

ABSTRACT

DYNAMICS OF POSITIVE EMOTION REGULATION: ASSOCIATIONS WITH YOUTH DEPRESSIVE SYMPTOMS

by Lauren M. Fussner

Emotion regulation is characterized by flexibly responding to situations through modulating the expression, intensity, and duration of an emotional experience. Emotion regulation is consistently linked to psychopathology, particularly depression. The current study tested how dynamics of positive emotion regulation are associated with youth depression symptoms. We explored how adolescents ($n = 135$) in grades 7 to 9 express positive affect (PA), respond to rewarding events with PA, and maintain PA following a rewarding event in the context of family interactions. Results revealed that low PA expression was associated with depression symptoms, but only in a context that elicited negative emotions. No association was found between response to PA and depression symptoms; however, shorter duration of PA was associated with depressive symptoms. Results suggest that youth higher in depressive symptoms appear able to respond similarly to rewarding events, but fail to maintain positive emotions especially in more conflictual contexts.

DYNAMICS OF POSITIVE EMOTION REGULATION: ASSOCIATIONS WITH YOUTH
DEPRESSIVE SYMPTOMS

A Thesis

Submitted to the
Faculty of Miami University
in partial fulfillment of
the requirements for the degree of
Master of Arts
Department of Psychology

by

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2013

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Dynamics of Positive Emotion Regulation: Associations with Youth Depressive Symptoms

Emotion regulation is a multifaceted construct that has gained increasing popularity among clinical, developmental, and social psychology researchers (Cole, Martin, & Dennis, 2004; Diamond & Aspinwall, 2003; Eisenberg, Cumberland, & Spinrad, 1998; Gross & John, 2003). Although numerous definitions of emotion regulation exist in the literature, adaptive emotion regulation is consistently linked to positive adjustment (Morris, Silk, Steinberg, Myers, & Robinson, 2007), while deficits in emotion regulation functioning contribute to multiple forms of child and adult psychopathology (Campbell-Sills & Barlow, 2007; Linehan, Bohus, & Lynch, 2007; Morris et al., 2007; Mullin & Hinshaw, 2007). Depression, in particular, has been referred to as a disorder of emotion regulation (Joormann & Gotlib, 2010) with impairment across several domains of regulatory functioning including sustained negative affect (NA) and reduced positive affect (PA; Joiner, Catanzaro, & Laurent, 1996). Although empirical research is beginning to uncover how emotion regulation may contribute to or maintain depressive symptomatology (McMakin et al., 2011; Olinio et al., 2011; Sheeber et al., 2012), noteworthy questions remain. Specifically, *where* deficits in emotion regulation occur (up-regulation vs. down-regulation) and how these deficits impact adolescent depression remain unaddressed. The current study investigated these questions by exploring dynamics of positive emotion regulation and their association with youth depressive symptoms in the context of parent-child interactions. Throughout adolescence, the parent-child relationship remains a salient environmental context in which adolescents learn to express and regulate emotions appropriately (Larson, Richards, Moneta, Holmbeck, & Duckett, 1996). The present study examined if youth depressive symptomatology was associated with (1) reduced expression of global PA, (2) diminished activation of PA response to rewarding events, and (3) deficits in maintaining PA following a rewarding event.

Emotion Regulation

The term “emotion regulation” has been used to describe a multitude of emotional processes including coping, self-regulation, and affective control (Gross & Thompson, 2007; Heiy, 2010). As such, the specific definition of emotion regulation is widely debated. Some researchers adhere to a trait-like perspective of emotion regulation, while others postulate a more transient, momentary change in emotional states (Cole et al., 2004). Further, it is often debated whether emotion regulation involves both controlled and automatic emotional responses, or if

emotion regulation is best defined as the deliberate modulation of emotional responses (Mauss, Bunge & Gross, 2007). Although the definition of emotion regulation frequently varies, adaptive emotion regulation involves flexible responses that are situationally-appropriate (McMakin et al., 2011; Thompson, 1994), whereas maladaptive emotion regulation includes responses that do not fit a given context either in valence or arousal (Gross & Thompson, 2007). In turn, maladaptive emotion regulation is implicated in psychopathology and social impairment (Campbell-Sills & Barlow, 2007; Eisenberg, Hofer, & Vaughan, 2007; Gross & Thompson, 2007). Thus, it is critical to adjustment and overall well being for individuals to successfully regulate emotions. Consistent with extant research, the current study conceptualized emotion regulation as an integrated process that includes both the generation and regulation of emotion in order to achieve one's goals (Campos, Frankel, & Camras, 2004, Eisenberg & Spinrad, 2004).

Emotion regulation influences the expression, intensity, and duration of emotion via processes that up-regulate, down-regulate, or maintain emotion (Campbell-Sills & Barlow, 2007). Together these critical processes can be considered the dynamics of emotion regulation. Dynamics of emotion regulation are essential indicators of emotion regulation processes and play an integral role in how emotions are regulated and expressed (Kuppens, Allen, & Sheeber, 2010; Thompson, 1994). Exploring emotional dynamics can provide insight into emotional responding and patterns of emotion regulation. Although dynamics of negative emotions are clearly relevant within the context of depression (Sheeber et al., 2009), the current investigation focused primarily on dynamics of positive emotion regulation at both broad and specific levels. At a broad level, the current investigation explored the *overall* intensity and frequency of youth PA (referred to as "overall PA expression") expressed during two distinct parent-child interaction tasks. At a more specific level, the present study explored the intensity of PA *response* following a rewarding event (referred to as "PA response") as well as the subsequent *duration* of PA response (referred to as "duration of PA") following a rewarding event. PA response captures PA activation and adolescents' ability to up-regulate positive emotions, whereas duration of PA captures maintenance of positive emotions. Investigating dynamics of youth positive emotion regulation enabled us to obtain a more complete understanding of emotion regulation processes and elucidate how specific deficits in positive emotion regulation may be associated with adolescent depressive symptomatology.

Emotion Regulation in Adolescence

Emotion regulation is influenced by both intrinsic and extrinsic processes (Calkins & Hill, 2007); however, the proportion of internal and external influence changes throughout development. In adults, emotion regulation is predominantly impacted by intrinsic processes (e.g., a mother regulates her own emotions); however, in children emotion regulation is heavily influenced by external processes (e.g., a mother regulates her child's emotions; Calkins & Hill, 2007). Adolescence represents a unique period of development where both intrinsic and extrinsic processes influence emotion regulation strategies. Research demonstrates that the development of emotional functioning predominantly occurs in a social context, with the family environment playing an influential role on children's acquisition of emotion regulation skills (Calkins & Hill, 2007; Thompson & Meyer, 2007). Therefore, it is likely that adolescents regulate their emotions via a combined process of both independent regulatory skills and extrinsic regulation from caregivers (Allen & Land, 1999). As such, the present study explored youth emotion regulation within the family context. Although we cannot distinguish intrinsic from extrinsic regulation in the current study, the family context is nevertheless an important, naturalistic context in which to investigate youth emotion regulation. The family environment shifts significantly during adolescence with rates of family conflict increasing during this period due to adolescents' desire to seek autonomy and independence from parents (Larson et al., 1996; Laursen & Collins, 1994). Specifically, interactions between caregivers and adolescents are characterized by elevated conflict and negativity and less support and overall positivity (Puig-Antich et al., 1993; Sheeber, Hops, & Davis, 2001). Despite these changes, caregivers remain influential in the lives of their adolescent children (Larson et al., 1996). Thus, investigating youth emotion regulation during family interactions is a critical context to explore the association between emotion regulation and youth depressive symptoms.

