' "needs" for parental support and control, as suggested by preadolescents' physiological responses to peer stress, parenting predicted better peer adjustment across the transition to middle school. However, when parental behaviors were mismatched with preadolescents' physiological responses, parenting predicted poorer peer adjustment across the transition to middle school.

When interactions emerged, low RSA/R served as a receptivity factor, such that preadolescents with low RSA/R gained the most from positive parental involvement (e.g., facilitation, directing). It is interesting to note that several other studies have also shown stronger environmental effects among children with low RSA/R. Specifically, children with low RSA/R and high exposure to environmental adversity, such as marital or family conflict, tend to exhibit higher levels of internalizing and externalizing problems (e.g., El-Sheikh et al., 2001; El-Sheikh & Erath, 2011; El-Sheikh & Whitson, 2006; Katz & Gottman, 1995; Obradović et al., 2011). Thus, children exhibiting low RSA/R may be more susceptible to the influence of both *positive* and *negative* dimensions of parenting or family environment. Results of the present study considered together with prior studies on family conflict and RSA suggest that low RSA/R may indicate sensitivity to the family context, providing some support for the biological sensitivity to context model (e.g., Ellis et al., 2011). However, studies that clearly delineate the marker of sensitivity to context (e.g., low or high RSA) and include the full range of negative to positive parenting are needed to test this hypothesis.

Results of the present study revealed that preadolescents with *low SCLR* and *high SCLR* may be more susceptible to parental influence (e.g., benefit from parental directing and problem-solving, respectively). Other studies report that marital conflict (El-Sheikh, 2005b; El-Sheikh et al., 2007), harsh parenting (Erath et al., 2011), and paternal antisocial behavior (Shannon,

Beauchaine, Brenner, Neuhaus, & Gatz, 2007) predict higher externalizing behaviors among children with higher SCLR. Additionally, some of these studies report that family stress does not predict increasing externalizing behaviors among children with lower SCLR; rather, children with lower SCLR exhibit high externalizing behaviors with or without family stress (Shannon et al., 2007) or exhibit stable-high levels of externalizing behaviors only in the context of family stress (Erath et al., 2011). The interactive effects of family processes and children's SCL/R may depend on the nature of the family variable and child outcome, as well as the context within which SCL/R is measured. Prior studies have not examined interactions between positive parenting and SCL/R, nor have they examined peer adjustment outcomes. In the present study, SCLR worked in the expected way, such that the association between problem-solving and lower levels of peer victimization was stronger among preadolescents with higher SCLR and the association between directing and higher levels of friendship support was stronger among preadolescents with lower SCLR.

Overall, results from the present study suggest that parental involvement in preadolescents' peer relationships may help to promote peer adjustment across the transition to middle school among preadolescents whose physiological responses to peer stress indicate vulnerability. In other words, preadolescents with physiological vulnerabilities may be most receptive to parental influence.

Sex Differences in Parenting in the Peer Domain and Peer Adjustment

Preliminary analyses revealed some sex differences in parenting and peer adjustment. Specifically, parents were more likely to facilitate peer interactions for girls than boys, consistent with a prior study (Vernberg et al., 1993). Among indices of peer adjustment, girls were more likely to report higher levels of friendship support and have higher teacher-reported peer

acceptance in middle school, compared to boys, consistent with prior studies (e.g., Parker et al., 2006; Vernberg et al., 1993; 2006). Boys received higher teacher ratings of peer victimization in middle school than girls, consistent with existing literature that boys typically receive higher ratings of peer victimization because they experience higher levels of physical victimization and relatively similar levels of relational victimization compared to girls (Card, Stuckey, Sawalani, & Little, 2008; Nansel et al., 2001; see Rose & Rudolph, 2006 for review).

Analyses examining whether the predictive association between parenting and peer adjustment differed by preadolescent sex revealed only one significant effect (e.g., the association between facilitation and preadolescent-reported peer victimization was moderated by sex). However, follow-up analyses of the significant interaction revealed that the simple slopes were not significant for either group. Results are consistent with findings from a prior study in which the predictive association between facilitation and later companionship and friendship intimacy did not differ by adolescent sex even though parents engaged in more facilitation behaviors with girls than boys (Vernberg et al., 1993). Findings were also consistent with another study in which parental prosocial coaching had a stronger effect on social skills for girls but not boys in one sample but no sex differences emerged in another sample (Mize & Pettit, 1997).

