



Published in final edited form as:

J Exp Child Psychol. 2015 August ; 136: 1–16. doi:10.1016/j.jecp.2015.02.009.

A Person-Centered Approach to Adolescent Emotion Regulation: Associations with Psychopathology and Parenting

Caitlin C. Turpyn^{a,*}, Tara M. Chaplin^a, Emily C. Cook^b, and Alexandra M. Martelli^a

Tara M. Chaplin: tchaplin@gmu.edu; Emily C. Cook: ecook@ric.edu; Alexandra M. Martelli: amartel2@gmu.edu

^aDepartment of Psychology, George Mason University; Fairfax, VA 22030, USA

^bDepartment of Psychology, Rhode Island College; Providence, RI 02908, USA

Abstract

Adolescence is a unique period of heightened emotional arousal and still-developing regulatory abilities. Adolescent emotion regulation patterns may be critically involved in adolescents' psychosocial development, but patterns of emotion regulation in youth are not well-understood. The present study used latent profile analysis (LPA) to elucidate patterns of emotion expression, experience, and emotion-related physiological arousal in adolescents. One-hundred ninety-eight adolescents and their primary caregivers participated in an emotionally-arousing parent-adolescent conflict interaction. Adolescent's observed emotion expressions, emotion experiences, and heart rate (HR) and caregiver parenting behaviors were assessed during and/or after the interaction. Parents reported on adolescents' internalizing and externalizing symptoms, and youth reported on depressive symptoms. The LPA revealed 4 emotion regulation profiles: a moderate HR-and-high expression profile, a suppression profile (with low negative emotion expression, high emotion experience), a low reactive profile, and a high reactive profile. The moderate HR-and-high expression profile was associated with lower conduct disorder symptoms; the suppression profile was related to lower anxiety symptoms; and the high reactive profile was associated with higher adolescent depressive symptoms. The high reactive and moderate HR-and-high expression profiles were associated with more negative/critical parenting behaviors. Findings suggest that profiles of adolescent emotion regulation can be empirically identified and may be significant risk factors for psychopathology.

Keywords

emotion; emotion regulation; adolescence; person-centered approach

Adolescence is a dynamic developmental period in which a series of hormonal, cognitive, and behavioral changes occur, leading to a heightened system of emotional arousal and a

© 2015 Published by Elsevier Inc.

*Corresponding author at: Department of Psychology, George Mason University, 4400 University Dr., MSN-3F5, Fairfax, VA 22030. Ph: 1-703-993-5066. Fax: 1-703-993-1359., cmauger@gmu.edu (C. Turpyn).

Publisher's Disclaimer: This is a PDF file of an unedited manuscript that has been accepted for publication. As a service to our customers we are providing this early version of the manuscript. The manuscript will undergo copyediting, typesetting, and review of the resulting proof before it is published in its final citable form. Please note that during the production process errors may be discovered which could affect the content, and all legal disclaimers that apply to the journal pertain.

still-developing regulatory control system (Galvan et al., 2006; Steinberg, 2005). Effective regulation of heightened emotional states is critical in navigating the novel stressors of adolescence such as puberty and shifting peer and family relationships (Eccles et al., 1993). Emotion regulation refers to the process by which emotions are automatically or volitionally monitored and modulated to facilitate a desired state or goal through internal processes and also external interpersonal influences (Cole, Martin, & Dennis, 2004; Thompson, 1994). Adolescents who experience difficulties regulating their emotions are vulnerable to poor social relationships, internalizing and externalizing disorders, and are more likely to engage in risky behaviors like substance use (Bradley, 2003; Silk, Steinberg, & Morris, 2003). Within-person variability in adolescents' responses across emotion domains (e.g., expression, subjective experience, and physiology) may reflect meaningful patterns of emotion regulation (Zalewski, Lengua, Wilson, Trancik, & Bazinet, 2011a) perhaps impacting current and future mental health (Aldao, Nolen-Hoeksema, & Schweizer, 2010). Therefore, understanding types of emerging emotion regulation patterns in youth may provide insight into the development and progression of psychopathology and risk behaviors during a critical period for emotional development.

Emotions are considered dynamic, multisystem responses including expressive, experiential (e.g., self-reported emotion), and physiological components. Early theories of emotion suggest a *concordance* model of emotion—that all types of emotion systems respond in concert to produce a coherent emotional response (e.g., Ekman, 1992; Izard, 1977). For example, in a concordance model, anger may be expected to manifest in facial expressions (Izard, 1979), appraisal of experience as anger, and increased physiological reactivity (Ekman, Levenson, & Friesen, 1983). However, accumulating research reports a relative lack of correlation among expected emotion response systems in direction and magnitude (Mauss & Robinson, 2009). This lack of association is often called emotion *discordance* (e.g., Evers et al., 2014; Hollenstein & Lanteigne, 2014; Lanteigne, Flynn, Eastabrook, & Hollenstein, 2012; Mauss, Levenson, McCarter, & Wilhelm, 2005). Some research suggests that emotion discordance may result from emotion regulatory processes (Butler, Gross, & Barnard, 2013; Hollenstein & Lanteigne, 2014; Lewis, 2011). That is, the down- or up-regulation of emotion may impact certain emotion domains (e.g., expression) more than others (e.g., physiology), thus resulting in emotional discordance among systems. For that reason, patterns of emotion discordance may indicate the presence of some form of emotion regulation.

Theoretical Models of Emotion Discordance/Emotion Regulation Patterns

Varying patterns of activation across emotion domains appear in a number of theoretical models of emotion with implications for emotion regulation and psychopathology. For one, Gross's process model describes one response-focused emotion regulation strategy, expressive suppression (Gross, 1998a, 2002), a strategy which reflects a distinct pattern of emotion discordance. Specifically, expressive suppression refers to high levels of subjective emotion experience and high physiological arousal, but low expression of emotion (Gross, 1998a, 1998b; Gross & Levenson, 1997; Harris, 2001; Richards & Gross, 1999). Indeed, Butler, Gross, and Barnard (2013) found that participants prompted to suppress the expression of their emotions showed reduced emotional concordance across continuous

measures of emotion expressive behavior and physiology, presumably with low expressive behavior but moderate or high physiology. Importantly, the consistent use of emotion regulation strategies such as suppression is linked with depression, anxiety, and externalizing disorders (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Gross & John, 2003; Larsen et al., 2013). A second theoretical model of emotion discordance involves a pattern of high reported negative emotion but low physiological arousal. This model has been proposed to be an under-reactive pattern of emotion regulation (Hastings et al., 2009; Raine, 2002), and studies have found evidence for this type of emotion discordance in youth. For example, Hastings et al. (2009) found that high reported anger experience and low HR was associated with adolescent externalizing problems (ages 11 to 16). This finding is consistent with literature indicating youth with conduct disorder tend to have lower emotional responsivity and physiological reactivity including lower HR (Ortiz & Raine, 2004). This under-reactive pattern of emotion regulation may reveal an important risk pattern. Finally, a third theoretical model has proposed that a pattern of high reactive concordant responses—indicated by high levels of expressed emotion, experienced emotion, and physiological arousal—may occur in individuals particularly when they are in intense emotional states (Mauss, Levenson, McCarter, Wilhelm, & Gross, 2005) or when resources are unavailable for inhibition or regulation (Lewis, 2011). Patterns of chronically high reactive concordant responses may evidence an under-regulated response style and also place individuals at risk for psychopathology as high negative emotion reactivity is linked with depression and problem behaviors in adolescence (Silk, Steinberg, & Morris, 2003; Wetter, 2009).

While these theoretical models suggest important patterns of emotion discordance and regulation, they have mostly been supported by self-report studies of emotion regulation styles (e.g., Larsen et al, 2013; Silk et al., 2003) or are limited to discordance among two emotion domains in youth (e.g. Hastings et al, 2009). The assessment of multiple emotion domains can facilitate inferences about emotion regulation when discordant responses are present (e.g. low expression of negative emotion when physiologically aroused or subjectively experiencing high levels of anger) or, when concordant responses are present (e.g. high reactivity across expression, experience, and physiological arousal). For this reason, the present study aims to advance understanding of adolescent emotion patterns and their relationship with psychopathology symptoms by collectively interpreting multiple measures of emotion to find empirically derived person-centered patterns of emotion discordance/regulation.

