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# Emotion Regulation as a Mediator of Adolescent Developmental Processes and Problem Outcomes

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To the Graduate Council:

I am submitting herewith a dissertation written by Katherine Little Kivisto entitled "Emotion Regulation as a Mediator of Adolescent Developmental Processes and Problem Outcomes." I have examined the final electronic copy of this dissertation for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Doctor of Philosophy, with a major in Psychology.

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Emotion Regulation as a Mediator of Adolescent Developmental Processes and Problem  
Outcomes

A Dissertation  
Presented for the  
Doctor of Philosophy  
Degree  
The University of Tennessee, Knoxville

Katherine Little Kivisto  
August, 2011

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## **Dedication**

To the adolescents whose struggles inspired this work.

## **Acknowledgments**

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## ABSTRACT

Recent models of adolescent development and psychopathology emphasize the importance of the social regulation of emotion during adolescence (Allen & Manning, 2007; Allen & Miga, 2010), and emotion regulation as a mediating factor between multiple aspects of adolescent development and adolescent adjustment (Morris, Silk, Steinberg, Myers, & Robinson, 2007). The present dissertation investigated these two phenomena in two separate studies of adolescent development, emotion regulation, and psychological adjustment.

In study one, a new measure of adolescent social regulation of emotion – the Managing Distress Interpersonally Scale, or MANDI – showed good internal consistency, test-retest reliability and factor structure across two samples (217 college students in sample one and 63 community adolescents in sample two). The MANDI also showed good convergent and discriminant validity in its relations with independent assessments of adolescent emotion regulation, relationship functioning, psychological functioning, and physiological regulation of emotion.

In study two, 64 community adolescents completed self-report, interview, and physiological procedures (salivary cortisol and respiratory sinus arrhythmia), while one of their parents also completed survey measures. Emotion regulation was found to mediate the developmental context and adolescent depressive symptoms, alcohol problems, and peer aggression. Findings are discussed in terms of the utility of intervening at the level of emotion regulation for adolescents displaying difficulty with internalizing and externalizing symptoms.

## TABLE OF CONTENTS

Chapter	Page
<b>I. GENERAL INTRODUCTION</b> .....	1
Theories of Emotion Regulation .....	2
Attachment Theory and the Development of Emotion Regulation .....	3
Family Systems and Temperamental Factors .....	5
Empirical Foundations for Examining Emotion Regulation as a Mediator of Developmental Context and Adolescent Psychopathology .....	6
References .....	8
<b>II. ASSESSING ADOLESCENTS' INTERPERSONAL BEHAVIORS FOR MANAGING DISTRESS: THE MANAGING DISTRESS INTERPERSONALLY SCALE (MANDI)</b> .....	13
Abstract .....	14
Introduction .....	15
The Importance of Peers for Regulating Negative Affect .....	15
Theory and Methods of Managing Distress Interpersonally .....	16
Existing Measures .....	19
Implications of Interpersonal Distress Management Behaviors for Adolescent Functioning .....	20
Study One Hypotheses .....	21
Sample 1 Method .....	22
Preliminary Procedures .....	22
Participants and Procedure .....	22
Measures .....	23
Sample 1 Results .....	26
Romantic Partner Scale Descriptive Statistics .....	26
Romantic Partner Scale Reliability .....	26
Romantic Partner Scale Validity .....	28
Follow-Up Analysis: Gender Effects .....	30
Friends Scale Descriptive Statistics .....	30
Friends Scale Reliability .....	30
Friends Scale Validity .....	32
Follow-Up Analysis: Gender Effects .....	34
Follow-Up Analysis: Romantic Partners vs. Friends .....	34
Sample 1 Discussion .....	34
Sample 2 Method .....	37
Participants .....	37
Procedure .....	38
Measures .....	40
Sample 2 Results .....	44
Manipulation Check .....	44
Friends Descriptive Statistics .....	45



	Friends Scale Reliability.....	45
	Friends Scale Validity .....	46
	Sample 2 Discussion .....	48
	General Discussion and Future Directions .....	50
	References .....	52
	Appendix .....	61
III.	<b>EMOTION REGULATION AS A MEDIATOR OF ADOLESCENT DEVELOPMENTAL PROCESSES AND PROBLEM OUTCOMES</b> .....	71
	Abstract .....	72
	Introduction .....	73
	The Developmental Context and Emotion Regulation .....	74
	The Role of Physiology .....	75
	Developmental Context, Emotion Regulation, and Psychopathology .....	76
	Appraisals .....	78
	Summary and Hypotheses .....	79
	Method .....	80
	Participants .....	80
	Procedures .....	81
	Measures.....	84
	Results .....	90
	Preliminary Analyses .....	90
	Primary Analyses .....	92
	Post Hoc Analyses .....	99
	Discussion.....	103
	References .....	110
	Appendix .....	121
IV.	<b>GENERAL DISCUSSION</b> .....	147
	References .....	151
VITA	.....	152

## LIST OF TABLES

Table	Page
1. MANDI-Romantic Partners Scale Items .....	61
2. MANDI-Friends Scale Items .....	62
3. Study 1 Descriptive Statistics for Final Scales.....	63
4. Final Factor Loadings for MANDI-RP and –FR Items from CFA in Two Samples of Adolescents .....	64
5. Study 1 Correlations within the MANDI-RP (from CFA) .....	65
6. Study 1 Correlations between the MANDI-RP (Top) or MANDI-FR (Bottom) and Theoretically Related Scales .....	66
7. Study 1 Correlations within the MANDI-FR (from CFA) .....	67
8. Study 2 Descriptive Statistics.....	68
9. Study 2 Correlations within the MANDI-FR (from CFA) .....	69
10. Study 2 Partial Correlations between MANDI-FR Scales and Theoretically Related Scales (Controlling for Age, Gender, and Family Income) .....	70
11. Means and Standard Deviations of Study Variables .....	121
12. Correlations among Study Variables .....	122

## LIST OF FIGURES

Figure	Page
1. RSA Hypothesis 1: The Teen-Parent relationship will predict Emotion Regulation ..	126
2. RSA Hypothesis 2: Temperament will predict Emotion Regulation .....	127
3. RSA Hypothesis 3: The Teen-Parent Relationship and Temperament will predict Depression.....	128
4. RSA Hypothesis 4: Emotion Regulation Mediates the Teen-Parent Relationship and Temperament in predicting Depression.....	129
5. RSA Hypothesis 5: The Teen-Parent Relationship and Temperament will predict Teen Alcohol Problems .....	130
6. RSA Hypothesis 6: Emotion Regulation Mediates the Teen-Parent Relationship and Temperament in predicting Alcohol Problems (model failed to run) .....	131
7. RSA Hypothesis 7: The Teen-Parent Relationship and Temperament will predict Peer Aggression.....	132
8. RSA Hypothesis 8: Emotion Regulation Mediates the Teen-Parent Relationship and Temperament in predicting Aggression with Peers (model failed to run) .....	133
9. Cortisol Hypothesis 1: The Teen-Parent Relationship will predict Emotion Regulation .....	134
10. Cortisol Hypothesis 2: Temperament will Predict Emotion Regulation (model failed to run) .....	135
11. Cortisol Hypothesis 3: The Teen-Parent Relationship and Temperament will predict Teen Depressive Symptoms (model failed to run) .....	136
12. Cortisol Hypothesis 4: Emotion Regulation Mediates the Teen-Parent Relationship and Temperament in predicting Depression (model failed to run) .....	137
13. Cortisol Hypothesis 5: The Teen-Parent Relationship and Temperament will predict Teen Alcohol Problems (model failed to run) .....	138
14. Cortisol Hypothesis 6: Emotion Regulation Mediates the Teen-Parent Relationship and Temperament in predicting Alcohol Problems (model failed to run) .....	139
15. Hypothesis 7: The Teen-Parent Relationship and Temperament will predict Peer Aggression (model failed to run) .....	140
16. Cortisol Hypothesis 8: Emotion Regulation Mediates the Teen-Parent Relationship and Temperament in predicting Aggression with Peers (model failed to run) .....	141
17. Post-Hoc Test: Emotion Regulation Mediates the Relation between Developmental Factors and Depressive Symptoms.....	142
18. Post-Hoc Test: Emotion Regulation Mediates the Relation between Developmental Factors and Change in Depressive Symptoms Over Time .....	143
19. Post-Hoc Test: Emotion Regulation Mediates the Relation between Developmental Factors and Alcohol Problems .....	144
20. Negative Appraisals of Distress Tolerance Moderate the Effects of Lashing Out on Adolescent Alcohol Problems .....	145
21. Post-Hoc Test: Emotion Regulation Mediates the Relation between Developmental Factors and Peer Aggression .....	146

## **CHAPTER 1: GENERAL INTRODUCTION**

## **Theories of Emotion Regulation**

Adolescence is like a property inspection. It is a time when foundations are tested for their stability, limits are disputed and re-negotiated, and details are magnified. Personality and early experiences with caregivers lay the foundations for interpersonal relationships, and adolescence is the time when individuals first begin to test the stability of this foundation by establishing significant relationships outside of the family (Furman & Buhrmester, 1992). An adolescent's success in these new relationships is rooted in his or her ability to regulate emotional experiences, even as he or she spends increasing time away from direct contact with the caregivers who, in ideal circumstances, provided the foundations of emotion regulation. Emotion regulation has been defined in various ways, but for the purpose of this dissertation, it is defined as those mechanisms that serve to modulate, inhibit, and enhance emotional experiences and expressions, both effortfully and automatically (Calkins & Hill, 2007). Emotion regulation in and through social interactions with peers was recently proposed as a key developmental task of adolescence (Allen & Manning, 2007; Allen & Miga, 2010). The social regulation of emotion, its development, and impact on adolescent functioning are key components of Chapter 2 of this dissertation.

In less than ideal developmental circumstances, emotion regulation may fail to develop adequately, and adolescents may find themselves in states of periodic or chronic dysregulation that are implicated in adolescent internalizing and externalizing problems (see Chapter 3, for an extensive review). Morris and colleagues (2007) proposed a theoretical model that grounded emotion regulation between developmental circumstances and adolescent adjustment. Specifically, they emphasized the importance of emotion regulation as a mediating factor between multiple aspects of adolescent development (e.g. adolescent temperament, parenting,

attachment, and observational learning) and adolescent adjustment (including internalizing and externalizing symptoms; Morris, Silk, Steinberg, Myers, & Robinson, 2007). Emotion regulation as a mediator between developmental factors and adolescent psychopathology is the focus of Chapter 3 of this dissertation.

Using attachment theory as a guide, the development of emotion regulation is briefly reviewed below. Further, the interplay between adolescent temperament and the family system is also reviewed as far as its effect on the development of adolescent emotion regulation. Finally, the empirical literature documenting the complex relations between attachment, temperament, family environment, emotion regulation, and adolescent psychopathology are highlighted and pulled together under Morris and colleagues' (2007) "emotion regulation as mediator" model.

### **Attachment Theory and the Development of Emotion Regulation**

Attachment relationships are formed with important caregivers in the first year of life (Bowlby, 1969/1982). These relationships are specific partnerships characterized by 1) *proximity-seeking*, 2) using the attachment figure as a *secure base* from which to explore the environment, 3) seeking the attachment figure as a *safe haven* in times of distress, and 4) *protest* at times of forced separation (Ainsworth, 1989; Bowlby, 1969/1982). Based on repeated experiences with sensitive and responsive caregivers, individuals develop a sense of secure attachment (Ainsworth, Bell, & Stayton, 1971; Ainsworth, Blehar, Waters, & Wall, 1978; Mikulincer, Shaver, & Pereg, 2003). Insecure attachments result when there is caregiver misattunement or lack of responsiveness to infant signals (Ainsworth et al., 1978).

Once formed, these attachment styles tend to be stable through early adulthood, via increasingly complex cognitive representations of interactions with caregivers (Fraley, 2002).

Eventually, attachment becomes an internalized construct, and adolescents approach new relationships based on their previous experiences and internalized models of how relationships work (Bowlby, 1969/1982; Shaver & Mikulincer, 2002). Securely attached adolescents are generally able to use these internalized models to self-regulate their emotions, and are also able to seek out others for assistance with self-regulation (Allen, 2008; Shaver & Mikulincer, 2002).

Insecurely attached adolescents are less able or unable to self-regulate their emotions.

Adolescents who are preoccupied with respect to their attachment relationships (also called anxiously attached) vigilantly monitor signs of threat and cling to others who may be a source of emotion regulation, which others may find overwhelming (Cassidy & Kobak, 1988; Mikulincer, Shaver, & Pereg, 2003). Dismissing (or avoidantly attached) adolescents expect others to be unavailable to help them cope with emotions, and defensively avoid others as a self-protective measure (Cassidy & Kobak, 1988; Mikulincer et al., 2003; Shaver & Mikulincer, 2002).

In adolescence, cognitive developments, specifically the new capacity for formal operational thinking, allow for abstract reasoning about feelings and a more comprehensive picture of one's own and others' emotional experiences (Allen & Land, 1999; Piaget, 1947). Adolescence research tends to support the theory that attachment security is associated with better emotion regulation in adolescence (Kobak & Sceery, 1988). For example, when angered, securely attached adolescents tend to use anger constructively and as a problem-solving tool, even when solving relationship problems (Zimmerman, Maier, Winter, & Grossman, 2001). When experimenting in the new and highly emotionally charged arena of sexuality, securely attached adolescents tend to experience fewer negative and more positive emotions during sexual encounters than insecurely attached adolescents (Tracy, Shaver, Albino, & Cooper, 2003). Alternatively, attachment insecurity is linked to general deficits in regulating negative affect

(Mikulincer, 1998; Rosenstein & Horowitz, 1996). For example, insecurely attached adolescents' anger may be more intense, out of control, and disruptive to their peer relationships and to their ability to muster cognitive resources (Mikulincer, 1998; Zimmerman, Maier, Winter, & Grossman, 2001).

### **Family Systems and Temperamental Factors**

**Family Systems.** Bowen's (1985) family systems theory provides a model whereby adolescents and parents have mutual influence on each other throughout the development process. Intrapersonally, a well-differentiated adolescent is able to separate thinking and feeling, and is able to do both spontaneously and adaptively, whereas interpersonally, a well-differentiated adolescent is able to separate his or her thoughts and feelings from those of the parents, and take definite positions on issues (Bowen, 1985). Undifferentiated adolescents have trouble separating thoughts and feelings, are often psychologically overwhelmed by what they feel, and may be enmeshed with their parents' emotions. Empirically, adolescents who were triangulated into parental conflict were more emotionally reactive one year later (Buehler & Welsh, 2009). Alternatively, cohesive and flexible family environments that provide warmth without excessive enmeshment may provide sufficient conditions to help adolescents regulate emotions and explore autonomy in emotion regulation with peers.

**Temperament.** Not all emotion regulation is a result of parenting or relational factors. Temperament is one factor that strongly predicts children's and adolescents' emotion regulation (Wills, Gibbons, & Brody, 2000). In general, child and adolescent temperament is defined as the set of inborn, biologically established behavioral characteristics that determine how easy or difficult a child is to parent (Belsky & Jaffee, 2006). There are several classification systems for infant temperament – the earliest and most recognizable being that of Thomas and Chess (1977).



Infant irritability, adaptability, rhythmicity and soothability are among the most relevant dimensions of temperament for emotion regulation (Rothbart & Sheese, 2007). Temperamental negativity in infancy is associated with difficulty regulating emotions, as measured by infant behaviors and biological measures (e.g., heart-rate variability, cortisol, EEG, and parasympathetic regulation; see Fox & Calkins, 2003; Calkins & Hill, 2007, for reviews).

Although infant temperament is theorized to remain stable throughout the life course, there are few studies of adolescent emotion regulation that specifically include adolescent temperament.

### **Empirical Foundations for Examining Emotion Regulation as a Mediator of Developmental Context and Adolescent Psychopathology**

Attachment, temperament, and broader family relationships are implicated in the development of adolescent internalizing symptoms (Allen, Porter, McFarland, McElhaney, & Marsh, 2007; Allen, Moore, Kuperminc, & Bell, 1998; Franck & Beuhler, 2007; Margolese, Markiewicz, & Doyle, 2005; Rosenstein & Horowitz, 1996; Weitzman, 2006; Buehler & Welsh, 2009) and externalizing behaviors (Allen, Moore, Kuperminc, & Bell, 1998; Bartle & Sabatelli, 1989; Franck & Beuhler, 2007; Rosenstein & Horowitz, 1996; Richmond & Stocker, 2006; Volk, Edwards, Lewis, & Sprenkle, 1989). Emotional over- and under-regulation are also associated with internalizing and externalizing symptoms in young people (Cole, Michel, & Teti, 1994; Eisenberg et al., 2000; John & Gross, 2007; Mullin & Hinshaw, 2007). Furthermore, links between emotion regulation and developmental psychopathology have been explored from self-report, observational, and physiological perspectives (for a more nuanced review of these systems, please see Chapters 2 and 3). Finally, Yap and colleagues (2010) recently published empirical findings indicating that emotion regulation mediated links between developmental context and adolescent depression.

**The present set of studies.** The goal of the current dissertation project is to partially test the “emotion regulation as mediator” model, by locating emotion regulation as a mediator between adolescent developmental factors (including adolescent-parent relationships and adolescent temperament) and psychological problems (including internalizing and externalizing symptoms). This proposed project involves two stand-alone studies. The first paper is a psychometric study of a new survey measure of social emotional regulation. The second paper empirically tests the mediating effects of adolescent emotion regulation proposed above, using the new survey instrument as one measure of emotion regulation. The major hypotheses of the proposed project are: 1) that social regulation of emotion in adolescents is measurable and will be associated with established measures of intrapersonal emotion regulation, relationship functioning, and adjustment, and 2) that associations between adolescent developmental factors and psychological problems will be mediated, at least in part, by adolescents’ emotional regulatory capacities.

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**CHAPTER 2: ASSESSING ADOLESCENTS' INTERPERSONAL BEHAVIORS FOR  
MANAGING DISTRESS: THE MANAGING DISTRESS INTERPERSONALLY SCALE  
(MANDI)**

**ABSTRACT**

Interpersonal or social regulation of emotion in adolescence is emerging as an important area in adolescent development, yet research instruments assessing adolescent strategies for managing distress interpersonally with same-age peers are currently lacking. The present series



of studies tested the reliability and validity of a measure assessing adolescents' interpersonal distress management (MANDI) with peers and romantic partners in two samples of adolescents. Study 1 assessed late adolescents (ages 18-19) and Study 2 assessed middle to late adolescents (ages 14-17) and one of their parents. In Study 1, adolescents completed the MANDI scales and comparison measures of attachment security, emotion regulation, and psychological functioning. In addition, in Study 2, adolescents also completed a laboratory stress task, and parents completed a survey of adolescent temperament. Subscales of the MANDI-Romantic Partner and MANDI-Friends were related in expected ways to attachment security, emotion regulation, stress response, and temperament. Further, the MANDI scales cross-sectionally predicted adolescent prosocial behavior, internalizing, and externalizing problems. We conclude that the MANDI-RP and MANDI-FR are reliable and valid measures for assessing adolescent interpersonal distress management.

## **INTRODUCTION**

Distress is an inevitable aspect of the human experience, and adolescents are in a unique developmental position regarding the management of distress. The cognitive, physiological, and relational changes that emerge during adolescence allow for adolescents to think abstractly about

distress for the first time. Further, these changes allow adolescents more frequent and diverse opportunities to experience and manage distress. Prior to adolescence, soothing of distress is primarily provided by a parent or other more mature caregiver (Bowlby, 1969/1982). During adolescence, parents are still primary attachment figures, yet there is a co-existing push to seek autonomy from parents and create intensified bonds in close peer relationships (Buhrmester, 1996; Collins, van Dulmen, Crouter, & Booth, 2006; Furman & Buhrmester, 1992; Hartup, 1992; Hill & Holmbeck, 1986). At moderate levels of distress, adolescents are likely to turn to peers rather than parents for support (Allen & Land, 1999; Furman & Buhrmester, 1992). The purpose of this paper is to describe a newly developed instrument for assessing the ways in which adolescents involve peers and romantic partners as they attempt to manage distress.

### **The Importance of Peers for Regulating Negative Affect**

During adolescence, peers and romantic partners become an increasingly important source of emotional support (Furman & Buhrmester, 1992). Emerging research suggests that adolescents may even view the meaning of romantic partners' behaviors as essentially identical to the meanings of their own behaviors (Welsh & Dickson, 2007). Accordingly, negotiating emotion regulation in and through social interactions with same-age peers may be a key developmental task of adolescence and beyond (Allen & Manning, 2007). Seeking close contact with a trusted other during times of threat is an essential component of attachment relationships (Ainsworth, 1989; Bowlby, 1969/1982), and the degree of security in adolescents' attachment states of mind may be analogous to adolescent social emotion regulation capacities (Allen & Miga, 2010). Therefore, attachment theory provides a useful framework for identifying relevant distress management behaviors. Whereas peers may or may not serve as primary attachment figures during adolescence, they do begin to serve some attachment functions, such as a safe

haven in times of threat (Allen, 2008). In addition, peers and romantic partners may be involved in meeting the adolescent's need for peer affiliation and sexual exploration, two components of the Affectional Systems Model proposed by Harlow and Harlow (1965) and elaborated by Bowlby (1969/1982). The attachment, affiliation, and sexual systems provide a guiding framework for the present series of studies that examine a new measure of adolescents' interpersonal distress management behaviors.

### **Theory and Methods of Managing Distress Interpersonally**

**Attachment-related behaviors.** Internal working models based on attachment relationships influence individuals' support- and proximity-seeking behaviors when distressed (see Mikulincer & Shaver, 2008, for review). According to attachment theory, securely attached adolescents should seek support and closeness from peers when moderately distressed (see Mikulincer & Shaver, 2002), and indeed, securely attached adolescents in distress are more likely than insecure adolescents to effectively seek and receive support from their social networks (Seiffge-Krenke & Beyers, 2005). Secure late adolescents and young adults also engage in and are able to be soothed by proximity-seeking when distressed (McGowan, 2002; Mikulincer & Florian, 1997). Alternatively, distressed adolescents with insecure representations of attachment relationships would likely expect peers to be unavailable, unresponsive, and/or hold malicious intentions. Anxiously attached individuals, who are vigilant to signs of threat and potential abandonment (see Mikulincer & Shaver, 2003), tend to alert romantic partners to their distress by using non-verbal signals, such as crying, pouting, and sulking (Collins & Feeney, 2000). Anxiously attached individuals are also inclined to intensify their distress signals over time, which may escalate into angry protests (Mikulincer & Shaver, 2003). Avoidantly attached adolescents, who expect others to be unavailable during times of distress (see Mikulincer &

Shaver, 2003), are less likely to seek proximity or support when distressed, and may instead withdraw from peers (Collins & Feeney, 2000; Fraley & Shaver, 1998). In summary, attachment theory and research point to some specific peer-directed behaviors that distressed adolescents are differentially likely to engage in depending on their attachment style, including proximity seeking (both verbal and nonverbal), support seeking, anger, and withdrawal from peer interaction.

**Active Affiliation.** Response Styles Theory (Nolen-Hoeksema, 1987, 1991) proposes that distracting oneself from negative affect states with pleasant activities can be an adaptive response to depressed mood. Nolen-Hoeksema (1991) specifically mentions engaging in social activities with friends as a potentially effective, engrossing, and positively reinforcing behavior. Peer pressure peaks during adolescence (Berndt, 1979), and despite its bad reputation, peer pressure also encourages adolescents to engage in positive affiliative behaviors (for review, see Brown, Bakken, Ameringer, & Mahon, 2008). Thus, engaging in social activities with peers when distressed may be a particularly adaptive strategy for managing negative affect. However, the quality and characteristics of socializing with peers are important. Adolescents who spend time with friends excessively discussing their problems, or co-ruminating, may be at higher risk for depression and anxiety (Rose, Carlson, & Waller, 2007), whereas engaging in active behaviors together may be a protective factor for internalizing problems (for review, see Lejuez, Hopko, Acierno, Daughters, & Pagoto, 2011). Therefore, the current series of studies specifically targets time spent with friends doing activities.

**Sexual behavior.** Bowlby (1969/1982) proposed that attachment and sexuality are separate but related behavioral systems necessary for human survival. Research suggests that, among anxiously attached individuals in particular, sexuality may be confused with attachment

or used as a primary means of emotional closeness, reassurance, and stress reduction with romantic partners (Birnbaum, 2007; Davis, Shaver, & Vernon, 2004; Little, McNulty, & Reeder, 2008). Anxiously attached adolescents report that their goals for engaging in sexual behavior are to enhance emotional connection and prevent partner abandonment (Tracy, Shaver, Albino, & Cooper, 2003). Therefore, for adolescents who struggle with regulating distress, seeking sexual contact with a partner may be an interpersonal alternative to other forms of closeness or support seeking. However, this may be a maladaptive strategy for regulating emotions, as they are also less likely to experience sex as intimate or pleasurable (Tracy et al., 2003).

**Summary of Target Behaviors.** To summarize, distressed adolescents may react to distress by engaging with or disengaging from same-age peers in specific, measurable ways. First, adolescents may seek closeness and support through direct bids, such as overt support- or proximity-seeking, or through more indirect bids, such as seeking physical proximity through nonverbal means. In this study, we decided to link direct support- and proximity-seeking, because talking to an important peer from a distance or even imagining an important peer may lead to feelings of closeness (McGowan, 2002). Second, adolescents with a history of feeling thwarted in their attempts to become close to others may lash out at peers or romantic partners or withdraw socially. Third, adolescents may seek distraction from distress via social activities with peers and romantic partners. Finally, some adolescents may confuse sexual excitement or activity with soothing, and may engage with peers in sexual activity when distressed.

### **Existing Measures**

At this time, we are unaware of any self-report measure that assesses adolescent interpersonal strategies for managing distress. Existing measures of adolescent emotion regulation, distress tolerance, and self-regulation tend to focus on responses within the

individual. For example, existing measures assess adolescents' emotional awareness and clarity, cognitive appraisals of distress, capacity to regulate negative emotions, and self-blame for negative emotional states (d'Acremont & Van der Linden, 2007; Neumann, van Lier, Gratz, & Koot, 2010). One measure of adolescent responses to negative emotions includes behaviors, including self-distraction and delay of gratification (Moilanen, 2007); however, it does not include an assessment of ways adolescents may involve same-age peers in the regulation process. The existing studies of interpersonal regulation of emotion in adolescence use observed and coded interactions of adolescents with their close friends or romantic partners (e.g., Allen, Insabella, Porter, Smith, Land, & Phillips, 2006; Furman & Simon, 2006; Shulman, Tuval-Mashiach, Levrán, Anbar, 2006; Welsh & Dickson, 2007). These studies are rich in information and behavioral detail, but are not always feasible due to time and fiscal constraints on researchers. In addition, observational studies are more difficult to replicate across coders and research groups, whereas self-reports may be shared between researchers with relative ease. Further, clinicians may wish to assess an adolescent's ability to regulate his or her emotions in the context of peers as part of an overall assessment of his or her functioning.

The stress and coping literature delineates individuals' responses to problems in terms of problem-focused and emotion-focused coping (Folkman & Lazarus, 1985). Existing measures in this tradition, such as the COPE (Carver, Scheier, & Weintraub, 1989) assess some dimensions of interpersonal distress management, such as seeking instrumental social support (e.g., seeking advice), seeking emotional social support (e.g., seeking sympathy), and venting emotions. Although widely used, limitations of the COPE in terms of attachment theory include: it does not assess bids to seek proximity or differentiate between direct bids for support and indirect bids for support, it does not assess peer affiliation as a source of distraction, it does not assess venting

anger toward a specific person or group of people within the individual's social network, and the behavioral disengagement scale is directed at disengagement from problems rather than people. The current measure adds to the literature by including separate scales for direct and indirect social support/closeness-seeking, a scale assessing peer affiliation in activities, anger at specific members of the adolescent's social circle, and withdrawal from peers, all in the context of emotional distress.

### **Implications of Interpersonal Distress Management Behaviors for Adolescent Functioning**

There is ample evidence that poor regulation of negative emotions is strongly associated with individual dysfunction in adolescence. Specifically, poor emotion regulation in adolescence is associated with internalizing problems (Allen & Hare, 2007; Brody & Ge, 2001; Garnefski, Kraaij, Eten, 2005; Finkenauer et al., 2005; Lengua, 2003; Silk, Steinberg, & Morris, 2003), externalizing problems (Beauchaine, Gatzke-Kopp, Mead 2007; Brody and Ge, 2001; Garnefski, Kraaij, Eten, 2005; Mullin & Hinshaw, 2007; Penney & Moretti, 2010; Silk, Steinberg, & Morris, 2003), substance use (Brody and Ge, 2001; Colder and Chassin, 1997) and overall peer functioning (Eisenberg, Fabes, Guthrie, & Reiser, 2000). Based on this research, we posit that strategies intended to increase closeness, support, and positive interactions with peers during times of individual distress should be related to more positive functioning overall, whereas less adaptive strategies such as anger, withdrawal, and sex should be related to poorer functioning overall.