Overall, peer-related parenting appears to have similar effects on peer adjustment for girls and boys in the present study. Some inconsistencies between the results of the present study and the few existing studies that did find sex differences in the effects of peer-related parenting may be due in part to different measures of parenting behaviors and the age group of the samples. For example, studies that found sex differences in the association between parenting and peer adjustment used observations of parental problem-solving (Mize & Pettit, 1997), and

these studies were conducted with younger children (Mize & Pettit, 1997) and older adolescents (Updegraff et al., 2001). Future studies might consider assessing the same peer-related parenting behaviors and peer adjustment indices across different developmental periods (e.g., early, middle, late childhood, adolescence) to determine whether sex differences in the association between parenting and peer adjustment are found across developmental periods. Multiple informants of parenting behaviors may also provide information about whether sex differences may be related to different informants of parenting. Additionally, to build on the present study, three-way interactions between parenting, preadolescents' physiological responses, and preadolescent sex should be considered.

Limitations and Future Directions

Although the results of the present study advance knowledge about the associations among parenting in the peer domain, preadolescents' physiological responses to peers stress, and peer adjustment across the transition to middle school, future studies can extend this research in several ways. First, future studies should strengthen the peer-related parenting variables examined in the present study by including multiple informants and assessments of parenting, such as preadolescent reports of peer-related parenting or observations of parenting. Preadolescents' perceptions about their parents' involvement in their peer relationships may differ from parent reports and could differentially predict their peer adjustment. Indeed, research has found discrepancies in parent and child reports of parenting behaviors as well as differing predictive effects on children's adjustment by informant (e.g., Gaylord, Kitzmann, & Coleman, 2003; Mounts, 2007; Tein, Roosa, & Michaels, 1994).

Although the open-ended assessment of parental problem-solving advice about peer exclusion in the present study was novel and closely matched the peer-evaluative stress protocol

(i.e., prospect of negative peer evaluation), a limitation of this measure was that it assessed parental problem-solving to only one peer stress scenario. Additional measures of parental problem-solving in future studies would be informative. For example, more in-depth interviews with parents about how they have helped with a variety of real-life peer problems, or assessments of real-time parental social coaching about an ongoing peer problem, rather than hypothetical scenarios, may provide a better picture of parents actual involvement in preadolescents' peer relationships.

In addition, although parenting style and parenting behaviors are relatively distinct constructs, they are related, and the manner or style with which parenting behaviors are enacted may influence the effects of parenting behaviors (Darling & Steinberg, 1993; Mize & Pettit, 1997). Future studies should include measures of parenting style (i.e., the style with which peer-related parenting behaviors are enacted) to examine whether style moderates the association between parenting behaviors and peer adjustment. For example, Soenens et al. (2009) reported that when parental directing and prohibiting of friendships were conducted in an autonomy-granting manner, prohibiting predicted lower levels of deviant peer affiliation; however, when conducted in a psychologically controlling manner, prohibiting predicted higher levels of deviant peer affiliation.

Some researchers have stressed the importance of considering domain-specific parenting, arguing that this approach would allow researchers to better predict child outcomes within a specific domain (Coleman & Karraker, 2000; Costanzo & Woody, 1985; Smetana & Daddis, 2002), compared to more general parenting assessments. It would be interesting to examine the extent to which parenting in the peer domain may be unique or redundant with more general parenting behaviors, as well as similarities or differences in predictive effects to determine

whether future studies should consider a domain-specific approach to parenting. It also would be interesting to examine possible mediators that could further explain the association between peer-related parenting and preadolescent peer adjustment. It is possible that peer-related parenting indirectly affects peer adjustment through its direct influence on preadolescents' behaviors, such as preadolescents' actual rates of peer interactions, choice of friends (e.g., what their friends are like), or actual responses to peer exclusion.

Given the focus on positive peer-related parenting behaviors, the present study was unable to fully test contemporary person by environment models, such as biological sensitivity to context and differential susceptibility models (Ellis et al., 2011). That is, the present study did not determine whether preadolescents with physiological responses that reflected anxious-sensitivity or emotion dysregulation in the context of peer stress had the best outcomes in supportive environments (e.g., positive parenting) and the worst outcomes in adverse environments (e.g., negative parenting). To fully test these models, future studies should include parenting assessments that capture a broader range of peer-related parenting behaviors (positive and negative), such as autonomy-supporting versus controlling parental behaviors (Soenens et al., 2009) or problem-solving scenarios that might yield more negative responses than the exclusion situation examined in the present study (e.g., imagine your child is being bullied/victimized by kids at school).