Person-Centered Approach

An ideal strategy for understanding patterns of emotion discordance and regulation is through the use of person-centered statistical approaches, such as latent profile analysis (LPA). Person-centered analyses may give way to a substantively richer understanding of emotion discordance and regulation by empirically identifying heterogeneous, within-person emotion patterns. LPA can simultaneously model activation across multiple emotion subsystems, allowing profiles of reactivity and the theorized latent variable, emotion regulation, to be revealed. Similar to cluster analysis, LPA groups individuals by the patterning of variable values but differs by using a more rigorous and model-based approach to determine subsets of the population (Muthén & Muthén, 1998 – 2012). To date, few

studies have examined emotion regulation by using person-centered approaches, and very few with adolescents. In light of this limitation, adolescents' observed emotion expressions, reported emotion experiences, and heart rate in response to an emotionally-arousing parent-adolescent conflict task were examined, and latent profile analysis was used to discern adolescent emotion regulation profiles.

Person-Centered Studies of Emotion Regulation and Psychopathology

As noted above, only a few studies have examined emotion regulation patterns, particularly in adolescence, from a person-centered approach and related those patterns to psychopathology. These initial studies suggest that patterns of high emotionality are linked to greater psychopathology symptoms, peer rejection, and negative appraisal styles. For instance, Zalewski et al. (2011a, 2011b) examined children's (ages 8 to 11) observed emotion expression self-reports of emotion, and physiological arousal in a frustration-eliciting bead-sorting task and anxiety-eliciting speech task. Emotion measures were explored through latent profile analysis, and results indicated that emotion regulation profiles were identified and differentially associated with coping, appraisal styles, and adjustment. Specifically, the "moderately responsive" and "unregulated responsive" profiles (characterized by moderate and high arousal across frustration emotion domains) were associated with higher conduct problems and depression (Zalewski et al., 2011a). Further, this unregulated responsive profile was correlated with an appraisal style in which youth negatively evaluated others (Zalewski et al., 2011b). Latent profile analysis also identified anxiety and frustration groups indicating "low response or well-regulated," "response regulated," and "moderately responsive-expressive" children (Zalewski et al., 2011a, p. 958).

In a second study utilizing latent profile analysis, Smith, Hubbard, and Laurenceau (2011) investigated profiles of second grade children's anger control in a laboratory task in which children lost a board game to a cheating child confederate. Based on children's anger report, skin conductance, and anger expression, five groups were identified: "physiology-and-expression controllers," "expression-only controllers," "non-controllers," "non-reactive," and "non-reporters" (Smith et al., 2011, p. 221–222). Although this study did not explicitly examine psychopathology symptoms in children, findings revealed that the expression-only controllers (low expression, high physiological arousal, high self-report) and non-controllers (high levels across anger domains) were considered to be more aggressive and were more disliked by their peers.

Finally, Lanteigne et al. (2012) used cluster analyses to determine subgroups of emotion discordance patterns in a small sample ($n = 49$) of adolescent girls, ages 12–17. In response to a standardized speech task, the "experience-expressive" cluster (with high expressed emotion, high self-reported self-conscious emotions, and lower physiological arousal) was associated with greater difficulties regulating emotions and more internalizing problems relative to a higher physiological arousal group called the "arousal cluster" (Lanteigne et al., 2012, p. 7).

Each of these studies highlight the importance of utilizing person-centered approaches that include multiple emotion domains and find that high reactive emotion profiles may be maladaptive. However, beyond standard stress and emotion-eliciting tasks, there is a need to understand emotion patterns within significant interpersonal relationship contexts in adolescence, especially since external social influences (e.g., parenting behaviors, responses to adolescent emotion) may actually regulate youth's emotional states and youth's emotion regulation patterns may influence future interpersonal relationships (Cook, Buehler, & Blair, 2013; Thompson, 1994). Adolescents encounter many new social circumstances with the reorganization of family roles, increasing rates of family conflict, and more time and value placed on peer relationships during adolescence (Larson & Richards, 1991). While peer relationships are significant and evolving during this developmental period (Brown & Larson, 2009), the parent-adolescent relationship is also a central socializing agent for youth's emotional functioning throughout adolescence (Eisenberg, Cumberland, & Sinrad, 1998). Emotionally arousing interpersonal contexts with caregivers are of particular relevance since family difficulties have been implicated in adolescent psychopathology (Lewinsohn et al., 1994; Sheeber, Hops, Alpert, Davis, & Andrews, 1997; Steinberg, Lamborn, Darling, Mounts, & Dornbusch, 1994). Given this key role, parent-adolescent interactions may reveal maladaptive patterns of adolescent emotion that may place adolescents at risk for psychopathology. Hence, this study builds upon existing person-centered studies by exploring adolescents' patterns of emotion responses in an ecologically valid parent-adolescent conflict interaction.

Emotion Regulation Profiles and Parenting

Emotion regulation patterns, such as the profiles described above, are influenced by or related to a number of social processes within the family environment (Eisenberg, Cumberland, & Sinrad, 1998). Although the nature of parent-child relationships changes in adolescence, parenting style, practices, and parental emotionality are considered important interpersonal influences on child emotion regulation throughout development (Morris, Silk, Steinberg, Myers, & Robinson, 2007). However, the majority of research investigating parental factors and children's emotion regulation has focused on infancy through early childhood (Bariola, Gullone, & Hughes, 2011). To our knowledge, no person-centered studies of emotion regulation in adolescence have examined correlations between emotion regulation profiles and parenting or parent's emotional functioning.

Existing variable-centered research examining parenting styles and young children's emotion regulation shows that observed or self-reported negative parenting (e.g., over reactive discipline, negative control, hostility) is related to poor emotion regulation, evidenced by youth's poor effortful control (Karreman, van Tuijl, van Aken, & Dekovi, 2008; Morris et al., 2002), low vagal tone (Calkins, Smith, Gill, & Johnson, 1998), and higher frequency of negative emotion displays (Del Vecchio & Rhoads, 2010). While parenting style may impact youth's emotional development over time, youth's expression of dysregulated negative emotion and problem behaviors also elicit negative parenting behaviors (Huh, Tristan, Wade, & Stice, 2006; Patterson, 1982). Given the important correlations between parenting and the development of emotion regulation, the present study explored the relationship between negative parenting behaviors in a conflict interaction and

adolescent emotion regulation profiles in that interaction. Emotion Regulation Profiles and Gender.

Another factor that may influence adolescent emotion reactivity and regulation is gender. Gender has been widely examined in relation to styles of emotion reactivity and regulation. Girls are often considered more emotionally expressive than boys, particularly for positive emotion and for “softer” negative emotions such as sadness and anxiety (Brody & Hall, 2000; Buck, 1979; Chaplin & Aldao, 2012; Gross & John, 2003). Thus, gender may play a role in an adolescent’s pattern of emotion responses and emotion regulation, with girls potentially showing greater emotional reactivity patterns. Since gender may be associated with differential styles of expression, reactivity, and regulation, the present study examined gender as a correlate of emotion profiles.

The Present Study

To examine profiles of emotion regulation in adolescence, multiple indicators of adolescents’ responses to an ecologically valid emotion-elicitor (parent-adolescent conflict interactions) were measured. We examined observed negative and positive emotion expression, internal emotion experience reported by the adolescent, and HR reactivity. In our view, each measure reflects a distinct component of the emotion response. Emotion expression refers to the observable and behavioral manifestation of the emotion experience including facial and vocal cues. We chose to include both negative and positive emotion expression as adolescents may possess advanced means of masking emotion to meet social norms, potentially by expressing positive emotion in this interpersonal context. An emotion experience relies on the individual’s appraisal of his or her emotional state including the perception of physiological manifestations, emotion expression and associated cognitions. Although not specific to negative emotional arousal, HR reactivity was conceptualized as a measure of emotion-related physiological arousal. HR reactivity is related to both sympathetic and parasympathetic activity and was measured through change in HR (Mauss & Robinson, 2009).