Additionally, adolescence represents a period of development during which rates of psychopathology spike drastically (Kessler, Avenevoli, & Merikangas, 2001). Depression in particular peaks following puberty and continues to increase throughout adolescence (Thapar, Collishaw, Pine & Thapar, 2012). One factor that may influence rates of depression in youth are developmentally-typical changes in their overall emotional experience. Adolescents' emotional experience (or their daily range of positive and negative affect) changes across development (Larson, Moneta, Richards, & Wilson, 2002). Rates of PA naturally decline throughout early

adolescence, whereas rates of NA increase during early adolescence (Larson et al., 2002). Understanding the specific emotional processes associated with youth depressive symptomatology may assist in our understanding of the factors contributing to or maintaining adolescent depression.

Regulation of Positive Emotion and Depression

Extensive research has linked emotion regulation to adjustment outcomes and psychopathology (Cicchetti, Ackerman, & Izard, 1995; Gross & Muñoz, 1995; Keenan, 2000; Morris et al., 2007). Depression, in particular, is considered a disorder of impaired emotion regulation (Joormann & Gotlib, 2010) marked by deficits in regulatory functioning and altered emotional expression (Cole & Kaslow, 1988; Cole, Michel, & Teti, 1994; Dietz et al., 2008). Specifically, depression is uniquely associated with elevated NA (e.g., sadness, anger) and reduced PA (e.g., happiness). Indeed, deficits in the experience and activation of PA are a central feature of depression. However, much less is known about the modulation of emotional dynamics or the temporal characteristics of emotional processes, especially regarding PA. The tripartite model of anxiety and depression is the dominant emotion-based model of internalizing disorders (Clark & Watson, 1991). This model proposes that anxiety and depression share a component of general distress (NA), yet can be differentiated by physiological hyperarousal associated with anxiety and low PA associated with depression (Clark & Watson, 1991). Applications of the tripartite model to youth populations support the unique role of disrupted PA in adolescents with depression (Joiner et al., 1996). Thus, depression is associated with elevated NA yet can be distinguished from other affective disorders (i.e., anxiety) by diminished PA and altered PA functioning. The majority of research investigating emotion regulation and its association with psychopathology has focused on the regulation of negative emotions (Gross, Richards, & John, 2006). Although it is necessary to understand how individuals with symptoms of psychopathology regulate negative emotions, it is also important to understand how individuals regulate positive emotions. Research has demonstrated that PA and NA represent two fairly independent affective systems (Joiner & Blalock, 1995; Watson, Clark, & Tellegen, 1988). As such, the potential phenotypic outcomes within a given disorder that are associated with maladaptive regulation of either affective system are likely distinct as well (e.g., irritability versus anhedonia associated with disruption of NA versus PA regulation, respectively).

Recent investigations are beginning to explore how PA may be implicated in depressive symptomatology (McMakin et al., 2011; Sheeber et al., 2009); however, additional work is needed. The current study explored both broad and specific dynamics of positive emotion regulation in order to fully capture the emotional processes that may be associated with youth depressive symptomatology.

PA Expression

Low PA is a fundamental characteristic of major depressive disorder (MDD). Several of the core symptoms of depression are characterized by low PA, including social withdrawal, diminished motivation, and reduced capacity to experience pleasure in the environment (often known as anhedonia; Forbes & Dahl, 2005). Across multiple studies, adults and youth with depressive symptomatology self-report lower positive mood states compared to healthy individuals (e.g., Clark & Watson, 1991; Joiner et al., 1996). Sheeber and colleagues (2009) utilized the PANAS-X joviality subscale and reported that depressed youth experienced less frequent happiness than control participants. Studies employing ecological momentary assessment (EMA) further support the association between depressive symptomatology and reduced experience of PA. Silk and colleagues (2011) reported that the ratio of overall PA to NA was significantly higher for youth in the control group compared to youth with depression. These results suggest that youth with depression self-report significantly less PA, and more NA, compared to healthy controls.

Observational research investigating youth depression and PA during parent-child interactions, however, has yielded somewhat mixed results. Dietz and colleagues (2008) assessed observational youth affect during a ten-minute mother-child problem-solving interaction. Participants included adolescents with depression, adolescents at high-risk for developing depression (determined by family mental health history), and healthy control participants. Results revealed that depressed and high-risk youth displayed significantly lower levels of positivity than control participants (Dietz et al., 2008). Similarly, during two, 15-minute problem-solving interactions, depressed adolescents and their mothers both displayed less happy and caring affect (labeled facilitative behavior) than comparison families (Sheeber & Sorenson, 1998). McMakin and colleagues (2011) assessed PA in youth at high and low risk for depression (determined by maternal depressive history) during two interactions with their mothers. High-risk youth displayed less PA across positive and negative contexts compared to

low-risk youth, supporting the hypothesis that youth with depression and at risk for depression express lower levels of PA during observed family interactions. These findings are particularly noteworthy due to conflicting evidence reported by Sheeber and colleagues (2009). Across three, 18-minute family interaction tasks, results revealed no differences in the duration or frequency of observed happy affect for depressed and healthy youth (Sheeber et al., 2009). As mentioned above, this same study did report significant differences among depressed and healthy youth in self-report measures. The mixed results obtained using observational methodology emphasize the importance of exploring in-the-moment expressed affect. Observational data capture expressed emotions whereas self-report measures typically assess felt emotions. During interactions, it is particularly important to investigate expressed emotions since this is what others are able to observe and subsequently respond to. There is an overwhelming lack of research investigating youth depressive symptomatology and *expressed* affect (particularly expressed PA) during parent-child interactions, and the current study sought to address this concern. Given findings from previous literature, we expected overall PA expression to be inversely related to youth depression during two family interaction tasks.

PA Response

In addition to global PA expression, the present study explored two *specific* dynamics of youth PA regulation: youth PA response and duration of PA. These specific dynamics of PA regulation were investigated following a rewarding event. PA response assesses the up-regulation of affect via adolescents' positive affective response to a rewarding event. Individuals who express more intense PA following a rewarding event are considered to be more responsive to rewarding experiences, whereas individuals who express less intense PA following a rewarding event are less responsive to rewarding experiences. To date, much of what is known about adolescent depression and affective response has investigated children's attention and response to negative events. For example, adolescents with depression or at risk for depression selectively attend to negative stimuli (Gotlib, Krasnoperova, Yue, & Joormann, 2004; Hankin & Abramson, 2001) and display differences in neural activation regarding the anticipation and outcome of loss (Gotlib et al., 2010). Further, adult studies have demonstrated that individuals with depression display an abnormal response to negative feedback and may be more likely to experience greater spill-over effects of NA experienced in one context to a subsequent context (Elliott et al., 1996; Elliott, Sahakian, Herrod, Robbins, & Paykel, 1997). Collectively, extant

studies suggest that individuals with depressive symptoms are more responsive to negative events and display different patterns of responding relative to individuals with lower symptoms of depression. Although these studies provide a critical foundation for the association between depressive symptomatology and affective response, there remains a substantial lack of empirical literature exploring adolescents' affective response to *positive* events. Research informing our knowledge of affective response to positive events in individuals with depressive symptoms primarily originates from two distinct literatures: research exploring hedonic capacity and research investigating individual response to reward. These literatures differ in their level of analyses and the direction of the effect that is implied between depression and affective response. PA response merges these two literatures by investigating how individuals with depressive symptoms express PA following a rewarding event.

