

**POSITIVE EMOTION DEVELOPMENT ACROSS CHILDHOOD: ASSOCIATIONS
WITH PARENTING, SOCIAL COMPETENCE AND PROBLEM BEHAVIOR**

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Two complementary studies examined the unique contribution of positive emotion to development. The studies considered different ages, measured emotion in different contexts, and utilized different statistical methodologies, thereby answering distinct questions about the development of children's positivity, the relationship between mothers' and children's positivity, and the relationship between positivity and later behavioral outcomes.

Study 1 tested a conceptual model, examining the sequelae of positivity within the mother-child relationship. During toddlerhood, children spend the majority of their time at home, making relationships between mothers' and children's positive emotion particularly relevant. Concurrent bidirectional relationships at both 24 and 36 months between children's and mothers' positivity were found. Mothers' and children's positivity at 24 months predicted their own positivity at 36 months, but cross-lagged pathways were not significant. Mean differences in positivity were not found. Both mothers' and children's positivity at 36 months predicted later social competence, but only maternal positivity predicted internalizing and externalizing behaviors. Results of an alternative model, which included mothers' negative emotion, were consistent, except mothers' positive emotion no longer predicted internalizing behavior. Thus, positive emotion early in development predicts both later positivity and important developmental outcomes, over and above mothers' negative emotion.

Study 2 identified two trajectory groups of children's positive emotionality with peers from 24 months to 5th grade in childcare and school, complementing measures of positive

emotion with mothers in Study 1. The first, larger group started low in positivity and increased over childhood. The second, smaller group began high in positivity and decreased. These groups were significantly different in positivity at all time points. For both groups, tests of mean differences at consecutive ages indicated stability during toddlerhood and the school years, but change during preschool. High maternal positive emotion at 24 months predicted membership in the second group (high/decreasing), and membership in this group predicted greater social competence in 6th grade, but not internalizing or externalizing behavior. Thus, children's positive emotion with their peers exhibits distinct trajectories over childhood, which relate differently to developing social competence. Together the findings from these two studies demonstrate positive emotion's unique contributions to social development, especially positive development.

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1.0 INTRODUCTION

Children experience frequent and varied emotions on a daily basis and both positive and negative emotions influence behavior starting early in development (Saarni, 2006). The majority of the literature on children's emotions focuses on negative emotion such as sadness, anger, guilt, and depression. Importantly, positive emotion is relatively independent from negative emotion. It is not the absence or opposite of negative emotion, but is considered orthogonal (at least partially) to negative emotion (Ekkekakis, 2012) and is better represented as a separate dimension (Belsky, Hsieh & Crnic, 1996; Watson & Clark, 1997). Additionally, positive emotion shows different brain activation from negative emotion (Vytal & Hamann, 2010). As a result, positive emotion relates to psychosocial outcomes differently than negative emotion (Krueger, Hicks & McGue, 2001), and may operate through different mechanisms. Moreover, positive emotion is more than an immediate marker of wellbeing, it may also contribute to the development of wellbeing over time (Fredrickson, 2001). The current studies contribute foundational knowledge about the development of positive emotion over childhood and its relationship to children's behavior. In particular, two studies are presented that examine positive emotion across early development. Each relates children's positive emotion to mothers' positive emotion and mothers' and children's positive emotions to later behavioral outcomes including social competence and problem behaviors.

Davis & Suveg (2014) recently proposed a transactional model in which children's positive emotionality relates to developmental outcomes including adjustment and maladjustment, and serves as a moderator of contextual factors including biological and environmental factors (specifically genetics, culture and parenting) in predicting developmental outcomes. Taking up their charge to produce a "more nuanced approach to the study of child positive affect through...multi-method longitudinal assessments" (p. 97), the current studies expand and test a portion of their model longitudinally from 24 months to 6th grade using multiple measures of positive emotionality in both children and their mothers, across multiple measurement contexts, and with both questionnaire and observation measures. Specifically, it uses data from the National Institute of Child Health and Development Study of Early Childcare and Youth Development (NICHD) to examine the relationship between mothers' and children's positive emotions and behavioral outcomes in two studies. These studies test these relationships in distinct ways, as described below, and each answers unique questions about the development of positive emotion over time.

The first study tests a conceptual model of associations between mothers' and children's positive emotions from 24 to 36 months, and relationships between emotions at 36 months and outcomes in 1st grade (see Figure 1, p. 57). Extant research indicates that children's positive emotionality begins to stabilize around preschool (Davis & Suveg, 2014), in part because of advances in emotion regulation (Cole, Michel & Teti, 1994) and emotion understanding (Bretherton, Fritz, Zahn-Waxler & Ridgeway, 1986; Saarni, Campos, Camras & Witherington, 2006). Partly for this reason, the influence of mothers' positivity on their children's expressivity may begin to emerge in preschool. Children's and mothers' emotions are likely to influence each other bidirectionally during this age period as children's agency increases and they shape their

emotional climate. Accordingly, this study tests for associations between children's and mothers' positive emotions measured at 24 and 36 months, both concurrently and across time.