The present study’s first aim was to determine if subsets of adolescents could be identified based on emotion variables through latent profile analysis. We theorized that the latent variable, emotion regulation, can be inferred from profiles of emotion expression, experience, and physiological arousal. We predicted, based on past theory and research, that profiles of over-regulation (suppression), under-regulation (high reactive), blunted physiology (low HR), and normative arousal (low reactive) would emerge. The over-regulation profile or “suppression” profile was expected to consist of adolescents who showed low negative emotion expression, possibly high positive emotion expression, report high levels of negative emotion, and exhibit heightened physiological arousal. This profile is theoretically analogous to expressive suppression. The under-regulation profile or “high reactive” profile was expected to consist of adolescents who showed elevated responses across all emotion domains and were hypothesized to represent ineffective regulation. The blunted physiological profile or “low HR” profile was expected to consist of adolescents who showed lower HR reactivity relative to their expression and experience of emotion. Finally, a profile of moderate or average responses across levels of emotion variables was

expected to emerge, indicating a normative arousal or regulated response to a conflict interaction.

Our second aim was to determine if such profiles differentially relate to adolescent internalizing and externalizing symptoms and parenting. First, we hypothesized that adolescents with more psychopathology symptoms would fall outside of the low reactive profile. Specifically, we expected adolescents with greater internalizing problems to fall within a suppression profile or a high reactive profile, given theory and research linking internalizing problems to emotion suppression and to rumination/high reactivity (Larsen et al., 2013; Nolen-Hoeksema, 2000). We expected adolescents with greater externalizing symptoms to exhibit an under-regulated response and fall within a high reactive profile, or alternatively, a low HR profile given evidence linking under-reactivity of emotion and low HR with conduct problems (Ortiz & Raine, 2004). We expected a moderate or low reactive profile to represent a wellregulated group of adolescents and adolescents with fewer symptoms to fall within this profile. Secondly, we hypothesized that observed negative parenting behaviors (e.g., criticism) would be associated with less regulated or “at-risk” emotion profiles—the suppression, high reactive, and low HR profiles. Finally, given gender differences found in emotion expression and regulation, we examined associations between gender and the latent profiles.

Methods

Participants

Participants were 198 community adolescents (49% females) and their primary caregiver. Adolescents ranged from 10 – 17 years old ($M = 13.3$, $SD = 1.9$). Caregivers were mostly biological mothers (96%) with three biological fathers and one adoptive mother, grandmother, aunt, sister, and legal guardian. Most adolescents were European American (63.6%, 17.2% African American, 8.6% Latin American, 6.1% Asian American, 4.5% mixed /other) and approximately half had family household annual incomes above \$75,000 (49.2%; 15.1% between \$60,000–74,999; 6.1% between 45,000–59,999; 6.1% between 35,000–44,999; 5.6% between 25,000–34,999; 4.5% between 15,000–24,999; 7.8% below 15,000; 6.6% reported “don’t know/other;” $n = 179$). Families with adolescents in a metropolitan area in the Northeastern United States were recruited through newspaper advertisements, flyers, and mailings. The larger study was described to parents as a study of stress and problem behaviors in normal adolescents. Families were included if they had an adolescent in the 10–17 year old age range and were excluded if the child had a developmental disability or an $IQ < 70$. Families were representative of the community in terms of ethnicity and income level.

Procedure

This study utilized data from a larger study of adolescent stress response and risk behaviors. Participants attended two sessions, each spaced approximately one week apart. In the first session, adolescents and their primary caregiver completed questionnaires and interviews assessing adolescent psychopathology (i.e., depression, anxiety, ODD, conduct disorder symptoms) and other aspects of youth and parent life stress, reward-seeking, and social-

emotional functioning. In the second session, adolescents and their primary caregivers participated in a conflict interaction session in which their emotion expressions, self-reported emotions, and HR were examined before, during and after the interaction.

Conflict interaction session—The parent-adolescent interaction task (PAIT) was based on conflict tasks performed in prior research (e.g., Sheeber et al., 1997). As part of the conflict interaction session, parent and adolescent participated in a 25-minute adaptation period, a 10-minute conflict interaction and a one-hour recovery period. One hundred and thirty nine (70.20%) participants also completed an additional 10-minute substance use discussion directly following or preceding the conflict interaction (order was randomly assigned as part of the larger study). This report does not focus on the substance use discussion data. Emotional responses (including reported emotion, observed emotion, and HR) were not significantly different for youth who only completed the 10-minute conflict discussion versus those who completed both the conflict and substance use discussions (p 's > .10)

Upon arriving for the session, parent and adolescent reported to separate laboratory rooms and each completed the Issues Checklist (IC; Prinz, Foster, Kent, & O'Leary, 1979). The IC is a checklist of common family conflict topics (e.g., youth cleaning their bedroom, cursing) and has been used in prior research on parent-adolescent conflict (e.g. Sheeber et al., 1997). Both parent and adolescent marked the topics they discussed in the past month and then reported the anger level they experienced, ranging from 1 "calm" to 5 "angry" during the discussions. Next, parent and adolescent had a 25-minute adaptation period in which participants listened to two 5-minute relaxation tapes which guided them through calming imagery and muscle relaxation.

Following the adaptation period, pre-task measures of reported emotion and HR were measured. Pre-task HR was calculated by averaging HR recordings taken at ten second intervals for the duration of one minute. After pre-task measures were recorded, the parent and adolescent participated in the 10-minute conflict interaction task, which was videotaped. For the task, parent and adolescent were asked to discuss the mutually highest-rated conflict topic from the IC and asked to "use the next 10 minutes to discuss the issue and to try to reach a solution that you think will work for you". When the parent and adolescent endorsed different conflict topics, the parent's top-rated response was chosen. Participant HR was recorded every thirty seconds throughout the discussion. At the conclusion of the parent-adolescent interactions, participants reported on emotions experienced during the discussion(s).

Measures in Conflict Interaction Session

Observed emotion expression—Trained coders globally rated adolescent negative and positive emotion expression during the conflict interaction using the Parent-Adolescent Interaction Task (PAIT) Coding System (Second Author, 2010). Emotion expression coding was based on emotion coding systems in the literature (Cole, Barrett, & Zahn-Waxler, 1992; Ekman & Friesen, 1978; Izard, 1979). Coders assessed facial, vocal, gestural, and postural cues of negative and positive emotion to determine ratings. Negative emotion was rated on a

scale from 1 to 5 (“none” to “high”) based on cues for sadness, anger, fear, contempt and aggression (e.g., furrowed brows, crying). Positive emotion coding was also rated on a scale from 1 to 5 based on cues for happiness (e.g., smiling with crinkling around eyes, laughing). Coders were trained on the PAIT coding system for 6 hours and attended bi-monthly coding meetings to discuss coding questions. Thirty-eight of the videotapes (19.2%) were chosen at random, double-coded and checked for inter-rater reliability. The intra-class correlation coefficients (ICC’s) were acceptable to high for negative and positive emotion expression for adolescents ($ICC = .77$, $ICC = .81$, respectively).

Subjective emotion experience—Adolescents completed the Differential Emotions Scale-Revised short form (DES-R, Izard, 1972) plus Izard’s scale for anxiety ratings (Izard, 1972). Emotion subscales are comprised of five adjectives describing each emotion state. The DES-R demonstrates good psychometric properties (Izard, 1972) and has been applied in previous research with adolescents (Second Author, 2006). For this report, we examined two emotion subscales of the DES that we expected the conflict interaction to elicit— anxiety and anger. We examined the DES ratings of emotions that youth experienced during the interaction task, which youth reported immediately post-task.

Adolescent heart rate reactivity—A pulse sensor on the index finger connected to a Critikon Dinamap 120 Patient Monitor provided a measure of HR. HR was measured at pre-task, every 30 seconds during the PAIT, immediately after the PAIT, and 15 minutes post-task. For the current study, HR reactivity was calculated by subtracting pre-task HR from each individual’s peak HR (highest HR value during or after the PAIT), which has been used as a valid measure of reactivity to an acute stressor (Buss, Goldsmith, & Davidson, 2005).