Hedonic capacity is considered an individual's ability to experience PA following a reward situation (Cook, Spring, McChargue, & Hedeker, 2004; Meehl, 1975; 1987). Hedonic capacity is postulated to be trait-like (Fawcett, Clark, Scheftner, & Gibbons, 1983); therefore, some individuals experience positive emotions easily, whereas other individuals have difficulty experiencing positive emotions. Empirical research has frequently conceptualized hedonic capacity as positive emotionality. Positive emotionality is a dimension of temperament and hypothesized to play a role in the development of MDD (Shankman & Klein, 2003). Specifically, in preschool-aged children, low positive emotionality predicted depressive cognitive styles at age 7 and depressive symptoms at age 10 (Dougherty, Klein, Durbin, Hayden, & Olino, 2010; Hayden, Klein, Durbin, & Olino, 2006). These findings suggest that an individual's temperamental disposition to experience PA may serve as a risk factor for subsequent development of depression. Conversely, the ability to respond easily with positive emotions may be a protective factor in preventing the development of depression. Fredrickson (2004) has suggested that positive emotions may enhance individuals' psychological and physical well-being. Specifically, positive emotions may "undo" some of the detrimental effects of negative emotions, help individuals cope, and broaden one's thinking by enabling individuals to think creatively and flexibly (Fredrickson, 2004; Isen & Daubman, 1984; Isen, Daubman, & Nowicki, 1987). In sum, an individual's capacity to experience PA may be trait-like and subsequently influence children's risk for the development of depression. Individuals with low hedonic capacity (and potentially at greater risk for depression) will likely show less intense PA

in response to positive events. Thus, the trait of hedonic capacity may predispose youth to the development of depression and influence an individual's ability to express PA following a positive event.

Another area of literature that has informed our knowledge of affective response is response to reward. Individuals with depression experience disruption in reward processing and recent literature has investigated how depression influences response to reward using varied methodology (e.g., EEG, fMRI, behavioral reward task). Studies investigating brain activation in depressed adults using quantitative electroencephalography (EEG) have consistently reported that depression is associated with decreased left-sided frontal activation, an area of the cortex presumed to be associated with approach-related motivation and behavior (Gotlib, Ranganath, Rosenfeld, 1998; Henriques & Davidson, 1991). Studies investigating differences in neural activation through fMRI have reported that youth with depression demonstrate decreased activation in reward-related areas of the brain. Specifically, Forbes and colleagues (2006) utilized an independent decision-making task with varying magnitude and probability of monetary reward. Results suggested that adolescents with depression exhibited decreased responses in the anterior cingulate cortex (ACC), bilateral caudate, and inferior orbitofrontal cortex bilaterally compared to control participants during the decision making phase. This pattern of activation is consistent with decreased reactivity to reward. Behavioral studies have also supported the association between depression and disruption in reward processing. For example, Henriques and Davidson (2000) implemented a verbal recognition task utilizing three monetary pay-off conditions (neutral, reward, and punishment). Results demonstrated that adults with depression failed to adopt a more liberal response bias relative to controls when shifting from the neutral condition to the reward condition (Henriques & Davidson, 2000). These findings suggest that adults with depression demonstrate decreased approach-related behavior and are less motivated to maximize reward compared to healthy controls. Disruption in reward processing and decreased reactivity to reward may influence individual's expression of affect following a positive task. Exploring adolescents' response to reward is particularly noteworthy due to the natural inclination to seek reward during this developmental period (Cauffman et al., 2010). Thus, the dampening effect of depression on reward-seeking behavior may play a salient role during the adolescent years when individuals are typically more approach-oriented.

Individuals with depressive symptomatology are less inclined to seek reward, and may similarly be less expressive in their response to positive events.

The current study expanded on the findings from previous studies investigating positive emotionality and response to reward by addressing substantial gaps in the literature. Specifically, the present study investigated PA response employing a family success task paradigm. Previous literature has utilized individual task paradigms with monetary rewards. To our knowledge, affective response has not been explored in family interactions. Due to the importance of the family environment on emotional processes, the current study investigated how youth express PA after succeeding in a task with their mothers. We predicted that youth with elevated symptoms of depression would display diminished PA response.

Duration of PA

The ability to maintain PA once it is activated is another critical regulatory process associated with depressive symptomatology (Tomarken & Keener, 1998). Duration of emotional responding provides cues regarding an individual's control over their internal feeling states. Studies investigating duration of affect and depressive symptomatology have yielded divergent results and, subsequently, distinct theoretical explanations of findings. One account postulates that depressed individuals may experience all mood states for longer periods of time due to an inability to regulate emotions appropriately and flexibly. This theory is supported by investigations conducted by Kuppens and colleagues (2010; 2012) exploring emotional inertia. Emotional inertia represents the degree to which an individual's prior mood state influences their subsequent mood state (Kuppens et al., 2012). Highly inert emotional states are hypothesized to be resistant to both external and internal influences (Kuppens et al., 2010). Kuppens and colleagues (2010) reported that depressed adolescents demonstrated greater inertia for not only negative mood states like anger and dysphoria, but also positive mood states like happiness. These results suggest that adolescents with depression are more resistant to change their mood states. As such, although youth with depression may be less likely to experience PA, they may actually maintain such feelings *longer* than other youth on the rare occasions that they do.

Conflicting theories have postulated that individuals with depression are unable to maintain positive emotions and therefore experience PA for a shorter duration compared to healthy individuals (e.g., Tomarken & Keener, 1998). These theories may explain why individuals with depression report lower overall ratings of PA than their non-depressed peers.

Studies investigating the maintenance of PA have varied in their approach and methodology. Heller and colleagues (2009) obtained fMRI data while employing an emotion regulation paradigm to investigate adults' capacity to sustain positive emotions. During scanning, participants with depression and healthy controls were shown positive and negative images and instructed to suppress their emotional response (decrease PA), enhance their emotional response (increase PA), or simply attend to the visual stimuli. Results revealed that during the scanning session adults with depression demonstrated a decrease in activity in the nucleus accumbens (NAcc; Heller et al., 2009), a critical region of the brain linked to reward processing and positive emotion regulation (Ernst et al., 2004). Individuals with depression showed the greatest decrease in NAcc activity in the Enhance and Attend condition, whereas control individuals did not experience significant changes in NAcc activity across all conditions. These results suggest, "depressed individuals fail to sustain NAcc activation when amplifying PA" (Heller et al., 2009, p. 22446). Hypoactivation in the dorsolateral prefrontal cortex (PFC) has also been linked to depressive symptomatology (Davidson & Irwin, 1999). The PFC is implicated in PA functioning; specifically, by sustaining goal-directed behavior. Thus, diminished activity in the PFC may inhibit maintenance of PA states in individuals with depression. Behavioral work supports neuroscience findings. In adults, McMakin and colleagues (2009) found that adults maintained positive emotions for a shorter duration after viewing positive film clips. In adolescents, Sheeber and colleagues (2009) investigated the duration of happy affect in depressed youth using meta-emotion interviews (averaged across parent and youth report). Results revealed that youth with depression were rated as having shorter duration of happy affect than healthy controls (Sheeber et al., 2009). Notably, observational data from the same study indicated no difference between groups in expressed PA.

