



Published in final edited form as:

J Res Adolesc. 2018 June ; 28(2): 537–550. doi:10.1111/jora.12357.

Maternal Affective Expression and Adolescents' Subjective Experience of Positive Affect in Natural Settings

Julianne M. Griffith,
University of Pittsburgh

Jennifer S. Silk,
University of Pittsburgh

Caroline W. Oppenheimer,
University of Pittsburgh School of Medicine

Judith K. Morgan,
University of Pittsburgh School of Medicine

Cecile D. Ladouceur,
University of Pittsburgh School of Medicine

Erika E. Forbes, and
University of Pittsburgh School of Medicine

Ronald E. Dahl
University of California, Berkeley

Abstract

This study investigated the association between maternal affective expression during laboratory-based interaction tasks and adolescents' experience of positive affect (PA) in natural settings. Participants were 80 healthy adolescents and their mothers. Durations of maternal positive (PA) and negative affective (NA) expressions were observed during a conflict resolution task and a positive event planning interaction task. Ecological momentary assessment (EMA) procedures were employed to assess adolescents' momentary and peak experience of PA in daily life. Results indicated that maternal NA, but not maternal PA, was related to adolescents' EMA-reported PA. Adolescents whose mothers expressed more NA experienced less PA in daily environments. Results suggest that adolescents' exposure to maternal negative affective behavior is associated with adolescents' subjective daily well-being.

Among the changes encountered by adolescents are marked changes in the experience of positive emotions (Larson, Moneta, Richards, & Wilson, 2002). In addition to neurobiological changes in reward and affective processing systems associated with pubertal development (Forbes et al., 2010; Ladouceur, 2012; Moore et al., 2012), investigations examining adolescents' experienced daily affect have demonstrated a normative but

significant decline in subjective ratings of positive affect (PA) upon entry into the teenage years (Larson & Lampman-Petratis, 1989; Larson et al., 2002; Weinstein, Mermelstein, Hankin, Hedeker, & Flay, 2007). These disruptions in the experience of PA may render adolescents considerably vulnerable to various forms of emotional dysfunction, including psychiatric disorders such as depression and social anxiety (Forbes, Williamson, Ryan, & Dahl, 2004; Kashdan & Steger, 2006; Paus, Keshavan, & Giedd, 2008). Low PA youth may, for example, be less likely to seek out potentially rewarding experiences, less motivated to participate in normative social activities, and more likely to experience impairments in their capacity to derive pleasure from positive events (Forbes & Dahl, 2005).

Despite normative changes in the parent–child relationship characteristic of adolescence, parents have the potential to function as a source of ongoing support and influence during this transitional developmental stage (Hazel, Oppenheimer, Technow, Young, & Hankin, 2014; Longmore, Manning, & Giordano, 2013). Parental emotion socialization, or the process by which parents contribute to children’s understanding and experience of emotion, is thought to be highly influential in children’s emotional development (Eisenberg, Cumberland, & Spinrad, 1998). Indeed, parental support has been linked to youths’ experience of both negative and positive affect (Weinstein, Mermelstein, Hedeker, Hankin, & Flay, 2006). In the study of parenting and adolescent adjustment, however, research has largely focused on the socialization of adolescents’ negative emotions (e.g., Dallaire et al., 2006; Schwartz et al., 2014), and the relationship between parenting and adolescents’ PA remains largely understudied (see Gilbert, 2012). Recent research has suggested that parental “dampening” or invalidation of youth PA may be especially salient for emotion socialization, and such parental behaviors have been linked to greater levels of adolescent emotional dysfunction (Katz et al., 2014; Yap, Allen, & Ladouceur, 2008). Given the association between reduced PA and the experience of social anxiety and depression (Forbes & Dahl, 2005; Kashdan & Steger, 2006), as well as the social and psychological health-promoting qualities of increased PA (e.g., Cohn, Fredrickson, Brown, Mikels, & Conway, 2009; Fredrickson, Mancuso, Branigan, & Tugade, 2000), a more comprehensive investigation of parenting and adolescent PA is vital to understanding the ways in which family dynamics may function to promote vulnerability to or resilience against risk of psychopathology during this sensitive developmental stage. The present investigation seeks to contribute to the nascent literature on parental socialization of positive emotions in adolescence by exploring the relationship between parental affective expression and young people’s subjective experience of positive emotionality in their real-world environments.

Role of PA in Adolescence

Positive affect is a valuable aspect of human emotional experience and has been associated with a number of desirable social and emotional health outcomes. Researchers have found PA to function as a protective or “undoing” mechanism against the physical and emotional consequences of negative affective states (Fredrickson et al., 2000; Wichers et al., 2007). PA and the ability to up-regulate positive emotion has been proposed as a potential resilience-promoting factor for children at risk for psychopathology, such as depression (Silk et al., 2007). Indeed, individuals who up-regulate their PA via a variety of savoring strategies have been found to demonstrate higher levels of happiness than individuals who do not similarly

savor, or actively prolong, their positive experiences (Quoidbach, Berry, Hansenne, & Mikolajczak, 2010). Further evidence supports that savoring contributes to the successful reduction of depressive symptoms among youth (McMakin, Siegle, & Shirk, 2011). Given research demonstrating marked changes in affective processing systems associated with pubertal development (e.g., Forbes et al., 2010; Moore et al., 2012) and the role of reduced PA in youth emotional problems (Forbes et al., 2004; Kashdan & Steger, 2006), it is critical to investigate environmental predictors of PA in adolescence. Such an investigation is warranted in order to better understand and identify risk factors for emotional dysfunction and to inform interventions to promote resilience during this vulnerable stage of development.

Parenting and Adolescence: Promoting and Dampening PA

In addition to emergent psychopathology, puberty and the onset of adolescence are characterized by increasing autonomy and individuation—particularly in relation to the parent–child relationship (Steinberg, 1988). Regardless, parenting continues to operate as a profound influence across multiple domains of functioning well into the adolescent years (see Longmore et al., 2013). Family support has been linked to teens’ experience of both positive and negative affect (NA; Weinstein et al., 2006), and quality of the parent–adolescent relationship has been found to be predictive of psychological well-being through ages 17–19 (Hair, Moore, Garrett, Ling, & Cleveland, 2008). Parenting behaviors have further been linked to the onset of emotional disorders such as depression and social anxiety (Knappe, Beesdo-Baum, Fehm, Lieb, & Wittchen, 2012; Schwartz et al., 2014).

Contemporary developmental theory suggests that parenting may influence young people’s emotional experience via a number of distinct pathways (Morris, Silk, Steinberg, Myers, & Robinson, 2007). Consistent with this theoretical framework, parents who demonstrate warm and affectionate affective behavior in interactions with their children may promote adjustment by modeling effective emotional responding and/or implicitly communicating the appropriateness of positive emotional expressivity. Indeed, parents’ emotional expression—in addition to their responses to their children’s emotions and their discussion of emotions—has been identified as a key aspect of emotion socialization (Eisenberg et al., 1998).

Parental failure to respond in positive and supportive ways to youth’s expressions of positive emotionality has been implicated in adolescent emotional dysfunction (e.g., Katz et al., 2014; Yap et al., 2008). For example, parents who display low levels of positive emotional behavior or high levels of negative emotional behavior—specifically in response to their adolescent children’s expression of PA—may effectively “dampen” those adolescents’ experience of positive emotionality (Yap et al., 2008). Interpreted within a model of emotion socialization, parents who consistently fail to respond to their adolescents’ positive emotionality or respond to such emotionality with dismissal, hostility, or contempt, may be implicitly discouraging youth from engaging with positive experiences. Parental dampening of adolescent PA may inculcate youth with a general tendency to down-regulate their own positive emotionality, a regulation strategy associated with increased risk for emotional problems, such as depression (Katz et al., 2014; Raes, Smets, Nelis, & Schoofs, 2012; Yap et al., 2008).