Observed parenting behavior—Negative/critical parenting behavior was coded from videotapes of the parent-adolescent interaction task using the Parent-Adolescent Interaction Task (PAIT) Coding System (Second Author, 2010). Behaviors were rated on a scale from 1 to 5 (“none present” to “high level”) and included behaviors like mocking, criticizing, scolding, and interrupting. Based on the parenting literature (e.g. Gottman, Katz, & Hooven, 1997), coders examined parent facial expressions, speech content, behavior, and tone of voice to rate negative parenting. Reliability was acceptable for negative/critical parenting ($ICC = .84$).

Measures in Questionnaire/Interview Session

Adolescent psychopathology—Parents rated adolescent psychopathology symptoms using the Child Symptom Inventory (CSI, Gadow & Sprafkin, 1997). The CSI produces symptom count scores and dimensional symptom severity scores for most internalizing and externalizing disorders based on the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*, American Psychiatric Association, 1994). Symptoms are rated on a scale from 0 “never” to 3 “very often.” Symptom severity scores for generalized anxiety disorder (GAD, $\alpha = .89$), conduct disorder (CD, $\alpha = .68$), and oppositional defiant disorder (ODD, $\alpha = .76$) scales were examined. The CSI shows satisfactory psychometric properties (Sprafkin, Gadow, Salisbury, Schneider, & Loney, 2002) and has been used with adolescents (Chaplin

et al., 2012). To assess depressive symptoms, adolescents completed the Children's Depression Inventory (CDI, Kovacs, 2004), a widely used measure of depressive symptoms for children and adolescents. An overall severity sum score from the CDI was calculated ($\alpha = .72$). Although adolescents are considered more sensitive reporters of their own internalizing symptoms relative to their parents (Achenbach, McConaugh, & Howell, 1987; Sourander, Helstelä, & Helenius, 1999), adolescent self-report of anxiety was not available for the present study. Therefore, parent-reports of adolescent anxiety were examined using the CSI.

Data Analysis Plan

Latent profile analysis (LPA) was conducted to examine patterns of emotion response variables: negative and positive emotion expression, self-report of anxiety and anger experience, and HR reactivity. LPA is a form of mixture modeling in which latent classes are derived based on patterns of observed indicator variables (Muthén & Muthén, 1998–2012). In LPA, indicator variables are continuous and classes are described by variable means. By utilizing maximum likelihood testing, LPA incorporates individuals with data from at least one indicator variable (i.e., emotion expression, experience, HR). Therefore, data from the full sample was used to estimate the latent profiles. Data was missing at random including 5 participants missing HR data, 1 missing self-reported emotion, and 3 missing observed emotion expression scores. All analyses were conducted using Mplus Version 7.11.

The prediction of class membership from covariates or auxiliary variables is an important part in determining the theoretical validity of classes (Muthén, 2004). As such, classes were regressed on the covariates, gender and age, in the same step as estimating the latent classes, allowing these variables to influence class formation. Age and gender were chosen as covariates because of associations with emotion regulation in the literature (Nolen-Hoeksema, 2012; Zeman, Cassano, Perry-Parrish & Stegall, 2006). However, age was not significantly related to latent profiles. For the sake of parsimony, we report analyses without age as a covariate below. Results from the single step approach, used in the case of gender, may produce biased regression estimates or standard errors when direct effects exist between the covariate and latent profile indicators (Clark & Muthén, 2009). That is, the relationship between the covariate and latent classes may be influenced because the covariate's effect is brought about, in part, by its association with the latent class indicator. To assess for this potential issue, we tested for direct effects with the covariate gender. Results indicated that the direct effects between gender and latent class indicators were nonsignificant.

To account for relationships between psychopathology, parenting, and emotion profiles, latent classes were regressed on psychopathology and parenting variables in separate analyses using multinomial logistic regression in Mplus. These variables were modeled as auxiliary variables, outside the measurement model, using the Mplus auxiliary command (R3STEP). This approach utilizes the 3-step maximum likelihood method (Vermunt, 2010), a method which preserves the stability of class formation and takes into account measurement error associated with the most likely class membership (Asparouhov &

Muthén, 2013). Six adolescents were missing CSI scores and were excluded from regression analyses involving parent-reported symptoms. Three adolescents were missing negative parenting scores and were excluded from the regression analysis involving negative parenting.

Results

Descriptive Statistics and Correlations

Table 1 provides descriptive statistics and correlations among adolescent emotion response variables, parenting, and adolescent psychopathology. Among emotion variables, self-reported anxiety and anger showed the strongest positive correlation. In addition, adolescent negative emotion expression was positively correlated with anger self-reports and negatively correlated with positive emotion expression. Correlations among emotion variables and parenting revealed two small yet significant relationships—negative parenting was positively associated with adolescent reported anger and negative emotion expression. Finally, correlations among emotion variables and psychopathology yielded significant relations between depressive symptoms and adolescents' higher anxiety self-reports, anger self-reports, and negative emotion expression. Despite some small to moderate correlations, relationships among study variables support further examination using a multi-method, person-centered approach.

Latent Profile Analysis

LPA identified a four-class model using the emotion variables with gender entered as a covariate. The best fitting model was determined by assessing multiple fit statistics and the substantive meaning of latent classes. Classes were added iteratively and statistical information criteria including Akaike's Information Criterion (AIC; Akaike, 1987), Bayesian Information Criterion (BIC; Schwarz, 1978), and the adjusted BIC (Sclove, 1987) were considered, with lower information criterion values indicating greater model fit. The Bootstrapped Log Likelihood Ratio Test (BLRT) was also considered, as a significant BLRT p -value suggests that the number of classes explains the model significantly better than one less class (McLachlan & Peel, 2004). In addition, the entropy statistic provided information concerning group fit with values approaching one suggesting greater distinction between classes (Celeux & Soromenho, 1996). The four-class model demonstrated decreased BIC, AIC, and adjusted-BIC along with a significant BLRT p -value ($p < .001$). Log-likelihood ratio tests did not replicate for the 5-class model suggesting issues with convergence. Based on the aforementioned fit statistics, the four-class model was determined to be the best fit, in addition to being theoretically meaningful (Table 2).

Identified profiles—Emotion regulation profiles were inferred from the patterning of emotion variable means. Table 3 presents indicator variable means for each profile in the 4-class model. The standard deviations from the sample mean for each profile are presented in Figure 1. T -tests were conducted to compare latent profile indicator means with the grand mean.

Profile 1 was comprised of 14% percent of the sample and was characterized by moderate positive and high negative emotion expression, low to moderate emotion experience, and high HR reactivity relative to other groups. For this group, negative emotion expression levels were significantly higher than the grand mean ($t[27] = 12.46, p < .001$); self-reported anxiety was lower ($t[27] = -2.74, p < .05$); and HR reactivity was higher at a level approaching trend significance ($t[27] = 1.62, p = .116$). We called profile 1 a “moderate HR-and-high expression” subset of adolescents. Profile 2 represented 15% percent of the sample and was characterized by moderate positive and negative emotion expression, high reported emotion (anxiety and anger), and moderate HR reactivity. In this profile, self-reported anxiety and anger were significantly higher than the grand mean ($t[28] = 6.66, p < .001$; $t[28] = 12.16, p < .001$, respectively). Comparisons among standardized emotion indicators within this profile revealed that self-reported anxiety and anger were significantly higher than negative emotion expression ($t[28] = 13.68$; $t[28] = 26.84, p < .001$, respectively). This profile may represent a “suppression” profile as negative emotion expression did not meet the level of intensity of emotions experienced. Profile 3 contained 62% percent of the sample and was characterized by low to moderate responses across emotion indicators. Negative emotion expression was significantly lower than the grand mean ($t[123] = -11.52, p < .001$); self-reported anxiety was lower ($t[123] = -4.86, p < .001$); and self-reported anger was lower ($t[123] = -16.71, p < .001$). This profile may represent a “low reactive” response pattern and may signify a low-reactive and/or well-regulated subset of adolescents. Profile 4 contained 9% percent of the sample and was characterized by high negative emotion expression, low positive emotion expression, high reported negative emotion, and moderate HR reactivity. In profile 4, positive emotion expression was significantly lower than the grand mean ($t[16] = -2.44, p < .05$); negative emotion expression was significantly higher ($t[16] = 12.36, p < .001$); self-reported anxiety was higher ($t[16] = 3.51, p < .01$); and self-reported anger was higher ($t[16] = 11.22, p < .001$). This profile is considered the “high reactive” profile and may represent high emotional arousal and/or under-regulation of emotion.