In sum, recent investigations exploring duration of PA in depression are primarily divided into two distinct theoretical explanations with considerably mixed findings. Methodological differences may account for some discrepancies among results, yet a complete understanding of how duration of PA is associated with depressive symptoms in youth remains absent in the literature. The current study sought to clarify divergent results by investigating the duration of expressed PA once it is already activated (i.e., by a socially rewarding dyadic success task mentioned above). As postulated by Kuppens and colleagues (2010), youth with depression may express PA for a longer duration than healthy controls; yet, this finding of increased

emotional inertia was found only during conflictual and challenging tasks. In contrast, the present study explored how youth maintain PA while transitioning from a positive task to a problem-solving discussion task. Given evidence demonstrating overall impairments in PA functioning in depressed individuals, we hypothesized that youth with elevated symptoms of depression would express PA for a shorter duration than adolescents with reduced symptomatology. Maintaining PA during the transition to a negative task may be more difficult for youth since this transition allows for the possibility for NA to disrupt adolescents' experience of PA. Additionally, during a conflictual or challenging task, the valence of the context is clear; however, while transitioning to a new context, the valence is more ambiguous. In ambiguous contexts, youth may be more vulnerable to impaired expressions of affect and subsequently maintain PA for a shorter duration.

Current Study

Overall, the current study explored the relation between dynamics of youth emotion regulation (i.e., overall PA expression, PA response, duration of PA) and adolescent depressive symptomatology across two family interactions. The current study had three primary aims. The first aim (Aim 1) was to test the association between overall youth PA expression and youth symptoms of depression during two parent-child interaction tasks. Given that the few studies to examine youth PA in relation to depression within a family context have focused primarily on conflictual interactions (e.g., discussing family problems), it was deemed important to examine this relation in both a positive and negative interaction. Overall youth PA expression was hypothesized to be inversely related to adolescent depressive symptomatology in both a dyadic success task and a commonly-used family problem-solving task. Next, we tested the association between youth PA response to a rewarding event and youth symptoms of depression (Aim 2). It was hypothesized that youth with elevated symptoms of depression would display less intense PA response following a rewarding event. Finally, we tested the association between duration of youth PA following a rewarding event and youth depressive symptomatology (Aim 3). It was predicted that shorter duration of PA would be associated with elevated depression symptoms.

Method

Participants

Adolescents in grades 7 to 9 and one or both of their primary caregivers were recruited through public school records in central Missouri. Parents or legal guardians of potential

participants initially received a letter explaining the study and a telephone call requesting their participation along with their child's participation. Of 492 families contacted, 30% ($N = 150$) agreed to visit the lab and participate in the study. Twenty-four adolescents were accompanied by two caretakers, 113 adolescents were accompanied by the female caretaker only, and 13 adolescents were accompanied by the male caretaker only. Because the present study controlled for the influence of parenting behavior on youth affect expression and maternal and paternal caretakers socialize emotions using distinct behaviors (Denham et al., 2000), only families including a female caretaker were included in the current study ($n = 137$). Due to audio-visual problems during primary study tasks, one family was excluded from the study sample; thus, the total sample included 136 adolescents.

Adolescents (66 girls) ages 12 to 16 ($M = 13.60$; $SD = .91$) and their primary female caregivers (referred to as "mothers") participated in the current study. Female caregivers identified their children's race/ethnicity as predominantly Caucasian (85%), with one child identified as Hispanic/Latino, 6% identified as African American, 3% Asian/Asian-American, 4% Biracial/Mixed race, and one child identified as other. Mothers' ages ranged from 29 years to 60 years ($M = 43.90$; $SD = 6.08$). The majority of mothers were married or remarried (76%) and were biological mothers (83%). Two females were stepmothers, two were adoptive mothers, and one identified as a grandmother. Participants represented a middle-to upper-class sample with a mean income level ranging from \$40,000-\$75,000. Eighteen percent of families' annual income fell below \$40,000 and 54% of families' annual income fell above \$75,000.

Procedure

At a university-based laboratory, female caretakers provided written consent for their participation and their adolescent's participation, and youth provided written assent. The current investigation is part of a broader study analyzing the influence of internalizing symptomatology on affect expression across distinct contexts. For the larger study, families completed a battery of measures prior to participating in four interaction tasks each designed to elicit a set of distinct emotions (e.g., happiness, frustration). The current study used only the first two interaction tasks: a trivia success task and a problem-solving discussion task.

The first interaction task was a seven-minute trivia success task designed to elicit positive emotions (e.g., happy, excited). Families completed this task on a computer and were instructed to work together to arrive at correct answers. Research assistants informed families

they would earn more raffle tickets by answering questions correctly and quickly. Throughout the task, families received feedback regarding their progress, which increased at a steady, consistent rate for all families. Upon completion of the trivia success task, research assistants provided standardized feedback to all families, informing them that they had earned 11 raffle tickets and that few families had performed as well as their family.

Families next participated in the problem-solving discussion task. During the seven-minute problem-solving task, dyads discussed two topics previously endorsed by adolescents and parents as having caused mild conflict or frustration at home (e.g., chores, homework, curfew). The purpose of the problem-solving task was to investigate family interactions during a more naturalistic family discussion. Further, transitioning from a positive task to a neutral or negative task can provide insight regarding an individual's ability to regulate positive emotions.

Following completion of the interaction tasks, all families were given a resource list containing written resources (e.g., books, websites) addressing family relationships and adjustment, and contact information for local youth and family mental health services (including free services). Finally, all members were thanked for their participation and compensated for their time with \$10 each and equal entries into a drawing for a \$100 mall gift card given to one family chosen at random at the project's completion.

Self-Report Measures

Prior to participating in the success task and problem-solving interaction task, youth completed self-report measures.

Adolescent depression. The Children's Depression Inventory (CDI; Kovacs, 1992) is a 27-item questionnaire assessing multiple dimensions of childhood depression. Adolescents reported on their symptomatology over the previous two weeks. Statements on the CDI vary in severity and participants selected the statement that best represented how they are feeling. Sample items include: "I am sad once in a while" (scored 0), "I am sad many times" (scored 1), "I am sad all the time" (scored 2). Responses for each item were summed to produce a total score, with higher scores indicating more severe symptomatology. Due to IRB and school board concern, item 9 pertaining to suicide was excluded. The CDI has demonstrated acceptable internal consistency (Kovacs, 1992; Smucker, Craighead, Craighead, & Green, 1986), test-retest reliability (Smucker et al., 1986), and has demonstrated good convergent and discriminant validity (Hodges, 1990). Cronbach's alpha in the present sample was acceptable ($\alpha = .89$).

Youth state affect. Before completing the trivia success task (baseline) and after completing the trivia success task, adolescents reported their state affect indicating how they were feeling “at this moment.” Emotions included excited, sad, angry, nervous, frustrated, and happy. Items were scored from 0 (*not at all*) to 5 (*extremely*). PA was calculated as the mean for happiness and excited. Alpha values in the present sample were sufficient (baseline $\alpha = .78$; following success task: $\alpha = .83$).