Limitations of Previous Research

The majority of existing studies that have examined parental influences on adolescents' PA have been limited by their reliance upon retrospective self-report measures of parenting and emotions (e.g., Padilla-Walker, 2008; Weinstein et al., 2006). The ecological momentary assessment (EMA) protocol utilized in this study seeks to address this limitation by capturing adolescents' real-time experience of PA in their everyday environments, thereby mitigating the distorting effects of retrospective recall (Bradburn, Rips, & Shevell, 1987). Additionally, by using both behavioral observation and EMA data, this study will minimize the limitations, such as conflated associations, inherent in mono-method designs. Finally, much of the research to date on parenting and adolescent emotionality has been focused on youth NA and depressive symptoms. Knowledge of how normative variations in parental affect may be associated with healthy adolescents' lived experience of PA remains limited.

The Present Study

The present study aims to advance existing literature by considering the relationship between parental affective expression during dyadic, laboratory-based interaction tasks and healthy adolescents' PA in multiple real-world contexts. To elicit a range of affect and individual differences in affect, and to provide variety in contexts for parent-adolescent interaction, data from two different parent-adolescent interaction tasks were included in the analyses: an enjoyable activity planning interaction task designed to elicit more positive emotion, and a conflict resolution interaction task designed to elicit more negative emotion. Parent-adolescent relationships are characterized by both positive and negative interactions, and incorporating measures of parental affect in both contexts may allow us to more accurately capture the emotional dynamics at work between each dyad in their day-to-day lives. Adolescents' experience of PA was measured via EMA, a procedure which enabled us to collect repeated samples of youths' emotional experience as it occurred in their current naturalistic environments, addressing limitations of retrospective recall (Shiffman, Stone, & Hufford, 2008). In addition to youths' momentary experience of positive emotions, the EMA protocol employed in the present investigation assessed adolescents' ability to achieve high levels of PA in response to personally salient positive events (i.e., "peak" positive affect), providing further insight into the nuances of youths' daily emotional experience.

Further, previous research suggests that emotional lability may be related to less optimal psychological functioning (e.g., Kuppens, Van Mechelen, Nezlek, Dossche, & Timmermans, 2007). Indeed, affective variability has been implicated in the experience of anhedonic depression both concurrently and longitudinally in adult populations (Thompson, Berenbaum, & Bredemeier, 2011). The present study will explore variance in PA as a covariate in the relationship between maternal affect and adolescent PA, with the aim of providing a more comprehensive assessment of youth's broader emotional well-being.

Based upon existing research in both child and adolescent populations, particularly studies on the effect of parent "dampening" of youth PA, we hypothesized that (1) lower levels of parental PA in the interaction tasks would be associated with lower adolescent current and peak levels of PA and (2) higher levels of parental NA in the interaction tasks would be

associated with lower adolescent current and peak levels of PA. We also explored whether these associations were moderated by age. Post-hoc analyses examined the relationship between parental affect and youth NA, in order to probe the extent to which findings were specific to youths' experience of PA.

METHODS

Participants

Participants were 80 healthy youth (46 female) and their mothers. Participants ranged in age from 9 to 17 ($M[SD] = 13.84 [2.60]$) with roughly equivalent numbers of early, mid-, and late adolescents (23 age 9–11, 28 age 12–14, 29 age 15–17). The sample represents subset of typically developing participants from a larger study aimed at developing and validating measures across the transition into adolescence. Included subjects were primarily Caucasian (78.8%), with smaller numbers identifying as African American (15.0%), biracial (3.8%), Asian American (1.3%), and other (1.3%). Of participating mothers, 91.2% reported completing at least a high school education, and 57.6% reported attaining a standard college or university degree or greater. Participants were recruited through pediatricians' offices and community advertisements. After completing a brief phone interview, eligible families (i.e., those reporting no current psychiatric symptoms or psychiatric history for the child) were invited to the laboratory to complete further assessment.

Screening procedures—The sample was comprised of participants from two phases of a multistage study. For participants in the first phase of the study ($N = 52$), parents of children 12 years of age and older were asked to complete the Adolescent Symptom Inventory 4 (ASI-4; Gadow & Sprafkin, 1998a) and parents of children under 12 years of age were asked to complete the Child Symptom Inventory 4 (CSI-4; Gadow & Sprafkin, 1998b) upon their initial laboratory visit. The ASI-4 and CSI-4 both inquire about child behavior over 17 categories related to *DSM-IV* (American Psychiatric Association, 1994) diagnoses. The ASI-4 and CSI-4 demonstrate convergent and discriminant validity with clinician diagnoses (Gadow, Devincent, Pomeroy, & Azizian, 2005; Gadow & Sprafkin, 1998a,b). When questionnaire-screening procedures suggested that a *DSM-IV* disorder might be present, the relevant module of the Schedule for Affective Disorders and Schizophrenia in School-Age Children—Present and Lifetime Version (K-SADS-PL; Kaufman, Birmaher, Brent, & Rao, 1997) was administered to finalize decisions about eligibility. Participants in the second phase of the study ($N = 28$) were all screened using the K-SADS-PL. The K-SADS-PL is a semi-structured clinical interview designed to elicit diagnostic information related to the child's current and lifetime experience of a range of psychiatric disorders as defined by the *DSM-IV*. In this study, parents and youth were interviewed separately, with the interviewer integrating data from both informants to determine the child's final diagnostic status. All interviews were conducted by trained BA- and MA-level interviewers. Youth were excluded from the study if they met criteria for any Axis I disorder. The subsample was limited to nondisordered youth in order to understand normative patterns of development in emotionally healthy adolescents.

Procedure

Upon completion of initial screening procedures, adolescents and their mothers participated in a 2–3 hr laboratory visit during which they were administered a battery of questionnaires and briefed on EMA procedures. Dyads were additionally asked to complete a series of videotaped interaction tasks facilitated by trained research assistants during the visit. Following the initial laboratory visit, participants completed a home-based EMA protocol spanning three consecutive weekends. Procedures were identical for participants recruited in both phases of the study.

Measures

Demographics—Participants were administered a brief questionnaire assessing basic demographic information, including age, gender, race, family structure, and maternal education level.

Parents–adolescent interaction tasks

Conflict resolution task: Parent–adolescent dyads were filmed engaging in a “hot topics” discussion intended to elicit NA (Hetherington & Clingempeel, 1992). During the 8-min videotaped interaction task, youth and their mothers were asked to discuss areas of conflict that both members of the dyad identified as highly salient within their relationship. To prompt discussion, the pair was given a card listing two topics endorsed by both parent and adolescent as frequent sources of conflict as well as instructions to address (1) how recent disagreements may have started, (2) who else may have gotten involved, (3) how the disagreement may have ended, and (4) how they would plan to deal with these areas of disagreement if they were to come up in the future. Dyads were encouraged to identify possible solutions during their discussion.

Plan a fun activity task: After completing the conflict resolution task, dyads were asked to engage in an enjoyable activity planning discussion intended to elicit PA (Hollenstein, Granic, Stoolmiller, & Snyder, 2004). During the 5-min videotaped interaction, mother and adolescent were instructed to plan a mutually enjoyable activity that they could participate in together in the next week. Parent–adolescent dyads were given a reminder card with instructions to plan a mutually enjoyable activity in as much detail as possible, with the suggestion that the activity need not be expensive or time-consuming.

SPAFF coding: Parental affective behavior during the videotaped interaction tasks was coded using the Specific Affect (SPAFF) Coding System, 10-Code Version (Gottman, McCoy, Coan, & Collier, 1996). Affective codes were generated based on a combination of verbal content, voice tone, facial expression, and physical cues. Durations of various affective states were coded for each discussion. To assess intercoder agreement, approximately 25% of video clips were coded for reliability. Kappa was .74, indicating acceptable inter-rater reliability. For the purposes of this project, maternal negative affective expression was assessed via a composite score representing mean duration of scornful, angry, fearful/tense, sad, and complaining affects. Maternal positive affective expression was similarly assessed via a composite score representing mean duration of interested, joyful,

and affectionate affects. Analogous composite scores were calculated to index duration of child affect within each discussion.