Multinomial Regression

Relationships between auxiliary variables and latent classes were examined through multinomial logistic regression with gender as a covariate in the LPA model. Table 4 presents odds ratios and confidence intervals (CI's) of the associations between latent profiles and auxiliary variables including adolescent depressive, GAD, CD, ODD symptoms, and negative parenting. Profile 3, the low reactive profile, was used as a reference group in regression analyses.

Gender—Multinomial regression indicated that girls were significantly more likely than boys to be members of the high reactive profile than the low reactive profile ($OR = 2.77, p < .05, 95\% CI [1.58, 4.87]$).

Internalizing symptoms—Adolescents with higher depressive symptoms were more likely to be members of the high reactive profile relative to the low reactive profile ($OR = 1.10, p < .01$). Depressive symptoms did not significantly relate to the moderate HR-and-high expression or suppression profiles.

Adolescents with higher levels of GAD symptoms were less likely to be members of the suppression profile relative to the low reactive profile ($OR = .78, p < .01$). GAD symptoms did not significantly relate to the moderate HR-and-high expression or high reactive profiles.

Externalizing symptoms—Adolescents with higher CD symptoms were less likely to be members of the moderate HR-and-high expression profile relative to the low reactive profile ($OR = 0.53, p < .05$). CD symptoms did not significantly relate to the suppression or high reactive profile, and ODD symptoms did not significantly relate to emotion profiles.

Negative Parenting—Relative to the low reactive profile, higher ratings of observed negative parenting were associated with the moderate HR-and-high expression profile ($OR = 2.32, p < .01$) and to the high reactive profile ($OR = 1.90, p < .01$). For every one unit increase in observed negative parenting (measured on a scale from 1 to 5), adolescents were approximately two times more likely to be in the moderate HR-and-high expression and high reactive profiles relative to the low reactive profile.

Discussion

The goal of the present study was to explore profiles of adolescents' emotion responses across multiple domains to a family conflict interaction and relations to psychopathology symptoms and parenting. Person-centered analyses were applied to determine patterns of emotion responses that may evidence patterns of emotion regulation. To our knowledge, this is the first study to examine emotion regulation profiles through a person-centered approach within the important social context of a parent-adolescent conflict. Four emotion regulation profiles emerged elucidating ways in which adolescents may respond emotionally to conflict with parents. Adolescents were characterized by moderate physiological reactivity and high negative expression called a "moderate HR-and-high expression" profile, inhibited negative emotion expression called a "suppression" profile, low to moderate responses called a "low reactive" profile, and elevated responses called a "high reactive" profile. Results support the notion that patterns of emotion responses may meaningfully relate to psychopathology symptoms in adolescence. Additionally, findings indicated that negative parenting during the conflict interaction was associated with adolescents belonging to potentially less emotionally regulated profiles including the moderate HR-and-high expression and high reactive profile.

The high reactive profile represented adolescents who exhibited heightened emotion responses across negative emotion indicators, indicating that these adolescents may have high negative emotional arousal and/or difficulty down-regulating negative emotion. In this non-clinical sample, the high reactive profile made up only 9% of the sample, suggesting that a small subset of normative adolescents experience an uninhibited, elevated negative emotional response to conflict with a caregiver. Furthermore, adolescents who reported more depressive symptoms were more likely to be members of the high reactive profile. This finding is consistent with other work demonstrating under-regulated profiles of adolescents' emotion responses are related to depressive symptoms (Zalewski et al., 2011a) and supports affective models of mood disorders which maintain that dysregulation of negative emotion, including rumination and amplification of negative emotion, is a key

feature of depression and anxiety (Campbell-Sills & Barlow, 2007; Nolen-Hoeksema, 2000). Unexpectedly, though, parent-reported GAD symptoms, another type of internalizing symptom, were not associated with the high reactive profile. Perhaps the parent-reported measure of internalizing symptoms may not have fully captured adolescents' internal thoughts and feelings, especially symptoms of anxiety.

In regard to parenting, the adolescents within the high reactive profile were more likely to have parents who exhibited negative parenting behaviors in the conflict interaction. Harsh or critical parenting behaviors may have elicited or contributed to a negative emotional response from these adolescents. Alternatively, youth's emotionally reactive behavior within the interaction may have elicited parents' negative behaviors and emotional responses. Consistent with coercive family process models (Patterson, 1982), such negative parent-adolescent interchanges may reinforce adolescents' coercive or aversive behaviors and increase their risk for psychopathology (Davis, Sheeber, & Hops, 2002; Kazdin, 1987; Patterson, Reid, & Dishion, 1992).

In addition, girls were more likely to be in the high reactive profile than boys. This finding suggests girls may be more prone to experience and express an unregulated, heightened negative emotion response in a parent-adolescent conflict. This profile offers some support for the notion that girls express and experience higher levels of emotions than do boys, except perhaps for anger (Brody & Hall, 2000; Buck, 1979). However, this profile may evidence a more extreme emotion expression and experience. The high reactive pattern of emotion regulation, given that it was related to depressive symptoms, may also help to explain girls' higher levels of depression than boys in adolescence (Hankin et al., 1998). In sum, the high reactive profile may represent a high-risk subset of adolescents identified by heightened emotionality, negative parenting behaviors, gender, and depressive symptoms.

As hypothesized, a group of adolescents emerged who displayed average levels of negative emotion expression while still reporting experiences of considerable negative emotion, especially anger (see Table 3), a group similar to the theorized expressive suppression pattern. Interestingly, this suppression profile displayed positive emotions within the conflict discussion, with a mean score approximate to other groups. This pattern suggests that these adolescents not only neutralized or expressively suppressed elevated feelings of anger but also were able to display some positive emotion, perhaps as a way to mask internal negative feelings. Findings relating the suppression profile to internalizing and externalizing symptoms were contrary to our hypotheses. Specifically, members of the suppression profile had *lower* parent-reported GAD relative to the low reactive profile. It is unclear whether this finding suggests that the suppression profile represents adaptive regulation of negative emotion or that parents reported fewer symptoms for these adolescents due to the nature of expressive suppression. These adolescents may consistently inhibit the expression of negative emotion; and thus, parents did not detect and report their adolescent's distress or potential symptoms.

The profile distinguished by moderate HR reactivity and high negative emotion expression, called the moderate HR-and-high expression profile, was unexpected. However, membership to this profile was positively related to observed negative parenting suggesting

critical parenting during a conflict may be associated with adolescents who experience a moderate degree of physiological arousal and express negative emotion, at least when interacting in the context of hostile parents. Additionally, the moderate HR-and-high expression profile was associated with lower parent-reported conduct symptoms. This is consistent with past theory and research, which finds that physiological reactivity buffers youth from conduct disorder symptoms (Raine, Venables, & Williams, 1995; Zahn-Waxler, Cole, Welsh, & Fox, 1995). Further, conduct disorder has been linked with a lack of emotional responsiveness and empathy; characteristics often conceptualized as callous-unemotional traits (Wootton, Frick, Shelton, & Silverthorn, 1997). Perhaps, this subset of adolescents showing moderate levels of HR reactivity and high negative emotional expression may respond with more empathy and adaptive arousal to discussions with parents (perhaps they may also be more likely to follow parental rules, due to this arousal), providing a buffer against behavioral patterns related to conduct disorder.