### **Study One Hypotheses**

This survey instrument is designed to examine multiple ways that adolescents may or may not engage with their peers when feeling emotionally distressed. This study assessed the

reliability and validity of a non-romantic Friends version of the scale and a Romantic Partner version, using two separate samples. Sample two only included the Friends version.

Six hypotheses were made about the scale:

1. There would be six distinct behavioral subscales: Direct Bids for Support/Closeness, Indirect Bids for Support/Closeness, Active Affiliation in Social Activities, Lashing Out, Withdrawal, and Sexual Behavior<sup>1</sup>.
2. Each subscale would show adequate internal consistency and test-retest reliability.
3. The Direct Bids, Indirect Bids, and Active Affiliation subscales would be positively associated with one another, negatively associated with attachment insecurity, and negatively associated with existing measures of poor self-regulation and distress tolerance.
4. The Direct Bids, Indirect Bids, and Active Affiliation subscales would have negative associations with measures of poor functioning and positive associations with measures of adaptive functioning.
5. The Lashing Out, Withdrawal, and Sex subscales would be positively associated with one another, with measures of attachment insecurity, and with existing measures of poor self-regulation and distress tolerance.
6. The Lashing Out, Withdrawal, and Sex subscales would be positively associated with measures of poor functioning and negatively associated with measures of adaptive functioning.

## **SAMPLE ONE METHOD**

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<sup>1</sup> Sexual Behavior was only assessed with Romantic Partners. Because of the fluidity of adolescent romantic/sexual experiences (e.g., Collins, Welsh, & Furman, 2009; Furman & Hand, 2006), the Romantic Partner scale specified that adolescents answer about a certain partner, whereas the Friends scale specified that adolescents answer about friends in general with whom adolescents were not involved in romantic or sexual behaviors.



### **Preliminary Procedures**

Before analyzing for statistical reliability and validity, an early version of the MANDI-RP version was distributed to a psychology research group made up of 15 male and female undergraduate students, Ph.D. graduate students, and faculty. Group members heard a presentation on the measure, which explained that the purpose of the measure was to assess behaviors in relationships in response to distress, and were then asked to read and reflect on the items and provide feedback on their face validity. This process helped to clarify the wording and narrow down the measure from 40 items to 33 items.

### **Participants and Procedure**

The sample consisted of 217 late adolescents (ages 18-19, 36% male, 12% minority, 97% heterosexual) recruited from a large Southeastern university to participate in a larger anonymous study of relationship attitudes and behaviors. Late adolescents received course credit to come to a private computer lab and fill out online surveys at two time points, spaced one week apart. Of the 217 adolescents who participated at Time 1, 169 reported having a romantic partner currently or in the past 6 months, and 136 (63%) returned to complete Time 2. One hundred two adolescents who reported having a romantic partner completed both time points. There were no significant differences in terms of age, gender, ethnicity, current socioeconomic status, overall distress tolerance, or depressive symptoms between the adolescents who participated fully and those who dropped out for Time 2, or between those with and without romantic partners.

Computer lab sessions lasted one hour at Time 1 and 30 minutes at Time 2. Sessions ranged from five to 16 participants per visit. The lab sessions were administered by a trained graduate or undergraduate research assistant who gave specific, standardized instructions. To protect confidentiality, participants were instructed to remain in their seats until all had

completed their surveys to prevent accidental viewing of others' responses, and non-participants were excluded from the lab. Further, participants' confidentiality and anonymity were protected in linking data from Time 1 to Time 2 by using a unique string of letters and numbers provided by participants at both time points. All participants provided informed consent and all procedures were approved by the University's IRB.

### Measures

**MANDI-Romantic Partner.** The MANDI-Romantic Partner (MANDI-RP) version asked adolescents to report how often they tend to engage in various behaviors with a romantic partner when “distressed or upset.” The final scale consisted of 28 items on a six-point Likert-type scale (1 = *never* to 6 = *always*) and 6 independent subscales. Each item began with the stem “When I’m distressed or upset...” (see Table 1 for a list of the items and subscales – all tables are listed in the Appendix). Seeking support and closeness was divided into direct and indirect subscales. Direct bids for closeness-seeking assessed different ways in which adolescents directly approached partners for closeness and support when distressed (e.g., “I ask my partner for suggestions on how to feel better”). Indirect bids closeness-seeking assessed ways that adolescents approached partners more indirectly or non-verbally for closeness and support (e.g., “I try to stay with my partner for as long as I can”). Rejecting closeness was divided into two separate scales to account for behaviors that push others away from the self and behaviors that remove the self from others. Lashing Out assessed adolescents' use of angry outbursts with their partners (e.g., “I say things to my partner out of anger that I later regret”). Withdrawal assessed adolescents' attempts to distance themselves from their partners (e.g., “I withdraw from my partner”). Active Affiliation assessed ways that adolescents initiated or joined in with social activities with their partners (“I make plans to do something active with my partner”). Sexual

contact-seeking assessed the extent to which adolescents engaged in sexual behavior in response to feeling distressed (e.g., “I try to get my partner to have sex with me”). Scores are determined using the mean of each subscale. The MANDI-Partner version was administered at Time 1 and Time 2.

**MANDI-Friends.** The MANDI-Friends (MANDI-FR) version was nearly identical to the partner version, but did not include the Sexual contact-seeking subscale, and instructions and all items were written to assess behaviors with close friends (see Table 2 for items). The MANDI-FR version was administered at Time 1 and Time 2.

**Demographic information.** A measure created for this project asked common demographic questions including participants’ gender, age, ethnicity, educational status, marital status, and romantic relationship status. The demographic form also asked participants to list the first three letters of the city where they were born, the month of their birth, their middle initial, and their shoe size as a way of anonymously linking Time 1 and Time 2 data.

**The Experiences in Close Relationships Scale (ECR).** The ECR (Brennan, Clark & Shaver, 1998) is a 36-item scale tapping variations in attachment anxiety (“I’m afraid that I will lose my partner’s love”) and attachment avoidance (e.g., “I find it difficult to allow myself to depend on romantic partners”). Participants rated the extent to which items described their feelings in close relationships on a 7-point Likert scale (1 = *strongly disagree* to 7 = *strongly agree*). The ECR was administered at Time 1 with adequate internal consistency, anxiety  $\alpha = .94$ , avoidance  $\alpha = .91$ .

**The Distress Tolerance Scale (DTS).** The DTS (Simons & Gaher, 2005) is a 15-item scale that asked participants to think about times in the past they have felt distressed or upset (e.g., “feeling distressed or upset is unbearable to me”). Participants were asked to rate

statements about overall distress tolerance, distress absorption, distress appraisals, and emotion regulation on a 5-point Likert scale (1 = *strongly agree* to 5 = *strongly disagree*). The DTS was administered at Time 1. Only mean overall distress tolerance,  $\alpha = .90$ , and distress appraisal,  $\alpha = .81$ , were used in the current study.

**Centers for Epidemiological Studies Depression Scale (CES-D).** The CES-D (Radloff, 1977) was completed at Time 1. Participants responded to 20 items describing symptoms experienced during the past week on a four point scale (0 = *less than 1 day*, 1 = *1–2 days*, 2 = *3–4 days*, 3 = *5 or more days*). Scores were summed and ranged from 0 to 60, with higher scores indicating more severe depressive symptoms. According to the scale’s author, scores ranging from 0 to 15 reflect depressive levels found in the general population, scores ranging from 16 to 38 are considered “at risk,” and scores above 39 resemble depressed patients in a clinical population (Radloff, 1977). In the present sample, the scores ranged from 20 to 72, with  $\alpha = .90$ .

**The Adolescent Self Regulatory Inventory (ASRI).** The ASRI (Moilanen, 2007) is a 27-item instrument assessing self regulation on two scales: short- and long-term regulation. Capacities for short- and long-term regulation include several domains including behavior, cognition, emotions, and attention (e.g., “Little problems detract me from my long-term plans,” “I lose control whenever I don’t get my way.”) Items were rated on a 5-point Likert scale (1 = *not at all true for me* to 5 = *very true for me*). The ASRI was administered at Time 1, with short-term  $\alpha = .65$  and long-term  $\alpha = .76$ .

## SAMPLE ONE RESULTS

### Romantic Partner Scale Descriptive Statistics

Please see Table 3 for means and standard deviations for all variables in Study 1.

### Romantic Partner Scale Reliability

**Romantic Partner Scale Internal Consistency.** The six romantic partner (RP) subscales were assessed for internal consistency using Cronbach's alpha (see Appendix A for exact items). The following describes the procedure for eliminating items with poor internal consistency with the theoretically derived subscales. The Direct Bids scale was originally comprised of eight items,  $\alpha = .82$ . Upon examining the alpha if items were deleted, item 25 was dropped, which improved internal consistency,  $\alpha = .83$ . The Indirect Bids scale was originally comprised of five items,  $\alpha = .77$ . Due to the slightly low internal consistency, items were examined to determine if the model fit could be improved by deleting any items. Upon examining the alpha if items were deleted, it was determined that items 14 and 21 contributed poorly to internal consistency, and were dropped from the Indirect Bids subscale, improving the internal consistency,  $\alpha = .84$ . The Active Affiliation scale was originally comprised of four items,  $\alpha = .82$ . None of the items stood out as poorly contributing to internal consistency, however, item 27 was eliminated because "hanging out" was deemed too vague to sufficiently describe an active behavior. The resulting internal consistency for Active Affiliation remained adequate,  $\alpha = .77$ . The Lashing Out scale was originally comprised of five items,  $\alpha = .79$ . Upon examining the alpha if items were deleted, it was determined that item 4 had poor variability and contributed poorly to internal consistency. After removing this item, internal consistency for the Lashing Out scale was adequate,  $\alpha = .82$ . The Withdrawal scale was originally comprised of five items,  $\alpha = .84$ . Due to adequate internal consistency, no items were deleted. The Sex scale was originally comprised of five items,  $\alpha = .69$ . Upon examining items 2 and 23, we decided to delete them from the scale because of poor face validity (e.g., a hug or back rub could be physically comforting with or without sexual contact). Dropping items 2 and 23 led to improved internal consistency,  $\alpha = .80$ .

**Romantic Partner Scale Confirmatory Factor Analysis.** After determining internal consistency for the individual RP subscales, a Confirmatory Factor Analysis (CFA) was completed using AMOS 17 (Arbuckle, 1999). To test model fitness, we examined several fit indices, including a  $\chi^2/df \leq 2$  (Wheaton, Muthén, Alwin, & Summers, 1977); CFI  $\geq .95$  (Hu & Bentler, 1999); and RMSEA  $< .05$  = good, RMSEA  $.05 - .08$  = reasonable or acceptable; RMSEA  $.08 - .10$  = mediocre; and RMSEA  $\geq .10$  = poor (Browne & Cudeck, 1993; MacCallum, Browne, & Sugawara, 1996). Each theoretically determined subscale was entered as a latent variable with scale items entered as observed variables. Model fit statistics for the RP scales were initially inconsistent, with an acceptable  $\chi^2/df$  ratio:  $\chi^2 = 559.49$ ,  $df = 284$  (Wheaton, Muthén, Alwin, & Summers, 1977); poor CFI =  $.86$  (Hu & Bentler, 1999); and mediocre RMSEA =  $.08$  (90% CI =  $.07-.09$ ) (MacCallum, Browne, & Sugawara, 1996). Individual factor loadings were examined to understand poor model fit. Items 5, 18, 20, and 24 on the Direct scale were low compared to other Direct scale items. Item 29 from the Lash Out scale and item 28 from the Sex scale were also deleted for low relative factor loadings. After deleting the above items, indices of model fit were more consistently in the acceptable range,  $\chi^2 = 195.75$ ,  $df = 120$ ; with improved CFI =  $.94$  (Hu & Bentler, 1999); and reasonable RMSEA =  $.06$  (90% CI =  $.05-.08$ ) (Browne & Cudeck, 1993). This was a statistically significant change  $\Delta\chi^2 = 363.7$ ,  $\Delta df = 164$ ,  $p < .001$ . See Table 4 for final factor loadings. Final scale alphas for each scale after items were deleted were as follows: T1 Direct,  $\alpha = .73$ ; T1 Indirect,  $\alpha = .84$ ; T1 Active Affiliation,  $\alpha = .77$ ; T1 Lash Out,  $\alpha = .80$ ; T1 Withdrawal,  $\alpha = .83$ ; T1 Sex,  $\alpha = .84$ .

**Romantic Partner Scale Test-Retest Reliability.** First, internal consistencies were calculated for the Time 2 RP subscales, based on the changes made to the Time 1 RP subscales. All were in the adequate range, except for Direct, which was low and consistent with T1: T2

Direct,  $\alpha = .73$ ; T2 Indirect,  $\alpha = .89$ ; T2 Active Affiliation,  $\alpha = .88$ ; T2 Lash Out,  $\alpha = .85$ ; T2 Withdrawal,  $\alpha = .88$ ; T2 Sex,  $\alpha = .87$ . Next, correlations between Time 1 and Time 2 subscales were computed. Test-retest reliability was excellent for each of the six subscales Direct  $r = .74$ ,  $p < .001$ ; Indirect  $r = .78$ ,  $p < .001$ ; Active Active Affiliation  $r = .79$ ,  $p < .001$ ; Lash Out  $r = .71$ ,  $p < .001$ ; Withdrawal  $r = .73$ ,  $p < .001$ ; T2 Sex  $r = .75$ ,  $p < .001$ .

### **Romantic Partner Scale Validity**

**Validity within the Romantic Partner Measure.** The MANDI-RP subscales' relations with each other were analyzed using the correlations that emerged in the CFA analysis (see Table 5). These correlation values were estimated while accounting for relations among each of the other latent subscales. As expected, Direct Bids, Indirect Bids, and Active Affiliation were all positively correlated with one another. Further, these three scales were significantly negatively correlated with Withdrawal, conceptually the opposite of closeness-seeking, providing evidence for the discriminate validity of these scales. Indirect Bids, and Active Affiliation were weakly negatively correlated with Lashing Out. Lashing Out and Withdrawal were highly correlated with one another. The Sex subscale was unrelated to all other subscales.

**Romantic Partner Scale Concurrent Validity.** First, the MANDI-RP subscales were correlated with measures of attachment anxiety and avoidance, distress tolerance, and self-regulation. Results of these correlation analyses can be found in Table 6 (top). Making Direct Bids for Support was significantly negatively correlated with attachment anxiety,  $r = .13$ ,  $p < .05$ , and avoidance,  $r = -.51$ ,  $p < .001$ , consistent with predictions. The Indirect Bids for Support and Active Affiliation scales were also significantly negatively correlated with attachment avoidance,  $r = -.44$ ,  $p < .001$  and  $r = -.25$ ,  $p < .001$ , respectively, but were not significantly negatively correlated with anxiety. Individuals who did more Lashing Out at their partners

reported higher attachment anxiety and avoidance,  $r = .30, p < .001$  and  $r = .19, p < .01$ , respectively. Lashing Out was also significantly positively correlated with long-term self-regulation difficulties,  $r = .27, p < .001$ , difficulties overall with distress tolerance,  $r = .32, p < .001$ , and negative appraisals of one's ability to tolerate distress,  $r = .31, p < .001$ .

Withdrawing from a romantic partner during times of distress was positively correlated with attachment avoidance,  $r = .56, p < .001$ , and attachment anxiety,  $r = .34, p < .001$ . Withdrawal was also correlated with long-term self-regulation difficulties,  $r = .15, p < .05$ , poor distress tolerance,  $r = .24, p < .001$ , negative appraisals of one's ability to tolerate distress,  $r = .28, p < .001$ . Seeking sexual contact during times of distress was positively correlated with attachment anxiety,  $r = .19, p < .05$  and long-term self-regulation difficulties,  $r = 0.24, p < .01$ .

Next, depressive symptoms were regressed separately on the MANDI RP subscales. Age, sex, and socioeconomic status were controlled in all analyses. Direct bids, Indirect bids, and Active Affiliation did not significantly predict depressive symptoms. Lashing Out and Withdrawal predicted greater depressive symptoms,  $\beta = .25, t(161) = 3.31, p = .001, R^2_{\text{change}} = .06$ , and  $\beta = .20, t(157) = 2.57, p = .01, R^2 = .04$ , respectively. Sex trended toward predicting greater depressive symptoms,  $\beta = .15, t(157) = 1.93, p = .06, R^2_{\text{change}} = .02$ .



### Follow-Up Analysis: Gender Effects

There is a rich research literature on similarities and differences in coping styles among males and females, most of which first emerge during adolescence. Coping with distressing feelings emotions tends to show particular gender differences, with female adolescents engaging in more rumination and emotions-focused coping and males engaging in more problem-solving and distracting strategies (Nolen-Hoeksema, 1987, 1991). Further, observational studies of heterosexual and homosexual couples' disagreements reveal that women tend to do more demanding of their partners, whereas men do more withdrawal (e.g., Baucom, McFarland, & Christensen, 2010; Christensen, Noller, & Fitzpatrick, 1988). For these reasons, we conducted post-hoc analyses testing for gender differences within MANDI-RP subscales. Females engaged more often in Direct bids,  $t(164) = -5.05, p < .001$  ( $M_{females} = 4.19, M_{males} = 3.41$ ); Indirect bids,  $t(162) = -2.98, p < .01$  ( $M_{females} = 4.01, M_{males} = 3.54$ ); and Active Affiliative strategies,  $t(166) = -3.04, p < .01$  ( $M_{females} = 3.63, M_{males} = 3.17$ ) than males. Males tended to use more Withdrawal,  $t(158) = 1.33, p < .05$  ( $M_{females} = 2.33, M_{males} = 2.52$ ) than females. There were no sex differences for Lashing Out or Sex.

### Friends Scale Descriptive Statistics.

Please see Table 1 for means and standard deviations for all study variables.

### Friends Scale Reliability

**Friends Scale Internal Consistency.** The five friend (FR) subscales were assessed for internal consistency using Cronbach's alpha. The following describes the procedure for eliminating items with poor internal consistency with the theoretically derived subscales. The Direct Bids scale was originally comprised of nine items,  $\alpha = .89$ . Although item 2 was internally consistent with the other items, it was deleted for two reasons. First, it was difficult to

reconcile it theoretically with the other items in the Direct Bids scale, and second, the frequency data was highly skewed for male participants, who predominantly reported that they never or almost never asked their friends for a hug when distressed or upset. After deleting item 2, the internal consistency remained adequate,  $\alpha = .87$ . The Indirect Bids scale was originally comprised of five items,  $\alpha = .78$  and item analysis revealed that deleting items would not result in better internal consistency. The Active Affiliation scale was originally comprised of four items,  $\alpha = .86$ . None of items stood out as poorly contributing to internal consistency; however, item 24 was eliminated because “hanging out” was deemed too vague to sufficiently describe an active behavior. The resulting internal consistency for Active Affiliation remained good,  $\alpha = .81$ . The Lashing Out scale was originally comprised of five items,  $\alpha = .76$ . Upon inspection of item frequencies, we deleted item 4 (“I try to make my friends feel as upset as I feel”), because 88% of participants endorsed that they had never or almost done this. The resulting internal consistency for Lashing Out remained adequate,  $\alpha = .72$ . The Withdrawal scale was originally comprised of five items,  $\alpha = .80$ . None of the items stood out as poorly contributing to internal consistency, so none were deleted.

**Friends Scale Confirmatory Factor Analysis.** After determining internal consistency for the individual FR subscales, a Confirmatory Factor Analysis (CFA) was completed using AMOS 17 (Arbuckle, 1999). Each theoretically determined subscale was entered as a latent variable with scale items as observed variables. Model fit for the initial FR scales was poor,  $\chi^2 = 1051.70$ ,  $df = 314$  (Wheaton et al., 1977),  $P < .001$ ;  $CFI = .77$  (Hu & Bentler, 1999);  $RMSEA = .11$  (MacCallum et al., 1996). Inspection of the results revealed several items with conspicuously low regression estimates. Specifically, in the Direct scale, item 22 ( $\beta = .36$ ); Indirect scale, item 13 ( $\beta = .31$ ) and item 20 ( $\beta = .36$ ); Lash Out scale, item 25 ( $\beta = .43$ );

Withdrawal scale, item 28 ( $\beta = .37$ ); with all other estimates ( $\beta > .55$ ). Dropping these five items resulted in fair overall model fit  $\chi^2 = 343.79$ ,  $df = 160$ ,  $CFI = .92$ ;  $RMSEA = .07$  (90% CI = .06-.09), with  $\Delta\chi^2 = 707.91$ ,  $\Delta df = 154$ ,  $p < .001$ . However, due to the low CFI (Hu & Bentler, 1999), items were examined once more. Item 23 from the Direct scale ( $\beta = .68$ ) and item 9 ( $\beta = .73$ ) from the Withdrawal scale were deleted due to low regression estimates compared to other items within their respective scales. Dropping these two items resulted in a marginally higher  $CFI = .93$ , with other fit statistics of  $\chi^2 = 260.05$ ,  $df = 125$ ;  $RMSEA = .07$  (90% CI = .06-.08);  $\Delta\chi^2 = 83.74$ ,  $\Delta df = 35$ ,  $p < .001$ . Further attempts to improve model fit by deleting items with low relative regression weights led to reductions in model fit.

Internal consistency was recalculated for each of the scales with deleted items, and remained adequate: Direct,  $\alpha = .88$ ; Indirect,  $\alpha = .85$ ; Active Affiliation,  $\alpha = .81$ ; Withdrawal,  $\alpha = .83$ ; and Lashing Out,  $\alpha = .72$ . All factor loadings were in acceptable ranges (see Table 4).

**Friends Scale Test-Retest Reliability.** First, internal consistencies were calculated for the Time 2 MANDI-FR subscales based on the changes made to the Time 1 subscales. All were in the adequate range: T2 Direct,  $\alpha = .89$ ; T2 Indirect,  $\alpha = .91$ ; T2 Active Affiliation  $\alpha = .87$ ; T2 Lash Out  $\alpha = .79$ ; T2 Withdrawal  $\alpha = .87$ . Next, correlations between Time 1 and Time 2 subscales were computed. Test-retest reliability was adequate for each of the six subscales: T1 to T2 Direct  $r = .86$ ,  $p < .001$ ; T1 to T2 Indirect  $r = .75$ ,  $p < .001$ ; T1 to T2 Active Affiliation  $r = .75$ ,  $p < .001$ ; T1 to T2 Lash Out  $r = .64$ ,  $p < .001$ ; T1 to T2 Withdrawal  $r = .66$ ,  $p < .001$ .

### **Friends Scale Validity**

**Validity within the Friends Scale.** MANDI-FR subscales' relations with each other were analyzed using the correlations that emerged in the CFA analysis (see Table 7). These correlation values were estimated while accounting for relations among each of the other latent

subscales. As expected, Direct bids, Indirect bids, and Active Affiliation were positively correlated with one another. Direct bids, Indirect bids, and Active Affiliation were all negatively correlated with Withdrawal, but unrelated to Lashing Out. Lashing Out and Withdrawal were positively correlated with one another.

**Friends Scale Concurrent Validity.** First, the MANDI-FR subscales were correlated with measures of attachment anxiety and avoidance, distress tolerance, and self-regulation. Results of these correlation analyses can be found in Table 6 (bottom). Making Direct Bids for Support was significantly negatively correlated with Attachment Avoidance,  $r = -.23, p < .01$ . Indirect Bids for Support/Closeness was weakly positively correlated with attachment anxiety,  $r = .14, p < .05$ , and poor distress tolerance,  $r = .15, p < .05$ . Active Affiliation was weakly negatively correlated with Attachment Avoidance,  $r = -.14, p < .05$ , Long-Term Self-Regulation difficulties,  $r = -.18, p < .01$ . Lashing Out was associated with greater Attachment Anxiety,  $r = .29, p < .001$ , and Attachment Avoidance,  $r = .29, p < .001$ . Lashing Out was also positively correlated with Long- and Short-Term Regulation difficulties,  $r = .47, p < .001$  and  $r = .21, p < .001$ , respectively, poor distress tolerance,  $r = .18, p < .01$ , and negative Appraisals of one's ability to tolerate distress,  $r = .22, p < .001$ . Withdrawal from friends when under distress was positively correlated with Attachment Avoidance,  $r = .25, p < .001$ , poor distress tolerance,  $r = .15, p < .05$ , negative distress appraisals,  $r = .17, p < .001$ , and poor long-term regulation,  $r = .22, p < .001$ .

Next, depressive symptoms were regressed separately on the MANDI FR subscales. Age, sex, and socioeconomic status were controlled in all analyses. Only Withdrawal predicted greater depressive symptoms,  $\beta = .19, t(205) = 2.69, p < .01; R^2_{\text{change}} = .03$ .

### Follow-Up Analysis: Gender Effects

For reasons listed above in the MANDI-RP results, we conducted post-hoc analyses testing for gender differences within MANDI-FR subscales. With friends, females tended to use more Direct bids,  $t(206) = -7.70, p < .001$  ( $M_{females} = 3.65, M_{males} = 2.63$ ); Indirect bids,  $t(204) = -4.08, p < .001$  ( $M_{females} = 3.84, M_{males} = 3.26$ ); and Active Affiliation,  $t(204) = -3.85, p < .001$  ( $M_{females} = 3.86, M_{males} = 3.32$ ), than males. There were no sex differences for Withdrawal or Lashing Out with friends.

### Follow-Up Analysis: Romantic Partners vs. Friends

To examine similarities and differences in the ways adolescents behaved with romantic partners and friends when distressed, mean differences between friends and romantic partners were tested using independent samples T-tests (two-tailed, because we did not have specific predictions about specific subscales). Participants reported making more Direct and Indirect bids for closeness with romantic partners than friends,  $t(156) = 7.27, p < .001$ ;  $t(153) = 2.16, p < .05$ , respectively (see Table 5 for means), but engaged in more Active Affiliation with friends than romantic partners,  $t(156) = -3.37, p < .001$ . Late adolescents in distress did more Lashing Out with romantic partners than with friends,  $t(154) = 7.67, p < .001$ . There were no differences across measures for withdrawal.

## SAMPLE ONE DISCUSSION

In Study One, Sample One, we assessed the validity of the MANDI-Romantic Partner and MANDI-Friends scales with a sample of 18- and 19-year old late adolescents in their first or second year at a large Southeastern University. The results provided partial preliminary support for our hypotheses. The items of both MANDI versions loaded onto the expected factors: Direct Bids for Closeness/Support, Indirect Bids for Closeness, Active Affiliation, Lashing Out,

Withdrawal, and Sex (RP only). Overall, these scales showed good internal consistency, factor structure, and test-retest reliability. One exception was the MANDI-RP Direct bids subscale, which had poorer than expected internal consistency. This may be because adolescent romantic relationships are experienced as relatively temporary with more emphasis on affectionate and sexual behaviors than declarative statements of emotional needs. On both versions of the scale, Direct Bids, Indirect Bids, and Active Affiliation were associated with one another and with Withdrawal in the expected ways. In the Romantic Partner version, Indirect Bids was related to Lashing Out in the expected direction. Lashing Out and Withdrawal were related to each other in the expected way, and Lashing Out was also positively correlated with Sex-seeking. Unexpectedly, Direct Bids and Active Affiliation were not related to Lashing Out.

In comparing the MANDI-RP subscales to other related constructs, they performed mostly as hypothesized. The subscales tapping into nonsexual methods of seeking support and closeness were associated with greater attachment security. The scales tapping into different methods of pushing away from closeness were positively related to problems with distress tolerance and self-regulation, and attachment insecurity. As expected, seeking sexual contact when distressed was positively correlated with attachment anxiety and problems in self-regulation. The MANDI-FR subscales performed similarly, with one exception: Indirect bids was positively related to attachment anxiety. This may be because both indirect approaches to gaining closeness and attachment anxiety include by definition aspects of clinginess or vigilance to the behaviors of the other(s) in the relationship. It may also reflect that the measure of attachment security assessed romantic attachments, and thus may have been a poor measure for comparing to the MANDI-FR.