Ecological momentary assessment—Adolescents' real-world experience of PA was measured via EMA data collected over the course of three 5-day blocks following participants' initial laboratory visit. Developed through pilot testing and validated for use with adolescent populations (Axelson et al., 2003; Silk et al., 2011), the cellular telephone methodology utilized in this study offers optimal accuracy by allowing for probes for unclear responses and limiting writing requirements for younger participants. During their laboratory visit, participants completed a brief orientation session in which they were introduced to the answer-only cellular telephone devices on which EMA calls would be delivered, as well as familiarized with the interview questions. Prior to receiving the modified cellular telephone equipment, youth were given the opportunity to seek clarification on any items they found confusing or unclear.

Adolescents received calls from trained interviewers during a sampling period spanning Thurs-day afternoon to Monday evening for three consecutive weeks. Participants received two calls between the hours of 4 p.m. and 9:30 p.m. each Thursday, Friday, and Monday during the 3-week calling period. On Saturdays and Sundays, youth received four calls delivered between the hours of 11 a.m. and 9:30 p.m. In total, participants were asked to complete 42 calls. If a participant did not pick up the phone, callers were instructed to attempt the call again after 10 min. If a participant was asleep prior to receiving the call, he or she was offered a few minutes to wake up before being called again to complete the interview. Adolescents were assured that their answers would remain confidential and would not be shared with their parents unless safety concerns were to arise. Participants were compensated for their participation.

Approximately 5 min in length, each EMA call was comprised of a series of structured interview questions adapted from Silk, Steinberg, and Morris (2003) assessing adolescents' momentary affect, as well as their peak affect in response to the most enjoyable and most aversive events that occurred within the previous hour. On each call, adolescents were prompted to rate their experience of a variety of emotions using a 5-point scale ranging from (1) *very slightly or not at all* to (5) *extremely*. For the current study, momentary PA was operationalized as adolescents' ratings of how happy, cheerful, interested, and excited they felt at the time of each call, averaged across the four positive emotions. Adolescents' peak PA was measured using their 1–5 rating of how happy they felt in response to their self-nominated most positive event within the last hour. Nominated events included such everyday experiences as eating delicious food, spending time with friends, and participating in sports. Momentary NA was similarly operationalized using a mean score of adolescents' ratings of how sad, nervous, upset, and angry they felt at each call. Peak NA was measured using ratings of NA in response to adolescents' self-nominated most negative event within the last hour. Events included such everyday experiences as doing homework, arguing with siblings, and completing household chores. Participants completed an average of 36.64 (87%) calls during the sampling period ($SD = 4.33$).

Data Analytic Plan

SPAFF-coded parental positive affective expression scores for each discussion were significantly correlated ($r = .36, p = .001$) and therefore parental PA scores were summed across tasks to yield a single, aggregate score of parental PA within each parent–adolescent dyad. SPAFF coded parental negative affective expression scores for each discussion were similarly significantly correlated ($r = .40, p < .001$) and were therefore summed across tasks to yield a single, aggregate score of parental NA. Post-hoc analyses were conducted to probe context-specific associations between maternal affectivity and youth PA. Due to substantial positive skew, scores of parental negative affective expression were transformed using base-10 logarithmic transformations in order to meet assumptions of normalcy required of the statistical analyses.

Hypotheses were tested using hierarchical mixed effects modeling using restricted maximum likelihood estimations computed in HLM7 (Raudenbush, Bryk, & Congdon, 2011). Hierarchical mixed effects models permit researchers to analyze data in which repeated measures data, such as emotions at each sample (level 1) are nested within subjects (level 2). Child PA ratings were entered at level 1, and maternal affect was entered at level 2. Child age, child gender, and maternal education level were added as level 2 covariates. Additional covariates were calculated for each subject representing standard deviations in momentary and peak PA ratings across calls in order to provide a measure of PA variability. Sample equations are provided below.

Level 1 equation:

$$PA_{ij} = \beta_{0j} + r_{ij}.$$

Level 2 equation:

$$\beta_{0j} = \gamma_{00} + \gamma_{01} * (\text{Maternal Affect}) + \gamma_2 * (\text{PA Variability}) + \gamma_{03} * (\text{Gender}) + \gamma_{04} * (\text{Age}) + \gamma_{05} * (\text{Maternal Education}) + u_{0j}.$$

Given the broad range of participant age represented in the present sample, Age \times Maternal affect interaction terms were created to evaluate moderation by age.

Level 1 equation:

$$PA_{it} = \pi_{0i} + e_{it}.$$

Level 2 equation:

$$\pi_{0i} = \beta_{00} + \beta_{01} * (\text{Maternal Affect}) + \beta_{02} * (\text{Child Age}) + \beta_{03} * (\text{Maternal Affect} \times \text{Child Age}) + r_{0i}.$$

In order to consider how maternal affect may be associated with adolescent PA in real time, additional post-hoc analyses were conducted to explore the relationship between maternal positive and negative affective expression and adolescents' observed laboratory-observed PA. Linear regression analyses were performed to evaluate the relationship between

maternal affective expression and adolescent PA across tasks, controlling for age, gender, and maternal education.

RESULTS

Preliminary Analyses

The means and standard deviations for all primary variables are presented in Table 1. For descriptive purposes, adolescents' EMA-reported momentary and peak affect ratings were averaged across calls to generate mean scores. Representative examples of within-person variability in momentary and peak PA ratings across calls are provided in Figures 1 and 2, respectively. Bivariate correlations were conducted to examine the relationship between primary variables of interest (see Table 1).

Parental Affective Expression and Adolescent PA

Mixed effects models indicated that maternal NA but not PA was related to adolescents' experience of PA in daily life. As reported in Table 2, analyses revealed a significant negative relationship between maternal NA across tasks and adolescents' momentary PA ($b = -.33, p = .04$). Results remained significant after controlling for variability in momentary PA ($b = -.33, p = .02$). Maternal NA similarly demonstrated a significant negative relationship with adolescent peak PA ($b = -.32, p = .03$; see Table 2). Results remained significant at the trend level after controlling for variability in peak PA ($Rb = -.28, p = .07$). As shown in Table 3, post-hoc analyses revealed that maternal NA was significantly related to adolescent momentary PA in the conflict resolution discussion ($b = -.34, p = .04$) but not significantly related in the fun activity planning discussion ($b = -.30, p = .18$). Similarly, maternal NA during the conflict resolution discussion was related to adolescent peak PA ($b = -.33, p = .03$); however, maternal NA during the fun activity planning discussion was not significantly related to adolescent peak PA ($b = -.33, p = .18$; see Table 3). No Age \times Maternal NA interaction was found.

Models indicated no significant relationship between total duration of maternal PA across tasks and adolescents' momentary PA ($b = -.00, p = .71$), or peak PA ($b = -.00, p = .51$). As reported in Table 4, moderation analyses revealed an unexpected Age \times Maternal PA interaction for the prediction of adolescent peak PA ($b = .00, p = .003$). As illustrated in Figure 3, post-hoc test of simple slopes indicated a significant negative relationship between duration of maternal PA and adolescent peak PA among younger adolescents ($-1 SD, b = -.00, t = -2.84, p < .01$), such that younger adolescents exposed to lower maternal PA demonstrated higher levels of PA in response to personally salient positive events. Among older adolescents, maternal PA was not significantly related to adolescent peak PA ($+1 SD, b = .00, t = 1.58, p = .12$).

Neither maternal PA nor maternal NA was significantly related to youth laboratory-observed PA (all $ps > .05$). Similarly, neither maternal PA nor maternal NA was significantly related to adolescents' momentary or peak NA (all $ps > .05$), suggesting the relationship between maternal affect and youth emotionality is specific to youths' self-reported daily PA.