Observed Measures

Youth expressed PA and maternal support (used as a covariate in analyses) were coded using an adapted version of the System for Coding Interactions of Family Functioning (SCIFF; Lindahl & Malik, 2001). The SCIFF is theoretically derived from family systems theory, structural family theory, and social learning theory. SCIFF codes have been utilized in multiple empirical investigations (e.g., Kitzmann, 2000; Lindahl, 1998) and demonstrate sufficient interobserver reliability ($\alpha = .78$ to $.80$). Research assistants were trained extensively by the project director and a trained graduate student. Training consisted of an introduction to the system and manual, several meetings to practice coding, and training videos compiled by senior staff. Additionally, trainees were required to code a minimum of 30 interactions in order to be reliable with a gold standard before coding independently. Interrater reliability was calculated with absolute-agreement intraclass correlation and was sufficient for overall PA expression ($r = .73$), PA response ($r = .63$) and maternal support ($r = .74$). For the current study, dynamics of PA regulation were operationalized in various ways as described below:

Overall PA expression. Overall youth PA expression was coded during the trivia success task and the problem-solving task. PA was assessed through adolescents’ laughter, smiles, affection, and enjoyment in the discussion with their parent. Affect scores ranged from 1 (*very low*) to 5 (*high*) with higher scores indicating greater intensity and frequency of affective behavior. Trained coders rated youth for each minute of the seven-minute trivia success task and for each minute of the seven-minute problem-solving discussion task (see Figure 1). To account for variability in interaction times (i.e., some families interacted for under 7 minutes, whereas others interacted for over 7 minutes), overall PA expression was calculated using the average score across the total number of minutes that families interacted for each task. A separate overall score was calculated for the trivia success task (labeled “mean PA success”) and for the problem-solving task (“mean PA problem-solving”).

PA response. Given the novelty of this construct and that expressed emotion has been shown to correlate only modestly with self-reported felt emotion (Geist & Gilbert, 1996), PA response was calculated both behaviorally (observed youth PA response) and using self-report measures (youth state PA). Observed youth PA response was coded in the time period following the trivia success task, starting when the researcher began to provide families with standardized positive feedback, reiterating their success on the trivia task, and ending at the time participants began completing the self-report measure of state affect (see Figure 1). Observed PA response was coded using the same criteria outlined above for PA expression. Observed PA response scores ranged from 1 (*very low*) to 5 (*high*). In order to test the relation between depression symptoms and intensity of PA response, youth were required to receive a score of 2 or above in order to be classified as responding to the trivia success task. Self-report of youth state PA following the trivia success task was utilized to include all youth ($n = 135$) in analyses and explore potential differences in behavioral vs. self-report PA response. This measure is described in detail above.

Duration of PA. Duration of youth PA was coded following the trivia success task, from the time of the first positive expression to the time of the first negative expression. In order to keep the sample size consistent across PA response and duration of PA, the first positive expression was required to be displayed before youth began completing the self-report measure of state affect. Duration of PA was operationalized as the number of seconds from the first positive expression to the first negative expression following the rewarding trivia task. Coding for all 136 adolescents was conducted in pairs to ensure accuracy. Coders independently coded the first positive and negative expression, then met to resolve discrepancies. Percent agreement for the time of the first positive expression and the first negative expression was sufficient (percent agreement = 69%).

Observed Maternal Support. Observed maternal support was coded during the problem-solving task. Maternal support was coded to statistically control for the possibility that individual differences in expressions of PA in the problem-solving task may be reflective not of true deficits in emotion regulation, but rather of differential elicitation of or opportunities to express PA given the social nature of the problem-solving task. That is, the trivia success task provided youth with standardized positive environmental stimuli through consistent positive feedback, whereas the problem-solving discussion task likely varied in the rate of positive

environmental stimuli due to distinct interaction patterns between parents and youth in various families. Maternal support was coded using the adapted version of the SCIFF. A single global score for maternal support was assessed through mother's verbal expressions (e.g., "I can tell this is frustrating for you") and nonverbal expressions (e.g., providing nurturing touches that indicate the parent is aware of the child's emotional state) and assessed mother's ability to recognize and meet children's emotional needs and provide comfort and reassurance. Maternal support scores ranged from 1 (*very low*) to 5 (*high*) with higher scores indicating greater intensity and frequency of supportive, helpful, and nurturing behavior across the problem-solving task.

Results

Before testing hypotheses, preliminary analyses were conducted to test for outliers and to check the distribution of scores. Descriptive statistics revealed that youth depression scores were not normally distributed (kurtosis = 4.49). To correct for this, youth symptom scores were transformed by calculating the square root (kurtosis = .28). A scatter plot of youth depression scores and overall PA expression revealed that one youth was an outlier on both x- and y-axes. Thus, this family was removed from all analyses ($n = 135$). Means, standard deviations, and intercorrelations between study measures are presented in Table 1.

Aim 1: Test the association between overall youth PA expression and youth symptoms of depression during two parent-child interaction tasks

To test research aim 1, the bivariate relations of overall youth PA expression and youth symptoms of depression were calculated in the trivia success task and in the problem-solving task. Contrary to hypotheses, during the success task, overall youth PA expression was not significantly associated with youth depressive symptomatology ($r = -0.02, p = .82$). However, during the problem-solving task, as predicted, overall youth PA expression was inversely related to youth depressive symptomatology ($r = -0.20, p < .05$). Thus, youth with elevated symptoms of depression expressed less intense and less frequent displays of PA across seven minutes than youth with lower levels of depressive symptoms during the problem-solving task only.

Due to conflicting results based on context (i.e., success task vs. problem-solving task), we further examined the association between youth expressed PA and youth depressive symptoms. Recall that throughout the trivia success task families received frequent, standardized positive feedback informing participants they were performing well, obtaining more points, and were improving their standing relative to other (fictional) families. Since no association between

expressed PA and youth symptoms of depression was found in this task, it was necessary to test if the association between PA and depression symptomatology, that was significant in the problem-solving task, emerged simply because youth with elevated symptoms of depression had fewer opportunities to express PA during this task. To test this empirically, we conducted linear regression analysis to investigate if youth expressed PA predicted youth symptoms of depression, controlling for observed maternal supportive behavior. We conceptualized observed maternal support as a proxy for the amount of environmental positivity, most consistent with the experience of positivity participants received during the trivia success task (i.e., the standardized positive feedback). Considering bivariate relations, maternal support was related to youth expressed PA ($r = 0.18, p < .05$) and inversely related to youth symptoms of depression ($r = -0.20, p < .05$). More importantly, a multiple linear regression analysis revealed that youth expressed PA still predicted youth symptoms of depression (though marginally; $b = -0.08, \beta = -0.17, t = -1.92, p = .058$) even after controlling for maternal supportive behavior ($b = -0.05, \beta = -0.17, t = -1.96, p = .052$), $F = 4.56 (p = .01), R^2 = .07$.