In comparing the MANDI-RP and -FR scales to depressive symptoms, as expected, the scales tapping into different methods of pushing away from closeness and sexual contact-seeking under distress were associated with greater depressive symptoms. Although we expected support/closeness-seeking behaviors to predict fewer self-reported depressive symptoms, this finding did not emerge. The reasons for this are unclear. It may be that the behaviors assessed by the MANDI relate directly to indexes of functioning, such that strategies assumed to be healthy for social regulation of emotion may only relate to positive outcomes, and strategies assumed to be maladaptive only relate to negative outcomes. For example, developmentally adaptive methods of interpersonal distress management, such as seeking closeness with peers at a time when peer importance mushrooms, may better predict other measures of healthy functioning, such as social competence. Alternatively, the findings from Study 1 are consistent with the hypothesis that the MANDI scales assessing less adaptive methods of interpersonal distress management, such as seeking sexual contact or rejecting/withdrawing from peers, may be specifically related to dysfunction. It is unclear from the findings presented so far if this dysfunction is limited to internalizing problems, or if it extends to externalizing problems as well.

Follow-up analyses revealed gender and peer type differences in the MANDI scales. Rather than problematic, these findings seem consistent with what we know of adolescent close relationships. Specifically, females were more likely than males to seek support and closeness with friends and romantic partners, and males were more likely to withdraw from romantic partners than females. These findings are consistent with findings that females use more closeness-seeking and males use more distancing in arguments with romantic partners (Baucom, McFarland, & Christensen, 2010). Overall, the late adolescents in this sample were more likely

to engage in Direct bids, Indirect bids, and Lashing Out with romantic partners than friends, but were more likely to engage in Active Affiliation and Withdrawal with friends than partners. These findings are consistent with research showing that romantic relationships are particularly intense (Collins and van Dulmen, 2006), and therefore may be magnets for more intense emotional interactions than friends.

Strengths of Study One, Sample One, include a fairly large sample size, multiple assessments allowing for test-retest reliability, and multiple comparison measures. One limitation of the wording in the MANDI-RP version is that the instructions allow for adolescents to report on current or recent romantic partners, which lacks specificity, as perceptions of past relationships may be clouded by negative feelings about the relationship ending. Future versions should distinguish between current and recent romantic partners using separate questionnaires. Additional limitations include the use of a convenience college-student sample, which limits generalizability to a larger adolescent population; single reporters of adolescent behavior; data derived only from survey instruments, leading to common method variance; and some unexpected null findings regarding adolescent attachment and adjustment, potentially due to measure choice. Some of these limitations are addressed in Study One, Sample Two.

## **SAMPLE TWO METHOD**

### **Participants**

Study two was a pilot study of 62 adolescents aged 14-17,  $M = 14.81$  ( $SD = 1.00$ ), 17.5% minority, 54% male, and one of their parents, recruited from the community in a small Southeastern city. The majority of adolescents ( $N = 54$ ; 85.7%) participated with their mother/mother figure. Family income ranged from less than \$10,000 to greater than \$100,000, with Median = \$40,000-\$50,000, which contains median income for families in the state (Median



= \$40,895; U.S. Census Bureau, 2010). Adolescents and parents were recruited via community flyers, online social networking sites, online advertising, and word-of-mouth. Adolescents received a \$15 giftcard to a national retail store chain and their parents were paid \$20 cash for participating in a 1 ½ hour laboratory visit. During the visit, adolescents and parents were first seated in a room together with a research assistant, who explained the study procedures and obtained written informed consent/assent from parents and adolescents, respectively. Adolescents and parents were then separated and completed the study in different rooms. The University's Institutional Review Board approved all procedures.

### **Procedures**

Flyers and advertisements distributed online and in the community included a brief summary of study information, along with the name of the study and phone numbers to get in touch with the research team. When parents or adolescents contacted the research team, they were told: "Thank you for getting in touch with us today. We are asking for volunteers to help us learn more about relationships between teens and their parents. The project involves coming to our private offices at the University of Tennessee and filling out a survey, doing a short interview, and doing a stress hormone test. Participation in the study is totally up to you, and you can stop at any point. Your answers will be kept completely confidential, so that no one will be able to link your answers to your name and other personal information. If you agree to participate, the study will take about one and one half hours to complete." Families who agreed to participate were scheduled for a late afternoon or early evening appointment (between 4 and 6 pm).

**Laboratory visit.** When families arrived, they were met by a trained graduate or undergraduate researcher who had previously signed a statement of confidentiality. Researchers

explained the study procedures and obtained written informed consent/assent from parents and adolescents, respectively, for all study procedures including a phone follow-up. Adolescents and parents were then separated and completed questionnaires in different rooms. Parents completed their surveys in a quiet room alone, but were told that the researcher would check on them periodically to answer questions. Parents were informed that they would likely finish before their teens, and were provided with magazines to read while they waited. The adolescents were first asked to complete some preliminary questionnaires, including a baseline measure of positive and negative affect.

**Baseline respiratory sinus arrhythmia (RSA).** Next, adolescents were attached to a UFI Biolog device designed to measure the time, in milliseconds, between heartbeats, which was later converted to a measure of RSA via a computer program (described below). Adolescents were given electrodes to attach to the skin of their right forearm (in the soft underside, away from any bony prominences), right collarbone, and left ribcage area. They were then instructed to sit quietly, without fidgeting or using their cell phones, and watched a five minute video showing peaceful scenes and playing peaceful music. Most of the adolescents described this video as peaceful or boring. The interviewer left the room during the relaxation video to reduce distractions and to keep the procedure standardized.

**Stressful task and RSA.** After the baseline task, the researcher immediately began the Peer Experiences Interview (PEI; please see Measures section below for a detailed description), which was developed for the current study and lasted for a total of 17 minutes. Adolescents were presented with two open-ended questions and were given five minutes to answer each question. In between questions two and three, adolescents were given two minutes to complete a measure of positive and negative affect. The procedure was timed by a computer (with stopwatch backup)

to keep the interview timing standardized. At the end of each segment, the interviewer was prompted by the computer to move on to the next question. Adolescents' RSA was monitored throughout the baseline video and PEI.

After the Peer Experiences Interview, adolescents were unhooked from the biologic device and given a brief exit interview. They then completed several self-report surveys. When parents and adolescents completed their surveys, they were debriefed, thanked, and compensated for their time. Adolescents received a \$15 Target gift card, and parents received \$20 cash for their time. In the event that the parent or adolescent seemed upset, or needed further debriefing or a specific referral, the research assistants were instructed to contact the graduate student PI and/or the Faculty Advisor, a licensed clinical psychologist, for further instructions.

### **Measures**

**Demographic Information.** Adolescents and parents each completed a brief demographic information form that included age, gender, ethnicity, adolescent's grade in school, and parents' education. Parents also answered a question about family income.

**MANDI-FR.** Please see description in Study 1. Testing the MANDI-RP would have required that participants currently or had recently been in a romantic relationship lasting one or more months. Only 25 adolescents (40%) in the community sample reported having romantic partners, and of this sub-sample, only 18 had been dating 1 month or more. With such a limited sample size, we opted to only test the MANDI-FR.

**Peer Attachment.** Adolescents completed the 25-item peer attachment scale of the Inventory of Parent and Peer Attachment (IPPA; Armsden & Greenberg, 1987). The peer attachment scale includes an index of overall attachment to peers and three subscales: peer trust ("My friends accept me as I am"), peer communication ("My friends listen to what I have to

say”), and peer alienation (“I feel alone or apart when I am with my friends”). Participants rated the extent to which items describe them on a 5-point scale (1 = *Almost Never or Never True* to 5 = *Almost Always or Always True*). Higher scores on the overall scale and subscales indicate greater attachment security, except for the peer alienation scale, which was reverse coded in the overall scale. In the current study, only the overall scale,  $\alpha = .90$ , and the peer alienation scale,  $\alpha = .67$ , were used.

**Social Competence.** Adolescents completed the close friendship competence subscale of the Self Perception Profile for Adolescents (SPPA; Harter, 1988). This consisted of 5 items on an unusual four point scale designed to minimize social desirability. Specifically, adolescents were presented with two opposing statements, for example, “Some teens find it hard to make friends,” “but for other teens it’s pretty easy.” Adolescents were first asked to pick which statement was most true for them, and then to rate if it was “sort of true for me” or “really true for me.” The statements were then coded such that higher scores indicated better social functioning, with  $\alpha = .75$ .

**Peer Aggression, Isolation, and Prosocial Interactions.** The Children’s Social Behavior Scale – Self Report (CSBS; Crick & Grotpeter, 1995) is a 15-item scale with six subscales: perceived peer acceptance, isolation from peers, negative affect, engagement in caring acts, engagement in overt aggression, and engagement in relational aggression. The scale was adapted to reflect adolescent age-appropriate activities (e.g., wording such as “play with friends” was changed to “hang out with friends”). Adolescents read descriptions of teenage behavior, feelings, and characteristics, and rated how often they feel or do something similar on a scale from 1 (*never*) to 5 (*all the time*). Only the physical aggression scale was used for this study,  $\alpha = .73$ .

**Alcohol Problems.** The Rutgers Alcohol Problem Index (White & Labouvie, 1989) is a 23-item self-report measure of adolescent problem drinking. Adolescents responded to items about problems they may have experienced because of their drinking in the past 3 years, such as “not able to do your homework or study for a test,” on a 5-point scale (0 = *never* to 4 = *more than 10 times*). Internal consistency for this study was very good,  $\alpha = .93$ .

**Centers for Epidemiological Studies Depression Scale (CES-D).** The CES-D (Radloff, 1977) was completed at Time 1. Participants responded to 20 items describing symptoms experienced during the past week on a four point scale (0 = *less than 1 day*, 1 = *1–2 days*, 2 = *3–4 days*, 3 = *5 or more days*). Scores were summed and ranged from 0 to 60, with higher scores indicating more severe depressive symptoms. According to the scale’s author, scores ranging from 0 to 15 reflect depressive levels found in the general population, scores ranging from 16 to 38 are considered “at risk,” and scores above 39 resemble depressed patients in a clinical population (Radloff, 1977). In the present sample, the scores ranged from 20 to 72, with  $\alpha = .87$ .

**Adolescent Temperament.** The Revised Dimensions of Temperament Survey (DOTS-R; Thomas & Chess, 1981) was completed by parents about the target adolescents. The DOTS-R is a 54-item questionnaire assessing temperament on several subscales: activity level, attention span/distractibility, adaptability/approach-withdrawal, rhythmicity, and irritability. Items were answered on a 4-point Likert scale (1 = *usually false* to 4 = *usually true*). For the current study, only activity level was included in analyses, and showed good internal consistency,  $\alpha = .88$ .

**The Peer Experiences Interview (PEI).** The PEI is a social stress task for adolescents adapted from the Yale Interpersonal Stressor (YIPS; Stroud, Tanofsky-Kraff, Wilfley, & Salovey, 2000). The YIPS is a social stress paradigm that involves social rejection of a participant by two age- and sex-matched confederates. The task involves a baseline period and a

gradual increase in social stress (via increasing peer rejection). The YIPS has several advantages as a stressor task; it does require that participants bring a partner or peer to the lab to discuss existing disagreements or challenges (e.g., Chango, McElhaney, & Allen, 2009; Levenson & Gottman, 1983), or perform difficult tasks, such as mental math or public speaking before an audience (Kirschbaum, Kirke, & Helhammer, 1993), which is not a truly interpersonal exchange. However, because the paradigm requires two sex- and age-matched peer confederates, it was not feasible for the present study.

Using the YIPS as a guide, we built upon priming tasks previously used to induce feelings of relationship threat and distress in laboratory participants (Mikulincer, Gillath, & Shaver, 2002). Two open-ended questions were asked by a highly-trained graduate or undergraduate interviewer. The adolescents were given five minutes to respond to each question, and were instructed to keep talking until asked to stop. After the five-minute quiet baseline period (the standardized video), adolescents completed a talking baseline with the neutral socially-oriented prompt: “Tell me about your friends.” Second, and in place of rejection by confederates, adolescents were asked to recount incidents of being hurt, rejected, or betrayed by a close peer. Specifically, the interviewer presented the stressor question: “Tell me about a time recently when you felt hurt, betrayed, or rejected by a close friend.” If adolescents had difficulty answering or finished answering before the five minutes were over, interviewers prompted the adolescents with standardized, open-ended follow-up questions. Interviewers were instructed that the purpose of the interview was to keep the adolescents talking for the entire five minutes, with as little interviewer input as possible.

**Respiratory Sinus Arrhythmia (RSA).** RSA was calculated from interbeat intervals (IBI) collected using the UFI Biolog device during the baseline video and PEI procedures. IBI

was recorded for a total of 20 minutes. This recording produced a long data stream and was separated into separate segments for analysis (video baseline, talking baseline, and stressor task). IBI data is not time series data, but can be converted to time series data by interpolating data points at a fixed sampling rate (Allen, 2002). The Cardiac Metric program (Allen, 2002) uses a 10 Hz sampling rate with linear interpolation. Each segment was first converted to a time series, and then to RSA (as the log of band limited variance of IBI), using the Cardiac Metric (CMet) program (Allen, 2002). Higher baseline RSA is associated with better emotion regulation, whereas higher RSA under stress is associated with poorer emotion regulation (Porges, 1995). Under stress, suppression of RSA is associated with better emotion regulation (Porges, 1995).

## **SAMPLE TWO RESULTS**

### **Manipulation Check**

As a check to the PEI's efficacy for engineering social stress, participants completed the 20-item Positive and Negative Affects Scale (PANAS; Watson, Clark, & Tellegen, 1988). Adolescents read each item and indicated "to what extent do you feel this way right now?" on a 5 point scale (1 = *very slightly or not at all* to 5 = *extremely*). Positive and negative affect subscales were calculated by summing responses to the 10 positive items (e.g., "excited," "happy") and 10 negative items (e.g., "hostile," "nervous"), respectively. The PANAS was administered at baseline (positive  $\alpha = .87$ , negative  $\alpha = .78$ ) and immediately after the stressor segment of the Peer Experiences Interview (positive  $\alpha = .85$ , negative  $\alpha = .83$ ). Adolescents reported greater positive affect at baseline,  $M = 30.7$  ( $SD = 7.7$ ), than following the stressor task,  $M = 28.5$  ( $SD = 7.5$ ), a statistically significant difference,  $t(62) = 3.72$ ,  $p < .001$ . However, this may not represent a clinically significant difference. Adolescents also reported increased negative affect following the stressor task,  $M = 15.1$  ( $SD = 4.5$ ), than at baseline,  $M = 14.5$  ( $SD$

= 5.1), but this difference did not reach statistical significance,  $t(62) = -.98, p = .33$ .

Adolescents were also asked two exit interview questions regarding 1) the subjective seriousness of the event and 2) the level of subjective distress at the time. Adolescents responded verbally on a scale from 1 to 5 (1 = *not at all serious/upset* and 5 = *the most serious/upsetting negative event ever experienced*). The Median response for both questions was 3 (*fairly serious/upset*). It is unclear if participants were responding to the task with sufficient negativity to indicate a clinically significant level of social stress, which was taken into account when interpreting results.

### **Friends Descriptive statistics**

Please see Table 8 for study descriptive statistics.

### **Friends Scale Reliability**

**Internal consistency.** The five friend (FR) subscales were assessed for internal consistency using Cronbach's alpha. The majority of the subscales showed adequate internal consistency: Direct Bids,  $\alpha = .88$ ; Indirect Bids,  $\alpha = .80$ ; Withdrawal,  $\alpha = .80$ . Active Affiliation and Lashing Out showed lower than expected internal consistency,  $\alpha = .61$  and  $\alpha = .65$ , respectively. These slightly lower alphas may be related to the smaller sample size in Study 2.

**Confirmatory factor analysis.** A Confirmatory Factor Analysis (CFA) was completed using AMOS 17 (Arbuckle, 1999). To test model fitness, we included several fit indices, including a  $\chi^2/df \leq 2$  (Wheaton, Muthén, Alwen, & Summers, 1977); CFI  $\geq .95$  (Hu & Bentler, 1999); and RMSEA  $< .05$  = good, RMSEA  $.05 - .08$  = reasonable or acceptable; RMSEA  $.08 - .10$  = mediocre; and RMSEA  $\geq .10$  = poor (Browne & Cudeck, 1993; MacCallum, Browne, & Sugawara, 1996). Each theoretically determined subscale was entered as a latent variable with scale items as observed variables. The resulting MANDI-FR scales evidenced good model fit,  $\chi^2$



=145.02,  $df = 125$ ;  $CFI = .96$ ;  $RMSEA = .05$  (90% CI = .00 - .08), with factor loadings within an acceptable range (see Table 4, far right).

### **Friends Scale Validity**

**Within-scale validity.** The MANDI-FR measure subscales' relations with each other were analyzed using the correlations that emerged in the CFA analysis (see Table 9). These correlation values were estimated while accounting for relations among each of the other latent subscales. Direct Bids was significantly positively correlated with Indirect Bids,  $r = .47$ ,  $p < .001$ , and Active Affiliation,  $r = .51$ ,  $p < .001$ , and was unrelated to Lashing Out or Withdrawal. Indirect Bids and Active Affiliation were significantly positively correlated with one another,  $r = .51$ ,  $p < .001$ . Both Indirect Bids and Active Affiliation were significantly negatively correlated with Withdrawal,  $r = -.44$ ,  $p < .001$  and  $r = -.35$ ,  $p < .05$ , respectively. Lashing Out and Withdrawal were significantly correlated with one another,  $r = .61$ ,  $p < .001$ .

**Concurrent validity.** In Study 2, partial correlations were conducted with the MANDI-FR subscales, measures of peer attachment, and parent report of adolescent temperament, controlling for adolescent age, sex, and family income. Results of these correlation analyses can be found in Table 10. Making Direct Bids was significantly positively correlated with overall peer attachment,  $r = .54$ ,  $p < .001$ . Greater use of Indirect Bids was positively correlated with overall peer attachment,  $r = .36$ ,  $p < .01$ , and parent reports of adolescent temperamental activity,  $r = .24$ ,  $p < .05$ . Active Affiliation was positively correlated with overall peer attachment,  $r = .36$ ,  $p < .01$ , and positively correlated with parent report of temperamental activity,  $r = .23$ ,  $p < .05$ . Lashing Out was positively correlated with peer alienation,  $r = .46$ ,  $p < .001$ , and negatively correlated with overall peer attachment,  $r = -.22$ ,  $p < .05$ . Withdrawal was positively correlated with peer alienation,  $r = .54$ ,  $p < .001$ , negatively correlated with overall peer attachment,  $r = -$

.43,  $p < .001$ , and negatively correlated with parent report of adolescent activity,  $r = -.28$ ,  $p < .05$ .

Additional partial correlations were conducted between the MANDI-FR subscales and adolescent physiological response to stress. Specifically, we tested correlations between the MANDI-FR subscales and adolescent baseline talking respiratory sinus arrhythmia (RSA), controlling for age, sex, income, and resting baseline RSA. We also tested correlations between the MANDI-FR subscales and adolescent RSA in response to a laboratory-induced stress task (controlling for age, sex, income, resting baseline RSA, and talking baseline RSA). Among the MANDI-FR scales, Direct Bids, Indirect Bids, and Active Affiliation were positively related to talking baseline RSA (see Table 10), suggesting better physiological regulation of negative emotion at baseline. Withdrawal was negatively correlated with RSA in the baseline talking task, suggesting poorer physiological regulation of negative emotion at baseline. Only Withdrawal and Active Affiliation were associated with stress RSA. Specifically, adolescents who reported greater Withdrawal in response to distress also had higher RSA in response to laboratory-induced stress,  $r = .30$ ,  $p < .05$ , suggesting poorer physiological regulation of negative emotion both at baseline and under stress.

To assess the relationships between MANDI-FR scales and adolescent adjustment, we regressed prosocial behavior, social competence, depressive symptoms, physical aggression, and alcohol problems on the MANDI-FR scales. Age, sex, and parental income were controlled in all analyses. Making Direct and Indirect bids when distressed predicted greater prosocial behavior with peers,  $\beta = .48$ ,  $t(63) = 4.23$ ,  $p < .001$ ;  $\Delta R^2 = .19$ , and  $\beta = .32$ ,  $t(63) = 2.86$ ,  $p < .01$ ;  $\Delta R^2 = .10$ , respectively. Active Affiliation when distressed predicted better social competence,  $\beta = .42$ ,  $t(46) = 2.94$ ,  $p < .01$ ;  $\Delta R^2 = .16$ . Lashing Out when distressed predicted greater physical

aggression,  $\beta = .54$ ,  $t(61) = 4.78$ ,  $p < .001$ ;  $\Delta R^2 = .41$ , and alcohol problems,  $\beta = .55$ ,  $t(61) = 4.96$ ,  $p < .001$ ;  $\Delta R^2 = .30$ . Lashing out showed a trend toward predicting greater depressive symptoms,  $\beta = .23$ ,  $t(61) = 1.83$ ,  $p = .07$ ;  $\Delta R^2 = .05$ . Withdrawal significantly predicted greater depressive symptoms,  $\beta = .48$ ,  $t(61) = 4.05$ ,  $p < .001$ ;  $\Delta R^2 = .20$ , and poorer social competence,  $\beta = -.56$ ,  $t(44) = -4.06$ ,  $p < .001$ ;  $\Delta R^2 = .38$ . Withdrawal showed a trend toward predicting greater alcohol problems,  $\beta = .24$ ,  $t(60) = 1.81$ ,  $p = .08$ ;  $\Delta R^2 = .09$ .

### **SAMPLE TWO DISCUSSION**

In Study One, Sample Two, we sought to replicate and expand on findings from the MANDI-FR in Sample One, with a new sample of middle through older adolescents, with the addition of parent report data, physiological data, and added measures of prosocial and externalizing behaviors. Similarly to Study 1, and as expected, the MANDI-FR showed good internal consistency and adequate factor structure. As in Study 1, Direct bids, Indirect Bids, and Active Affiliation were significantly positively correlated with one another. Indirect Bids and Active Affiliation were negatively related to Withdrawal. Unexpectedly, making Direct bids was unrelated to Withdrawal, which may be a consequence of the small sample size. Direct Bids, Indirect Bids, and Active Affiliation were unrelated to Lashing Out, and Withdrawal and Lashing Out were positively related.

In comparing the MANDI-FR scales to similar constructs, they performed mostly as hypothesized. Specifically, the subscales tapping into methods of seeking support and closeness during distress were associated with greater peer attachment security and better baseline physiological emotion regulation. Indirect bids and Active Affiliation were also associated with parents' reports of adolescents' greater physical activity throughout the day. The scales tapping into methods of pushing away from closeness during distress were associated with peer

alienation, and Withdrawal in particular was associated with less attachment security with peers overall. Withdrawal was also related to parents' reports of adolescents' lower physical activity throughout the day and physiological indicators of poor emotion regulation during a social stressor task.

In comparing the MANDI-FR to measures of positive and negative adolescent functioning, the subscales tapping into nonsexual methods of seeking support and closeness during distress were associated with positive interactions with peers, but, like Study 1, were unrelated to internalizing or externalizing symptoms. The scales tapping into distancing oneself from closeness were associated with greater internalizing and externalizing problems, including depressive symptoms, peer aggression, and alcohol use. Withdrawal was associated with poorer social competence, but was otherwise unrelated to measures of positive functioning. These findings appear to support our conclusion from Study 1 that the MANDI scales assess behavioral patterns that are very specifically related to adolescent functioning. For example, behaviors as assessed by the MANDI presumed to be developmentally maladaptive (e.g., angry reactions to peers and withdrawal from peers) were associated with indices of poorer psychological functioning, whereas behaviors proposed to be developmentally adaptive (e.g., seeking peer interaction when moderately distressed) were associated with positive functioning, and vice versa.

Strengths of Study 2 include a socioeconomically diverse community sample, data from multiple reporters, physiological data, and additional measures of adolescent positive and negative functioning. Limitations include a small percentage of minority participants and a small sample size, which may have limited generalizability and the power to find some of the predicted associations. However, despite the small sample size, subscales of the MANDI-FR predicted

respectable amounts of variance in measures of adolescent functioning, and, we believe, sufficiently replicated findings from Study 1.

### **GENERAL DISCUSSION AND FUTURE DIRECTIONS**

In Study One, we proposed a new measure of adolescent strategies for managing distress in the context of close friendships and romantic relationships, based on theoretical models of emotion regulation and distress tolerance. To our knowledge, no such measurement tool currently exists, yet that this is an important and growing area in understanding normal and pathological adolescent development. In the present set of two samples, we found that the MANDI-RP and MANDI-FR showed good reliability and validity across multiple time points, and additional testing of the MANDI-FR replicated and extended reliability and validity findings from Sample 1. Specifically, the MANDI-FR and -RP appear to assess two sides of the developmental coin: scales presumed to assess healthy peer involvement in adolescents' distress management were associated with one another, with secure attachment to peers, and with positive psychological functioning. Scales presumed to assess less adaptive peer involvement or disavowal of peer relationships during periods of distress were associated with one another, insecure peer attachments, negative psychological functioning, and in some cases, lower levels of positive psychological functioning. These findings are congruent with past observational research indicating that patterns of interpersonal distress management that lead to experiences of soothing may foster healthy interdependence in adolescent peer and romantic relationships (Feeney, 2007). Alternatively, patterns of managing distress interpersonally that result in the distressed adolescent feeling rejected, ignored, or unloved may lead to clingy dependence or relationship dysfunction (Feeney, 2007). Therefore, measuring interpersonal distress management behaviors during adolescence may provide parents, educators, and clinicians the

opportunity to support adolescents' positive interpersonal strategies for managing distress and help revise negative interpersonal strategies before they become ingrained relationship patterns.

Future research using the MANDI scales may aim to assess individual differences in how and when adolescents rely on peers for distress management and what this might mean for adaptive functioning in relationships. For example, adolescents with problems at home may begin relying on peers for emotional support and regulation earlier than average. This diversion from the normal course of development could serve as a protective factor or it could be linked to negative psychological functioning. In addition, given the finding that use of strategies differed by participant sex, this might serve as an interesting and important moderator for how the MANDI relates to adolescent psychological functioning. Finally, the source of adolescent distress may be important for responses to the MANDI: when peers are a direct source of distress, responses to the MANDI scales might be different. Increasing specificity in these ways and beyond may help to further the understanding of normative and pathological adolescent emotion regulation, distress tolerance, and psychopathology.