In summary, we found important patterns of emotion regulation within a relevant parent-adolescent interpersonal context, relating to both psychopathology symptoms and parenting behaviors within the conflict interaction. To note, the present study's sample was comprised of primarily upper-middle income families, a demographic which limits the study's ability to generalize to middle to lower income populations. With respect to adolescents' psychopathology symptoms, the absence of adolescent reported generalized anxiety symptoms is a limitation as multiple informants are preferable, especially for internalizing symptoms such as anxiety. Future studies may benefit from both adolescent and parent reported symptoms across clinical criteria.

Due to the cross-sectional nature of the data, the present study is limited in determining the causal direction between psychopathology, parenting and emotion regulation profiles. In particular, it is unclear how parent and adolescent behaviors may have interacted to mutually influence emotion response and regulation. That is, parenting may not only influence adolescents' emotion regulation patterns, but dysregulated emotion patterns may also elicit negative behaviors in parents. In this vein, the grouping of adolescents by emotion response variables relied on aggregate scores of expression, experience and physiology across the conflict interaction. Future studies may benefit from a micro-analytic or moment-by-moment analysis of the temporal dynamics of emotion responses within adolescent and between parent-adolescent dyads. Similarly, parent and adolescent emotion expression was coded as global negative affect. As such, we are unable to differentiate between expressions of anger versus anxiety as was possible for self-reported emotion experience.

Despite the limitations, the present study revealed meaningful heterogeneity concerning adolescents' emotion responses and regulation in a parent-adolescent conflict interaction. Through the use of person-centered analyses, we found four patterns of emotion responses (moderate HR-and-high expression, suppression, low reactive, and high reactive). Reports of adolescents' internalizing and externalizing symptoms and observations of negative parenting were associated with membership to emotion regulation profiles, importantly with reactivity associated with depressive symptoms and with HR/emotional expression protective against conduct symptoms. Taken together, this study underscores the importance of implementing multi-method assessment of emotion responses and person-centered

analyses to facilitate understanding of at-risk emotion regulation patterns in youth. Understanding such at-risk patterns of emotion regulation may provide important clinical insight in both the prevention and treatment of adolescent psychopathology.

Acknowledgments

Support for this project was provided by the National Institutes of Health (NIH) through grants K01-DA024759 (PI: Second Author), R01-DA033431 (PI: Second Author) and by a grant from the ABMRF/Foundation for Alcohol Research (PI: Second Author). The authors gratefully acknowledge these study sponsors, the participating families, and the research staff who contributed significantly to the work—particularly Jessica Simmons and Amysue Hansen. The study sponsors did not have a role in study design, collection, analysis, and interpretation of data, the writing of the report, or the decision to submit the manuscript for publication.

References

- Achenbach TM, McConaugh SH, Howell CT. Child/adolescent behavior problems: Implications of cross-informant correlations for situational specificity. *Psychological Bulletin*. 1987; 101(198):213–232. [PubMed: 3562706]
- Akaike H. Factor analysis and AIC. *Psychometrika*. 1987; 52:317–322.
- Aldao A, Nolen-Hoeksema S, Schweizer S. Emotion-regulation strategies across psychopathology: A meta-analytic review. *Clinical Psychology Review*. 2010; 30(2):217–237. [PubMed: 20015584]
- American Psychiatric Association. *Diagnostic and statistical manual of mental disorders*. 4. 1994.
- Author Citation. Anger, happiness, and sadness: Associations with depressive symptoms in late adolescence. *Journal of Youth and Adolescence*. 2006; 35(6):977–986.
- Author Citation. Parent-Adolescent Interaction Task (PAIT) Coding System. 2010 Unpublished manual.
- Asparouhov, T.; Muthén, B. Auxiliary variables in mixture modeling: 3-step approaches using Mplus. 2013. Retrieved from www.statmodel.com
- Bariola E, Gullone E, Hughes EK. Child and adolescent emotion regulation: The role of parental emotion regulation and expression. *Clinical Child and Family Psychology Review*. 2011; 14(2): 198–212. [PubMed: 21424275]
- Bradley, S. *Affect regulation and the development of psychopathology*. New York, NY: Guilford Press; 2003.
- Brody, LR.; Hall, JA. Gender, emotion, and expression. In: Lewis, M.; Haviland, JM., editors. *Handbook of emotions*. 2. New York, NY: Guilford Press; 2000. p. 338-349.
- Brown, BB.; Larson, J. Peer relationships in adolescence. In: Lerner, RM.; Steinberg, L., editors. *The handbook of adolescent psychology*. Hoboken, NJ: John Wiley & Sons; 2009. p. 74-103.
- Buck, R. Individual differences in nonverbal sending accuracy and electrodermal responding: The externalizing-internalizing dimension. In: Rosenthal, R., editor. *Skill in non-verbal communication*. Cambridge, MA: Oelgeschlager, Gunn, & Hain; 1979. p. 140-170.
- Buss KA, Goldsmith HH, Davidson RJ. Cardiac reactivity is associated with changes in negative emotion in 24-month-olds. *Developmental Psychobiology*. 2005; 46:118–132. [PubMed: 15732055]
- Butler EA, Gross JJ, Barnard K. Testing the effects of suppression and reappraisal on emotional concordance using a multivariate multilevel model. *Biological Psychology*. 2013; 98:6–18. [PubMed: 24055556]
- Calkins SD, Smith CL, Gill KL, Johnson MC. Maternal interactive style across contexts: Relations to emotional, behavioral and physiological regulation during toddlerhood. *Social Development*. 1998; 7(3):350–369.
- Campbell-Sills, L.; Barlow, DH. Incorporating emotion regulation into conceptualizations and treatments of anxiety and mood disorders. In: Gross, JJ., editor. *Handbook of emotion regulation*. New York, NY: Guilford Press; 2007. p. 542-559.
- Celeux G, Soromenho G. An entropy criterion for assessing the number of clusters in a mixture model. *Journal of Classification*. 1996; 13(2):195–212.