Aim 2: Explore the association between youth PA response to a rewarding event and youth symptoms of depression

To test research aim 2, we coded PA response both behaviorally and using self-report measures. Those youth who did not respond to the rewarding trivia task with PA and received a score of “1” ($n = 14$) were not included in analyses for PA response. Recall that in the coding system for observed PA, a score of “1” represents the absence of any type of PA response. Although the majority of participants scored a “2” or above on behavioral PA expression following the trivia success task (as would be expected), some did not. Differences between youth who responded with PA following the trivia success task ($n = 118$) and youth who did not respond with PA following the trivia success task ($n = 14$) were analyzed using independent samples t-tests. Results revealed significant differences in overall PA expression during the trivia success task for youth who responded following the success task ($M = 2.47$) and youth who did not respond ($M = 1.62; t = -4.70, p < .001$); however, no differences existed in child sex or depression level between these two groups. Thus, those youth who respond to the trivia success task with PA may have differences in their ability or capacity to express PA; however, this is not due to differences in sex or symptoms of depression.

For those youth who did respond, level of PA response was not associated with youth symptoms of depression bivariately (observed PA response: $r = -0.02, p = .83$; self-report PA response: $r = -0.02, p = .85$). Multiple regression analyses were also conducted to test if youth PA response, controlling for youth PA at baseline (i.e., change in PA across the rewarding task), predicted youth symptoms of depression. Both behavioral and self-report measures of youth PA response were used for analyses. Prior to conducting regression analyses, all scores were standardized to account for use of distinct scales (i.e., self report versus observed measures). Contrary to hypotheses, PA response following a rewarding task did not predict youth symptomatology (observed PA response: $b = -0.01, \beta = -0.02, t = -0.20, p = 0.84$; self-report PA response: $b = -0.01, \beta = -0.02, t = -0.17, p = .87$). Thus, following a positive event, youth with elevated symptoms of depression responded similarly (both behaviorally and via self-report measures) to youth with lower levels of symptomatology.

Aim 3: Examine the association between duration of youth PA following a rewarding event and youth depressive symptomatology

To test research aim 3, linear regression analyses were conducted with duration of youth PA (i.e., total seconds from first behavioral expression of PA following the trivia success task to first NA expression) as the independent variable and youth symptoms of depression as the dependent variable. Only youth that responded to the trivia success task with PA ($n = 118$) were included in analyses. As predicted, duration of youth PA negatively predicted youth depressive symptomatology ($b = -0.01, \beta = -0.25, t = -2.72, p < .01$). Given that depression was unrelated to level of PA response, it is unlikely that the relation of depression to shorter duration was due to a lower PA starting point (i.e., easier to decrease). To be certain, a second regression was conducted controlling for PA response. Results indicated that duration of PA was inversely related to youth depression ($b = -0.01, \beta = -0.25, t = -2.71, p < .01$), even controlling for intensity of initial PA response ($b = -0.01, \beta = -0.02, t = -0.20, p = .84$). Thus, youth with elevated symptoms of depression displayed shorter duration of PA expression relative to youth with lower levels of depressive symptoms.

Discussion

The current study explored broad and specific dynamics of PA regulation in relation to youths' depressive symptomatology. Recent literature (Forbes & Dahl, 2012; McMakin et al., 2011; Olino et al., 2011) has postulated differences in reward-related responses that may

contribute to disrupted regulation and increase risk for depression; however, the specific regulatory processes that are disrupted for youth with depression are not well understood. This study is one of the first investigations to explore dynamics of PA regulation using observational methodology and distinct family interaction tasks. By investigating various dynamics of PA regulation (i.e., expression, response, duration), the goal of the current study was to elucidate the specific deficits in emotion regulation that are most associated with youth depressive symptoms. Findings suggested that adolescents' depressive symptoms were associated with altered PA expression, yet only in certain contexts, were unrelated to PA response following a rewarding event, but were related to shorter PA duration.

Aim 1: Association between overall youth PA expression and depression symptoms

The current study investigated broad PA regulation by examining overall PA expression during two family interaction tasks. The type of context differentiated whether PA expression was related to youth depressive symptoms or not. No association between PA expression and youth depressive symptoms was found during the trivia success task. In contrast, and in support of study hypotheses, reduced PA expression was associated with depressive symptoms during the problem-solving task. This result held even when controlling for maternal support in the problem-solving task (used as a proxy for an environmental stimulus that might elicit PA). Thus, results suggest that youth PA expression is related to youth symptoms of depression; however, only in certain contexts.

Although we predicted that low PA would be associated with elevated depressive symptoms across both family interactions, results suggest that contextual variables may play a critical role in facilitating or weakening this association. Specifically, a predominantly negative context (i.e., the problem-solving discussion) appeared to promote the association between low PA and depression, whereas a non-negative context (i.e., the trivia success task) seemingly weakened this relation. Further, our results support other studies finding that youth with depression display reduced PA during a problem-solving interaction (Dietz et al., 2008, Sheeber & Sorenson, 1998), but when investigated during a non-negative family interaction task (i.e., a evening meal at home) no differences in smiles or positive behavior between depressed and comparison youth have been found (Dadds & Sanders, 1992). Importantly, the current study examined both types of interactions in the same youth, providing even stronger support for the

notion that context is critical when considering the relation of depression to youth displays of affect, particularly PA.

Several potential factors may help explain this pattern of results. During the negative problem-solving discussion, PA expression may have been influenced by the level of parent-child conflict, such that youth with elevated levels of symptomatology experienced greater conflict and expressed lower overall levels of PA. Research demonstrates that families with depressed adolescents are characterized by higher levels of conflict and lower levels of support (Sheeber & Sorenson, 1998). Although the current study controlled for the level of maternal support during the problem-solving interaction as a stimulus that may elicit youth PA, we did not control for the level of conflict. Additionally, during the problem-solving discussion, youth levels of PA may have been impacted by their ability to “bounce back” from the experience of NA. It is likely that during the problem-solving discussion, mothers and children experienced a wide variety of emotions ranging from happiness to frustration. Fredrickson (1998; 2001; 2004) has hypothesized that positive emotions may play a facilitative role helping individuals recover and bounce back from the experience of negative emotions. Individuals with elevated symptoms of depression, may not have the ability to recover as quickly from the experience of negative emotions and therefore experience lower levels of PA overall.

In contrast, the success task may have been such an overtly positive interaction task that it was completely devoid of potential NA-eliciting stimuli that might interfere with PA functioning. For example, youth may not have experienced as broad of a range of emotions as they experienced in the problem-solving task, and rather experienced predominantly positive emotions. Thus, NA may not have had the opportunity to disrupt the experience of PA during the success task. Additionally, since families succeeded in the trivia task together, the likelihood that parent-child conflict emerged in the success task is much lower than the potential that conflict emerged in the problem-solving task. As such youth may not have had as many opportunities to experience negative emotions in the success task, which may serve to explain our differential pattern of results and suggest that the experience of NA may play a fundamental role driving the reduction of PA.

Collectively, results from Aim 1 demonstrate that context plays an influential role on how youth express PA. Our findings suggest that PA expression is most associated with youth depressive symptoms not in contexts that elicit positive emotions, but rather in contexts that

allow for, or elicit, the experience of negative emotions. These results suggest that deficits in emotion expression for youth with depression may not emerge in overtly positive contexts, but rather during everyday discussions when conflict and NA has the opportunity to disrupt PA. Such a finding has important methodological implications for future research examining the investigation between emotion expression and youth depression, and suggests that studies should employ a wide-range of contexts to investigate these relations.