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## APPENDIX

### Appendix A

Table 1

#### *MANDI-Romantic Partners Scale Items*

1.	I ask my partner for advice on how to deal with the bad feelings I am having.	DIR
2.	I ask my partner for a hug.	-----
3.	I try to be around my partner at all times.	IND
4.	I try to make my partner feel as upset as I feel.	-----
5.	I let my partner know that I wish he/she would tell me it's going to be ok.	-----
6.	I try to organize a fun activity with my partner.	AFFIL
7.	I ask my partner for suggestions for how to help me feel better.	DIR
8.	I stay with my partner as long as I can.	IND
9.	I go somewhere to get away from my partner.	-----
10.	I keep my partner as close as possible.	IND
11.	I get into fights with my partner.	LASH
12.	I am more irritable with my partner than usual.	LASH
3.	I initiate sexual behavior with my partner.	SEX
14.	I drop hints to my partner that I want her/him to say or do something nice for me.	-----
15.	I make plans to spend time with my partner when s/he is doing something fun.	AFFIL
16.	I withdraw from my partner.	W/D
17.	I seek out a place where I can be away from my partner.	W/D
18.	I tell my partner how much I need her/him.	-----
19.	I say things to my partner out of anger (including some things I might later regret).	LASH
20.	I talk to my partner in person about what is upsetting me.	-----
21.	I drop hints that I would like my partner to tell me I'm doing well.	-----
22.	I engage in foreplay with my partner.	SEX
23.	I ask my partner for a back rub or massage.	-----
24.	I talk to my partner on the phone about what's bothering me.	-----
25.	I ask or tell my partner not to criticize me.	-----
26.	I try to get my partner to listen to me.	DIR
27.	I make plans to hang out with my partner.	-----
28.	I kiss or make out with my partner.	-----
29.	I try to push my partner away.	-----
30.	I try to get my partner to have sex with me.	SEX
31.	I try to get away from my partner.	W/D
32.	I make plans to do something active with my partner.	AFFIL
33.	I don't talk to my partner about it.	-----

DIR=direct; IND=indirect; AFFIL=active affiliation; LASH=lash out; W/D=withdraw; SEX=sexual contact-seeking; ----- = dropped



## Appendix B

Table 2

### *MANDI-Friends Scale Items*

1.	I ask my friends for advice on how to deal with the bad feelings I am having.	DIR
2.	I ask my friends for a hug.	-----
3.	I try to be around my friends at all times.	IND
4.	I try to make my friends feel as upset as I feel.	-----
5.	I let my friends know that I wish they would tell me it's going to be ok.	DIR
6.	I try to organize a fun activity with my friends.	AFFIL
7.	I ask my friends for suggestions for how to help me feel better.	DIR
8.	I stay with my friends as long as I can.	IND
9.	I go somewhere to get away from my friends.	-----
10.	I keep my friends as close as possible.	IND
11.	I get into fights with my friends.	LASH
12.	I am more irritable with my friends than usual.	LASH
13.	I drop hints to my friends that I want them to say or do something nice for me.	-----
14.	I make plans to spend time with my friends when they are doing something fun.	AFFIL
15.	I withdraw from my friends.	W/D
16.	I seek out a place where I can be away from my friends.	W/D
17.	I tell my friends how much I need them.	DIR
18.	I say things to my friends out of anger that I later regret.	LASH
19.	I talk to my friends in person about what is upsetting me.	DIR
20.	I drop hints that I would like my friends to tell me I'm doing well.	-----
21.	I talk to my friends on the phone about what's bothering me.	DIR
22.	I ask or tell my friends not to criticize me.	-----
23.	I try to get my friends to listen to me.	-----
24.	I make plans to hang out with my friends.	-----
25.	I try to push my friends away.	-----
26.	I try to get away from my friends.	W/D
27.	I make plans to do something active with my friends.	AFFIL
28.	I don't talk to my friends about it.	-----

DIR=direct; IND=indirect; AFFIL=active affiliation; LASH=lash out; W/D=withdraw; ----- = dropped

### Appendix C

Table 3

*Study 1 Descriptive Statistics for Final Scales*

Scale	Time 1 <i>M (SD)</i>	Time 2 <i>M (SD)</i>
RP Direct Bids (7 items)	3.32 (1.01)	3.91 (.96)
RP Indirect Bids (3 items)	3.85 (.97)	3.79 (1.01)
RP Active Affiliation (3 items)	3.47 (.96)	3.66 (1.04)
RP Lashing Out (4 items)	2.98 (.96)	2.89 (.89)
RP Withdrawal (5 items)	2.39 (.84)	2.30 (.79)
RP Sex-seeking(4 items)	2.22 (.97)	1.96 (.94)
FR Direct Bids (7 items)	3.50 (1.11)	3.58 (1.10)
FR Indirect Bids (3 items)	3.63 (1.03)	3.73 (1.06)
FR Active Affiliation (3 items)	3.66 (1.01)	3.82 (1.01)
FR Lashing Out (4 items)	2.47 (.83)	2.51 (.87)
FR Withdrawal (4 items)	2.55 (.92)	2.47 (.88)
Attachment Anxiety	2.98 (1.20)	---
Attachment Avoidance	3.00 (1.02)	---
Depressive Symptoms	34.60 (10.15)	---
Poor Distress Tolerance	2.67 (.66)	---
Negative Appraisal of Distress Tolerance	2.49 (.71)	---
Poor Long Term Self-Regulation	2.28 (.50)	---

### Appendix D

Table 4

*Final Factor Loadings for MANDI-RP and –FR Items from CFA in Two Samples of Adolescents*

MANDI-RP Scale			MANDI-FR Scale			
Item #	Scale	Estimate RP Study 1	Item #	Scale	Estimate FR Study 1	Estimate FR Study 2
1.	DIR	.69	1.	DIR	.76	.86
7.	DIR	.73	5.	DIR	.69	.68
26.	DIR	.64	7.	DIR	.77	.86
3.	IND	.77	17.	DIR	.72	.85
8.	IND	.77	19.	DIR	.76	.76
10.	IND	.88	21.	DIR	.74	.70
6.	AFFIL	.77	3.	IND	.76	.60
15.	AFFIL	.63	8.	IND	.85	.78
32.	AFFIL	.81	10.	IND	.84	.93
11.	LASH	.90	6.	AFFIL	.71	.65
12.	LASH	.70	14.	AFFIL	.71	.49
19.	LASH	.69	27.	AFFIL	.87	.62
16.	W/D	.81	11.	LASH	.73	.65
17.	W/D	.78	12.	LASH	.59	.63
31.	W/D	.79	18.	LASH	.76	.67
13.	SEX	.81	15.	W/D	.91	.77
22.	SEX	.86	16.	W/D	.79	.74
30.	SEX	.71	26.	W/D	.68	.79

DIR=direct; IND=indirect; AFFIL=active affiliation; LASH=lash out; W/D=withdraw; SEX=sexual contact-seeking; ----- = dropped

### Appendix E

Table 5

*Study 1 Correlations within the MANDI-RP (from CFA)*

	RP Indirect Bids	RP Affiliation	RP Lashing Out	RP Withdrawal	RP Sex-seeking
RP Direct Bids	.66***	.59***	.09	-.39***	-.14
RP Indirect Bids		.57***	-.18*	-.65***	.01
RP Affiliation			-.17	-.39***	.14
RP Lashing Out				.60***	.23**
RP Withdrawal					.10

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

## Appendix F

Table 6

*Study 1 Correlations between the MANDI-RP (Top) or MANDI-FR (Bottom) and Theoretically Related Scales*

	Poor Long Term Self-Regulation	Poor Distress Tolerance	Negative Appraisal of Distress Tolerance	Attachment Anxiety	Attachment Avoidance
RP Direct Bids	-.11	-.07	-.10	-.13*	-.51***
RP Indirect Bids	-.07	.09	.02	-.10	-.44***
RP Affiliation	-.12	-.02	.00	-.08	-.25***
RP Lashing Out	.27***	.32***	.31***	.30***	.19**
RP Withdrawal	.15*	.24***	.28***	.34***	.56***
RP Sex-Seeking	.28***	.15*	.22**	.19*	.01
FR Direct Bids	-.05	.08	.04	.05	-.23**
FR Indirect Bids	-.10	.15*	.10	.14*	-.09
FR Affiliation	-.18**	.01	.01	-.02	-.14*
FR Lashing Out	.53***	.20**	.08	.34***	.29***
FR Withdrawal	.17**	.13*	.08	.10	.25***

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

## Appendix G

Table 7

*Study 1 Correlations within the MANDI-FR (from CFA)*

	FR Indirect Bids	FR Affiliation	FR Lashing Out	FR Withdrawal
FR Direct Bids	.70***	.68***	.04	-.26***
FR Indirect Bids		.86***	-.04	-.52***
FR Active Affiliation			-.02	-.44***
FR Lashing Out				.41***

\*\*\*  $p < .001$

## Appendix H

Table 8

### *Study 2 Descriptive Statistics*

Scale	<i>M (SD)</i>
FR Direct Bids	3.16 (1.05)
FR Indirect Bids	4.16 (1.02)
FR Active Affiliation	3.79 (.97)
FR Lashing Out	2.07 (.70)
FR Withdrawal	1.96 (.75)
Peer Attachment	3.92 (.54)
Peer Alienation	2.23 (.64)
Temperamental Activity Level (Parent Report)	2.37 (.71)
RSA Resting Baseline	6.72 (.97)
RSA Talking Baseline	6.74 (.88)
RSA Stressor Task	6.75 (.85)
Social Competence	3.15 (.61)
Prosocial Behavior	3.88 (.66)
Physical Aggression	1.65 (.79)
Alcohol Problems	1.95 (7.37)
Depressive Symptoms	35.29 (10.37)

## Appendix I

Table 9

*Study 2 Correlations within the MANDI-FR (from CFA)*

	FR Indirect Bids	FR Active Affiliation	FR Lashing Out	FR Withdrawal
FR Direct Bids	.47***	.52***	.28	.12
FR Indirect Bids		.51***	-.09	-.40**
FR Affiliation			.18	-.33*
FR Lashing Out				.58***

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



### Appendix J

Table 10

*Study 2 Partial Correlations Between MANDI-FR Scales and Theoretically Related Scales*

*(Controlling for Age, Gender, and Family Income)*

	Peer Attachment	Peer Alienation	Temperamental Activity Level (Parent Report)	RSA Talking Baseline <sup>a</sup>	RSA Stress Task <sup>b</sup>
FR Direct Bids	.53***	-.06	-.08	.24*	-.01
FR Indirect Bids	.36**	-.01	.24*	.31*	.07
FR Active Affiliation	.41**	-.08	.23*	.28*	-.06
FR Lashing Out	-.22*	.46***	.01	-.03	-.01
FR Withdrawal	-.43***	.54***	-.28*	-.42**	.21 <sup>+</sup>

<sup>+</sup>  $p < .10$ , \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ ; <sup>a</sup> controlling for quiet baseline; <sup>b</sup> controlling for quiet and talking baseline.

**CHAPTER 3: EMOTION REGULATION AS A MEDIATOR OF ADOLESCENT  
DEVELOPMENTAL PROCESSES AND PROBLEM OUTCOMES**

## **ABSTRACT**

Recent models of adolescent development and psychopathology emphasize importance of emotion regulation as a mediating factor between multiple aspects of adolescent development and adolescent adjustment (Morris et al, 2007). The current multi-method, multi-reporter study explored this model with a sample of 64 14 to 17-year-old adolescents and their parents. Biological and self-report indicators of emotional reactivity and regulation were hypothesized to mediate relations between adolescent developmental-contextual factors (including parent report of family environment, adolescent report of insecure attachment, and physiological temperament) and psychological problems (depressive symptoms, alcohol use, and peer aggression). Using three separate path models, we found partial support for our hypotheses. Findings have implications for intervention and prevention of adolescent psychopathology.

## INTRODUCTION

In 2007, approximately 26% of high school students reported an episode of heavy drinking in the past month (CDC, 2008). Further, a staggering 25% of depressed adolescents are diagnosed with a co-occurring substance abuse disorder (for review see Sher & Grekin, 2007). Mental health problems are the leading cause of disability among middle-to-late adolescents, yet the majority of these problems are not treated before adulthood (Avenevoli et al., 2008). There is a clear need for research to further our understanding of the correlates of adolescent psychopathology in order to design better prevention and intervention techniques. Adolescent psychological disorders, including internalizing disorders (e.g., anxiety and depression), externalizing disorders (e.g. aggressive and impulse control disorders), and substance abuse are linked to myriad factors (Mayes & Suchman, 2006). The focus of the current study is to clarify the complex relationships between family factors, temperament, emotion regulation, and a select number of adolescent psychological outcomes. The current study adds to the literature by concurrently testing multiple predictors of adolescent psychological problems, and is designed to promote the application of scientifically-based prevention and intervention techniques for adolescent psychopathology.

In a recent theoretical model, Morris and colleagues (2007) proposed that emotion regulation is a mediating mechanism between the larger developmental context and adolescent psychopathology. In the model, developmental context is made up of a host of adolescent characteristics, parent characteristics, and parent-adolescent/family relationship factors. Theoretically, emotion regulation starts developing early in life and is facilitated throughout youth by the complex interplay between temperament, brain development and function, interactions with specific caregivers, and the social context (Gross & Thompson, 2007; Morris et

al., 2007). Researchers have identified emotion regulation as an outcome of parent-child relationships, as well as a predictor of adolescent psychopathology (Mayes & Suchman, 2006).

### **The Developmental Context and Emotion Regulation**

Emotion regulation processes are those mechanisms that serve to modulate, inhibit, and enhance emotional experiences and expressions, and may be both effortful and automatic (Calkins & Hill, 2007). From an attachment framework, Allen and Manning (2007) theorize that the regulation of emotion through social interactions is a central task of adolescence. The development of emotion regulation proceeds from almost entirely external influence (e.g. caregivers), to a combination of external and internal regulation (Walden & Smith, 1997). Specifically, children rely on parents to provide for all of their needs, including needs for soothing, regulating experience, and modeling behavior (Ainsworth, 1989; Bowlby, 1969/1982). By the time a child reaches adolescence, repeated experiences of soothing and regulation from attachment figures combined with the development of formal operational thinking allow individuals to increasingly internalize the soothing and security-enhancing function of the attachment figure (Allen & Land, 1999; Mikulincer, Shaver, & Pereg, 2003). As a result, securely attached adolescents may develop cognitive schemas for effective self-regulation of emotion (Mikulincer et al., 2003). Alternatively, some adolescents have limited or no experience with being soothed and no models for self-regulation; for example, adolescents with insecure attachment relationships with caregivers (Ainsworth, 1989; Bowlby, 1969/1982). These adolescents may be unable to regulate emotions effectively because emotional distress becomes an object of preoccupation/rumination or avoidance (Shaver & Mikulincer, 2002). In turn, adolescents with insecure attachments to caregivers may be emotionally explosive or withdrawn

with heightened physiological arousal (Mikulincer, 1998; Rosenstein & Horowitz, 1996; Zimmerman, Maier, Winter, & Grossman, 2001).

In addition to attachment processes, the family system may also promote or disrupt emotion regulation. For example, in families with poor interpersonal and emotional boundaries, adolescents are more reactive (Bowen, 1985; Buehler & Welsh, 2009). As suggested by Bowen's (1985) theory, relationships between parents and children are not unidirectional. An adolescent's temperament, or the constellation of traits with which he or she is born (Plomin, 1986), plays an important role in shaping the parent-adolescent relationship via the goodness-of-fit between parents and adolescents and the relative challenge presented to those engaged in parenting the child (Belsky & Jaffee, 2006). Temperament also strongly predicts emotion regulation (Wills, Gibbons, & Brody, 2000). Research utilizing observational and biological methods indicates that temperamental negativity is associated with difficulty regulating emotions as early as infancy (see Fox & Calkins, 2003, and Calkins & Hill, 2007, for reviews). However, less is known about the interplay between family environment, temperament, and adolescents' experiences of regulating emotions.

### **The Role of Physiology**

Physiology is increasingly implicated in adolescent self- and emotion regulation. Of particular interest in recent research literature are indexes of autonomic arousal and suppression. The hypothalamic-pituitary-adrenal (HPA) axis is responsible for activating the sympathetic nervous system (e.g., the "fight, flight, or freeze" response). One hormone released during this response is cortisol, also known as the "stress hormone." In the typical adolescent, cortisol is released in a diurnal rhythm – levels rise sharply within an hour of waking, peak within the first

few hours of the day, and then decline slowly over the second half of the day (Goodyer, 2006). In addition, youth typically secrete cortisol when stressed (Van Goozen et al., 2000).

Stress response can also be measured by parasympathetic nervous system activation (e.g. the “rest and digest” response). Respiratory sinus arrhythmia (RSA), sometimes known as vagal tone, is one measure of parasympathetic activation (Porges, 1995). RSA literally refers to a predictable change in heart rhythm due to respiration, that is, the heart rate increases with inspiration and decreases with expiration. Measuring RSA is one way of observing the extent to which individuals increase or withdraw stimulation of the vagus nerve. The vagus nerve is tasked with many regulatory functions, including regulating heart rhythm. When activated, the vagus nerve provides more regulation, but when nerve impulses are withdrawn, the heart rate and rhythm may increase as necessary. In other words, higher RSA indicates more vagal nerve activity, a proxy measurement for parasympathetic nervous system activity. Lower RSA, a measure of withdrawal of vagal tone, allows for the sympathetic nervous system to act more efficiently. Normal adolescents show higher RSA at rest and lower RSA in response to stress (Martens et al., 2010).

### **Developmental Context, Emotion Regulation, and Psychopathology**

Research has documented associations between attachment organization and adolescent problems, such that insecurely attached adolescents display more internalizing symptoms, (Allen, Moore, Kuperminc, & Bell, 1998; Kobak, Sudler, & Gamble, 1991), externalizing behaviors (Allen & Kuperminc, 1995; Allen & Land, 1999), and substance abuse (Rosenstein & Horowitz, 1996). Researchers and clinicians have also linked poorer adolescent differentiation of self in relation to the family as well as adolescent triangulation into parental conflict with adolescent internalizing symptoms (e.g., Franck & Buehler, 2007; Knauth, Skowron, & Escobar,

2006; Weitzman, 2006), externalizing behaviors (e.g., Franck & Buehler, 2007; Richmond & Stocker, 2006), and substance abuse (Mayes & Suchman, 2006; McNight, 2008; Volk et al., 1989). Alternatively, better parent marital relationships are associated with physiological markers of adequate emotion regulation, including lower levels of salivary cortisol, and a steeper diurnal slope (Pendry & Adam, 2007).

Furthermore, the inability to adequately regulate emotions is an essential symptom of adolescent mood, anxiety, and conduct disorders (APA, 2000), and it is implicated as a risk factor for alcohol and other substance abuse (Conger, 1956; Khantzian, 1990). Specifically, poor emotion regulation in adolescence is associated with internalizing problems (Allen & Hare, 2007; Brody & Ge, 2001; Garnefski, Kraaij, Etten, 2005; Finkenauer, Engels, & Baumeister., 2005; Lengua, 2003; Silk, Steinberg, & Morris, 2003), externalizing problems (Beauchaine, Gatzke-Kopp, Mead 2007; Brody and Ge, 2001; Garnefski et al., 2005; Mullin & Hinshaw, 2007; Penney & Moretti, 2010; Silk et al. , 2003), substance use (Brody and Ge, 2001; Colder and Chassin, 1997) and overall peer functioning (Eisenberg, Fabes, Guthrie, & Reiser, 2000).

Physiological indices of emotion regulation are also associated with psychopathology. Increased secretion of cortisol in response to stress over several months is associated with depression (Susman, Dorn, Inoff-Germain, Nottelmann, & Chrousos, 1997), behavioral problems (Susman et al., 1997), and greater general and social anxiety in adolescent girls (Schiefelbein & Susman, 2006). Hypersecretion of cortisol in the morning predicts the development of major depression in adolescents (Goodyer et al., 2000), and youth at risk for internalizing problems and depression show lower resting RSA (Bosch, Riese, Ormel, Verhulst, & Oldehinkel, 2009 ; Byrne et al., 2010; Calkins, Graziano, & Keane, 2007). Alternatively, adolescents diagnosed with Conduct Disorder show a hyposecretion of cortisol even when under stress (Van Goozen et al.,



2000), and show higher RSA in response to either a stressor task or reward (Beauchaine, Gatzke-Kopp, Mead, 2007; Katz, 2007). Unfortunately, little work has been done to bridge the gap between physiological processes and externalizing behaviors in adolescence (Mullin & Hinshaw, 2007), and there are no known studies of adolescent physiological regulation of emotion and alcohol use problems.

### **Appraisals**

Important to any study of emotion regulation is the individual's perceived capacity to cope with negative emotions. Appraisals of ability to cope are associated with alcohol use and peer aggression. Among adolescents and adults, the experience of overwhelming negative emotion is also strongly associated with problem drinking (e.g., Cooper et al., 1995). This finding is consistent with the self-medication hypothesis (Khantzian, 1990), suggesting that individuals may use drugs and alcohol to cope with psychological distress. Individuals may turn to alcohol based on appraisals of fewer alternative strategies or opportunities to cope (Sher & Grekin, 2007). Drinking may be particularly reinforcing in the short-term, as alcohol may actually serve to decrease arousal and interrupt encoding of stressful experiences (Sayette, 1993). High reactivity in young people is also linked overt aggression with peers through negative emotionality (Caspi, 2000; Eisenberg et al., 2001). Reactive aggression, defined as emotion-driven defensive reactions to perceived provocation, may be especially linked to emotional reactivity and dysregulation (Mullin & Hinshaw, 2007). Adolescents with distorted appraisals about their ability to cope with negative events in their lives may be at greater risk for reacting aggressively with peers (Asarnow & Callan, 1985; Crick & Dodge, 1996).

## Summary and Hypotheses

In summary, the literature suggests that both temperamental disposition and lifelong, cross-generational experiences with families are associated with the capacity to regulate emotional experiences. In turn, poor emotion regulation may exacerbate existing family dynamics and increase risk for further problems (Mayes & Suchman, 2006; Sheeber, Hops, & Davis, 2001; Yap, Allen, & Sheeber, 2007; Yap, Schwartz, Byrne, Simmons, & Allen, 2010). The major hypothesis of the proposed project is that associations between adolescent developmental processes (family relationships and temperament) and adolescent problems (depressive symptoms, alcohol problems, and aggression with peers) will be mediated, at least in part, by adolescents' emotional regulatory capacities and appraisals. Specifically:

1. The Parent-Adolescent Relationship will predict Adolescent Emotion Regulation.
  - a. Adolescent Self-Reports of Attachment, Family Cohesion, and Family Flexibility, as well as Parent Reports of Family Cohesion and Flexibility will be predicted by a latent Parent-Adolescent Relationship Variable.
  - b. Adolescent Self-Reports of Emotion Regulation and Physiological Responses to a Social/Interpersonal Stress Task will be predicted by a latent Emotion Regulation Variable.
  - c. The Latent Family Relationship Variable will predict the Latent Emotion Regulation Variable.
2. Adolescent Temperament will predict Adolescent Emotion Regulation.
  - a. Parent report of adolescent temperament and adolescent baseline physiological data will be predicted by a latent Adolescent Temperament Variable.

- b. The latent adolescent Temperament Variable will predict Adolescent Emotion Regulation.
3. Both Adolescent Temperament and the Parent-Adolescent Relationship Variables will Predict Adolescent Depression.
4. Adolescent Emotion Regulation will Mediate the Effects of the Parent-Adolescent Relationship and Adolescent Depression.
5. Both Adolescent Temperament and the Parent-Adolescent Relationship Variables will Predict Adolescent Alcohol Use.
6. Adolescent Emotion Regulation will Mediate the Effects of the Parent-Adolescent Relationship and Adolescent Alcohol Use.
7. Both Adolescent Temperament and the Parent-Adolescent Relationship Variables will Predict Adolescent Peer Aggression.
8. Adolescent Emotion Regulation will Mediate the Effects of the Parent-Adolescent Relationship and Adolescent Peer Aggression.

## **METHOD**

### **Participants**

Participants in the study were 64 adolescents aged 14-17,  $M = 14.81$  ( $SD = 1.00$ ), 17.5% minority, 54% male, and one of their parents, recruited from the community in a small Southeastern city. The majority of adolescents ( $N = 54$ ; 85.7%) participated with their mother/mother figure. Family income ranged from less than \$10,000 to greater than \$100,000 ( $Median = \$40,000$ - $\$50,000$ ), which is similar to median income for families in the community. Adolescents and parents were recruited via community flyers, online social networking sites, online advertising, radio advertising, and word-of-mouth. Adolescents were excluded if they

answered affirmatively to taking psychotropic medications, which could potentially affect salivary cortisol levels.

### **Procedures**

Flyers and advertisements distributed online and in the community included a brief summary of study information, along with the name of the study and phone numbers to get in touch with the research team. When parents or adolescents contacted the research team, they were told: “Thank you for getting in touch with us today. We are asking for volunteers to help us learn more about relationships between teens and their parents. The project involves coming to our private offices at the University of Tennessee and filling out a survey, doing a short interview, and doing a stress hormone test. Participation in the study is totally up to you, and you can stop at any point. Your answers will be kept completely confidential, so that no one will be able to link your answers to your name and other personal information. If you agree to participate, the study will take about one and one half hours to complete.” Families who agreed to participate were scheduled for a late afternoon or early evening appointment (between 4 and 6 pm), in order to control for changes in cortisol levels due to cortisol’s diurnal rhythm. Adolescents were also instructed not to eat or drink anything besides water for one hour prior to the visits, to prevent food-related interference with cortisol assays.

**Laboratory visit.** When families arrived, they were met by a trained graduate or undergraduate researcher who had previously signed a statement of confidentiality. Researchers explained the study procedures and obtained written informed consent/assent from parents and adolescents, respectively, for all study procedures including a phone follow-up. Adolescents and parents were then separated and completed questionnaires in different rooms. Parents completed their surveys in a quiet room alone, but were told that the researcher would check on them

periodically to answer questions. Parents were informed that they would likely finish before their teens, and were provided with magazines to read while they waited. The adolescents were first asked to complete some preliminary questionnaires, including a baseline measure of positive and negative affect.

**Baseline cortisol.** After completing the initial surveys, adolescents were told, “something we’re trying to understand about teenagers is the level of stress in their lives. Some teens feel like they’re under a lot of stress, but others do not. What I’d like to do is measure your stress level by getting a sample of saliva, or spit, from you. This is not a drug test, and your saliva/spit will not be used for anything once we test it for stress hormones, and after the test is done, it will be destroyed. Would you be willing to put these two swabs in your mouth for a couple of minutes?” Adolescents were then asked to rinse their mouths with water from the water fountain approximately 15 feet from the office. Once back in the office, adolescents were given two Salimetrics® sorbettes, which resemble small, triangle-shaped sponges on a stick. They were instructed to place them under the tongue, “like a thermometer,” and to hold them still for 90 seconds. Salivettes were placed into a 250 mL plastic centrifuge vial, with sponge tips pointing up, which was capped and labeled with the participant’s assigned ID number, sealed with parafilm, and placed in the freezer at  $-80^{\circ}$  C. Non-latex gloves were provided to the research assistants for handling the saliva sample.

**Baseline respiratory sinus arrhythmia (RSA).** Next, adolescents were attached to a UFI Biolog device designed to measure the time, in milliseconds, between heartbeats, which was later converted to a measure of RSA via a computer program (described below). Adolescents were given electrodes to attach to the skin of their right forearm (in the soft underside, away from any bony prominences), right collarbone, and left ribcage area. They were then instructed

to sit quietly, without fidgeting or using their cell phones, and watched a five minute video showing peaceful scenes and playing peaceful music. Most of the adolescents described this video as peaceful or boring. The interviewer left the room during the relaxation video to reduce distractions and to keep the procedure standardized.

**Stressful task, RSA, and cortisol.** After the baseline task, the researcher immediately began the Peer Experiences Interview (PEI; please see Measures section below for a detailed description), which was developed for the current study and lasted for a total of 17 minutes. Adolescents were presented with two open-ended questions and were given five minutes to answer each question. In between questions two and three, adolescents were given two minutes to complete a measure of positive and negative affect. The procedure was timed by a computer (with stopwatch backup) to keep the interview timing standardized. At the end of each segment, the interviewer was prompted by the computer to move on to the next question. Adolescents' RSA was monitored throughout the baseline video and PEI. Adolescents' salivary cortisol was assessed 30 minutes following the stressful component of the PEI, to account for the time required for saliva to register peak levels of cortisol following a stressful task (Dickerson & Kemeny, 2004).

After the Peer Experiences Interview, adolescents were unhooked from the biologic device and given a brief exit interview. They then completed several self-report surveys. When parents and adolescents completed their surveys, they were debriefed, thanked, and compensated for their time. Adolescents received a \$15 Target gift card, and parents received \$20 cash for their time. In the event that the parent or adolescent seemed upset, or needed further debriefing or a specific referral, the research assistants were instructed to contact the graduate student PI and/or the Faculty Advisor, a licensed clinical psychologist, for further instructions.

**Follow-up.** Approximately eight months after the initial laboratory visit, adolescents were contacted by telephone to obtain follow-up information. Trained graduate and undergraduate interviewers first obtained verbal assent from parents before administering a five minute questionnaire over the phone. Participants were thanked again for their participation, but received no incentive for participating in the follow-up phone calls. A total of 43 adolescents participated in the telephone follow-up (67%). Of the adolescents who did not participate, most were unreachable due to disconnected phones or busy lifestyles. None that were reached declined to participate. The sample was assessed for differences in participants who only participated in the laboratory visit, and those who also participated in the phone follow-up. Only two differences emerged: adolescents who participated in both phases of the study had higher incomes,  $t(62) = -2.94, p < .01$ , and lower alcohol problems,  $t(61) = 2.76, p < .01$ , than those who only participated in the laboratory visit.

### Measures

A *Demographic Questionnaire* was created for this project that included common demographic questions including participants' gender, age, ethnicity, and educational status. Parents also completed a demographic information form that included SES and family structure questions.

**Adolescent-Parent Relationship.** The FACES-IV (Olson, Gorall, & Tiesel, 2007) is the fourth edition of a 62-item scale designed to evaluate family functioning, and is completed by adolescents and their participating parents. Subscales in this study included flexibility and cohesion (21 items each) (e.g. "Our family tries new ways of dealing with problems;" "Family members are involved in each others' lives," respectively). Participants rated flexibility and

cohesion on a 5-point scale, from 1 (*strongly disagree*) to 5 (*strongly agree*). Scores were determined using the mean of each subscale.