- Chaplin TM, Aldao A. Gender differences in emotion expression in children: A meta-analytic review. *Psychological Bulletin*. 2012; 139:735–765. [PubMed: 23231534]
- Chaplin TM, Sinha R, Simmons JA, Healy SM, Mayes LC, Hommer RE, Crowley MJ. Parent–adolescent conflict interactions and adolescent alcohol use. *Addictive Behaviors*. 2012; 37(5):605–612. [PubMed: 22341765]
- Clark, SL.; Muthén, B. Relating latent class analysis results to variables not included in the analysis. 2009. Retrieved from <http://www.statmodel.com/download/relatinglca.pdf>
- Cole PM, Martin SE, Dennis TA. Emotion regulation as a scientific construct: Methodological challenges and directions for child development research. *Child Development*. 2004; 75(2):317–333. [PubMed: 15056186]
- Cole PM, Barrett KC, Zahn-Waxler C. Emotion displays in two-year-olds during mishaps. *Child Development*. 1992; 63(2):314–324. [PubMed: 1611936]
- Cook EC, Buehler C, Blair BL. Adolescents' emotional reactivity across relationship contexts. *Developmental Psychology*. 2013; 49(2):341. [PubMed: 22545839]
- Davis, B.; Sheeber, L.; Hops, H. Coercive family processes and adolescent depression. In: Reid, JG.; Patterson, GR.; Snyder, J., editors. *Antisocial behavior in children and adolescents: A developmental analysis and model for intervention*. Washington, DC: American Psychological Association; 2002. p. 173-192.
- Del Vecchio T, Rhoades KA. Bidirectional influences in mother–toddler dyads: An examination of the relative influence of mothers' and children's behaviours. *Infant and Child Development*. 2010; 19(5):516–529. [PubMed: 20953329]
- Eccles JS, Midgley C, Wigfield A, Buchanan CM, Reuman D, Flanagan C, Mac Iver D. Development during adolescence: the impact of stage-environment fit on young adolescents' experiences in schools and in families. *American Psychologist*. 1993; 48(2):90. [PubMed: 8442578]
- Eisenberg N, Cumberland A, Spinrad TL. Parental socialization of emotion. *Psychological Inquiry*. 1998; 9(4):241–273. [PubMed: 16865170]
- Ekman P. Are there basic emotions? *Psychological Review*. 1992; 99(3):550–553. [PubMed: 1344638]
- Ekman, P.; Friesen, WV. *Facial action coding system: A technique for the measurement of facial movement*. Palo Alto, CA: Consulting Psychologists Press; 1978.
- Ekman P, Levenson RW, Friesen WV. Autonomic nervous system activity distinguishes among emotions. *Science*. 1983; 221(4616):1208–1210. [PubMed: 6612338]
- Evers C, Hopp H, Gross JJ, Fischer AH, Manstead AS, Mauss IB. Emotion response coherence: A dual-process perspective. *Biological Psychology*. 2013; 98:43–49. [PubMed: 24239595]
- Gadow, KD.; Sprafkin, J. *Early Childhood Symptom Inventory-4 norms manual*. Stony Brook, NY: Checkmate Plus; 1997.
- Galvan A, Hare TA, Parra CE, Penn J, Voss H, Glover G, Casey BJ. Earlier development of the accumbens relative to orbitofrontal cortex might underlie risk-taking behavior in adolescents. *The Journal of Neuroscience*. 2006; 26(25):6885–6892. [PubMed: 16793895]
- Gottman, JM.; Katz, LF.; Hooven, C., editors. *Meta-emotion: How families communicate emotionally*. Hillsdale, NJ: Lawrence Erlbaum Associates; 1997.
- Gross JJ. Antecedent- and response-focused emotion regulation: Divergent consequences for experience, expression, and physiology. *Journal of Personality and Social Psychology*. 1998a; 74(1):224–237. [PubMed: 9457784]
- Gross JJ. The emerging field of emotion regulation: An integrative review. *Review of General Psychology*. 1998b; 2:271–299.
- Gross JJ. Emotion regulation: Affective, cognitive, and social consequences. *Psychophysiology*. 2002; 39(3):281–291. [PubMed: 12212647]
- Gross JJ, John OP. Individual differences in two emotion regulation processes: implications for affect, relationships, and well-being. *Journal of Personality and Social Psychology*. 2003; 85(2):348–362. [PubMed: 12916575]
- Gross JJ, Levenson RW. Hiding feelings: The acute effects of inhibiting negative and positive emotion. *Journal of Abnormal Psychology*. 1997; 106(1):95–103. [PubMed: 9103721]

- Hankin BL, Abramson LY, Moffitt TE, Silva PA, McGee R, Angell KE. Development of depression from preadolescence to young adulthood: Emerging gender differences in a 10-year longitudinal study. *Journal of Abnormal Psychology*. 1998; 107(1):128–140. [PubMed: 9505045]
- Harris CR. Cardiovascular responses of embarrassment and effects of emotional suppression in a social setting. *Journal of Personality and Social Psychology*. 2001; 81(5):886–897. [PubMed: 11708564]
- Hastings PD, Nuselovici JN, Klimes-Dougan B, Kendziora KT, Usher BA, Ho MHR, Zahn-Waxler C. Dysregulated coherence of subjective and cardiac emotional activation in adolescents with internalizing and externalizing problems. *Journal of Child Psychology and Psychiatry*. 2009; 50(11):1348–1356. [PubMed: 19818089]
- Hollenstein T, Lanteigne D. Models and methods of emotional concordance. *Biological Psychology*. 2014; 98:1–5. [PubMed: 24394718]
- Huh D, Tristan J, Wade E, Stice E. Does problem behavior elicit poor parenting? A prospective study of adolescent girls. *Journal of Adolescent Research*. 2006; 21(2):185–204. [PubMed: 16528407]
- Izard, CE. *Patterns of emotions: A new analysis of anxiety and depression*. New York: Academic Press; 1972.
- Izard, CE. *The maximally discriminative facial movement coding system (MAX)*. Newark, DE: University of Delaware, Instructional Resource Center; 1979.
- Karremans A, van Tuijl C, van Aken MA, Deković M. Parenting, coparenting, and effortful control in preschoolers. *Journal of Family Psychology*. 2008; 22(1):30–40. [PubMed: 18266530]
- Kazdin, AE. *Conduct disorders in childhood and adolescence*. Newbury Park, CA: Sage Publications; 1987.
- Kovacs, M. *Children's depression inventory (CDI)*. Toronto: Multi-Health Systems; 2004.
- Lanteigne DM, Flynn JJ, Eastabrook JM, Hollenstein T. Discordant patterns among emotional experience, arousal, and expression in adolescence: Relations with emotion regulation and internalizing problems. *Canadian Journal of Behavioral Science*. 2012; 46(1):29–39.
- Larsen JK, Vermulst AA, Geenen R, van Middendorp H, English T, Gross JJ, ... & Engels RC. Emotion regulation in adolescence: A prospective study of expressive suppression and depressive symptoms. *The Journal of Early Adolescence*. 2013; 33(2):184–200.
- Larson R, Richards MH. Daily companionship in late childhood and early adolescence: Changing developmental contexts. *Child Development*. 1991; 62(2):284–300. [PubMed: 2055123]
- Lewinsohn PM, Roberts RE, Seeley JR, Rohde P, Gotlib IH, Hops H. Adolescent psychopathology: II. Psychosocial risk factors for depression. *Journal of Abnormal Psychology*. 1994; 103(2):302. [PubMed: 8040500]
- Lewis M. Inside and outside: The relation between emotional states and expressions. *Emotion Review*. 2011; 3(2):189–196.
- Mauss IB, Levenson RW, McCarter L, Wilhelm FH, Gross JJ. The tie that binds? Coherence among emotion experience, behavior, and physiology. *Emotion*. 2005; 5(2):175–190. [PubMed: 15982083]
- Mauss IB, Robinson MD. Measures of emotion: A review. *Cognition and Emotion*. 2009; 23(2):209–237. [PubMed: 19809584]
- McLachlan, G.; Peel, D. *Finite mixture models*. New York: John Wiley & Sons; 2004.
- 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(2):361–388. [PubMed: 19756175]
- Morris AS, Silk JS, Steinberg L, Sessa FM, Avenevoli S, Essex MJ. Temperamental vulnerability and negative parenting as interacting predictors of child adjustment. *Journal of Marriage and Family*. 2002; 64(2):461–471.
- Muthén, B. Latent variable analysis: Growth mixture modeling and related techniques for longitudinal data. In: Kaplan, D., editor. *Handbook of quantitative methodology for the social sciences*. Newbury Park, CA: Sage Publications; 2004. p. 345–368.
- Muthén, LK.; Muthén, BO. *Mplus user's guide*. 7. Los Angeles, CA: Muthén & Muthén; 1998–2012.