DISCUSSION

Despite the considerable role attributed to PA in contemporary conceptualizations of both adolescent depression and adolescent well-being, relatively little is known regarding interpersonal correlates of PA in nonclinical adolescent populations. Findings of the present study provide evidence that normative variation in maternal affective behavior is significantly related to youth's self-reported experience of PA in daily life. Specifically, adolescents of mothers higher in negative affectivity, as assessed in a laboratory-based interaction paradigm, reported lower levels of both peak and momentary PA when assessed in their real-world environments. It is notable that even among psychologically healthy mother–adolescent dyads, it seems parenting factors are associated with adolescents' daily affective experience.

Results are consistent with previous work on parental “dampening” of youth PA (e.g., Yap et al., 2008). Research conducted by Yap et al. (2008) suggests that maternal aversive and dysphoric responses to adolescents' expression of PA may be related to greater affective dysfunction in adolescent children. Indeed, parents of depressed youth have been found to report greater “dampening” of their children's PA than parents of healthy youth (Katz et al., 2014). Moreover, parental invalidating or dampening reactions to adolescent displays of PA have been associated with greater use of maladaptive emotional regulation strategies among psychologically healthy youth (Yap et al., 2008).

In addition to “dampening” youth PA, maternal negative affectivity has been linked with dysfunctional patterns of adolescent emotion regulation, increased adolescent depressive symptomatology, and adolescents' blunted neural reactivity to social rewards (Luebbe & Bell, 2014; Tan et al., 2014; Yap, Schwartz, Byrne, Simmons, & Allen, 2010). Parenting behavior characterized by high levels of NA has been associated with youths' attention biases to anger (Gulley, Oppenheimer, & Hankin, 2014), which may undermine adolescents' ability to attend to and be influenced by positive stimuli in the environment. Additionally, hostile or unsupportive parenting behavior has been implicated in children's development of depressogenic cognitive styles, exposing them to risk for affective dysfunction (Sheeber, Hops, & Davis, 2001). Further, emerging neuroimaging research has demonstrated reductions in social affiliation and attenuated responses to social reward in youth at risk for depression (Olino, Silk, Osterritter, & Forbes, 2015). Such findings suggest that adolescents of high NA mothers may experience impairments in both their motivation to engage in potentially rewarding social experiences and their capacity to derive pleasure from such interactions.

Moreover, while much of the research on the influence of parenting on adolescent emotion regulation has focused on the down-regulation of negative affective states (Yap, Allen, & Sheeber, 2007), it seems plausible that adolescent children of parents high in negative emotionality may similarly struggle to up-regulate positive affective experiences and may be less likely to rate their subject experience of PA as highly as other youth. Further longitudinal research is needed to clarify the directionality of the relationship between parental negative affective expression and adolescent PA, as well as to probe the relationship between parental negative affectivity and youth PA regulation.

The relationship between maternal negative affective expression and youth PA seemed to be driven by affective dynamics observed in the context of the conflict resolution discussion. This finding is inconsistent with results reported by Schwartz et al. (2014) using similar task paradigms, indicating that higher levels of maternal negativity in the context of positive event planning interaction were prospectively related to the onset of major depressive disorder (MDD) in adolescent youth. Of note, however, the discussion tasks employed by Schwartz et al. (2014) were considerably longer in duration, perhaps facilitating greater variability in maternal affective expression. The relative brevity of the present discussion tasks may have limited observed variability in maternal affect. Further, Schwartz et al. (2014) assessed MDD onset but not adolescent PA. Present results should be interpreted with caution, however, as the order of discussion tasks was not randomized. It is possible that affective spillover from the conflict resolution discussion influenced the affective tone of the fun activity planning discussion, influencing the results. The context-specific relationship between maternal NA and adolescent PA should be further probed using randomized task designs and more extended behavioral observation.

Of note, no main effects emerged in analyses of maternal positive affective expression and adolescent PA in the present study, though age was found to moderate findings. Specifically, the interaction effect shows that maternal affect was associated with younger, but not older, youth's affect. Overall, compared to maternal NA, the association between maternal PA and child PA appears to be less consistent and robust and suggests that maternal PA may be less influential for child affect, especially among older youth. This interpretation is consistent with research by Yap, Schwartz, Byrne, Simmons, and Allen (2010) indicating no relationship between parental positive interpersonal behavior and adolescents' depressive symptoms. Indeed, the relative salience of parental negativity to adolescent emotional functioning has been found across previous literature (see Yap, Pilkington, Ryan, & Jorm, 2014 for review). However, the moderation effect of age showed that among younger youth the association between maternal and child PA was in an unexpected direction, such that lower levels of maternal PA were associated with higher levels of youth PA. It is unclear from our analyses why there might be an inverse association between mother and youth PA among younger adolescents. Additional longitudinal research is also needed to further elucidate how maternal PA might be associated with youths' subjective experience of PA across development.

The relationship between maternal affective behavior and adolescent affect was specific to adolescents' daily PA in the present study; no significant associations emerged between maternal affect and adolescents' experience of NA in daily life. This finding is interesting given previous literature linking parenting with youth NA and depressive symptoms (e.g., Padilla-Walker, 2008; Schwartz et al., 2012; Schwartz et al., 2014; Yap et al., 2010). Notably, however, this research linking parenting variables with adolescent depressive symptoms has largely relied upon comprehensive depression assessment measures that fail to distinguish between adolescent positive and negative emotionality. Given the distinct role of reduced PA in the phenomenology of adolescent depression (Forbes & Dahl, 2005), as well as findings indicating that changes in adolescent mood are principally driven by declines in PA in the context of relatively stable NA (Weinstein et al., 2007), it seems plausible that adolescence may be a particularly sensitive period in the development of PA. Additionally,

studies assessing the relationship between parenting and adolescent NA have assessed NA via self-report questionnaires, and have not examined how youth NA unfolds in daily life. Future research on parenting and adolescent depression should continue to assess adolescent mood along both negative and positive dimensions to further probe the relationship between parenting variables and youth real-world affect.

Further, no significant associations emerged between maternal affect and adolescents' laboratory-observed affect. This suggests that youths' manifested PA expression may not reflect the quality of their subjective experience of PA; indeed, bivariate correlations indicated that adolescent EMA- and laboratory-assessed PA were unrelated. Further, adolescents were observed to demonstrate low levels of PA in the laboratory, and it is possible that laboratory-based interaction tasks used in the present investigation failed to elicit naturalistic levels of youth PA expression. Future studies would be well-informed to assess adolescent PA on multiple levels of analysis and use more ecologically valid task paradigms to better understand how parenting variables may contribute to youth affective experience.

Results of the present study should be interpreted with caution, as the cross-sectional design precludes inferences of causality. While findings indicate the presence of a relationship between maternal negative affectivity and adolescent PA, the direction of the effect is unclear. Additionally, researchers should consider adolescents' lifetime exposure to parental negative affective experience, as the effects of parental emotionality are likely cumulative. Moreover, affective dynamics within the family are likely bidirectional and transactional in nature, and adolescent affect can be presumed to influence parental affective behavior (Morelen & Suveg, 2012). Temperamental factors and shared genetics are also likely contributors to the observed relationship (Jacobs et al., 2013; Kiff, Lengua, & Zalewski, 2011), and future longitudinal studies should be designed to consider and control for these variables.

In addition to parental affective expression, parents' reactions to their children's emotional displays are thought to be influential in emotion socialization (Eisenberg et al., 1998). Future research should consider the dynamic sequencing of mother-adolescent affective behavior in addition to its aggregate duration. Such data would permit investigators to further probe the relationship between maternal "dampening" responses to adolescent displays of positive emotionality specifically and adolescents' subsequent experience of PA. The laboratory-based behavioral observation paradigms utilized in this investigation represent a methodological improvement on existing self-report research; however, the inherent artificiality of laboratory-based interaction tasks and the low levels of observed maternal negative affectivity limit the ecological validity of the present findings.