The Inventory of Peer and Parent Attachment (IPPA; Arnsden & Greenburg, 1983) is a 75-item scale tapping adolescents' self-reported overall attachment to parents and peers and subscales of trust, alienation, and communication. Adolescents rated the extent to which items described them on a 5-point scale, from 1 (*almost never or never true*) to 5 (*almost always or always true*). For the present study, the mean of adolescents' overall reports of attachment to mothers and fathers was used as an assessment of overall attachment security with parents.

The Bell Object Relations Inventory (BORI; Bell, 2003) is a 31-item scale that measures adolescents' close interpersonal relationships on five subscales: alienation, insecure attachment, egocentricity, social incompetence, and positive attachment. For the present study, only the insecure attachment and positive attachment subscales were assessed. All items are True/False, and scales have shown excellent factorial invariance, good internal consistency, and construct validity (Bell, 2003).

**Temperament.** The Revised Dimensions of Temperament Survey (DOTS-R; Windle & Lerner, 1986) was completed by parents about the target adolescents. The DOTS-R is a 54-item questionnaire assessing temperament on several subscales, including adaptability/positivity when faced with new stimuli and rhythmicity of daily routine and habits. Items were answered on a 4-point scale from 1 (*usually false*) to 4 (*usually true*), such that higher scores indicate a more adaptable and rhythmic temperament.

**Emotion Regulation.** The Managing Distress Interpersonally Scale – Friend Version (MANDI-FR; Little-Kivisto, Gordon, Welsh, & Culpepper, in preparation) asks adolescents to report how often they tend to engage in various behaviors with close friends when “distressed or



upset.” The scale consisted of 25 items on a six-point Likert-type scale ranging from 1 (*never*) to 6 (*always*). Each item begins with the stem “When I’m distressed or upset....” The measure consists of five subscales; however, only one subscale was used for this study. The *Lashing-Out* subscale targets adolescents’ angry outbursts with their friends (e.g., “I say things to my friends out of anger that I later regret”). Scores were determined using the mean of each subscale.

The Distress Tolerance Scale (DTS; Simons & Gaher, 2005) is a 15-item scale that asks the participants to think about times in the past they have felt distressed or upset. The DTS provides a measure of overall distress tolerance, as well as subscales of Tolerance, Absorption, Appraisals, and Emotion Regulation. Participants were asked to rate each item on a 5-point scale, from 1 (*strongly agree*) to 5 (*strongly disagree*), and an overall mean score was calculated, as well as means for each subscale.

Recent research points to socially threatening paradigms as the most effective for activating the HPA axis and therefore the cortisol stress response (Gunnar, Talge, & Herrera, 2009). The Peer Experiences Interview (PEI) is a social stress task for adolescents adapted from the Yale Interpersonal Stressor (YIPS; Stroud, Tanofsky-Kraff, Wilfley, & Salovey, 2000). The YIPS is a social stress paradigm that involves social rejection of a participant by two age- and sex-matched confederates. The task involves a baseline period and a gradual increase in social stress (via increasing peer rejection). The YIPS has several advantages as a stressor task; it does not require that participants bring a partner or peer to the lab to discuss existing disagreements or challenges (e.g., Chango, McElhaney, & Allen, 2009; Levenson & Gottman, 1983), or perform difficult tasks, such as mental math or public speaking before an audience (Kirschbaum, Kirke, & Helhammer, 1993), which is not a truly interpersonal exchange. However, because the

paradigm requires two sex- and age-matched peer confederates, it was not feasible for the present study.

Using the YIPS as a guide, we built upon priming tasks previously used to induce feelings of relationship threat and distress in laboratory participants (Mikulincer, Gillath, & Shaver, 2002). Two open-ended questions were asked by a highly-trained graduate or undergraduate interviewer. The adolescents were given five minutes to respond to each question, and were instructed to keep talking until asked to stop. After the five-minute quiet baseline period (the standardized video), adolescents completed a talking baseline with the neutral prompt: “Tell me about your friends.” Second, and in place of rejection by confederates, adolescents were asked to recount incidents of being hurt, rejected, or betrayed by a close peer. Specifically, the interviewer presented the stressor question: “Tell me about a time recently when you felt hurt, betrayed, or rejected by a close friend.” Immediately after the five-minute stressor segment, adolescents were given two minutes to complete the PANAS (Watson, Clark, & Tellegen, 1998) to assess their positive and negative affect in the present moment. If adolescents finished the PANAS before two minutes passed, they were asked to sit quietly until prompted with the third interview question. If adolescents had difficulty answering or finished answering before the five minutes were over, interviewers prompted the adolescents with standardized, open-ended follow-up questions. Interviewers were instructed that the purpose of the interview was to keep the adolescents talking for the entire five minutes, with as little interviewer input as possible.

The Peer Experiences Interview - Exit Interview asked two questions regarding 1) the subjective seriousness of the event and 2) the level of subjective distress at the time. Adolescents

responded verbally on a scale from 1 (*not at all serious/upset*) to 5 (*the most serious/upsetting negative event ever experienced*).

Salivary cortisol secretion was measured at the beginning of the laboratory visit for a baseline level and at 30 minutes after the stressor task. Samples were frozen within 2 hours at -80° Celsius. Prior to analysis, saliva samples were thawed and centrifuged at 3500 rpm for 15 minutes. Samples were assayed for salivary cortisol using a highly sensitive enzyme immunoassay US FDA (510k) cleared for use as an in vitro diagnostic measure of adrenal function (Salimetrics, State college, PA). The test used 25 µl of saliva (for singlet determinations), had a lower limit of sensitivity of 0.007 µg/dl, and average intra- and inter-assay coefficients of variation of less than 5% and 10%, respectively. All samples were assayed in duplicate.

Respiratory sinus arrhythmia (RSA) was calculated from interbeat intervals (IBI) collected using a UFI Biolog device during the baseline video and PEI procedures. IBI was recorded for a total of 17 minutes. This recording produced a long data stream and was separated into three segments for analysis (quiet baseline, talking baseline, and stressor task). IBI data is not time series data, but can be converted to time series data by interpolating data points at a fixed sampling rate (Allen, 2002). The Cardiac Metric program (Allen, 2002) uses a 10 Hz sampling rate with linear interpolation. Each segment was first converted to a time series, and then to RSA (as the log of band limited variance of IBI), using the Cardiac Metric (CMet) program (Allen, 2002). Higher values of RSA indicate higher vagal tone, or more efficient activation of the parasympathetic nervous system (e.g., Grossman & Taylor, 2007; however, see Berntson, Cacioppo, & Grossman, 2007, for disagreement).

**Psychological Symptoms and Problem Behavior.** The Center for Epidemiologic Studies-Depression Scale (CES-D; Radloff, 1977) is a 20-item self-report instrument designed to measure depressive symptoms. Adolescents rated each item on a 4-point scale, from 1 (*really untrue for me*) to 4 (*really true for me*). Scores were summed and ranged from 0 to 60, with higher scores indicating more severe depressive symptoms. Specifically, scores ranging from 0 to 15 reflect depressive levels found in the general population, scores ranging from 16 to 38 are considered “at risk,” and scores above 39 resemble depressed patients in a clinical population (Radloff, 1977). The CES-D was administered at the laboratory visit and at the follow-up phone call.

The Children’s Peer Relations Scale (Crick, 1991) is a 15-item scale with six subscales: perceived peer acceptance, isolation from peers, negative affect, engagement in caring acts, engagement in overt aggression, and engagement in relational aggression. The scale was adapted to reflect adolescent age-appropriate activities (e.g., wording such as “play with friends” was changed to “hang out with friends”). Adolescents read descriptions of teenage behavior, feelings, and characteristics, and rated how often they feel or do something similar on a scale from 1 (*never*) to 5 (*all the time*). Only the overt physical aggression scale was used in the current study.

The Rutgers Alcohol Problem Index (White & Labouvie, 1989) is a 23-item self-report measure of adolescent problem drinking. Adolescents responded to items about problems they may have experienced because of their drinking in the past 3 years, such as “not able to do your homework or study for a test,” on a 5-point scale from 0 (*never*) to 4 (*more than 10 times*).

## RESULTS

### Preliminary Analyses

**Descriptive statistics.** Means and Standard Deviations of study variables are presented in Table 11 (all tables and figures are presented in the Appendix). Descriptive statistics fell within expected ranges for all variables. Tests for differences in study variables by adolescent demographics revealed that girls reported greater attachment insecurity,  $t(62) = -2.10, p < .05$  (girls  $M = 1.46$ , boys  $M = 1.36$ ); more difficulty with overall distress tolerance,  $t(62) = -2.17, p < .05$  (girls  $M = 2.44$ , boys  $M = 2.10$ ) and distress appraisal,  $t(62) = -2.08, p < .05$  (girls  $M = 2.22$ , boys  $M = 1.90$ ); and lower stress cortisol  $t(43) = 2.11, p < .05$  (girls  $M = .06$ , boys  $M = .13$ ). Ethnic minority adolescents reported higher family cohesion,  $t(61) = -3.11, p < .01$  (minority  $M = 30.75$ , non-minority  $M = 26.16$ ), and more physical aggression with peers,  $t(61) = -2.17, p < .05$  (minority  $M = 2.08$ , non-minority  $M = 1.55$ ). Parents of minority adolescents reported greater family flexibility,  $t(61) = -3.11, p < .05$  (minority  $M = 28.75$ , non-minority  $M = 26.45$ ). In families that reported higher levels of income, participating adolescents showed higher levels of baseline RSA  $F(8, 52) = 2.28, p < .05$ , suggesting greater physiological resilience among adolescents from higher-income homes. Study variables did not vary significantly by adolescent age or whether they participated with their mother or father.

**Correlations.** Correlations between study variables supported the hypothesis that adolescent temperamental and family relationship factors were significantly related to adolescent emotion regulation, which was in turn was related to adolescent psychological symptoms (see Table 12). Specifically, adolescent report of secure attachment was positively correlated with baseline RSA,  $r = .33, p < .01$ , and negatively correlated with poor distress tolerance, negative distress appraisals, time 1 depressive symptoms, and physical aggression,  $r = -.18$  to  $-.45, p < .10$

to .01. Insecure attachment was negatively correlated with baseline RSA,  $r = -.39, p < .001$ , and positively correlated with cortisol stress response, poor distress tolerance, negative distress appraisal, and time 1 depressive symptoms,  $r = .26$  to  $.37, p < .05$  to  $.01$ .

Adolescent reports of family cohesion and flexibility were both negatively correlated with poor distress tolerance, negative distress appraisal, and time 1 depressive symptoms,  $r = -.18$  to  $-.41, p < .10$  to  $.001$ . In addition, adolescent report of family cohesion was negatively correlated with baseline cortisol,  $r = -.18, p < .10$ , and family flexibility was also negatively correlated with alcohol problems and physical aggression,  $r = -.17, p < .10$  and  $r = -.23, p < .05$ , respectively. Parents' reports of family flexibility and cohesion were negatively correlated with adolescents' poor distress appraisal and time 1 depressive symptoms,  $r = -.19$  to  $-.31, p < .10$  to  $.01$ .

Parent report of adolescent adaptability was negatively correlated with time 1 depressive symptoms,  $r = -.34, p < .01$ . Difficulty with distress tolerance and poor distress appraisals were positively correlated with depressive symptoms at time 1,  $r = .29$  to  $.42, p < .01$  to  $.001$ , and time 2,  $r = .33$  to  $.42, p < .05$  to  $.01$ . Lashing out in response to distress was positively correlated with depressive symptoms at time 1, alcohol problems, and physical aggression toward peers,  $r = .24$  to  $.50, p < .05$  to  $.001$ . Baseline cortisol was positively correlated with alcohol problems,  $r = .29, p < .05$ .

**Manipulation check.** As a check to the PEI's efficacy for engineering social stress, participants completed the 20-item Positive and Negative Affects Scale (PANAS; Watson, Clark, & Tellegen, 1988). Adolescents read each item and indicated "to what extent do you feel this way right now?" on a 5 point scale (1 = *very slightly or not at all* to 5 = *extremely*). Positive and negative affect subscales were calculated by summing responses to the 10 positive items (e.g.,

“excited,” “happy”) and 10 negative items (e.g., “hostile,” “nervous”), respectively. The PANAS was administered at baseline and immediately after the stressor segment of the Peer Experiences Interview. Adolescents reported greater positive affect at baseline,  $M = 30.7$  ( $SD = 7.7$ ), than following the stressor task,  $M = 28.5$  ( $SD = 7.5$ ), a statistically significant difference,  $t(62) = 3.72, p < .001$ . However, this may not represent a clinically significant difference. Adolescents also reported increased negative affect following the stressor task,  $M = 15.1$  ( $SD = 4.5$ ), than at baseline,  $M = 14.5$  ( $SD = 5.1$ ), but this difference did not reach statistical significance,  $t(62) = -.98, p = .33$ . Adolescents were also asked two exit interview questions regarding 1) the subjective seriousness of the event and 2) the level of subjective distress at the time. Adolescents responded verbally on a scale from 1 to 5 (1 = *not at all serious/upset* and 5 = *the most serious/upsetting negative event ever experienced*). The Median response for both questions was 3 (*fairly serious/upset*). It is unclear if participants were responding to the task with sufficient negativity to indicate a clinically significant level of social stress, which was taken into account when interpreting results.

### Primary Analyses

Missing physiological data was present due to equipment failure, inadequate saliva collection as a result of environmental factors (room too hot and dry), and errors in the salivary assay process. For these reasons, data analyses were conducted separately for RSA and salivary cortisol. All structural equation were estimated using AMOS 17 (Arbuckle, 1999) utilizing Maximum Likelihood Estimation with standardized path coefficients. To test model fitness, we included several fit indices, including a  $\chi^2/df \leq 2$  (Wheaton, Muthén, Alwen, & Summers, 1977); CFI  $\geq .95$  (Hu & Bentler, 1999); and RMSEA  $< .05$  = good, RMSEA .05 - .08 =

reasonable or acceptable; RMSEA .08 - .10 = mediocre; and RMSEA  $\geq$  .10 = poor (Browne & Cudeck, 1993; MacCallum, Browne, & Sugawara, 1996).

**RSA Hypothesis 1: The parent-adolescent relationship will predict adolescent emotion regulation.** First, two correlated latent variables were created based on adolescent and parent reports of family relationships, respectively. The latent variable Teen Report of Family Relationship was comprised of adolescent report of attachment to parents, family flexibility, and family cohesion. The latent variable Parent Report of Family Relationship was comprised of parent report of family flexibility and cohesion. The measurement model showed poor overall fit (Hu & Bentler, 1999; MacCallum, Browne, & Sugawara, 1996),  $\chi^2 = 21.87$ ,  $df = 11$ ,  $CFI = .87$ ,  $RMSEA = .13$ . Second, the latent variable Adolescent Emotion Regulation was created using Stress RSA response and adolescent self-report of total distress tolerance. Third, Adolescent Emotion Regulation was regressed on both Family Relationship variables (see Figure 1; all models used completely standardized robust maximum likelihood parameter estimates), with mediocre model fit (Hu & Bentler, 1999; MacCallum et al., 1996)  $\chi^2 = 17.77$ ,  $df = 11$ ,  $CFI = .92$ ,  $RMSEA = .10$ . More positive Teen and Parent Reports of the Family Relationship were negatively associated with poor Teen Emotion Regulation,  $\beta = -.18$  and  $\beta = -.14$ , respectively; however, neither regression estimate reached statistical significance.

**RSA Hypothesis 2: Adolescent temperament will predict adolescent emotion regulation.** First, a latent Temperament variable was constructed using adolescent baseline RSA, parent report of adolescent adaptability, and parent report of adolescent rhythmicity. The measurement model showed model fit consistent with a saturated measurement model,  $\chi^2 = .30$ ,  $df = 3$ ,  $CFI = 1.00$ ,  $RMSEA = .00$ . The latent variable Adolescent Emotion Regulation was regressed on Temperament (see Figure 2), with saturated model fit  $\chi^2 = .45$ ,  $df = 3$ ,  $CFI = 1.00$ ,



$RMSEA = .00$ . The error terms of baseline RSA and stress RSA were allowed to correlate in this model,  $r = .90$ ,  $p < .001$ , and all subsequent models, in order to account for the large amount of shared variance between them. Temperament predicted Emotion Regulation, however in the opposite direction than expected,  $\beta = .31$ , such that greater temperamental resilience predicted poorer emotion regulation. However, this estimate did not reach statistical significance.

**RSA Hypothesis 3: Both adolescent temperament and the parent-adolescent relationship will predict adolescent depression.** Depression was regressed on the latent variables Adolescent Report of Family Relationship, Parent Report of Family Relationship, and Adolescent Temperament (see Figure 3), with poor model fit (Hu & Bentler, 1999; MacCallum et al., 1996),  $\chi^2 = 34.94$ ,  $df = 22$ ,  $CFI = .82$ ,  $RMSEA = .10$ . As expected, positive Teen Report of the Family Relationship and resilient Temperament were both negatively associated with Depressive Symptoms,  $\beta = -.21$  and  $\beta = -.29$ , respectively, although not significantly so. Parent Report of the Family Relationship was unrelated to depressive symptoms,  $\beta = -.01$ .

**RSA Hypothesis 4: Emotion regulation will mediate the relationships between the parent-adolescent relationship and temperament on adolescent depression.** A structural equation model was conducted where Family Relationship (parent and adolescent reports) and Adolescent Temperament predicted depressive symptoms through Adolescent Emotion Regulation (see Figure 4), with the model providing a good fit to the data (Hu & Bentler, 1999; Browne & Cudeck, 1993),  $\chi^2 = 44.57$ ,  $df = 37$ ,  $CFI = .96$ ,  $RMSEA = .06$ . None of the hypothesized pathways were statistically significant, although they were in the expected directions. Specifically, positive Teen Report of the Family Relationship and resilient Temperament were both negatively associated with poor Emotion Regulation,  $\beta = -.32$  and  $\beta = -.39$ , respectively, and poor Emotion Regulation was associated with greater depressive

symptoms,  $\beta = .78$ . Tests of indirect effects (MacKinnon, Lockwood, Hoffman, West, & Sheets, 2002; Sobel, 1982) were conducted to obtain the  $z'$  by multiplying the standardized regression coefficient of path a by the standardized regression coefficient of path b, and dividing the product by the product of the standard errors of path a and b, producing a z-score. Separate tests of indirect effects were conducted for each predictor in the model: adolescent report of the family relationship,  $z = -.40$ ,  $p = .34$ ; parent report of the family relationship,  $z = .02$ ,  $p > .50$ ; and temperament,  $z = -.02$ ,  $p > .50$ . All were non-significant.

**RSA Hypothesis 5: Both adolescent temperament and the parent-adolescent relationship will predict adolescent alcohol problems.** Adolescent report of problem alcohol use was regressed on the latent variables Adolescent Report of Family Relationship, Parent Report of Family Relationship, and Adolescent Temperament (see Figure 5), with the model showing an adequate fit (Hu & Bentler, 1999; Browne & Cudeck, 1993),  $\chi^2 = 28.66$ ,  $df = 22$ ,  $CFI = .94$ ,  $RMSEA = .07$ . As expected, positive Teen Report of the Family Relationship and resilient Temperament were both negatively associated with alcohol problems,  $\beta = -.30$  and  $\beta = -.12$ , respectively, although not significantly so. Unexpectedly, Parent Report of the Family Relationship was positively associated with adolescent alcohol problems,  $\beta = .23$ ; however this association was also non-significant.

**RSA Hypothesis 6: Adolescent emotion regulation will mediate the effects of the parent-adolescent relationship and adolescent temperament on alcohol use.** A structural equation model was conducted where Family Relationship (parent and adolescent reports) and Adolescent Temperament predicted Adolescent Emotion Regulation, which in turn predicted adolescent alcohol problems (see Figure 6). Although the minimum was achieved and model fit was estimated, one of the standardized regression paths was greater than 1, suggesting an

impossible solution. This is possibly due to the large number of estimated paths in the model relative to the sample size. Specifically, it is recommended that ratio of N to paths estimated not drop below 10:1 (Kline, 1998). Furthermore, as this ratio declines, one is more likely to have difficulty analyzing the model using SEM or obtaining bogus results (e.g.,  $\beta > 1.00$ ; Kline, 1998).

**RSA Hypothesis 7: Both adolescent temperament and the parent-adolescent relationship will predict adolescent physical aggression toward peers.** Adolescent report of aggression toward peers was regressed on the latent variables Adolescent Report of Family Relationship, Parent Report of Family Relationship, and Adolescent Temperament (see Figure 7), with poor model fit (Hu & Bentler, 1999; MacCallum et al., 1996),  $\chi^2 = 34.44$ ,  $df = 22$ ,  $CFI = .89$ ,  $RMSEA = .10$ . As expected, positive Teen Report of the Family Relationship and resilient Temperament were both negatively associated with peer aggression,  $\beta = -.30$  and  $\beta = -.20$ , respectively, although not significantly so. Unexpectedly, Parent Report of the Family Relationship was positively associated with adolescent peer aggression,  $\beta = .28$ ; however this association was also non-significant.

**RSA Hypothesis 8: Adolescent emotion regulation will mediate the effects of the parent-adolescent relationship and adolescent temperament on physical aggression toward peers.** A structural equation model was estimated in which Family Relationship (parent and adolescent reports) and Adolescent Temperament predicted Adolescent Emotion Regulation, which in turn predicted adolescent peer aggression (see Figure 8). However, this model was unidentified and failed to run, potentially due to the large number of paths relative to the small sample size.

**Cortisol Hypothesis 1: The parent-adolescent relationship will predict adolescent emotion regulation.** Adolescent cortisol stress response was regressed on both Family Relationship variables, controlling for the number of hours since awakening and baseline cortisol (see Figure 9), with the model showing a good fit to the data ((Hu & Bentler, 1999; Browne & Cudeck, 1993),  $\chi^2 = 15.1$ ,  $df = 13$ ,  $CFI = .97$ ,  $RMSEA = .06$ ). More positive Teen Report of the Family Relationship was negatively associated with cortisol stress response,  $\beta = -.11$ , although not significantly so. Unexpectedly, more positive Parent Report of the Family Relationship was positively associated with adolescent cortisol stress response,  $\beta = .34$ . However, this result was non-significant.

**Cortisol Hypothesis 2: Adolescent temperament will predict adolescent emotion regulation.** A latent Temperament variable was constructed using adolescent baseline cortisol, parent report of adolescent adaptability, and parent report of adolescent rhythmicity. The measurement model showed model fit consistent with a saturated measurement model,  $\chi^2 = .00$ ,  $df = 0$ ,  $CFI = 1.00$ ,  $RMSEA = .00$ . Cortisol stress response was regressed on Temperament, controlling for the number of hours since awakening (see Figure 10), but this model was unidentified and failed to run.

**Cortisol Hypothesis 3: Both adolescent temperament and the parent-adolescent relationship will predict adolescent depression.** Depression was regressed on the latent variables Adolescent Report of Family Relationship, Parent Report of Family Relationship, and Adolescent Temperament (see Figure 11). The solution of this model was inadmissible due to depressive symptoms having a negative error variance, which likely resulted from small sample size.

**Cortisol Hypothesis 4: Adolescent emotion regulation will mediate the effects of the parent-adolescent relationship and adolescent temperament on depression.** A structural equation model was estimated in which Family Relationship (parent and adolescent reports) and Adolescent Temperament predicted adolescent cortisol stress response, which in turn predicted adolescent depressive symptoms (see Figure 12). Although the minimum was achieved and model fit was estimated, two of the standardized regression paths were greater than 1, suggesting an impossible solution.

**Cortisol Hypothesis 5: Both adolescent temperament and the parent-adolescent relationship will predict adolescent alcohol problems.** Adolescent report of problem alcohol use was regressed on the latent variables Adolescent Report of Family Relationship, Parent Report of Family Relationship, and Adolescent Temperament (see Figure 13). Although the minimum was achieved and model fit was estimated, one of the standardized regression paths was greater than 1, suggesting an impossible solution.

**Cortisol Hypothesis 6: Adolescent emotion regulation will mediate the effects of the parent-adolescent relationship and adolescent temperament on alcohol use.** A structural equation model was estimated in which Family Relationship (parent and adolescent reports) and Adolescent Temperament predicted cortisol stress response, which in turn predicted adolescent alcohol problems (see Figure 14). Although the minimum was achieved and model fit was estimated, one of the standardized regression paths was greater than 1, suggesting an impossible solution.

**Cortisol Hypothesis 7: Both adolescent temperament and the parent-adolescent relationship will predict adolescent physical aggression toward peers.** Adolescent report of aggression toward peers was regressed on the latent variables Adolescent Report of Family

Relationship, Parent Report of Family Relationship, and Adolescent Temperament (see Figure 15). Although the minimum was achieved and model fit was estimated, two of the standardized regression paths were greater than 1, suggesting an impossible solution.

**Cortisol Hypothesis 8: Adolescent emotion regulation will mediate the effects of the parent-adolescent relationship and adolescent temperament on physical aggression toward peers.** A structural equation model was estimated in which Family Relationship (parent and adolescent reports) and Adolescent Temperament predicted adolescent cortisol stress response, which in turn predicted adolescent peer aggression (see Figure 16). Although the minimum was achieved and model fit was estimated, two of the standardized regression paths was greater than 1, suggesting an impossible solution.

**Depression at time 2.** Due to the limited sample size of participants who completed the follow-up study, analyses predicting depressive symptoms at time 2 were conducted using linear regression and controlling for time 1 depressive symptoms. Contrary to hypotheses, no developmental factors (e.g., attachment, family cohesion/flexibility, or temperament) were related to time 2 depressive symptoms. Only self-reported distress tolerance problems at time 1 predicted time 2 depressive symptoms,  $\beta = .31$ ,  $t(40) = 2.10$ ,  $p < .05$ ,  $R^2 = .09$ , such that greater difficulty with distress tolerance at time 1 predicted a greater increase in depressive symptoms 8 months later. Tests of mediation effects were conducted using linear regression, to ensure that no mediation was present. There were no significant mediation effects.

### **Post Hoc Analyses**

Due to the limitations inherent in utilizing SEM with a small sample, post hoc analyses were conducted as path analyses using AMOS 17 (Arbuckle, 1999) utilizing Maximum Likelihood Estimation with standardized path coefficients. Analyses were conducted separately

for each of the three outcome variables: depressive symptoms, alcohol problems, and physical aggression toward peers. The order of placement of observed variables in the models was determined a priori based on developmental theory (e.g., parent-adolescent relationship factors and temperament precede emotion regulation problems, which precede psychopathology), but were trimmed to obtain optimal fit with limited sample size. Based on these procedures, despite a priori hypotheses, these results should be considered exploratory.

Goodness-of-fit was compared between models accounting for age, gender, minority status, and income, and those not accounting for these demographic factors. Across each model, the inclusion of demographic variables resulted in a poorer fit of the model and showed no significant relationships with study outcomes. Therefore, demographic variables were omitted from subsequent models.

**Predicting depressive symptoms.** The final model examining depressive outcomes included the developmental predictors: parent report of family cohesion, teen report of attachment insecurity, and baseline RSA, and mediators: RSA stress response and overall distress tolerance. The final model partially supported the original hypotheses, with inconsistent model fit (Hu & Bentler, 1999; MacCallum et al., 1996),  $\chi^2 = 11.66$ ,  $df = 6$ ,  $CFI = .94$ ,  $RMSEA = .13$  (see Figure 17). The fit inconsistency was likely due to large ratio of estimated to available parameters and small sample size. The pathway between adolescent insecure attachment and poor distress tolerance was significant and in the expected direction,  $\beta = .45$ , as was the pathway between poor distress tolerance and depressive symptoms  $\beta = .26$ . However, tests of indirect effects were non-significant,  $z = .14$ ,  $p > .42$ . Additionally, there were no indirect effects for the effects of family cohesion on depressive symptoms through poor distress tolerance,  $z = .17$ ,  $p > .42$ . Stress RSA was not directly related to depressive symptoms; however, higher stress RSA

predicted greater self-reported problems with distress tolerance,  $\beta = .28$ , and poor distress tolerance predicted depressive symptoms,  $\beta = .26$ . This pathway also did not meet criteria for indirect effects,  $z = .32, p > .34$ . One indirect pathway in the model did meet criteria for significant indirect effects: baseline RSA predicted Stress RSA,  $\beta = .83$ , which in turn predicted poor distress tolerance,  $\beta = .23$ , indirect effect  $z = 27.14, p < .001$ .

The same model was estimated, adding depressive symptoms at time 2 (see figure 18). This model showed adequate fit,  $\chi^2 = 13.57, df = 10, CFI = .94, RMSEA = .10$ . In this model, attachment insecurity significantly predicted poor distress tolerance,  $\beta = .45$ , which in turn significantly predicted time 2 depressive symptoms,  $\beta = .30$ , (controlling for the effect of time 1 depression on time 2 depression). However, the test of indirect effects was non-significant,  $z = .14, p > .42$ .