Future studies with a multi-wave, transactional design to examine parenting in the peer domain and peer adjustment would build on the short-term longitudinal design of the present study. The reciprocal association between parenting behaviors and children's behaviors is well established (e.g., Ladd, 1992; Ladd & Pettit, 2002; Parke, 1992), yet research on parenting in the peer domain is relatively scarce compared to more general parenting. A multi-wave,

transactional model would allow for the examination of change in peer-related parenting behaviors over time and across major developmental periods. It seems likely that the effects of children's peer experiences and peer-related parenting are bidirectional.

Another limitation of the present study was the high percentage of preadolescents who transitioned from one elementary school to one middle school with the same peer group. Future studies should consider how different types of school transitions affect peer adjustment and predictors of peer adjustment across school transitions, as the literature on the effects of school transitions on children's adjustment is mixed (e.g., Cantin & Boivin, 2004; Eccles et al., 1996; Lohaus et al., 2004; Simmons & Blythe, 1987). It is possible that stronger parenting and parenting by physiology effects would have emerged if a greater proportion of participants had transitioned from small elementary schools to larger middle schools. Indeed, although some support for hypotheses emerged, only 17% of parenting by physiology interactions were significant in the present study. Aside from limitations in the measurement of parenting and the nature of the middle school transition in the present study, the low percentage of results that supported hypotheses may also be related to the relatively small sample size and limited power to detect interactions.

There are also some limitations of teacher reports in the present study. Different teachers provided assessments of preadolescents' pre- and post-transition peer adjustment. Thus, teacher reports of peer adjustment might reflect actual change in preadolescents' peer adjustment or different views of similar behaviors and experiences among different teachers reporting on peer adjustment. Additionally, students have different teachers for each subject in middle school, which may limit the validity of reports from a single teacher. Future studies should consider collecting multiple teacher reports for middle school (and high school) students to determine

whether there is high convergence among teachers about adolescents' peer adjustment. However, it is important to note that the validity of teacher reports of peer adjustment is generally well-established in part because teachers commonly observe preadolescents in peer contexts (Bierman, 2004). To supplement teacher reports, future studies should also include peer reports. Peer reports may most accurately reflect the actual treatment that preadolescents experience in the peer group.

Given the community sample of the present study, these findings may not generalize to higher risk populations. On average, preadolescents in our sample were relatively well-adjusted in the peer domain. Future studies should consider how parental involvement in peer relationships and youth responses to peer stress may independently and interactively predict adjustment among higher risk youths, such as those who experience more severe or chronic peer problems. These studies would further help to determine the extent to which parenting in the peer domain may be helpful and inform efforts to promote peer adjustment among youth at greatest risk for maladjustment.

Conclusions

Despite the limitations noted above, the present study advanced prior work by providing a domain-specific and conservative test of independent and interactive associations linking multiple dimensions of parenting in the peer domain and preadolescents' physiological responses to peer stress with predictors of peer adjustment across the transition to middle school. Results suggest that parental facilitation and problem-solving promote peer adjustment across the middle school transition among preadolescents who appear vulnerable on the basis of physiological responses that reflect emotion dysregulation and anxious sensitivity, respectively. Parental directing may promote peer adjustment across the middle school transition among preadolescents

who exhibit physiological responses that reflect disinhibition and disengagement from peer stress. Yet, the inconsistent patterns of associations, as well as design limitations of the present study, point to the need for further research on domain-specific parenting and peer adjustment.

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APPENDICES

Appendix A

Parent reports

Child Information

Sex:

Child Date of Birth and Age:

Ethnic group (Circle one)

- a. African American
- b. Asian
- c. Caucasian
- d. Native American
- e. Spanish Descent
- f. Other (please specify): _____

Family Information

Annual Household Income (Circle one)

- a. Less than 10,000
- b. 10,001-20,000
- c. 20,001-35,000
- d. 35,001-50,000
- e. 50,001-75,000
- f. More than 75,000

Parental Problem-Solving Advice

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.

What are 1 or 2 specific ways in which you would advise your child to deal with this situation?