Further, the relative contribution of paternal affectivity was not incorporated in the present analyses, and given the influential role of paternal relationships in adolescent functioning (Forehand & Nousiainen, 1993; Reeb & Conger, 2009), it will be critical for future studies to incorporate measures of paternal affective variables in their research. Additionally, a wide range of adolescent ages was represented in the current sample, and data assessing participant pubertal status were not available for all subjects. While adolescent age was not

found to moderate the association between maternal negative affective expression and youth PA, further research is needed to assess developmental differences in the relationship between parental affectivity and adolescents' experienced PA. Finally, this study's relatively small sample size, though consistent with previous studies incorporating similar behavioral observations (e.g., McMakin, Burkhouse et al., 2011) and EMA measures (e.g., Silk et al., 2011), may have limited analytic power. It will be important for future studies to replicate findings with larger sample sizes.

Despite the aforementioned limitations, this study demonstrates a number of considerable strengths and represents a significant addition to existing research on parent–adolescent affective dynamics. First, this investigation is among only a few studies to systematically examine the relationship between normative variations in parental affective expression and adolescents' experience of PA in a nonclinical sample. Findings, therefore, provide novel insights into the relationship between parenting variables and psychological functioning in adolescent children. Additionally, the EMA protocol employed in this study allowed us to assess youths' emotional experience in an ecologically valid context, providing key data regarding adolescent affective experience in the real world. The combination of observational assessment of parenting and EMA methodology is particularly novel, and this study provides some of the first evidence that parental affective behavior in interactions with adolescent children is associated with adolescents' experience of subjective well-being in their everyday worlds.

Overall, findings suggest that adolescents whose familial relationships are characterized by high levels of negative affective expression may be less able to achieve and sustain high levels of PA in daily life. Should results be replicated in longitudinal analyses, the present insights may prove valuable for clinicians designing and implementing family-based interventions to enhance youth PA. Indeed, it seems the modulation of parental negative affect may be a promising area of exploration in future research supporting efforts to reduce adolescents' risk for affective symptomatology.

References

- American Psychiatric Association. Diagnostic and statistical manual of mental disorders. 4. Washington, DC: Author; 1994.
- Axelson DA, Bertocci MA, Lewin DS, Trubnick LS, Birmaher B, Williamson DE, ... Dahl RE. Measuring mood and complex behavior in natural environments: Use of ecological momentary assessment in pediatric affective disorders. *Journal of Child and Adolescent Psychopharmacology*. 2003; 13:253–266. <https://doi.org/10.1089/104454603322572589>. [PubMed: 14642013]
- Bradburn NM, Rips LJ, Shevell SK. Answering autobiographical questions: The impact of memory and inference on surveys. *Science*. 1987; 236:157–161. <https://doi.org/10.1126/science.3563494>. [PubMed: 3563494]
- Cohn MA, Fredrickson BL, Brown SL, Mikels JA, Conway AM. Happiness unpacked: Positive emotions increase life satisfaction by building resilience. *Emotion*. 2009; 9:361–368. <https://doi.org/10.1037/a0015952>. [PubMed: 19485613]
- Dallaire DH, Pineda AQ, Cole DA, Ciesla JA, Jacquez F, LaGrange B, Bruce AE. Relation of positive and negative parenting to children's depressive symptoms. *Journal of Clinical Child and Adolescent Psychology*. 2006; 35:313–322. https://doi.org/10.1207/s15374424jccp3502_15. [PubMed: 16597227]

- Eisenberg N, Cumberland A, Spinrad TL. Parental socialization of emotion. *Psychological Inquiry*. 1998; 9:241–273. [PubMed: 16865170]
- Forbes EE, Dahl RE. Neural systems of positive affect: Relevance to understanding child and adolescent depression? *Development and Psychopathology*. 2005; 17:827–850. <https://doi.org/10.1017/S095457940505039X>. [PubMed: 16262994]
- Forbes EE, Ryan ND, Phillips ML, Manuck SB, Worthman CM, Moyles DL, ... Dahl RE. Healthy adolescents' neural response to reward: Associations with puberty, positive affect, and depressive symptoms. *Journal of the American Academy of Child and Adolescent Psychiatry*. 2010; 49:162–172. <https://doi.org/10.1097/00004583-201002000-00010>. [PubMed: 20215938]
- Forbes EE, Williamson DE, Ryan ND, Dahl RE. Positive and negative affect in depression: Influence of sex and puberty. *Annals of the New York Academy of Sciences*. 2004; 1021:341–347. <https://doi.org/10.1196/annals.1308.042>. [PubMed: 15251907]
- Forehand R, Nousiainen S. Maternal and paternal parenting: Critical dimensions in adolescent functioning. *Journal of Family Psychology*. 1993; 7:213–221. <https://doi.org/10.1037/0893-3200.7.2.213>.
- Fredrickson BL, Mancuso RA, Branigan C, Tugade MM. The undoing effect of positive emotions. *Motivation and Emotion*. 2000; 24:237–258. <https://doi.org/10.1023/A:1010796329158>. [PubMed: 21731120]
- Gadow KD, Devincent CJ, Pomeroy J, Azizian A. Comparison of DSM-IV symptoms in elementary school-age children with PDD versus clinic and community samples. *Autism*. 2005; 9:392–415. <https://doi.org/10.1177/1362361305056079>. [PubMed: 16155056]
- Gadow, KD., Sprafkin, J. Adolescent symptom inventory – 4: Norms manual. Stony Brook, NY: Checkmate Plus; 1998a.
- Gadow, KD., Sprafkin, J. Child symptom inventory – 4: Screening manual. Stony Brook, NY: Checkmate Plus; 1998b.
- Gilbert KE. The neglected role of positive emotion in adolescent psychopathology. *Clinical Psychology Review*. 2012; 32:467–481. <https://doi.org/10.1016/j.cpr.2012.05.005>. [PubMed: 22710138]
- Gottman, JM., McCoy, K., Coan, J., Collier, H. The specific affect coding system (SPAFF) for observing emotional communication in marital and family interaction. Mahwah, NJ: Lawrence Erlbaum; 1996.
- Gulley LD, Oppenheimer CW, Hankin BL. Associations among negative parenting, attention bias to anger, and social anxiety among youth. *Developmental Psychology*. 2014; 50:577–585. <https://doi.org/10.1037/a0033624>. [PubMed: 23815705]
- Hair EC, Moore KA, Garrett SB, Ling T, Cleveland K. The continued importance of quality parent–adolescent relationships during late adolescence. *Journal of Research on Adolescence*. 2008; 18:187–200. <https://doi.org/10.1111/j.1532-7795.2008.00556.x>.
- Hazel NA, Oppenheimer CW, Technow JR, Young JF, Hankin BL. Parent relationship quality buffers against the effect of peer stressors on depressive symptoms from middle childhood to adolescence. *Developmental Psychology*. 2014; 50:2115–2123. <https://doi.org/10.1037/a0037192>. [PubMed: 24932722]
- Hetherington EM, Clingempeel WG. Coping with marital transitions: A family systems perspective. *Monographs of the Society for Research in Child Development*. 1992; 57:1–242. <https://doi.org/10.2307/1166050>.
- Hollenstein T, Granic I, Stoolmiller M, Snyder J. Rigidity in parent–child interactions and the development of externalizing and internalizing behavior in early childhood. *Journal of Abnormal Child Psychology*. 2004; 32:595–607. <https://doi.org/10.1023/B:JACP.0000047209.37650.41>. [PubMed: 15648527]
- Jacobs N, Menne-Lothmann C, Derom C, Thiery E, van Os J, Wichers M. Deconstructing the familiarity of variability in momentary negative and positive affect. *Acta Psychiatrica Scandinavica*. 2013; 127:318–327. <https://doi.org/10.1111/j.1600-0447.2012.01924.x>. [PubMed: 22906203]