**Predicting alcohol problems.** The final alcohol problems as outcome model included the developmental predictors: parent report of family flexibility, teen report of attachment insecurity, and baseline cortisol, and mediators: distress appraisal and lashing out in response to distress. The model fit the data consistent with a saturated measurement model,  $\chi^2 = 3.58, df = 7, CFI = 1.00, RMSEA = .00$  (see Figure 19). This model also accounted for the number of hours between waking and the visit time, to control for variations in cortisol's diurnal rhythm across participants. The final model partially supported the original hypotheses. Lower levels of family flexibility predicted poorer appraisals of adolescents' ability to cope with distress,  $\beta = -.26$ , which in turn predicted greater angry lashing out in response to distress,  $\beta = .40$ , which predicted greater alcohol problems,  $\beta = .52$ . However, only the indirect effects from family flexibility, through negative distress appraisal, to lashing out reached significance,  $z = -37.14, p < .001$ . In models prior to the final trimmed model, baseline cortisol was unrelated to self-reported emotion



regulation measures. In the final model baseline cortisol showed a direct relation with alcohol, such that higher cortisol levels predicted greater alcohol problems, even when accounting for the other variables,  $\beta = .27, p < .05$ . Unexpectedly, attachment insecurity was statistically unrelated to distress appraisal or lashing out with peers.

Also unexpectedly, distress appraisal was negatively associated with alcohol problems, although not significant. Given the strong positive association between negative distress appraisal and lashing out with peers, and between lashing out with peers and alcohol problems, moderation effects were examined. To follow-up with this finding, we conducted an analysis of lashing out in distress as a moderator of the relation between distress appraisal and alcohol problems. Lashing out significantly moderated the relationship between negative appraisals and alcohol problems,  $\beta = .24, p < .05$ , such that at high levels of lashing out, alcohol problems did not vary as a result of distress appraisals,  $\beta = .06, p = .65$ . However, at low levels of lashing out, poor appraisals of one's distress tolerance were negatively related to alcohol problems,  $\beta = -.39, p < .05$  (see Figure 20). This was an unexpected and paradoxical finding, which may be linked to the relatively young mean age of the sample, the relatively few alcohol related problems reported by most participants, or a combination of the two.

**Predicting physical aggression.** The final model examining aggressive behavior with peers included the developmental predictors: parent report of family flexibility, teen report of attachment insecurity, and baseline RSA, and mediators: distress appraisal and lashing out in response to distress. The final model partially supported the hypotheses (see figure 21), and showed a reasonable fit to the data (Hu & Bentler, 1999; Browne & Cudeck, 1993),  $\chi^2 = 7.07, df = 5, CFI = .95, RMSEA = .085$ . Specifically, lower levels of family flexibility predicted poorer appraisals of distress tolerance,  $\beta = -.26$ , which predicted verbal lashing out with peers,  $\beta = .41$ ,

which predicted aggression toward peers,  $\beta = .53$ . These indirect effects were statistically significant, such that lower family flexibility predicted greater lashing out with peers through negative distress appraisals,  $z = 11.89, p < .001$ , and distress appraisals significantly predicted physical aggression with peers through lashing out,  $z = 38.07, p < .001$ . Insecure attachment was positively related to poor distress appraisal, but this path did not reach statistical significance. Baseline RSA was statistically unrelated to self-reports of emotion regulation. Unexpectedly, distress appraisal was negatively related to physical aggression with peers. Lashing out did not significantly moderate the relationship between negative appraisals and physical aggression,  $\beta = .09, p = .45$ .

## DISCUSSION

The current study built upon the theory that adolescent psychopathology is related to numerous developmental and contextual factors; specifically, the preparations for emotion regulation provided by the family context, adolescents' temperamental and biologically determined capacities to cope with stressors, and adolescents' own perceptions of their capacity to cope with negative feelings. In accounting for these myriad factors, this study adds to the literature by testing several components of the theoretical model that adolescent emotion regulation mediates the relationship between adolescent developmental factors and psychopathology (Morris et al., 2007). Depression, alcohol abuse, and peer aggression are each linked in the research literature to emotional dysregulation or family context, and the current study extends these findings by combining developmental context, emotion regulation, and psychopathology in a meaningful, theory-driven way.

Using sophisticated statistical modeling techniques and a multi-reporter, multi-method approach, models of indirect effects were estimated separately using physiological components

of emotion regulation: respiratory sinus arrhythmia (RSA) and salivary cortisol. Models were further broken down by outcome: depressive symptoms, alcohol problems, and peer aggression. We did not find statistical support for the originally proposed hypotheses. This lack of findings is likely due to the small sample size, the high level of complexity of the proposed structural equation models, and the resulting lack of power to predict more than approximately five to six hypothesized pathways.

However, some non-significant components of the hypothesized models did perform as expected. Specifically, in families that reported a more secure, flexible, and cohesive family environment, adolescents showed fewer problems regulating their emotions, reported fewer depressive symptoms, fewer alcohol-related problems, and less peer aggression. Further, when combined into the hypothesized model, positive family environment and adolescent resilient temperament were associated with fewer problems with emotion regulation (RSA and self-reported distress tolerance), which in turn was associated with greater depressive symptoms.

Unexpectedly, the combination of adolescents' resting parasympathetic regulation, temperamental rhythmicity, and environmental adaptability were positively associated with poorer emotion regulation. One potential explanation is that stress RSA is bidirectional within the individual, such that stress RSA greater than resting RSA (vagal augmentation under stress) implies problems in emotion regulation, whereas stress RSA lower than resting RSA (vagal withdrawal under stress) implies good emotion regulation. The model used in the current study may not have been sophisticated enough to effectively cope with stress RSA's bidirectional nature and its direct relationship with resting RSA. Future research may address this complexity by examining growth curve models of resting RSA, stress RSA, and return to resting RSA. Also unexpectedly, when accounting for adolescent report of family factors and adolescent

temperament, in families where parents reported greater family flexibility and cohesion, adolescents reported more alcohol-related problems, peer aggression, and higher levels of cortisol stress response. It is unclear if these findings are related to differences in parents' and adolescents' reports of the family environment. For example, in previous research, discrepancies between parent and adolescent reports of the same event (e.g., where parents' reports were more positive than adolescents) were related to poorer adolescent outcomes (McElhaney, Porter, Thompson, & Allen, 2008).

Notably, one significant finding indicated that poorer distress tolerance was not only related to concurrent depressive symptoms, but was also predictive of elevated depressive symptoms over time. Although this was only one component of hypothesized model, it was consistent with past research.

In post-hoc analyses, simpler models were created in which the essence of the original hypotheses were maintained, but models were pared down and simplified to path models. Using the simplified path models, we found that adolescents with more problematic parent/family relationships and temperamental dysregulation also showed poorer regulation of emotion, which in turn predicted greater adolescent depressive symptoms concurrently and over time. Similarly, adolescents with more problematic parent/family relationships and temperamental dysregulation also showed poorer appraisals of their ability to cope with distress and greater use of maladaptive distress management strategies, which in turn predicted adolescent alcohol problems and peer aggression (separately).

Adolescent insecure attachment to parents, but not parent report of family cohesion, predicted poorer adolescent distress tolerance, which in turn predicted greater depressive symptoms. It is possible that once we accounted for insecure attachment, family cohesion had

little additive predictive value: parent report of family cohesion and teen insecurity were negatively correlated, and thus multicollinearity may be to blame. Higher RSA in response to a stressful task predicted poorer distress tolerance, consistent with the hypothesis that vagal augmentation in response to a stressor indicates poor emotion regulation overall.

Parental reports of poorer family flexibility predicted adolescent negative appraisals of their ability to cope with distress, which in turn predicted greater self-report use of adolescent lashing out, which in turn predicted greater alcohol problems. This finding supported the hypothesis that developmental-contextual factors are related to adolescents' appraisals of their poor ability to cope with negative affect, which is related to dysregulated behavior and alcohol problems. Unique to this study, higher baseline levels of cortisol were directly related to higher alcohol problems. Unexpectedly, insecure attachment was unrelated to distress appraisals or lashing out behavior in adolescents. It is possible that when accounting for the family climate of flexibility, the attachment relationship lacked predictive impact. Baseline cortisol levels were also unrelated to self-reports of emotion regulation, highlighting potential differences between the experience of regulating emotions and temperamental/physiological reactivity. Further, this difference serves to highlight the importance of a multimethod approach similar to that used in the present study.

Parent reports of poor family flexibility predicted adolescent negative appraisals of their ability to cope with distress, which in turn predicted greater self-reported use of adolescent lashing out, which in turn predicted greater physical aggression. Insecure attachment was also positively related to poor distress appraisal, but not significantly so. This finding again highlights the importance of developmental context, appraisals of emotion regulation, and self-regulatory strategies for adolescent externalizing problems. Baseline RSA was unrelated to measures of

emotion regulation or peer aggression, suggesting that cognitive appraisals and family relationships may be more important for predicting peer aggression than temperamental/physiological reactivity.

Unexpectedly, adolescents who reported negative appraisals of their capacity to manage distress also reported fewer alcohol problems and less peer aggression, in the context of negative appraisals being positively related to lashing out in response to distress. Upon further exploration of this finding, it became clear that lashing out actually moderated the effects of negative distress appraisals on adolescent alcohol problems (which was not true for physical aggression with peers). Among adolescents who reported more lashing out, negative appraisals were unrelated to alcohol problems. However, among adolescents who reported less lashing out, increasing negative appraisals were associated with fewer alcohol problems. This finding was contrary to the spirit of the hypotheses, but might be explained by a third variable. For example, adolescents who self report more negative appraisals of coping with distress along with less externalization of anger may lack a general sense of self-efficacy. This may prohibit this group of adolescents from obtaining illicit substances in the first place, or they may be more prone to internalizing problems, instead. This finding requires replication and more nuance future research.

One major limitation of the current study was the small sample size. Complex structural equation models failed to run due to limited power. We were also unable to test all of the outcomes within the same model, which would be theoretically useful in that depression, alcohol use, and peer relationship problems are likely to overlap. Further, while the sample's proportion of minority adolescents was consistent with regional demographics, the overall number of minority participants was indeed small and limits the generalizability of the present findings to Caucasian adolescents. Finally, bidirectional models where adolescent emotion regulation are

both predicted by and predict the quality of family relationships were not assessed in this study, but are an alternative model for assessing adolescent psychopathology. Although a bidirectional prediction model was outside of the scope of the present theoretical model, it will be important to test with future research.

Despite its limitations, this study had several unique features. First, although pieces of the proposed model have been tested in the past, the current study combined multiple developmental contextual predictors of emotion regulation and psychopathology into a single study. Second, the study relied on adolescent and parent reports of the family environment, rather than one reporter's perspective. Third, the study included two measures of adolescent physiological regulation of emotion, both sympathetic and parasympathetic regulation. Fourth, despite the failure of some hypothesized pathways to predict emotion regulation or psychological symptoms, several of the non-significant findings were in the expected directions, and the findings that did emerge are all the more robust for controlling for these additional factors. Fifth, this is the only known study that examines the impact of self-reported and physiological facets of adolescent emotion regulation on adolescent alcohol-related problems. Future research is needed to replicate these initial findings.

This paper began with statistics on adolescent depression, substance abuse, and externalizing problems with peers. In describing a complex model that incorporates developmental-contextual predictors of adolescent problems, we may more accurately reflect processes faced by the significant players in adolescents lives. Parents, teachers, mentors, and clinicians are tasked with the responsibility of helping adolescents regulate their emotions even as adolescents are seeking ever-greater autonomy from adult figures. It is possible that therapeutic interventions focusing on improving adolescent emotion regulation may be of

particular use for helping adolescents in complex and disrupted family systems cope more effectively with negative affect, which may have a positive impact on the system and a preventative effect for the development of depression, alcohol problems, and peer aggression. Future research is needed to replicate our findings in larger samples and to test bidirectional effects of context and adolescent emotion regulation and behavior.



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**APPENDIX**

**Appendix K**

Table 11

*Means and Standard Deviations of Study Variables.*

Variable	<i>M</i>	<i>SD</i>	<i>N</i>
Insecure Attachment – BORI	1.40	0.21	64
Attachment Security – IPPA (parents combined)	3.57	0.66	64
Family Cohesion – Adolescent Report	27.00	4.88	64
Family Flexibility – Adolescent Report	23.80	4.69	64
Family Cohesion – Parent Report	30.48	2.99	64
Family Flexibility – Parent Report	26.86	3.51	64
Baseline RSA	6.74	0.97	61
Stress RSA	6.75	0.84	60
Baseline Cortisol	0.09	0.14	48
Stress Cortisol	.10	0.11	45
Hours Since Awakening	8.55	2.14	64
Distress Tolerance	2.26	0.65	64
Distress Appraisal	2.04	0.62	64
Lashing Out	2.06	0.70	62
Adaptability-Positivity – Parent Report	3.04	0.41	64
Rhythmicity – Parent Report	2.78	0.57	64
Total Depression T1	35.49	9.80	64
Total Depression T2	32.36	8.56	43
Alcohol Problems	1.92	7.31	63
Peer Aggression	1.64	0.79	64

## Appendix L

Table 12

### *Correlations Among Study Variables*

	Age	Minority	Parent Income	Insecure Attachment	Secure Attachment	Family Cohesion TN Report	Family Flexibility TN Report	Family Cohesion PA Report
Gender	-.10	.14	.09	.26*	.04	.07	.03	-.10
Age		-.16	-.15	.26*	.04	-.23*	-.13	-.17+
Minority Status			.09	-.13	.11	.37**	.22*	.17+
Parent Income				-.26*	.25*	.20+	.18+	.08
Insecure Attachment					-.25*	-.04	-.08	-.23*
Secure Attachment						.43***	.52***	.39***
Family Cohesion TN Report							.73***	.39***
Family Flexibility TN Report								.36**
Family Cohesion PA Report								
Family Flexibility PA Report								
Baseline RSA								
Stress RSA								
Baseline Cortisol								
Stress Cortisol								
Distress Tolerance								
Distress Appraisal								
Lashing Out								
Adaptability								
Positivity PA Report								
Rhythmicity PA Report								
Depressive Symptoms Time 1								
Depressive Symptoms Time 2								
Alcohol Problems								

+ =  $p < .10$ ; \* =  $p < .05$ ; \*\* =  $p < .01$ ; \*\*\* =  $p < .001$

## Appendix L

Table 12 continued

*Correlations Among Study Variables*

	Family Flexibility PA Report	Baseline RSA	Stress RSA	Baseline Cortisol	Stress Cortisol	Distress Tolerance
Gender	-.16	-.09	.08	-.15	-.31*	.27*
Age	-.17	-.04	-.17	.21+	.33*	.13
Minority Status	.26*	.02	-.01	-.07	-.10	-.07
Parent Income	.02	.36**	.30*	-.13	.05	.02
Insecure Attachment	-.13	-.39***	-.36**	-.01	.28*	.33**
Secure Attachment	.42***	.33**	.25*	-.04	.05	-.18+
Family Cohesion TN Report	.21*	.04	-.01	-.18+	-.01	-.19+
Family Flexibility TN Report	.34**	.02	-.03	-.14	.12	-.26*
Family Cohesion PA Report	.46***	.07	-.06	-.02	.10	-.09
Family Flexibility PA Report		.13	-.06	-.15	.08	-.18+
Baseline RSA			.82***	.09	-.05	.01
Stress RSA				.12	-.18	.09
Baseline Cortisol					.17	.05
Stress Cortisol						.02
Distress Tolerance						
Distress Appraisal						
Lashing Out						
Adaptability Positivity PA Report						
Rhythmicity PA Report						
Depressive Symptoms Time 1						
Depressive Symptoms Time 2						
Alcohol Problems						

+ =  $p < .10$ ; \* =  $p < .05$ ; \*\* =  $p < .01$ ; \*\*\* =  $p < .001$

## Appendix L

Table 12 continued

*Correlations Among Study Variables*

	Distress Appraisal	Lashing Out	Adaptability Positivity PA Report	Rhythmicity PA Report	Depressive Symptoms Time 1	Depressive Symptoms Time 2	Alcohol Problems
Gender	.26	.17+	-.05	-.11	.15	.32*	-.04
Age	.12	.01	-.23*	-.07	.17+	.21	.04
Minority Status	-.18+	.03	-.09	.01	-.04	.04	.11
Parent Income	-.02	.09	.22*	.15	-.21+	.08	-.24*
Insecure Attachment	.26*	.01	-.26*	-.12	.37**	.13	.02
Secure Attachment	-.37**	-.16	.18+	.10	-.45***	.05	-.13
Family Cohesion TN Report	-.26*	.01	.16+	.10	-.18+	-.10	-.05
Family Flexibility TN Report	-.41***	-.18+	.12	.25*	-.31**	-.16	-.17+
Family Cohesion PA Report	-.22*	.09	.40***	.33**	-.19+	.00	-.02
Family Flexibility PA Report	-.30**	-.08	.17+	.25*	-.31**	-.15	-.02
Baseline RSA	-.16	-.02	.22*	.18+	-.12	.22	-.05
Stress RSA	-.06	.01	.09	.12	-.05	.28+	-.03
Baseline Cortisol	.09	.06	-.22*	-.08	.15	.11	.29*
Stress Cortisol	-.06	-.09	-.15	.16	-.08	.02	.12
Distress Tolerance	.79***	.36**	.03	-.02	.29**	.42**	.07
Distress Appraisal		.40***	-.05	.02	.42***	.33*	.13
Lashing Out			.08	.00	.24*	.03	.49***
Adaptability Positivity PA Report				.30**	-.34**	-.01	-.02
Rhythmicity PA Report					-.17+	.05	-.01
Depressive Symptoms Time 1						.33*	.22*
Depressive Symptoms Time 2							--
Alcohol Problems							

+ =  $p < .10$ ; \* =  $p < .05$ ; \*\* =  $p < .01$ ; \*\*\* =  $p < .001$

## Appendix L

Table 12 continued

### *Correlations Among Study Variables*

	Physical Aggression
Gender	-.12
Age	-.01
Minority Status	.27*
Parent Income	-.02
Insecure Attachment	-.19+
Secure Attachment	-.22*
Family Cohesion TN Report	.02
Family Flexibility TN Report	-.23*
Family Cohesion PA Report	-.01
Family Flexibility PA Report	-.11
Baseline RSA	-.08
Stress RSA	-.05
Baseline Cortisol	.06
Stress Cortisol	.07
Distress Tolerance	-.09
Distress Appraisal	.05
Lashing Out	.50***
Adaptability Positivity PA Report	-.02
Rhythmicity PA Report	-.11
Depressive Symptoms Time 1	.07
Depressive Symptoms Time 2	.12
Alcohol Problems	.43***

+ =  $p < .10$ ; \* =  $p < .05$ ; \*\* =  $p < .01$ ; \*\*\* =  $p < .001$



## Appendix M

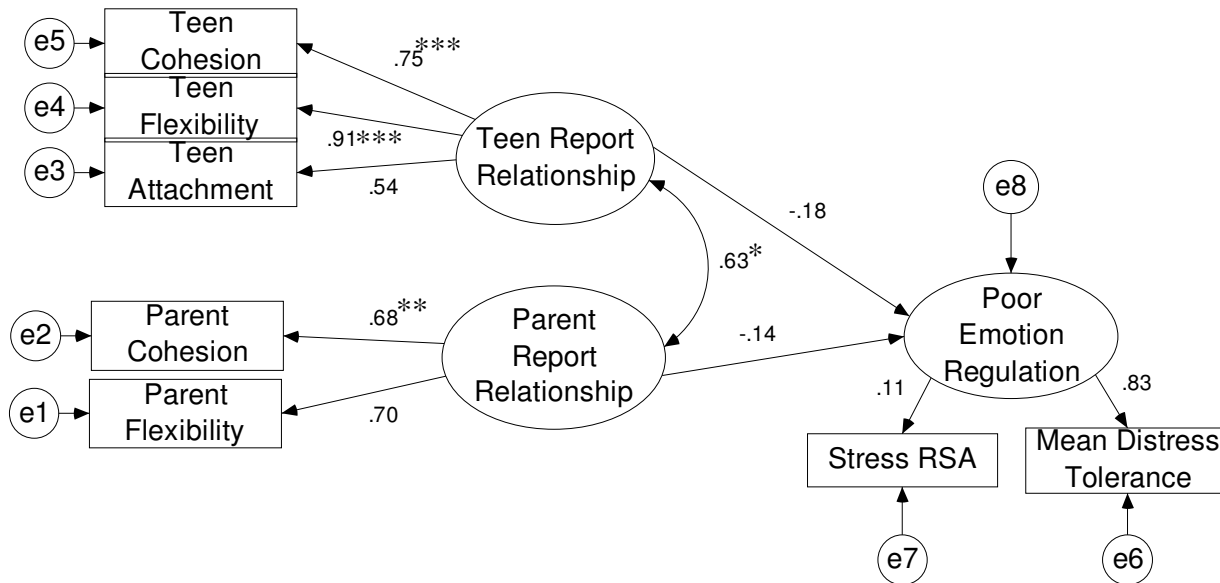


Figure 1. RSA Hypothesis 1: The Teen-Parent relationship will predict Emotion Regulation.

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

## Appendix N

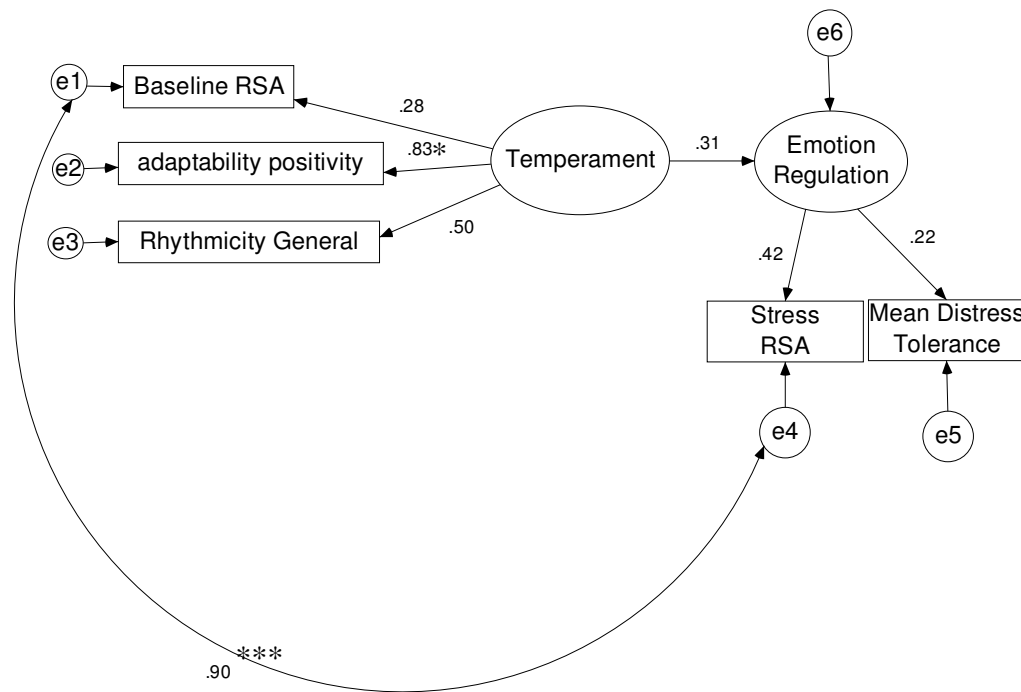


Figure 2. RSA Hypothesis 2: Temperament will predict Emotion Regulation.

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

## Appendix O

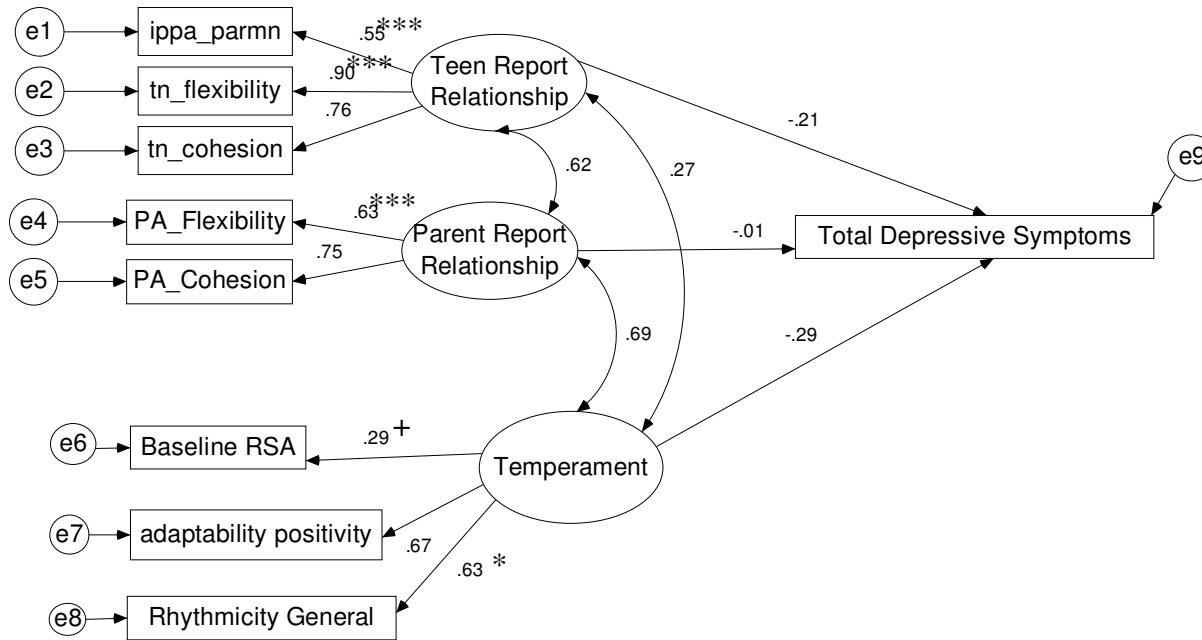


Figure 3. RSA Hypothesis 3: The Teen-Parent Relationship and Temperament will predict Depression.

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

Appendix P

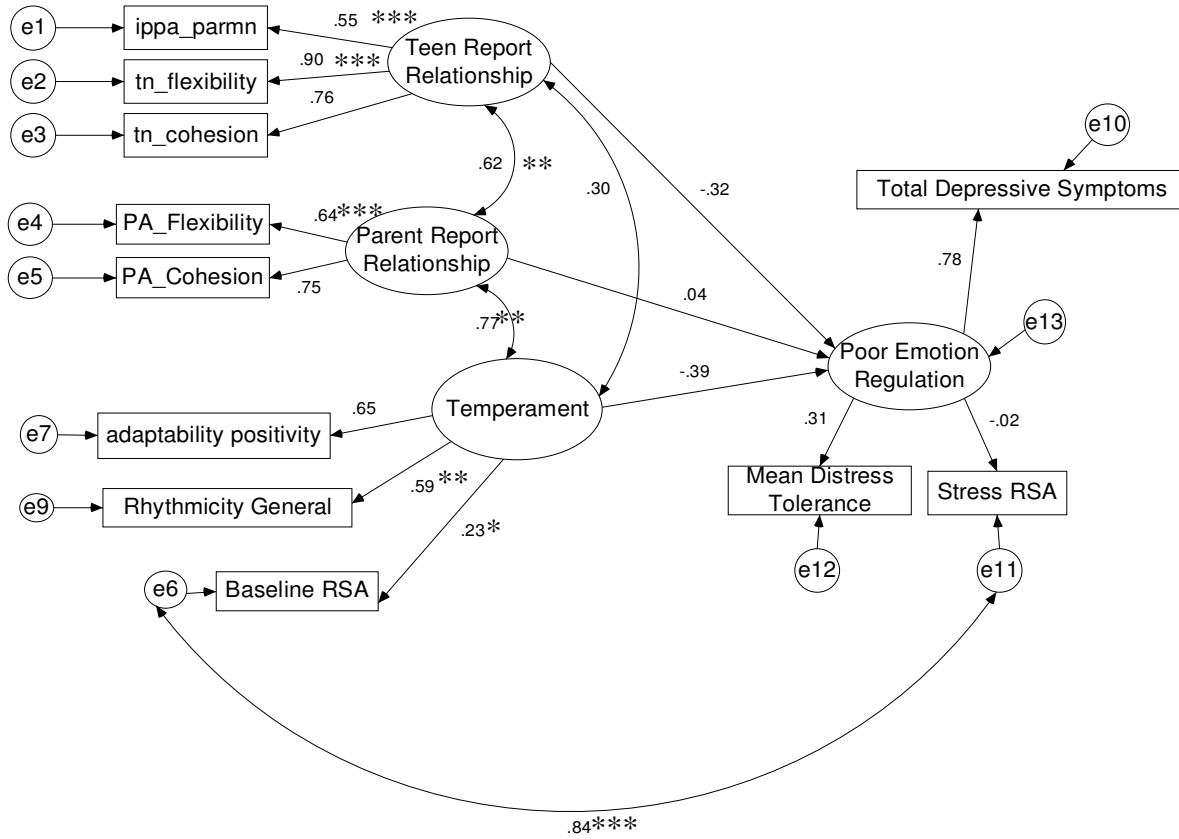


Figure 4. RSA Hypothesis 4: Emotion Regulation Mediates the Teen-Parent Relationship and Temperament in predicting Depression.