Aims 2 and 3: Associations of youth PA response and duration to depression symptoms

The current study also investigated the role of specific dynamics of PA regulation by exploring how PA response and duration of PA were related to youth symptoms of depression. Regarding PA response, results were in contrast to study hypotheses and suggested no association with depressive symptomatology. Notably, depression was not associated with either the magnitude in self-reported change in PA across the success task or the behavioral intensity of expressed PA following positive feedback regarding performance on this task. This finding contradicts fMRI research demonstrating that adolescents with elevated symptoms of depression display diminished activation to rewarding experiences (e.g., Forbes et al., 2009; Forbes, Shaw, & Dahl, 2007). Our lack of an association, however, supports literature suggesting that depressed individuals are able to respond behaviorally immediately following the presentation of pleasant and rewarding stimuli (McMakin, Santiago, & Shirk, 2009; Pizzagalli et al., 2008).

Indeed, one potential explanation for why no association was found between PA response and depressive symptoms may be the nature of the interaction task and the specific “reward” used in the current study. Specifically, the success task may have served as a highly activating event helping to trigger the experience of PA in the environment, similar to how pleasant event scheduling is used in treatments for depression to help individuals experience positive interactions and positive emotions (e.g., Lewinsohn, Clarke, Hops, & Andrews, 1990). Thus, the reward of winning and succeeding as a family may have activated the experience of PA for all youth and therefore weakened the association between diminished PA response and depressive symptomatology. Additionally, the success task used in the current study was fairly distinct from other tasks used to elicit positive response to reward. The majority of reward tasks utilize monetary incentive and are conducted in isolation of other family members. Although families won points and additional entries into a lottery drawing, and this could be construed as “monetary,” the social nature of our success task may account for differences in results, such that

caregivers may have encouraged youth to express PA when they were informed they won (e.g., through processes of family savoring). Finally, previous investigations have primarily focused on neural response to reward and neglected to explore behavioral response to reward. Thus, although decreased activation in reward related areas of the brain for youth with depression suggests an association between diminished PA response and depressive symptomatology, studies employing neural imaging methodology can only provide insight regarding where affective processing occurs in the brain (Bradley & Lang, 2000) and cannot speak to how emotions are expressed behaviorally. Findings from the current study may reflect differences in expressed versus felt (or activated) emotional experiences.

Regarding duration of PA, results were consistent with study hypotheses and suggested that shorter duration of PA following a rewarding event was associated with elevated symptoms of depression. Our findings support previous studies suggesting that youth with depression maintain PA for a shorter duration (Heller et al., 2009; Sheeber et al., 2009) and that individuals with depressive symptoms are less likely to savor and hold on to positive experiences (Bryant & Veroff, 2007). It may be that shorter duration of PA is associated with depressive symptomatology because the experience of PA is dampened more quickly by the experience of NA. Research demonstrates that individuals with depressive symptoms recognize and attend to NA more quickly (Gotlib et al., 2004). Therefore, perhaps youth who are more attuned to negative cues maintained PA for shorter duration because the experience of NA interrupted the maintenance of PA expression. Additionally, PA may function differently for each youth, such that some youth are able to enhance their experience of PA more readily than others. Research suggests that those individuals that are less resilient and at greater risk for psychopathology experience deficits in their ability to enhance positive emotions (Tugade & Fredrickson, 2004). Although our findings regarding duration of PA contradict the general theory of emotional inertia proposed by Kuppens and colleagues (2010; 2012), differences in interaction tasks likely account for these differences. Kuppens and colleagues (2010) did not find that positive emotions persisted during a positive family interaction task. Thus, the theory of emotional inertia may only occur in “emotionally taxing circumstances” (Kuppens et al., 2010, p. 989), rather than across all contexts. Similar to results in Aim 1, the context of an interaction task appears to play a central role in the association between youth affect expression and depressive symptomatology.

Together our results from Aims 2 and 3 suggest that deficits in PA regulation for youth with depressive symptoms do not occur during the up-regulation of PA (the response process), but rather during the maintenance phase (the duration process). Our findings are in direct support of McMakin and colleagues' (2009) investigation of positive emotion reactivity and maintenance in adults with depressive symptoms. This study utilized a continuous rating of experiential affect via an affect meter and compared dysphoric (i.e., higher in depressive symptoms) adults to nondysphoric controls. Results revealed that, relative to controls, dysphoric adults were equally responsive to positive emotion eliciting film clips, yet differed in their ability to maintain positive affect. The McMakin et al. (2009) study is one of the first (and potentially only) empirical investigations to explore both response and maintenance of positive emotional expression continuously in the same study. Our findings replicate and extend these findings using an adolescent sample and observational data.

Integrating Aims

Considering our results for both broad and specific dynamics together, our findings suggest that the association between youth positive emotion regulation and depressive symptoms is heavily influenced by the emotional valence of a given context. For example, it could be that during the trivia task, each piece of feedback youth experienced after answering a question functioned similarly to a single rewarding event. Thus, overall PA expression in the success task (calculated as the mean across the 7-minute trivia success task) was simply an average of multiple responses to rewarding situations. This would be in direct support of our findings for PA response and may suggest that our measure of broad dynamics of PA regulation actually consists of specific dynamics of PA regulation (i.e., several series of response and maintenance phases). Although it is important to understand the interplay among depression and PA expression in positive interactions, future studies should consider that associations appear to emerge most in conflictual contexts rather than in highly positive interactions. Our findings suggest that the emotional valence of a given context can strongly influence the expression and response of an adolescent's affective experience. The pivotal role of context is a growing area of interest as researchers are beginning to understand how emotion regulation functions differently in situations that pull for positive versus negative emotions (Aldao & Nolen-Hoeksema, 2012). It appears that context may be particularly important for depression risk, and specifically,

relations may be most pronounced when the opportunity to experience a wide range of emotions, and particularly negative emotions, is possible.

Indeed, our findings may suggest that the opportunity for youth to experience NA could partially explain the association between dynamics of PA regulation and depressive symptoms in certain contexts. In the problem-solving task, when families discussed two topics that had recently caused mild conflict or frustration at home, youth had the opportunity to experience a range of emotions. It could be that the experience of NA was so salient for some youth that they were unable to recover from this experience or express PA as quickly following the experience of NA. In contrast, during the success task, when no association between low PA and depressive symptoms was found, families had a much more limited opportunity to experience negative emotions since they continually received positive feedback. Further, during the transition from the success task to the problem-solving task, some youth may have attended to the upcoming problem-solving (and more negative) task rather than savor the success of the trivia task. This may, at least partially, explain our findings that duration of PA is associated with depressive symptoms. Future research would benefit from investigating this process in more detail. Although we were unable to counterbalance the interaction tasks in the current study given that our primary research questions focused on PA response and maintenance following a rewarding event, future research should investigate how positive emotions may play a repairing role following the experience of negative emotions or how negative emotions may intrude on experiences of PA. Our data demonstrate and support previous literature that PA is associated with youth depressive symptoms, but investigating the ratio of PA to NA across distinct interaction contexts would likely further elucidate which affective system may be more influential in driving the association between dynamics of emotion regulation and depressive symptoms.

Limitations and Future Directions

Findings of the current study should be considered in light of several limitations. First, the use of a community sample enabled us to explore dynamics of PA regulation across a wide range of depressive symptoms; however, examining these associations in clinical and at-risk samples is needed. Given that the current study found no association between PA expression in the success task and PA response following the success task and depressive symptoms, it is possible that associations would emerge among youth with more severe symptomatology.