- Kashdan TB, Steger MF. Expanding the topography of social anxiety: An experience-sampling assessment of positive emotions, positive events, and emotion suppression. *Psychological Science*. 2006; 17:120–128. <https://doi.org/10.1111/j.1467-9280.2006.01674.x>. [PubMed: 16466419]
- Katz LF, Shortt JW, Allen NB, Davis B, Hunter E, Leve C, Sheeber L. Parental emotion socialization in clinically depressed adolescents: Enhancing and dampening positive affect. *Journal of Abnormal Child Psychology*. 2014; 42:205–215. <https://doi.org/10.1007/s10802-013-9784-2>. [PubMed: 23942826]
- Kaufman J, Birmaher B, Brent D, Rao U. Schedule for Affective Disorders and Schizophrenia for School-Age Children–Present and Lifetime Version (K-SADS-PL): Initial reliability and validity data. *Journal of the American Academy of Child and Adolescent Psychiatry*. 1997; 36:980–988. [PubMed: 9204677]
- Kiff CJ, Lengua LJ, Zalewski M. Nature and nurturing: Parenting in the context of child temperament. *Clinical Child and Family Psychology Review*. 2011; 14:251–301. <https://doi.org/10.1007/s10567-011-009304>. [PubMed: 21461681]
- Knappe S, Beesdo-Baum K, Fehm L, Lieb R, Wittchen H. Characterizing the association between parenting and adolescent social phobia. *Journal of Anxiety Disorders*. 2012; 26:608–616. <https://doi.org/10.1016/j.janxdis.2012.02.014>. [PubMed: 22445318]
- Kuppens P, Van Mechelen I, Nezlek JB, Dossche D, Timmermans T. Individual differences in core affect variability and their relationship to personality and psychological adjustment. *Emotion*. 2007; 7:262–274. <https://doi.org/10.1037/1528-3542.7.2.262>. [PubMed: 17516805]
- Ladouceur CD. Neural systems supporting cognitive-affective interactions in adolescence: The role of puberty and implications for affective disorders. *Frontiers in Integrative Neuroscience*. 2012; 6:1–11. <https://doi.org/10.3389/fnint.2012.00065>. [PubMed: 22319479]
- Larson R, Lampman-Petratis C. Daily emotional states as reported by children and adolescents. *Child Development*. 1989; 60:1250–1260. <https://doi.org/10.2307/1130798>. [PubMed: 2805902]
- Larson RW, Moneta G, Richards MH, Wilson S. Continuity, stability, and change in daily emotional experience across adolescence. *Child Development*. 2002; 73:1151–1165. <https://doi.org/10.1111/1467-8624.00464>. [PubMed: 12146740]
- Longmore, MA., Manning, WD., Giordano, PC. Parent–child relationships in adolescence. New York: Routledge/Taylor & Francis Group; 2013.
- Luebke AM, Bell DJ. Positive and negative family emotional climate differentially predict youth anxiety and depression via distinct affective pathways. *Journal of Abnormal Child Psychology*. 2014; 42:897–911. <https://doi.org/10.1007/s10802-013-9838-5>. [PubMed: 24356797]
- McMakin DL, Burkhouse KL, Olino TM, Siegle GJ, Dahl RE, Silk JS. Affective functioning among early adolescents at high and low familial risk for depression and their mothers: A focus on individual and transactional processes across contexts. *Journal of Abnormal Child Psychology*. 2011; 39:1213–1225. <https://doi.org/10.1007/s10802-011-9540-4>. [PubMed: 21744058]
- McMakin DL, Siegle GJ, Shirk SR. Positive affect stimulation and sustainment (PASS) module for depressed mood: A preliminary investigation of treatment-related effects. *Cognitive Therapy and Research*. 2011; 35:217–226. <https://doi.org/10.1007/s10608-010-9311-5>. [PubMed: 22140287]
- Moore WE III, Pfeifer JH, Masten CL, Mazziotta JC, Iacoboni M, Dapretto M. Facing puberty: Associations between pubertal development and neural responses to affective facial displays. *Social Cognitive and Affective Neuroscience*. 2012; 7:35–43. <https://doi.org/10.1093/scan/nsr066>. [PubMed: 22228752]
- Morelen D, Suveg C. A real-time analysis of parent–child emotion discussions: The interaction is reciprocal. *Journal of Family Psychology*. 2012; 26:998–1003. <https://doi.org/10.1037/a0030148>. [PubMed: 23066675]
- Morris AS, Silk JS, Steinberg L, Myers SS, Robinson LR. The role of the family context in the development of emotion regulation. *Social Development*. 2007; 16:361–388. <https://doi.org/10.1111/j.1467-9507.2007.00389.x>. [PubMed: 19756175]
- Olino TM, Silk JS, Ostertter C, Forbes EE. Social reward in youth at risk for depression: A preliminary investigation of subjective and neural differences. *Journal of Child and Adolescent Psychopharmacology*. 2015; 25:711–721. <https://doi.org/10.1089/cap.2014.0165>. [PubMed: 26469133]

- Padilla-Walker LM. 'My mom makes me so angry!' Adolescent perceptions of mother-child interactions as correlates of adolescent emotions. *Social Development*. 2008; 17:306-325. <https://doi.org/10.1111/j.1467-9507.2007.00426.x>.
- Paus T, Keshavan M, Giedd JN. Why do many psychiatric disorders emerge during adolescence? *Nature Reviews Neuroscience*. 2008; 9:947-957. <https://doi.org/10.1038/nrn2513>. [PubMed: 19002191]
- Quoidbach J, Berry EV, Hansenne M, Mikolajczak M. Positive emotion regulation and well-being: Comparing the impact of eight savoring and dampening strategies. *Personality and Individual Differences*. 2010; 49:368-373. <https://doi.org/10.1016/j.paid.2010.03.048>.
- Raes F, Smets J, Nelis S, Schoofs H. Dampening of positive affect prospectively predicts depressive symptoms in non-clinical samples. *Cognition and Emotion*. 2012; 26:75-82. <https://doi.org/10.1080/02699931.2011.555474>. [PubMed: 21756217]
- Raudenbush, SW., Bryk, AS., Congdon, R. HLM 7.00 for windows [Computer software]. Lincolnwood, IL: Scientific Software International; 2011.
- Reeb BT, Conger KJ. The unique effect of paternal depressive symptoms on adolescent functioning: Associations with gender and father-adolescent relationship closeness. *Journal of Family Psychology*. 2009; 23:758-761. <https://doi.org/10.1037/a0016354>. [PubMed: 19803611]
- Schwartz OS, Byrne ML, Simmons JG, Whittle S, Dudgeon P, Yap MBH, ... Allen NB. Parenting during early adolescence and adolescent-onset major depression: A 6-year prospective longitudinal study. *Clinical Psychological Science*. 2014; 2:272-286. <https://doi.org/10.1177/2167702613505531>.
- Schwartz OS, Dudgeon P, Sheeber LB, Yap MBH, Simmons JG, Allen NB. Parental behaviors during family interactions predict changes in depression and anxiety symptoms during adolescence. *Journal of Abnormal Child Psychology*. 2012; 40:59-71. <https://doi.org/10.1007/s10802-011-9542-2>. [PubMed: 21789522]
- Sheeber L, Hops H, Davis B. Family processes in adolescent depression. *Clinical Child and Family Psychology Review*. 2001; 4:19-35. <https://doi.org/10.1023/A:1009524626436>. [PubMed: 11388562]
- Shiffman S, Stone AA, Hufford MR. Ecological momentary assessment. *Annual Review of Clinical Psychology*. 2008; 4:1-32. <https://doi.org/10.1146/annurev.clinpsy.3.022806.091415>.
- Silk JS, Forbes EE, Whalen DJ, Jakubcak JL, Thompson WK, Ryan ND, Dahl RE. Daily emotional dynamics in depressed youth: A cell phone ecological momentary assessment study. *Journal of Experimental Child Psychology*. 2011; 110:241-257. <https://doi.org/10.1016/j.jecp.2010.10.007>. [PubMed: 21112595]
- Silk JS, Steinberg L, Morris AS. Adolescents' emotion regulation in daily life: Links to depressive symptoms and problem behavior. *Child Development*. 2003; 74:1869-1880. <https://doi.org/10.1046/j.1467-8624.2003.00643.x>. [PubMed: 14669901]
- Silk JS, Vanderbilt-Adriance E, Shaw DS, Forbes EE, Whalen DJ, Ryan ND, Dahl RE. Resilience among children and adolescents at risk for depression: Mediation and moderation across social and neurobiological context. *Development and Psychopathology*. 2007; 19:841-865. <https://doi.org/10.1017/S0954579407000417>. [PubMed: 17705905]
- Steinberg L. Reciprocal relation between parent-child distance and pubertal maturation. *Developmental Psychology*. 1988; 24:122-128. <https://doi.org/10.1037/0012-1649.24.1.122>.
- Tan PZ, Lee KH, Dahl RE, Nelson EE, Stroud LJ, Siegle GJ, ... Silk JS. Associations between maternal negative affect and adolescent's neural response to peer evaluation. *Developmental Cognitive Neuroscience*. 2014; 8:28-39. <https://doi.org/10.1016/j.dcn.2014.01.006>. [PubMed: 24613174]
- Thompson RJ, Berenbaum H, Bredemeier K. Cross-sectional and longitudinal relations between affective instability and depression. *Journal of Affective Disorders*. 2011; 130:53-59. <https://doi.org/10.1016/j.jad.2010.09.021>. [PubMed: 20951438]
- Weinstein SM, Mermelstein RJ, Hankin BL, Hedeker D, Flay BR. Longitudinal patterns of daily affect and global mood during adolescence. *Journal of Research on Adolescence*. 2007; 17:587-600. <https://doi.org/10.1111/j.1532-7795.2007.00536.x>. [PubMed: 18461148]