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

## Appendix Q

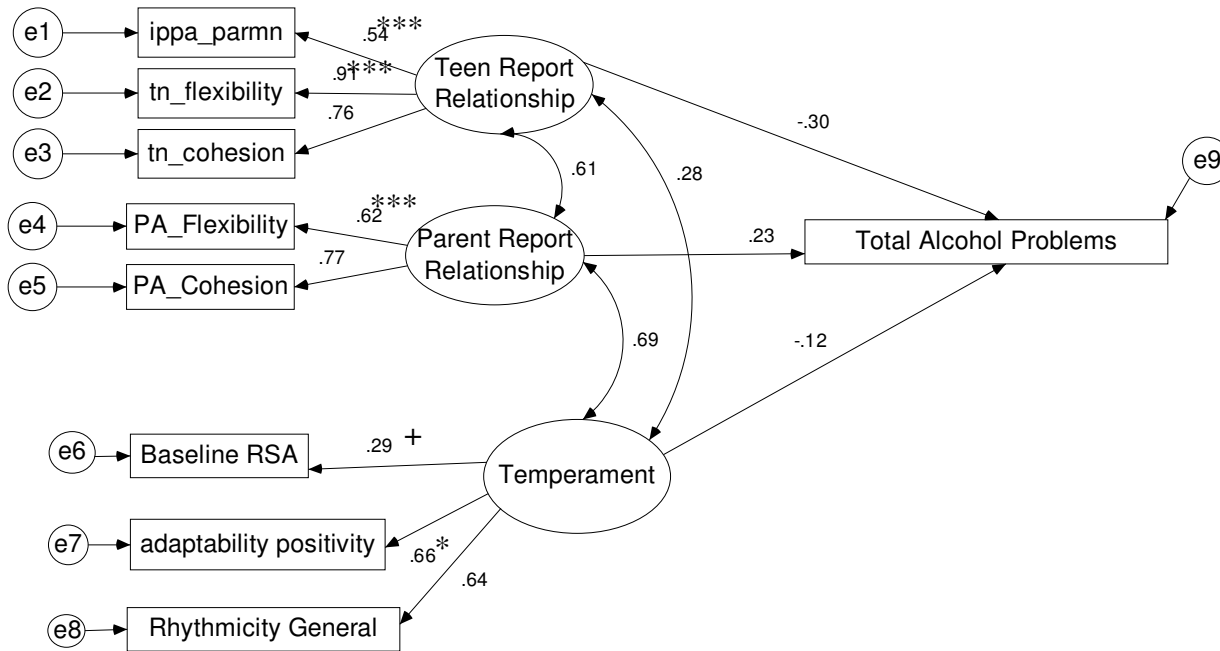


Figure 5. RSA Hypothesis 5: The Teen-Parent Relationship and Temperament will predict Teen Alcohol Problems.

+  $p < .10$  \*  $p < .05$ . \*\*  $p < .01$ . \*\*\*  $p < .001$ .

Appendix R

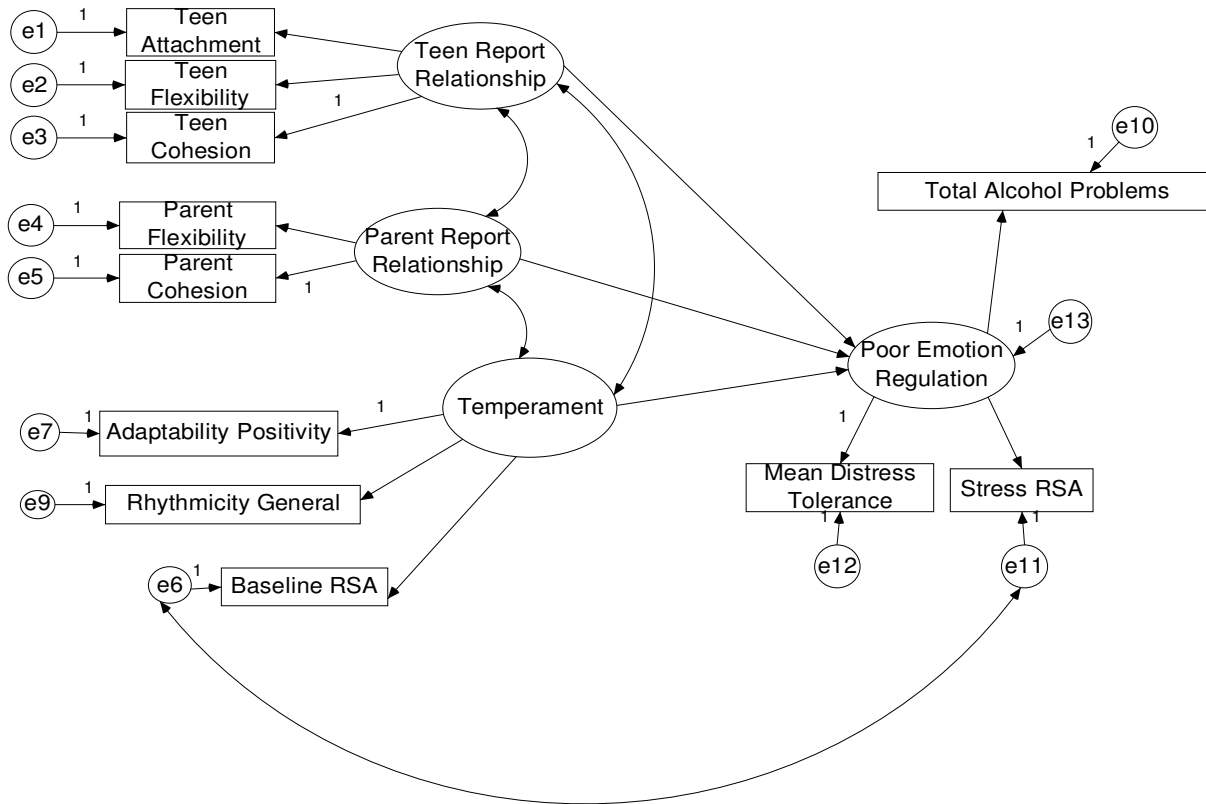


Figure 6. RSA Hypothesis 6: Emotion Regulation Mediates the Teen-Parent Relationship and Temperament in predicting Alcohol Problems (model failed to run).

Appendix S

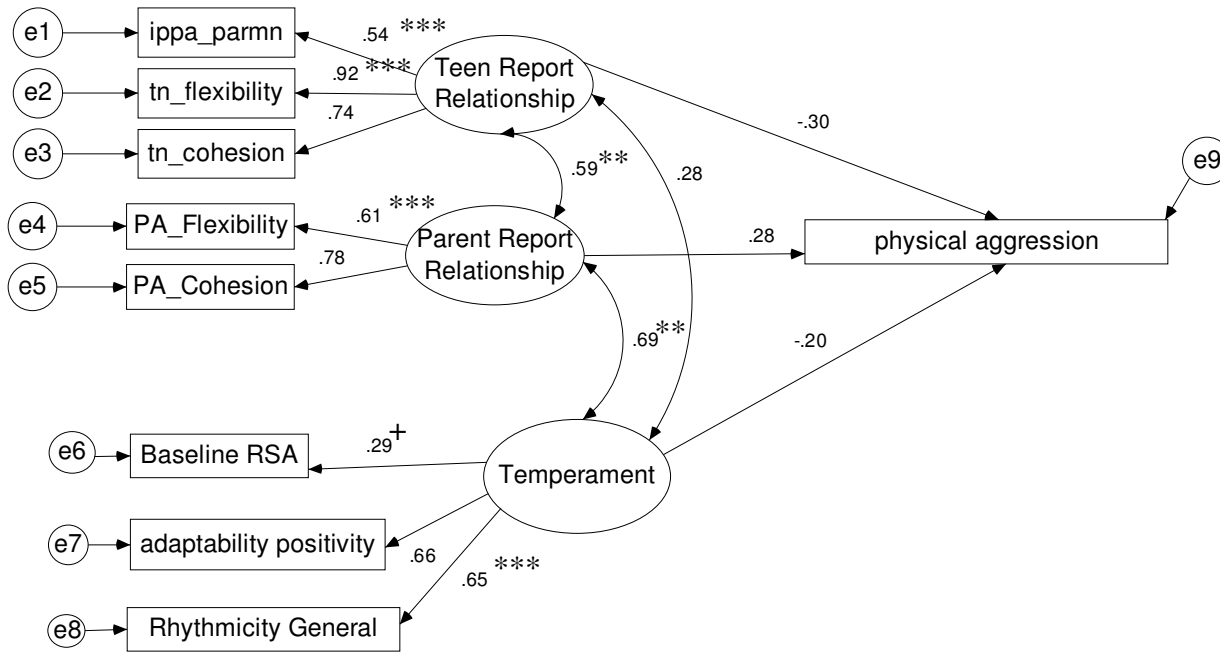


Figure 7. RSA Hypothesis 7: The Teen-Parent Relationship and Temperament will predict Peer Aggression.

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

## Appendix T

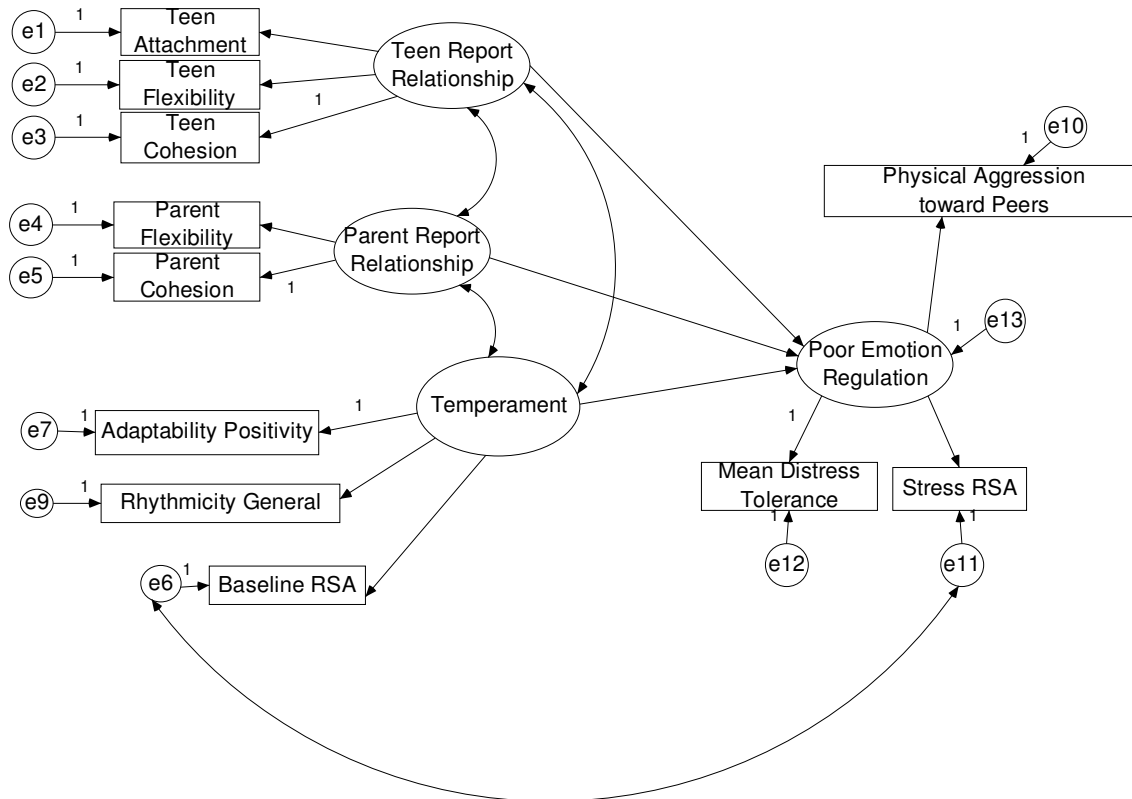


Figure 8. RSA Hypothesis 8: Emotion Regulation Mediates the Teen-Parent Relationship and Temperament in predicting Aggression with Peers (model failed to run).



Appendix U

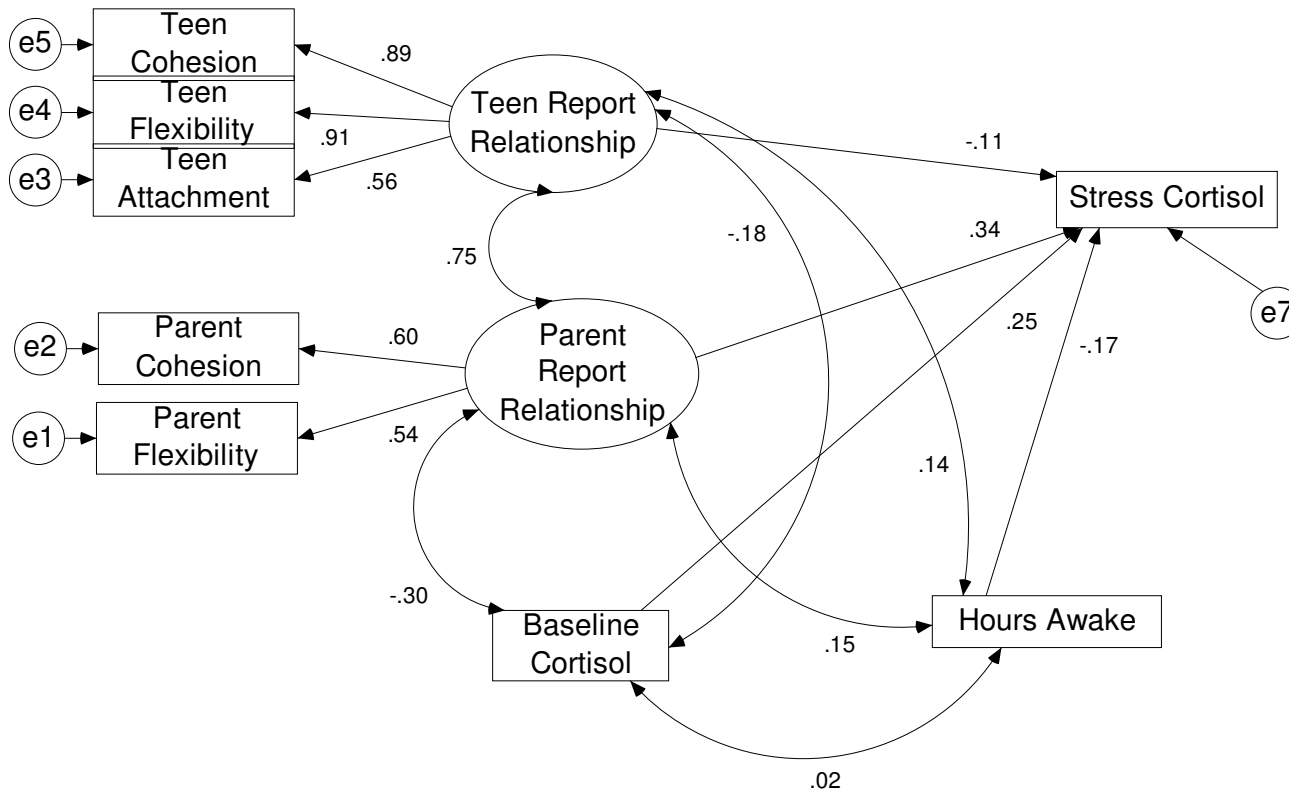


Figure 9. Cortisol Hypothesis 1: The Teen-Parent Relationship will predict Emotion Regulation.

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

## Appendix V

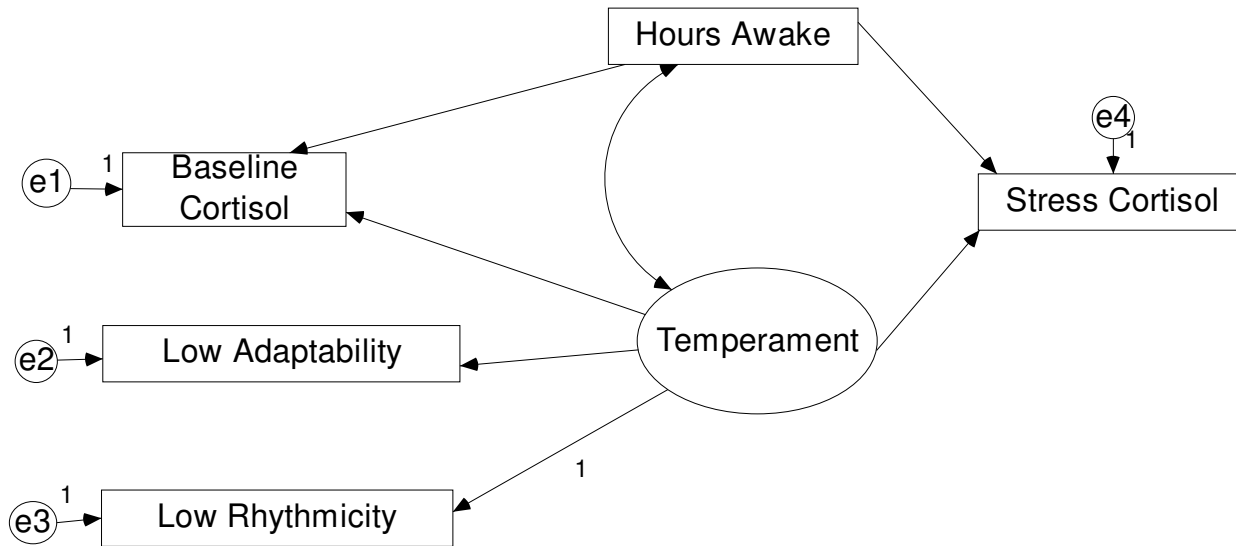


Figure 10. Cortisol Hypothesis 2: Temperament will Predict Emotion Regulation (model failed to run).

Appendix W

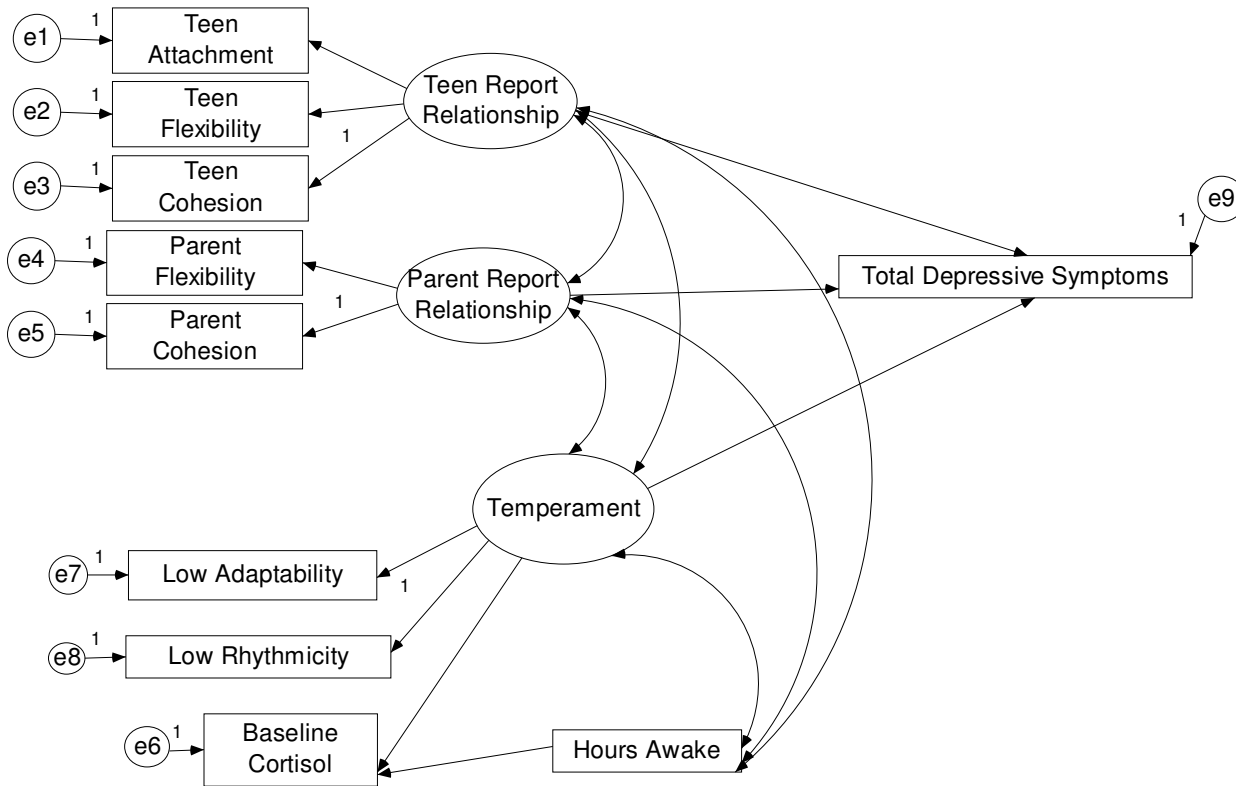


Figure 11. Cortisol Hypothesis 3: The Teen-Parent Relationship and Temperament will predict Teen Depressive Symptoms (model failed to run).

## Appendix X

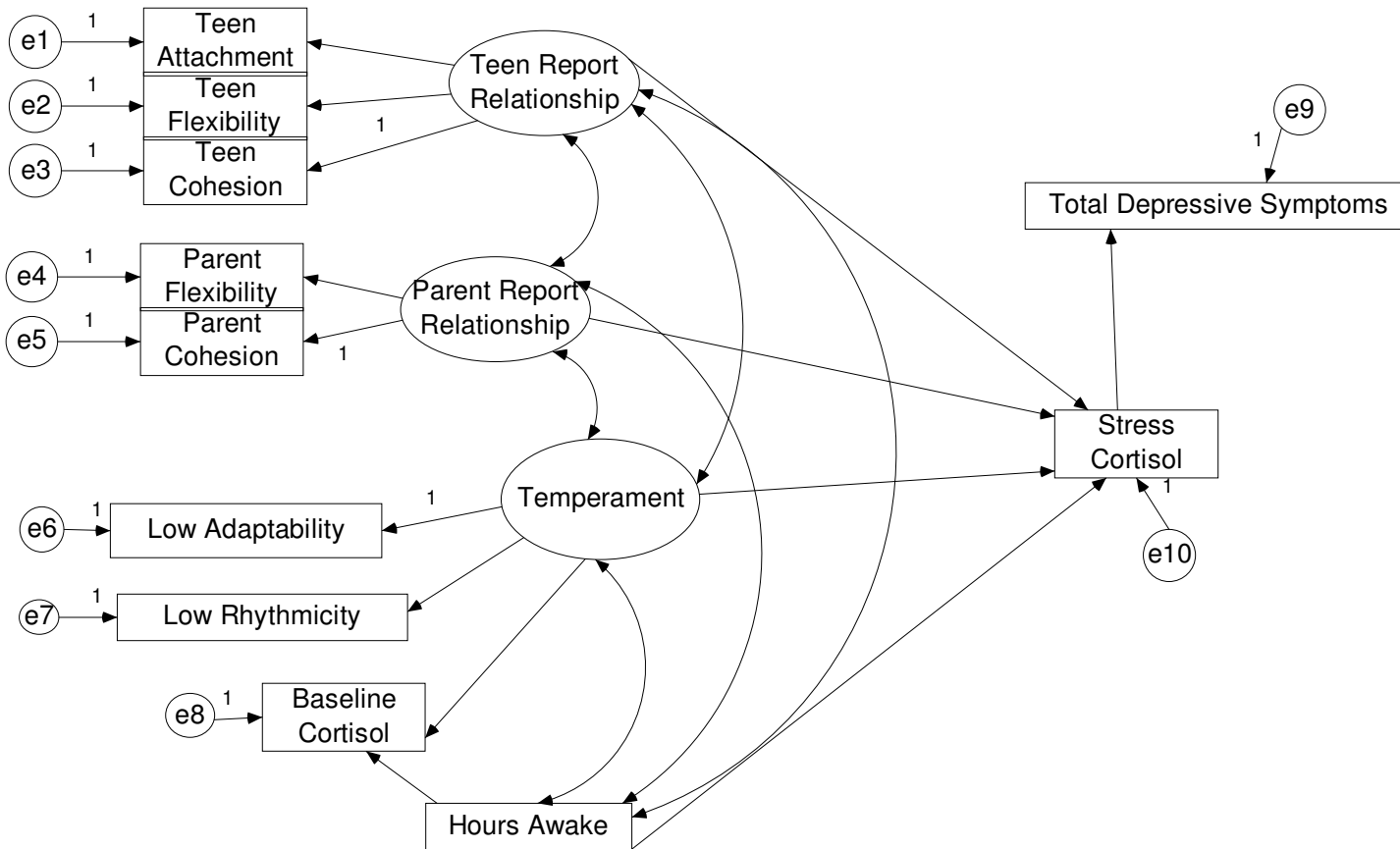


Figure 12. Cortisol Hypothesis 4: Emotion Regulation Mediates the Teen-Parent Relationship and Temperament in predicting Depression (model failed to run).

Appendix Y

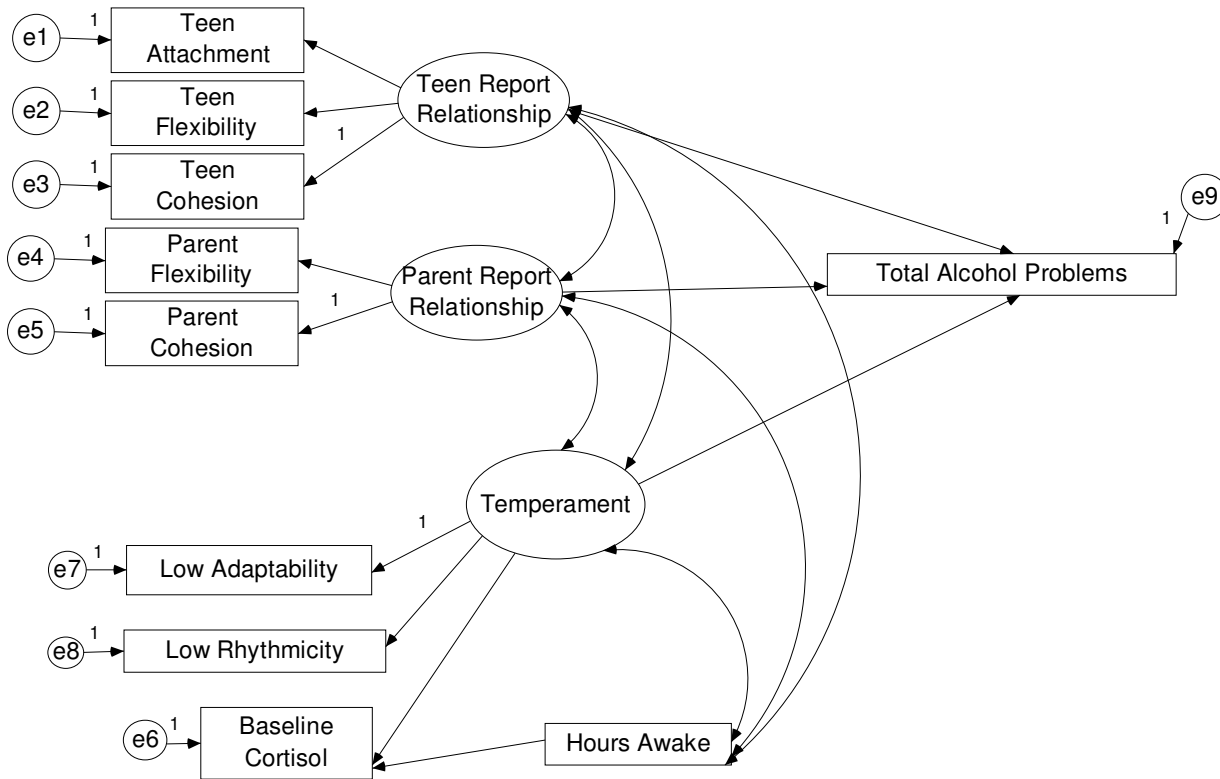


Figure 13. Cortisol Hypothesis 5: The Teen-Parent Relationship and Temperament will predict Teen Alcohol Problems (model failed to run).