Parental Directing

The following items concern your views on your child's peer relationships. Please indicate how much you agree with the following statements.

	Strongly disagree	Disagree	Somewhat disagree	Somewhat agree	Agree	Strongly agree
1. I encourage my child to do activities with kids I like.	1	2	3	4	5	6
2. I let my child know who he/she should be friends with.	1	2	3	4	5	6
3. If my child's friends do things that I don't approve of, then my child stops being friends with them.	1	2	3	4	5	6

4. I only want my child hanging around with kids who are like our family.	1	2	3	4	5	6
5. I tell my child if I don't want him/her to hang around with certain kids.	1	2	3	4	5	6
6. I talk to my child about the pros and cons of hanging around with certain people.	1	2	3	4	5	6
7. I tell my child that who he/she has for friends will affect his/her future.	1	2	3	4	5	6
8. I influence my child's selection of friends.	1	2	3	4	5	6

Parental Facilitation

Please indicate how often you do the following:

	Never	Almost never	Sometimes	Fairly often	Very often
1. Drive your child to parties or activities with other kids.	0	1	2	3	4
2. Let your child go to the movies with friends.	0	1	2	3	4
3. Let your child invite friends to sleep over.	0	1	2	3	4
4. Let your child invite friends when your family does things (e.g. family vacation, fair, sporting event, etc.).	0	1	2	3	4
5. Drive your child to friends' homes.	0	1	2	3	4
6. How much do you make extra efforts to help your child find or spend time with peers who are a good match with your child's personality?	0	1	2	3	4
7. How much do you make extra efforts to help your child find or spend time with peers who are a good match with your child's interests/hobbies?	0	1	2	3	4
8. How much do you make extra efforts to help your child spend time with friends he/she has made in school or extracurricular activities, outside of school/activity?	0	1	2	3	4

Preadolescent reports

Peer Victimization

Please answer the following questions about how often you have these experiences at school.

		Almost never		Sometimes		Almost always
1	How often do you get pushed or shoved by other peers at school?	1	2	3	4	5
2	How often does another peer exclude you when they want to get back at you for something?	1	2	3	4	5
3	How often does another kid say they won't like you unless you do what they want you to do?	1	2	3	4	5
4	How often do you get hit by another kid at school?	1	2	3	4	5
5	How often are you left out on purpose when it's time to do an activity?	1	2	3	4	5
6	How often have other kids told lies about you to make other kids not like you anymore?	1	2	3	4	5
7	How often have other kids said mean things about you to keep other people from liking you?	1	2	3	4	5
8	How often do other kids tease or make fun of you?	1	2	3	4	5
9	How often have you been bullied or harassed through a computer (e.g., internet or email)?	1	2	3	4	5
10	How often have you been bullied or harassed through a cell phone (e.g., text message)?	1	2	3	4	5
11	How often does a kid who is mad at you get back at you by not letting you be in their group anymore?	1	2	3	4	5

Friendship Support

Please circle the number that best describes your relationship with your good friends.

	Not at all true	A little true	Somewhat true	Pretty true	Very true
1. My friends care about me.	1	2	3	4	5
2. My friends don't listen to me.	1	2	3	4	5
3. My friends stick up for me when I'm being teased.	1	2	3	4	5
4. My friends and I get mad at each other a lot.	1	2	3	4	5
5. I talk to my friends when I am having a problem.	1	2	3	4	5
6. I can count on my friends when I need them.	1	2	3	4	5
7. My friends and I argue a lot.	1	2	3	4	5
8. I can always count on my friends to keep promises.	1	2	3	4	5

Teacher reports

Peer Acceptance

For each of the following statements, please circle the number that best describes this child.

	Almost never true of the child	Sometimes true of the child	Almost always true of the child
1 This child is well liked by peers.	1	2	3
2 This child is disliked by other children.	1	2	3

Peer Victimization

For each of the following statements, please circle the number that best describes this child.

	Almost never true	Sometimes true	Almost always true
1 Other children hit or push this child.	1	2	3
2 Other children tease or make fun of this child.	1	2	3
3 Other children pick on or bully this child.	1	2	3
4 Other children gossip or say mean things about this child.	1	2	3
5 Other children ignore this child to be mean.	1	2	3
6 Other children try to hurt this child's feelings by excluding him/her.	1	2	3