- Nolen-Hoeksema S. The role of rumination in depressive disorders and mixed anxiety/depressive symptoms. *Journal of Abnormal Psychology*. 2000; 109(3):504–511. [PubMed: 11016119]
- Nolen-Hoeksema S. Emotion regulation and psychopathology: The role of gender. *Annual Review of Clinical Psychology*. 2012; 8:161–187.
- Ortiz J, Raine A. HR level and antisocial behavior in children and adolescents: A meta-analysis. *Journal of the American Academy of Child & Adolescent Psychiatry*. 2004; 43(2):154–162. [PubMed: 14726721]
- Patterson, GR. Coercive family process. Eugene, OR: Castalia Publishing; 1982.
- Patterson, GR.; Reid, JB.; Dishion, TJ. Antisocial boys. Eugene, OR: Castalia Publishing; 1992.
- Prinz RJ, Foster S, Kent RN, O’Leary KD. Multivariate assessment of conflict in distressed and nondistressed mother-adolescent dyads. *Journal of Applied Behavior Analysis*. 1979; 12(4):691–700. [PubMed: 541311]
- Raine A. Biosocial studies of antisocial and violent behavior in children and adults: A review. *Journal of Abnormal Child Psychology*. 2002; 30(4):311–326. [PubMed: 12108763]
- Raine A, Venables PH, Williams M. High autonomic arousal and electrodermal orienting at age 15 years as protective factors against criminal behavior at age 29 years. *The American Journal of Psychiatry*. 1995; 152:1595–1600. [PubMed: 7485621]
- Richards JM, Gross JJ. Composure at any cost? The cognitive consequences of emotion suppression. *Personality and Social Psychology Bulletin*. 1999; 25:1033–1044.
- Schwarz G. Estimating the dimension of a model. *The Annals of Statistics*. 1978; 6(2):461–464.
- Sheeber L, Hops H, Alpert A, Davis B, Andrews J. Family support and conflict: Prospective relations to adolescent depression. *Journal of Abnormal Child Psychology*. 1997; 25(4):333–344. [PubMed: 9304449]
- Sclove SL. Application of model-selection criteria to some problems in multivariate analysis. *Psychometrika*. 1987; 52(3):333–343.
- Silk JS, Steinberg L, Morris AS. Adolescents’ emotion regulation in daily life: Links to depressive symptoms and problem behavior. *Child Development*. 2003; 74(6):1869–1880. [PubMed: 14669901]
- Smith M, Hubbard JA, Laurenceau JP. Profiles of anger control in second-grade children: Examination of self-report, observational, and physiological components. *Journal of Experimental Child Psychology*. 2011; 110(2):213–226. [PubMed: 21397250]
- Sourander A, Helstelä L, Helenius H. Parent-adolescent agreement on emotional and behavioral problems. *Social Psychiatry and Psychiatric Epidemiology*. 1999; 34(12):657–663. [PubMed: 10703276]
- Sprafkin J, Gadow KD, Salisbury H, Schneider J, Loney J. Further evidence of reliability and validity of the Child Symptom Inventory-4: Parent checklist in clinically referred boys. *Journal of Clinical Child and Adolescent Psychology*. 2002; 31(4):513–524. [PubMed: 12402570]
- Steinberg L. Cognitive and affective development in adolescence. *Trends in Cognitive Sciences*. 2005; 9(2):69–74. [PubMed: 15668099]
- Steinberg L, Lamborn SD, Darling N, Mounts NS, Dornbusch SM. Over-time changes in adjustment and competence among adolescents from authoritative, authoritarian, indulgent, and neglectful families. *Child Development*. 1994; 65(3):754–770. [PubMed: 8045165]
- Thompson RA. Emotion regulation: A theme in search of definition. *Monographs of the Society for Research in Child Development*. 1994; 59(3):25–52. [PubMed: 7984164]
- Vermunt JK. Latent class modeling with covariates: Two improved three-step approaches. *Political Analysis*. 2010; 18:450–469.
- Wetter, EK. Doctoral dissertation. 2009. Negative emotion reactivity as a trait vulnerability to depression in adolescents: A remitted depression study of adolescents. Retrieved from ProQuest Dissertations and Theses. (Accession Order No. AAT 3366541)
- Wootton JM, Frick PJ, Shelton KK, Silverthorn P. Ineffective parenting and childhood conduct problems: The moderating role of callous-unemotional traits. *Journal of Consulting and Clinical Psychology*. 1997; 65(2):301. [PubMed: 9086694]

- Zalewski M, Lengua LJ, Wilson AC, Trancik A, Bazinet A. Emotion regulation profiles, temperament, and adjustment problems in preadolescents. *Child Development*. 2011a; 82(3):951–966. [PubMed: 21413935]
- Zalewski M, Lengua LJ, Wilson AC, Trancik A, Bazinet A. Associations of coping and appraisal styles with emotion regulation during preadolescence. *Journal of Experimental Child Psychology*. 2011b; 110(2):141–158. [PubMed: 21507423]
- Zahn-Waxler C, Cole PM, Welsh JD, Fox NA. Psychophysiological correlates of empathy and prosocial behaviors in preschool children with behavior problems. *Development and Psychopathology*. 1995; 7(1):27–48.
- Zeman J, Cassano M, Perry-Parrish C, Stegall S. Emotion regulation in children and adolescents. *Journal of Developmental & Behavioral Pediatrics*. 2006; 27(2):155–168. [PubMed: 16682883]

Highlights

- We measured adolescents' emotional responses to a parent-adolescent conflict interaction.
- Adolescents fell into 4 latent emotion regulation profiles.
- Emotion regulation profiles were differentially related to psychopathology symptoms and parenting.



Figure 1. Latent profile standard deviations from the sample mean for adolescent expressed negative and positive emotion, heart rate reactivity, and self-reported anxiety and anger.

Table 1

Mean, Standard Deviations, and Bivariate Correlations among Study Variables

	Correlation									
	1	2	3	4	5	6	7	8	9	
1. Adolescent report anxiety	5.12 (2.20)									
2. Adolescent report anger	8.12 (3.68)	.58**								
3. Negative emotion expression	2.03 (1.02)	.10	.43**							
4. Positive emotion expression	2.70 (0.87)	-.05	-.09	-.15*						
5. HR reactivity	3.40 (5.85)	-.00	-.04	.03	.02					
6. Negative parenting	1.72 (0.88)	.03	.23*	.25*	.07	-.07				
7. Depressive symptoms	7.15 (6.33)	.19**	.20**	.21**	-.04	.03	-.05			
8. Generalized anxiety symptoms	10.34 (2.97)	.05	.08	.10	-.11	.06	-.14*	.24**		
9. Oppositional defiant symptoms	13.47 (4.41)	-.00	.09	.09	-.14	-.13	.09	.18*	.49**	
10. Conduct symptoms	15.99 (1.78)	.03	.04	.04	.01	-.08	.16*	.25**	.33**	.57**

Note. SD = Standard deviation; HR = Heart rate.

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

Table 2

Summary of Fit Statistics for Latent Profile Analysis

No. Classes	AIC	BIC	Adjusted-BIC	Entropy	BLRT
1 Class	4556.21	4595.67	4557.66	–	–
2 Class	4081.20	4137.10	4083.25	.94	.00
3 Class	4047.05	4125.96	4049.93	.94	.00
4 Class^a	4019.12	4121.06	4022.85	.90	.00

Note. AIC = Akaike information criterion; BIC = Bayesian information criterion; BLRT = Bootstrapped Log Likelihood Ratio Test.

^a 5 class model did not replicate.

Table 3

Latent Profile Means for Adolescent Report of Emotion, Observed Emotion Expression, and HR Reactivity

	Moderate HR-and-High Expression Profile 1 (14%)	Suppression Profile 2 (15%)	Low Reactive Profile 3 (62%)	High Reactive Profile 4 (9%)
Adolescent report anxiety	4.25	7.80	4.43	6.78
Adolescent report anger	7.43	13.10	6.09	15.09
Negative emotion expression (scale 1–5)	3.20	1.89	1.53	4.14
Positive emotion expression (scale 1–5)	2.45	2.81	2.79	2.30
HR reactivity	5.20	2.56	3.14	4.11

Author Manuscript

Author Manuscript

Author Manuscript

Author Manuscript

Table 4

Odds Ratios (95% CI's) of the Relationship Between Auxiliary Variables and Latent Profile Membership

	Moderate HR-and-High Expression Profile 1	Suppression Profile 2	High Reactive Profile 4
Depressive symptoms	1.06 [0.98 – 1.14]	1.05 [0.98 – 1.12]	1.10 [1.03 – 1.17]**
Generalized anxiety symptoms	0.74 [0.60 – 0.91] [†]	0.78 [0.66 – 0.92]**	1.00 [0.81 – 1.23]
Oppositional defiant symptoms	1.02 [0.90 – 1.15]	1.00 [0.90 – 1.12]	1.06 [0.92 – 1.29]
Conduct symptoms	0.53 [0.32 – 0.89]*	0.80 [0.60 – 1.07]	0.87 [0.53 – 1.41]
Negative parenting	2.32 [1.32 – 4.10]**	1.65 [0.93 – 2.97] [†]	1.90 [1.06 – 3.43]**

Note. CI = Confidence interval; HR = Heart rate; Reference Group = Profile 3, “Low Reactive.”

[†]
 $p < .10$

*
 $p < .05$

**
 $p < .01$