## Appendix Z

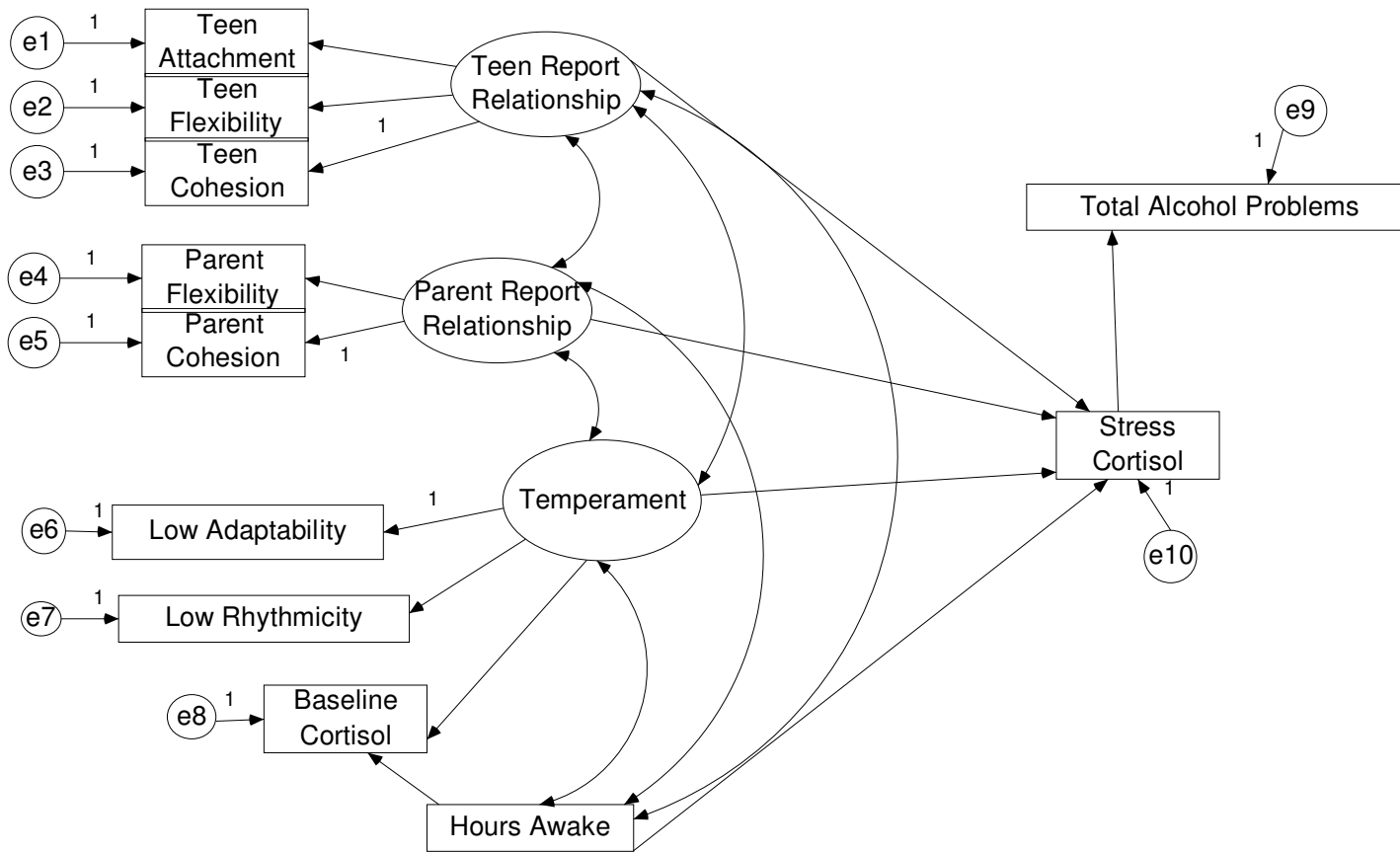


Figure 14. Cortisol Hypothesis 6: Emotion Regulation Mediates the Teen-Parent Relationship and Temperament in predicting Alcohol Problems (model failed to run).

Appendix AA

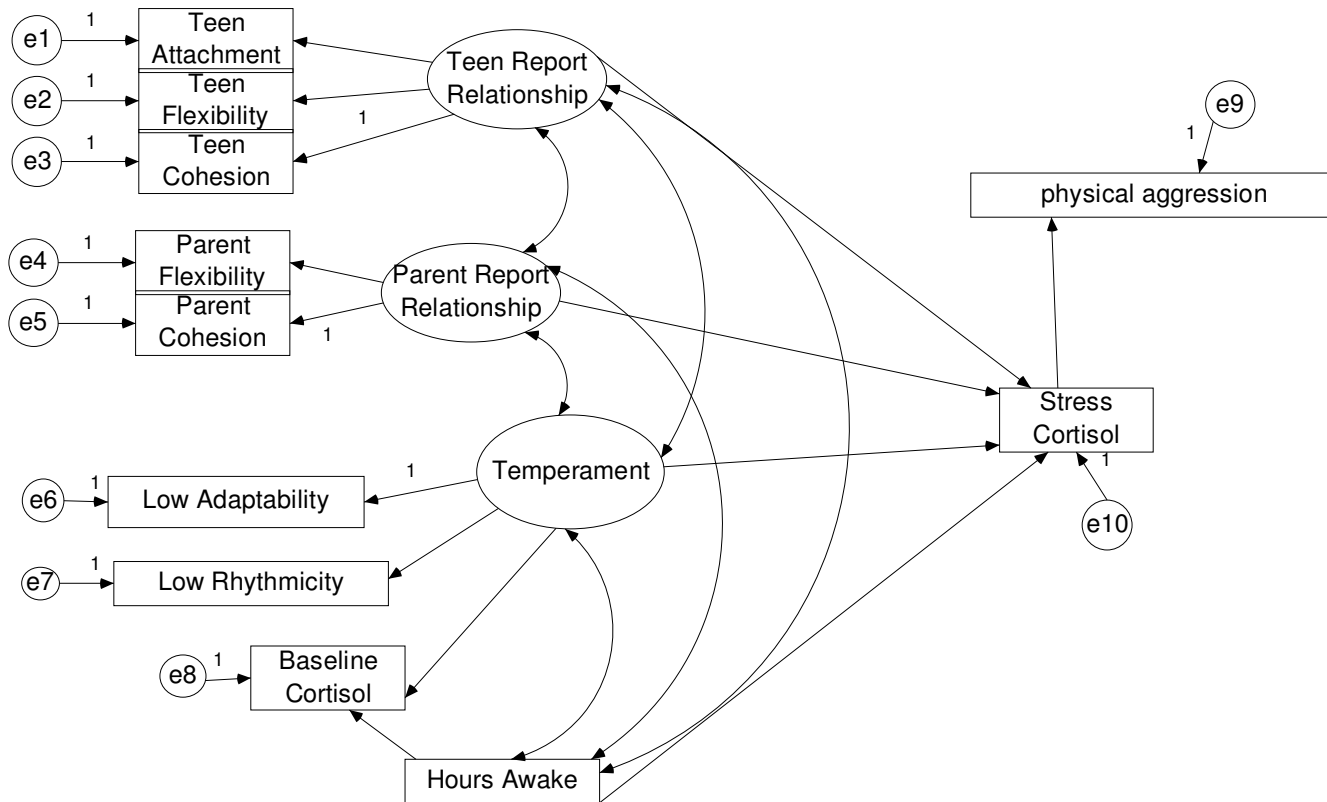


Figure 15. Hypothesis 7: The Teen-Parent Relationship and Temperament will predict Peer Aggression (model failed to run).

Appendix BB

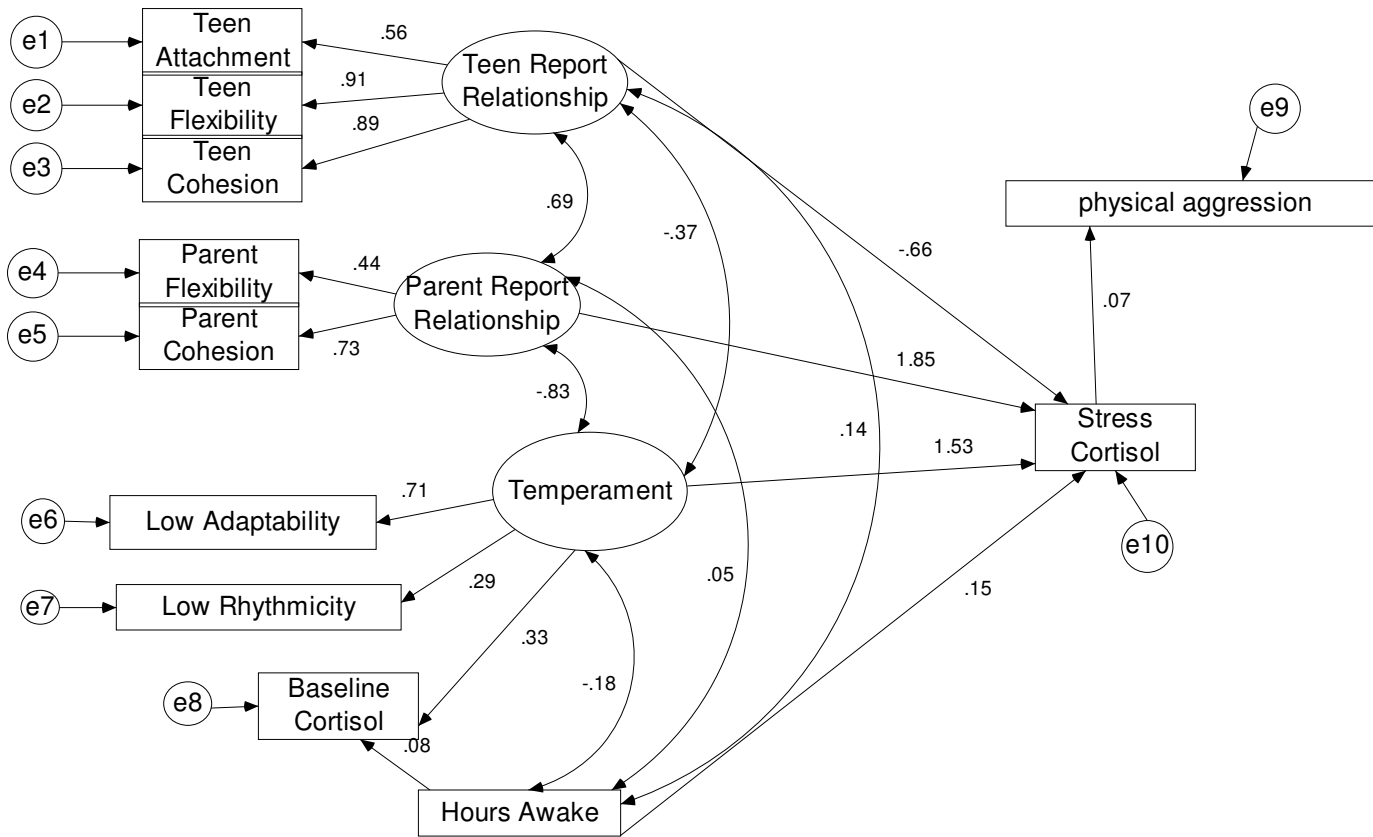


Figure 16. Cortisol Hypothesis 8: Emotion Regulation Mediates the Teen-Parent Relationship and Temperament in predicting Aggression with Peers (model failed to run).



## Appendix CC

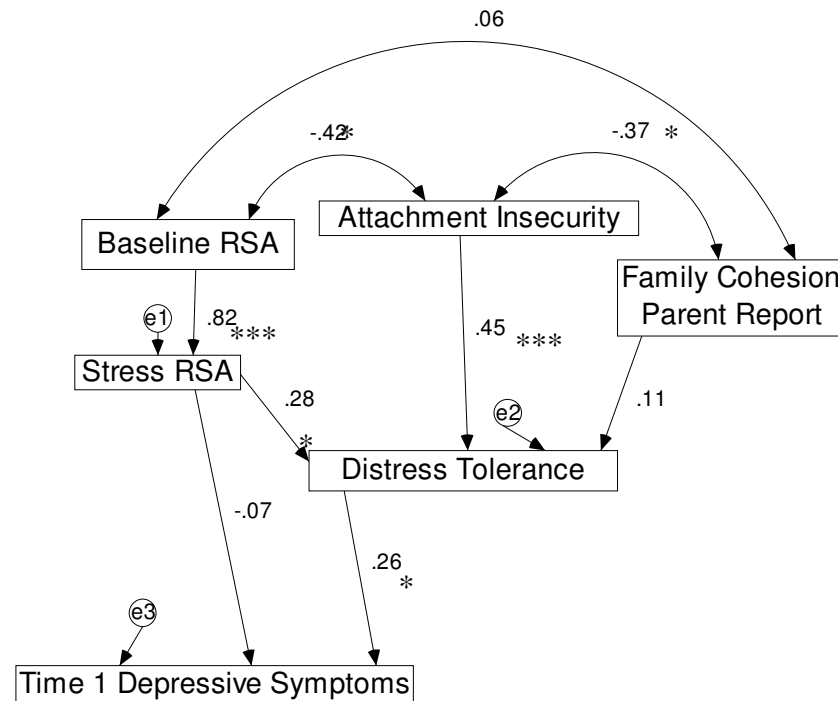


Figure 17. Post-Hoc Test: Emotion Regulation Mediates the Relation between Developmental Factors and Depressive Symptoms.

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

## Appendix DD

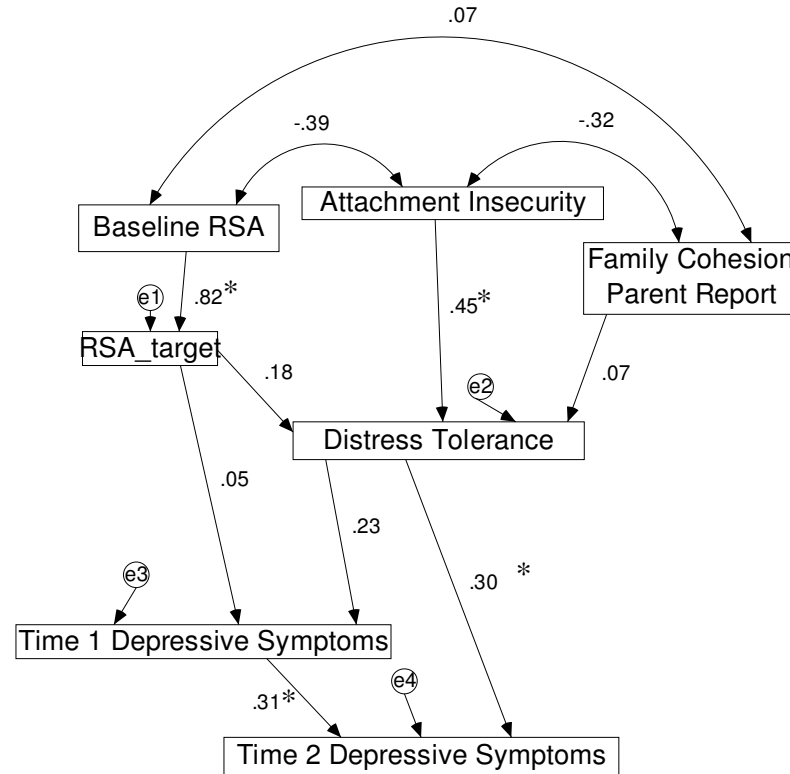


Figure 18. Post-Hoc Test: Emotion Regulation Mediates the Relation between Developmental Factors and Change in Depressive Symptoms Over Time.

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

## Appendix EE

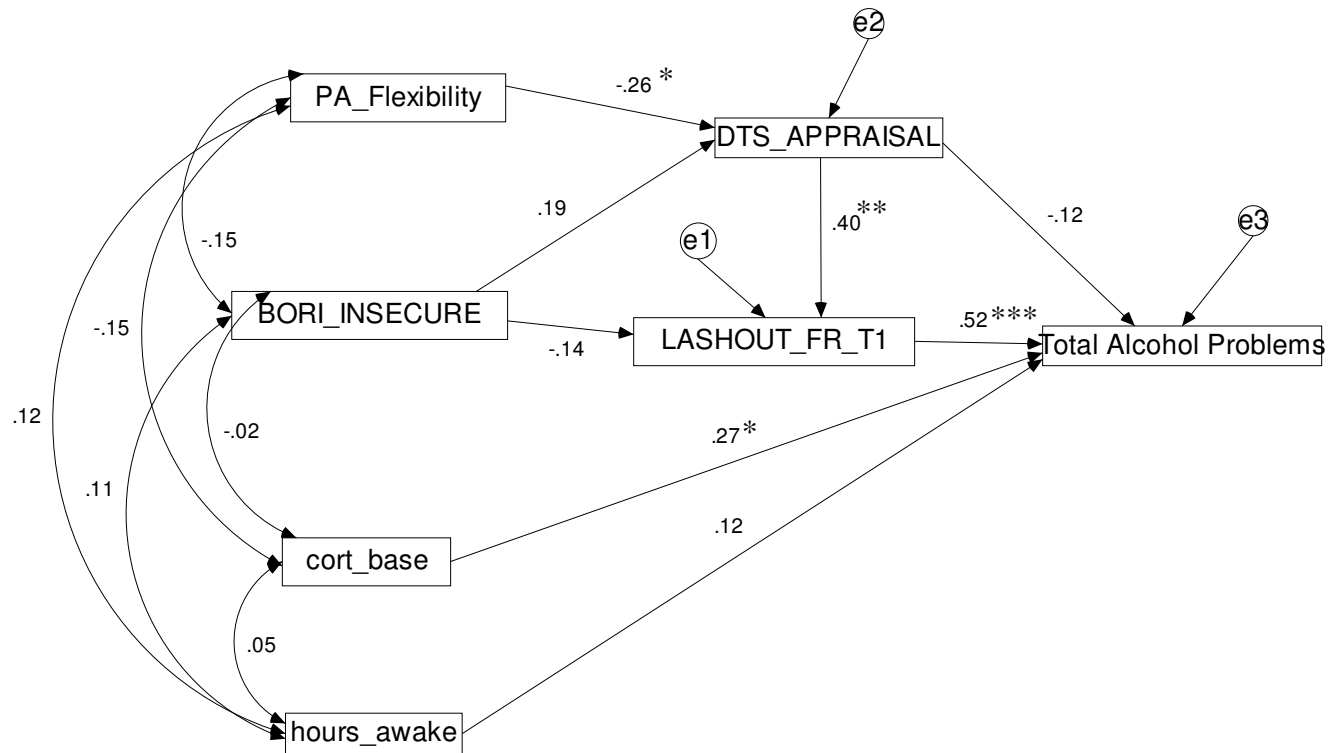


Figure 19. Post-Hoc Test: Emotion Regulation Mediates the Relation between Developmental Factors and Alcohol Problems.

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

Appendix FF

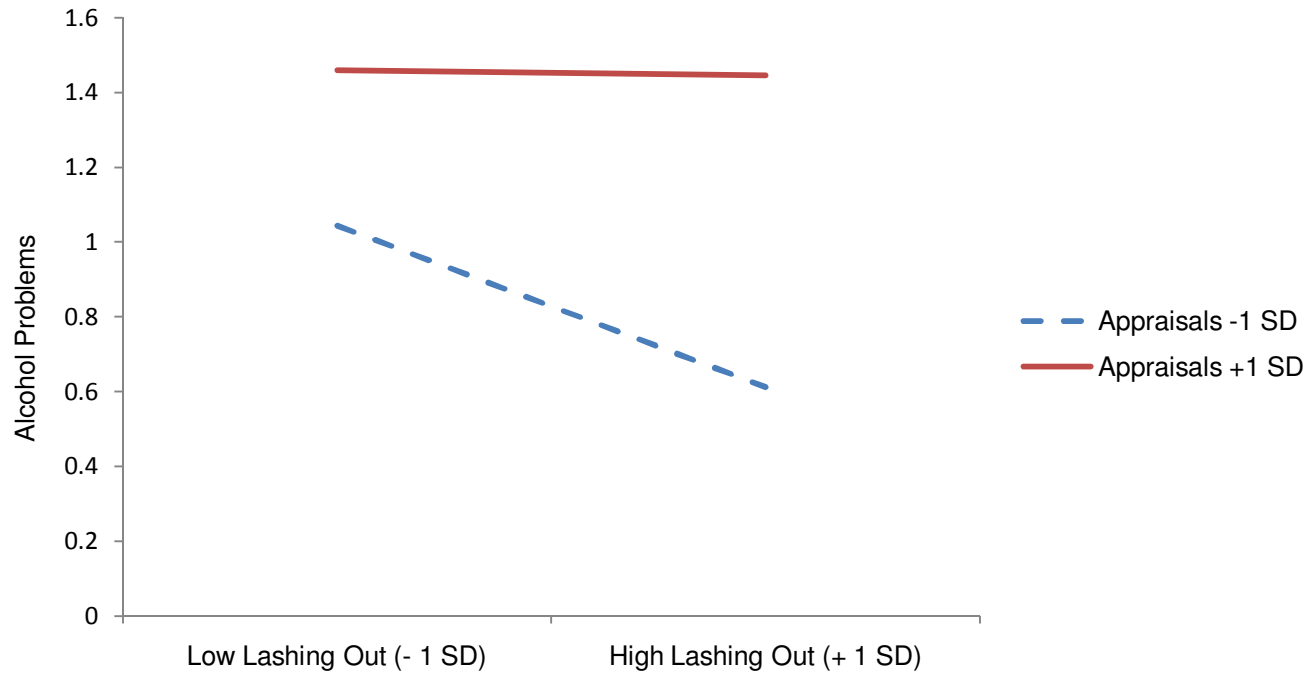


Figure 20. Negative appraisals of distress tolerance moderate the effects of lashing out on adolescent alcohol problems.

## Appendix GG

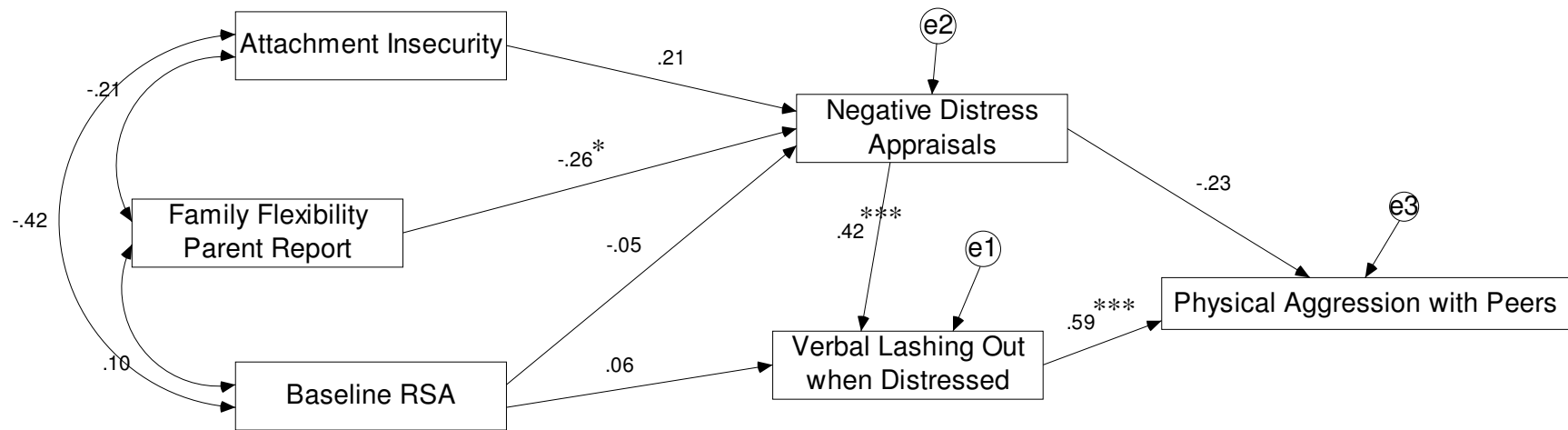


Figure 21. Post-Hoc Test: Emotion Regulation Mediates the Relation between Developmental Factors and Peer Aggression.

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

## **GENERAL DISCUSSION**

As specificity and sophistication in measuring individual differences in the human experience increase, there is a temptation to take a reductionist view of development and psychopathology, such that people are seen as psycho-physiological or neurobiological units. The goal of the current series of studies was to ground specific aspects of the autonomic nervous system within individuals within important interpersonal relationships. We examined the ways in which adolescents' social, cognitive, behavioral, and psycho-physiological regulation of emotion mediate theoretically early-developing constructs, such as temperament, attachment, and systemic family patterns, and psychopathology.

To that end, we first developed a measure of adolescent behavioral co-regulation of distress with same aged peers. This measure, in two versions and across two samples (late adolescent college students and middle to late community adolescents), showed good reliability and validity, and was associated with adolescent functioning in the expected ways. Specifically behaviors that drew peers closer to the distressed adolescent were associated with more positive peer functioning, whereas behaviors that pushed peers away were associated with greater depressive symptoms and poorer resting physiological regulation of distress.

Second, we proposed a series of complex statistical models, based on the theory that emotion regulation mediates the documented relations between developmental factors and psychopathology. The proposed models were too complex for the relatively small community sample to support. However, simpler models of emotion regulation mediating the developmental context and depressive symptoms, alcohol problems, and

peer aggression, did stand up to cross-sectional empirical testing. Simpler modeling also successfully predicted emotion regulation mediating relations between the developmental context and longitudinal increases in depressive symptoms.

This series of studies had several unique aspects, including: 1) measuring adolescents' interpersonal distress management with peers empirically and in self-report form for the first time, 2) testing the "emotion regulation as mediator" model using self-report and two physiological indicators of adolescent emotion regulation, and 3) being the only known study assessing the joint impact of temperament, developmental context, and emotion regulation on adolescent alcohol problems.

The findings presented here may be particularly useful for parents, educators, clinicians, and other mentors working with distressed adolescents. Emotion regulation, although related to ingrained patterns and developmental context, is also its own construct, and may be molded by new experiences and new environments. This, essentially, is the entire point of many types of therapeutic intervention (cite), that is, the co-creation of new interpersonal environment and an understanding and reworking of emotional reactions (cite). Further, repeated experiences of better regulated emotions in a therapeutic context may lead to changes at the behavioral, cognitive, and neurobiological levels, associated with better psychological functioning. Addressing adolescent emotion regulation may be a particularly apt point of intervention and/or prevention, because changing the psychosocial and family environments in dramatic ways is rare and difficult. In addition, with the rise of formal operational thinking and the capacity for abstraction, adolescents who are "coached" on emotion regulation may be better able



than younger children to begin to imagine how they might respond differently to emotional provocation. Existing therapeutic techniques, such as those that enhance the capacity to mentalize alternative affective states (e.g., Levy et al., 2006) and Dialectical Behavior Therapy (Linehan, Armstrong, Suarez, Allmon, & Heard, 1991), are just two possibilities for helping adolescents to develop better emotion regulation. In this way, emotion regulation may serve as a buffer for adolescents who are unable to change their environments, particularly those that are chaotic or distressing.

## REFERENCES

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1040.

## VITA

Katherine Claire Little received her B.A. in Psychology from the University of Virginia in Charlottesville, VA, in 2003. In 2005, she entered the doctoral program in clinical psychology at the University of Tennessee, Knoxville. From 2005 to 2011, she worked as a graduate student researcher under the supervision of Dr. Deborah Welsh studying adolescent peer and romantic relationships, sexuality, psychological functioning, and emotion regulation. She also worked part time as a graduate student researcher with Dr. Kristina Coop Gordon, studying marital and couple relationships, and Dr. Debora Baldwin, studying salivary cortisol and the stress response. In addition to research, Katherine worked as a graduate student clinician at the University of Tennessee Psychological Clinic from 2006-2010, as well as at the Knox County Juvenile Court from 2007-2008, and at Peninsula Village adolescent treatment facility from 2008-2009. Katherine taught two undergraduate courses at the University of Tennessee, PSYC 110: Introduction to Psychology and PSYC 330: Abnormal Psychology. In 2010, she married Aaron John Kivisto and changed her name to Katherine Little Kivisto.