- Weinstein SM, Mermelstein RJ, Hedeker D, Hankin BL, Flay BR. The time-varying influences of peer and family support on adolescent daily positive and negative affect. *Journal of Clinical Child and Adolescent Psychology*. 2006; 35:420–430. https://doi.org/10.1207/s15374424jccp3503_7. [PubMed: 16836479]
- Wichers MC, Myin-Germeys I, Jacobs N, Peeters F, Kenis G, Derom C, ... van Os J. Evidence that moment-to-moment variation in positive emotions buffer genetic risk for depression: A momentary assessment twin study. *Acta Psychiatrica Scandinavica*. 2007; 115:451–457. <https://doi.org/10.1111/j.1600-0447.2006.00924.x>. [PubMed: 17498156]
- Yap MBH, Allen NB, Ladouceur CD. Maternal socialization of positive affect: The impact of invalidation on adolescent emotion regulation and depressive symptomatology. *Child Development*. 2008; 79:1415–1431. <https://doi.org/10.1111/j.1467-8624.2008.01196.x>. [PubMed: 18826533]
- Yap MBH, Allen NB, Sheeber L. Using an emotion regulation framework to understand the role of temperament and family processes in risk for adolescent depressive disorders. *Clinical Child and Family Psychology Review*. 2007; 10:180–196. <https://doi.org/10.1007/s10567-006-0014-0>. [PubMed: 17265137]
- Yap MBH, Pilkington PD, Ryan SM, Jorm AF. Parental factors associated with depression and anxiety in young people: A systematic review and meta-analysis. *Journal of Affective Disorders*. 2014; 156:8–23. <https://doi.org/10.1016/j.jad.2013.11.007>. [PubMed: 24308895]
- Yap MBH, Schwartz OS, Byrne ML, Simmons JG, Allen NB. Maternal positive and negative interaction behaviors and early adolescents' depressive symptoms: Adolescent emotion regulation as a mediator. *Journal of Research on Adolescence*. 2010; 20:1014–1043. <https://doi.org/10.1111/j.1532-7795.2010.00665.x>.

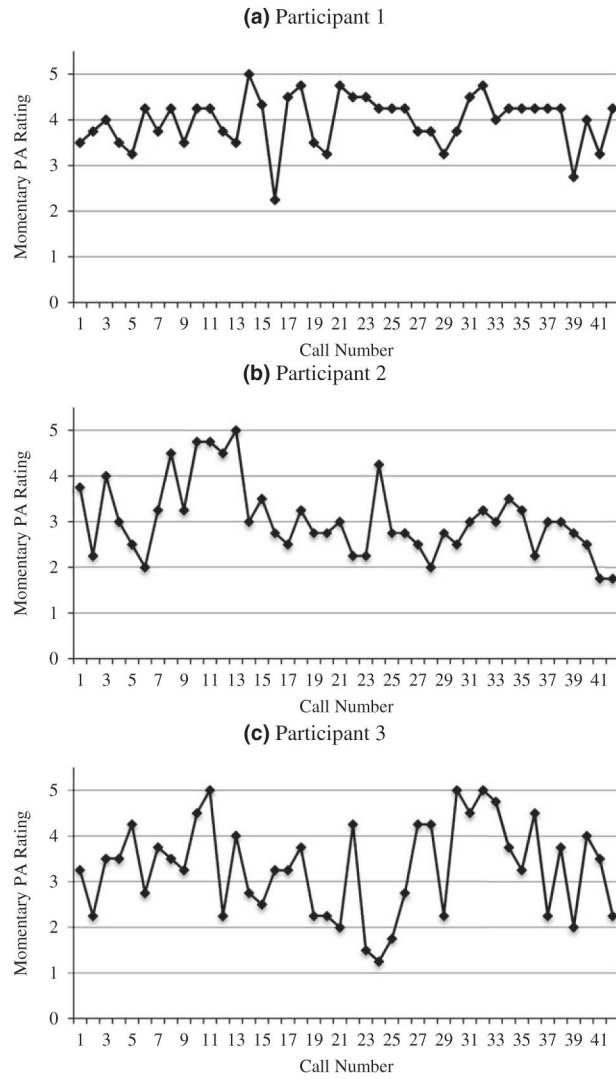


FIGURE 1.
 (a–c) Representative examples of within-person variability in adolescent momentary PA ratings across calls (Mean $SD = 0.59$).

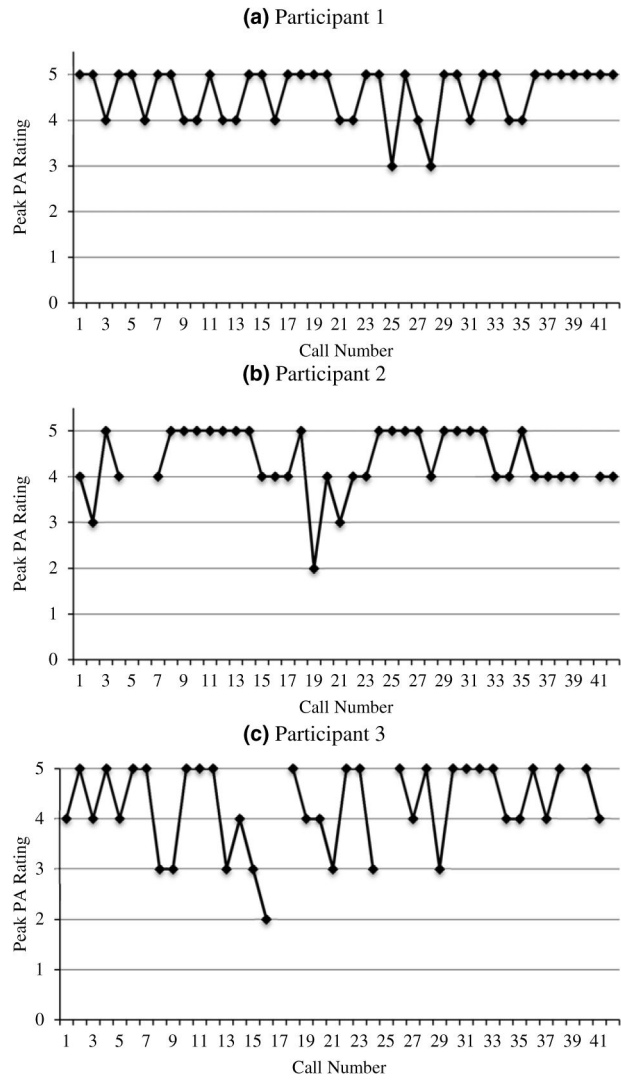


FIGURE 2. (a–c) Representative examples of within-person variability in adolescent peak PA ratings across calls (Mean $SD = 0.64$).