Diminished PA expression and reduced PA response to rewarding events may play a role in maintaining clinical levels of depressive symptoms (Olino et al., 2011); however, may not necessarily serve as etiological factors contributing to the onset of depressive symptomatology in youth. Second, the cross-sectional nature of our data inhibits the interpretation of causality. Low PA expression may reflect temperamental differences known to be risk factors for later onset of depression (Dougherty et al., 2010; Hayden et al., 2006). However, the presence of depressive symptoms may also alter affective responding (Forbes & Dahl, 2012). Future studies should explore these associations using a longitudinal research design in order to clarify risk factors for depression.

Further, the current study only examined a brief snapshot of PA response and duration of PA in youth. Additional research would benefit from exploring how youth respond to multiple rewarding events and maintain positivity over a prolonged period of time. Research has suggested that individuals with depression are responsive to individual rewarding events, but display deficits in reward learning over time (Pizagalli et al., 2008). Studies using EMA or experience sampling methodology would allow researchers to explore how youth respond to rewarding events in more naturalistic settings and across time. A strength of the current study was the use of observed affect expression; however, youth may respond differently via self-report measures of affect or physiological measures of responsivity and arousal and as such, this is a fruitful area for future research. Additionally, youth may express emotions differently in the presence of caregivers. The current study investigated broad and specific dynamics of positive emotion regulation during two family interaction tasks. Thus, parental behavior, patterns of family communication, and the overall emotional climate of families may have influenced how youth expressed and regulated emotions. Future research should compare how youth regulate emotions independently to how youth regulate emotions in the presence of caregivers in order to parse out intrinsic versus extrinsic regulation.

Finally, the sample used in the current study identified as primarily Caucasian, thus the small sample of ethnically-diverse youth precluded us from exploring ethnicity as a potential moderator of expression differences and youth symptomatology. Research demonstrates that emotional expressions, intensity and duration of emotional experiences, and display rules vary widely across cultures (Ekman, 1971; Matsumoto, 1993; Matsumoto, Kudoh, Scherer, & Walcott, 1988). Additionally, findings have reported that culture influences how individuals

express emotions in distinct contexts and in the presence of others (Friesen, 1972). These findings highlight the critical role that culture and ethnicity play on emotional experience and likely emotion regulation. Due to findings suggesting that depressive symptoms may manifest differently across cultures as well (Mezzich & Raab, 1980), future research should sample ethnically and racially diverse youth to explore the potential moderating role of culture on emotion expression and depressive symptoms.

Clinical Implications

The current study suggests several implications for treatment of youth depressive symptoms. First, due to distinct findings depending on context, clinicians should emphasize the importance of creating positive, warm, and supportive environments for their clients presenting with depressive symptomatology. This may require working with families to reduce familial conflict and parental stress. Additionally, building youth resources to utilize PA successfully seems important due to adolescents' inability to maintain PA for a sustained duration. One way to address this is for clinicians to work with youth to seek out positive activities that help them experience PA (i.e., pleasant events scheduling), then help youth engage in maintenance behaviors such as anticipating the event before they participate in it, being present during the activity, and reminiscing after completing the positive behavior. Additionally, identifying specific behaviors and activities that help maintain positive emotions would be useful in developing prevention and intervention programs (McMakin et al., 2009).

Conclusion

The current study utilized two family interaction tasks and observed youth affect expression to explore broad and specific dynamics of PA regulation in relation to depressive symptoms. Results suggested that low PA was most associated with elevated symptoms of youth depression in conflictual contexts, when youth have the opportunity for NA to disrupt their expression or maintenance of PA. No association between reduced PA expression and depressive symptoms was found during the success task or following the success task; however, low PA was associated with depressive symptoms during the problem-solving task. Additionally, a shorter duration of PA was associated with greater depressive symptoms. Overall, youth higher in depressive symptoms appear able to up-regulate emotions and respond similarly to rewarding events, but fail to maintain positive emotions especially in more conflictual contexts.

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Table 1.

Means and Standard Deviations for, and Intercorrelations between, Measures

	1	2	3	4	5	6	7	8
1. Child Depression	--							
2. Mean PA Success	-0.02	--						
3. Mean PA Discussion	-0.20*	0.44**	--					
4. State PA Baseline	-0.26**	0.13	0.10	--				
5. PA Response	-0.02	0.49**	0.30**	0.12	--			
6. State PA Post-Success	-0.01	0.08	-0.02	0.01	0.05	--		
7. Duration of PA	-0.25**	0.07	0.10	-0.04	0.01	0.06	--	
8. Mom Support	-0.20*	0.11	0.18*	0.03	0.12	0.21*	0.22*	--
<i>M</i>	0.50	2.38	1.62	3.11	2.70	3.88	156.85	3.25
<i>SD</i>	0.24	0.69	0.53	1.08	1.08	0.96	120.26	0.88

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

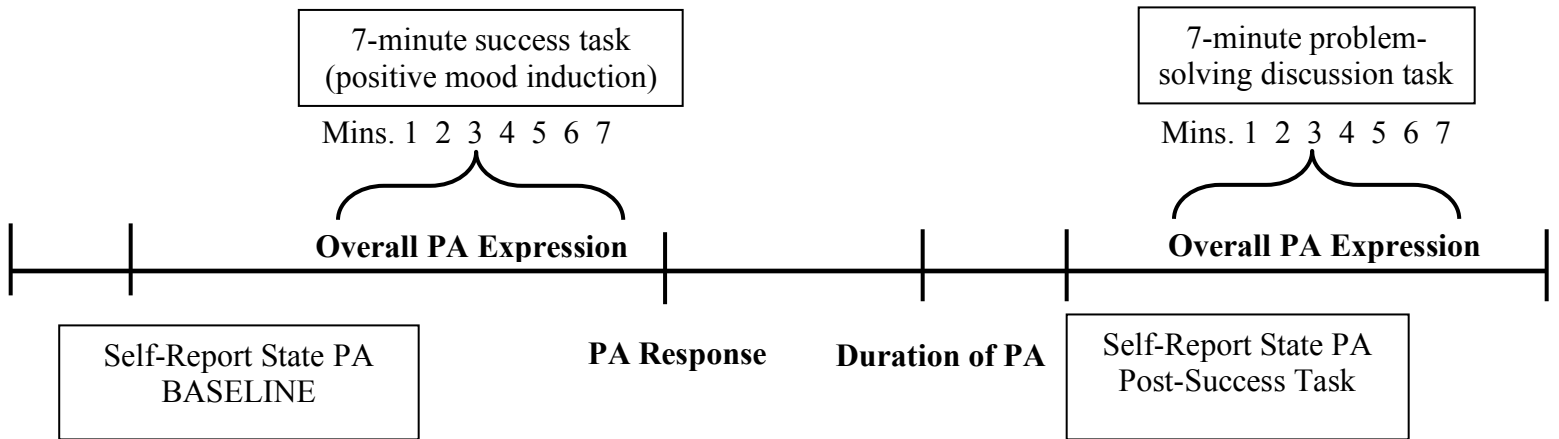


Figure 1. Schematic diagram of observed youth affect coding during mother-child interactions. The bolded variables are used for analyses.