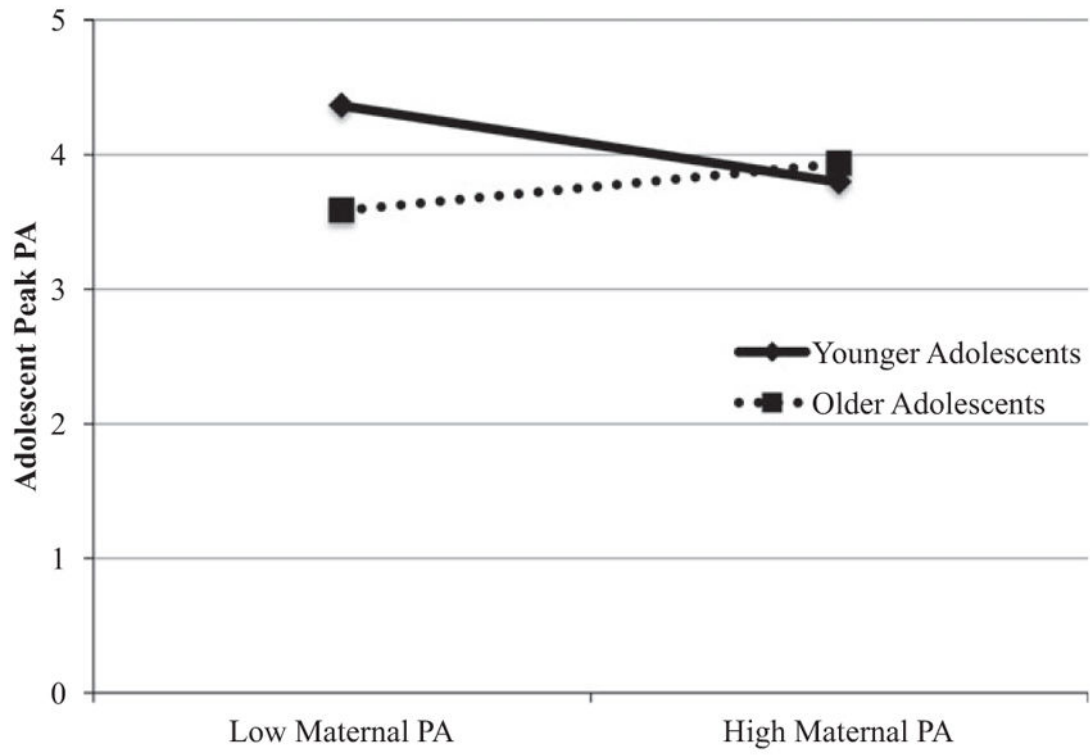


FIGURE 3. Interaction between adolescent age and maternal PA in predicting adolescent peak PA. Values are calculated at -1 *SD* from the mean.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

TABLE 1

Means (*SDs*) and Correlations Between Primary Variables

	M (SD)	1	2	3	4	5	6	7
1. Age	13.84 (2.60)							
2. Momentary PA	2.78 (0.90)	-.37**						
3. Peak PA	3.85 (0.69)	-.16	.74***					
4. Momentary NA	1.24 (0.27)	-.23*	.04	-.07				
5. Peak NA	2.00 (0.50)	-.41***	.38**	.30**	.58***			
6. Child PA across tasks	37.84 (24.40)	.20 [†]	-.03	-.02	-.09	-.06		
7. Maternal PA across tasks	102.93 (47.08)	-.31**	.11	-.09	.09	.10	-.02	
8. Maternal NA across tasks	12.54 (22.80) ^a	.01	-.20 [†]	-.25*	-.01	-.08	-.02	-.11

Note. Positive and negative parental affective expression measured in seconds.

^aValues reflect untransformed data.

[†] $p < .10$;

* $p < .05$;

** $p < .01$;

*** $p < .001$.

TABLE 2

Prediction of Adolescent Momentary and Peak PA From Maternal NA

Fixed effects (with robust standard errors)	b (SE b)	t-Ratio	df
Momentary PA			
Intercept	5.04 (.85)	5.90***	75
Gender	-0.25 (.18)	-1.38	75
Age	-0.12 (.04)	-3.16**	75
Maternal education	0.00 (.10)	0.00	75
Maternal NA	-0.33 (.16)	-2.12*	75
Variance component			
Intercept	0.68***		
Peak PA			
Intercept	5.33 (.57)	9.37***	75
Gender	-0.11 (.16)	-0.68	75
Age	-0.04 (.03)	-1.15	75
Maternal education	-0.10 (.07)	-1.56	75
Maternal NA	-0.32 (.14)	-2.41*	75
Variance component			
Intercept	0.42***		

†
 $p < .10$;*
 $p < .05$;**
 $p < .01$;***
 $p < .001$.

TABLE 3

Context-Specific Prediction of Adolescent PA From Maternal NA

Fixed effects (with robust standard errors)	b (SE b)	t-Ratio	df
Momentary PA			
Conflict resolution discussion			
Intercept	4.99 (.84)	5.93 ^{***}	75
Gender	-0.22 (.19)	-1.23	75
Age	-0.12 (.04)	-3.16 ^{**}	75
Maternal education	0.00 (.10)	0.00	75
Maternal NA	-0.34 (.16)	-2.12 [*]	75
Variance component			
Intercept	0.68 ^{***}		
Fun activity planning discussion			
Intercept	4.86 (.81)	6.02 ^{***}	75
Gender	-0.28 (.20)	-1.40	75
Age	-0.12 (.04)	-3.09 ^{**}	75
Maternal education	0.01 (.09)	0.05	75
Maternal NA	-0.30 (.22)	-1.37	75
Variance component			
Intercept	0.71 ^{***}		
Peak PA			
Conflict resolution discussion			
Intercept	5.28 (.56)	9.45 ^{***}	75
Gender	-0.08 (.15)	-0.52	75
Age	-0.04 (.03)	-1.15	75
Maternal education	-0.10 (.07)	-1.54	75
Maternal NA	-0.33 (.14)	-2.28 [*]	75
Variance component			
Intercept	0.42 ^{***}		
Fun activity planning discussion			
Intercept	5.18 (.56)	9.20 ^{***}	75
Gender	-0.014 (.17)	-0.80	75
Age	-0.03 (.03)	-1.10	75
Maternal education	-0.10 (.07)	-1.53	75
Maternal NA	-0.33 (.25)	-1.35	75
Variance component			
Intercept	0.43 ^{***}		

[†]
 $p < .10$;

^{*}
 $p < .05$;

**
 $p < .01$;

 $p < .001$.

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

TABLE 4

Prediction of Adolescent Peak PA From Maternal PA by Adolescent Age Interaction

Fixed effects (with robust standard errors)	b (SE b)	t-Ratio	df
Peak PA			
Intercept	3.92 (.07)	58.82 ***	76
Age	-0.06 (.03)	-0.243 *	76
Maternal PA	-0.00 (.00)	-0.74	76
Maternal PA × Age	0.00 (.00)	3.07 **	76
Variance component			
Intercept	0.38 ***		

†
 $p < .10$;*
 $p < .05$;**
 $p < .01$;***
 $p < .001$.