Additionally, the study tests for relationships between mothers' and children's positive emotions and children's later social competence and problem behaviors. These relationships have been considered by previous researchers at multiple age points, but haven't been considered together in an integrated model (e.g. Denham & Grout, 1992; Denham, Mitchell-Copeland, Strandberg, Auerbach & Blair, 1997; Halberstadt, Crisp & Eaton, 1999). The first study has 3 aims: 1) to examine longitudinal stability of and bidirectional effects between children's positive emotion and mothers' positive emotion between toddlerhood and preschool (24 and 36 months); 2) to test mothers' and children's positive emotions at 36 months as predictors of children's social competence and problem behavior in first grade; 3) to determine if the aforementioned relationships are robust to the inclusion of mothers' negative emotion in the model to ascertain whether positive emotion accounts for unique relationships above and beyond negative emotion.

The second study identifies multiple trajectory groups of children's positive emotion across childhood, from the toddler years to late elementary school, to determine if different patterns of positive emotion development exist. It then associates trajectory group membership with earlier maternal positive emotion and children's later social competence and problem behavior. Whereas the first study focuses on a more limited age period, namely the toddler and early school years, this study encompasses childhood between toddlerhood and pre-adolescence to provide a broader picture of the development of positive emotionality. Further, Study 2 examines trajectories of children's positive emotion in the childcare and school contexts, and is the first study to do so. As children age, they transition from spending the majority of their time in the home to increasing periods of time spent with peers. In the childcare/school context,

children interact with peers of similar developmental levels. Peers provide unique opportunities for the expression and development of positive emotion, in part because they are unable to scaffold positive emotionality in the same way that parents or teachers do. Thus, in this context, children encounter situations that might be both uniquely positive, but also socially or emotionally challenging. As a result, developmental patterns of positive emotionality may be different in the peer context than in the parent-child context (Davis & Suveg, 2014) with stability achieved at different points in development and unique groups of developmental patterns possibly also emerging. Considering trajectories of children's positive emotion in childcare/school in relation to mothers' positive emotion early in development permits inferences about influences on children's positive emotion outside of the immediate parent-child context, speaking to the generality and broader implications of mothers' positive emotion on children's development. Finally, measures of positive emotion in the childcare/school context are more externally valid than lab tasks as they represent children's emotion in naturalistic interactions, when the complexity and challenges of social exchange may either promote or tax the positive emotion system. The second study has three aims: 1) to assess patterns of change in children's positive emotionality over time, specifically, whether development from 24 months to 5th grade is better described by a single model of growth or by multiple latent clusters of growth that capture distinct patterns of development; 2) to determine whether and how childhood trajectories of positive emotion are predicted by maternal positive emotion at 24 months; and 3) to determine whether and how trajectories of children's positive emotion predict social competence and internalizing and externalizing behavior problems in 6th grade.

1.1 LITERATURE REVIEW

The following review first introduces the broad construct of positive emotionality and then focuses on each of the core dimensions of the models being tested: 1) development of positive emotion; 2) relationships between children's positive emotion and their behavior; 3) relationship of maternal positive emotion to children's positive emotion and behavior and; 4) maternal negative emotion and its relationship to positive emotion and behavioral outcomes.

1.1.1 What are positive emotions?

The definition of emotion has been debated since Aristotle (Cosmides & Tooby, 2000). The operational definition varies across researchers and fields, but most consistently involves facial expressions, physical changes such as hormonal and cardiovascular changes, subjective feelings and responses, and changes in attention and cognition (Davis & Suveg, 2014; Cohn & Fredrickson, 2009; Cosmides & Tooby, 2000), although no study examines all of these. For the purpose of this paper, positive emotions are operationalized in a similar fashion to Davis & Suveg (2014), who define positive emotions as a "set of hedonic, behavioral, motivational, and physiologic features" (from Forbes & Dahl, 2005) which include experiences and expressions of positivity defined through overt behaviors as well as components of temperament, which often include laughter and smiling.

The current studies consider both children's and mothers' expressed emotions primarily observed as momentary expressions during social interactions. The majority of research on positive emotion focuses on expressed emotions, particularly happiness, smiling and laughter. This includes expressed emotions that are state-like, mood states that are longer lasting, and

temperamental positive emotions, which are long-standing trait measures of stable emotion expression. These emotions are conveyed through facial, postural and vocal means.

As it is possible to feel emotion and not express it (Branscombe, 1988), especially in the case of adults who have been socialized to culturally acceptable emotion display rules (Mandler, 1975), the current studies also include felt emotions in mothers. Young children are unable to reliably report on their basic emotions (Luby et al., 2007) so felt emotions were measured only in adults. The following review focuses on measures of positive expressivity, and additionally for mothers on felt positive emotion.

Most current emotion theories (e.g. Discrete Emotion theories and Dimensional theories) were created to accommodate negative emotion, and applying them to positive emotion can be challenging. For example, positive emotions are relatively diffuse, lack distinct facial configurations or signs of autonomic arousal, and are fewer in number than negative emotions, (Cohn & Fredrickson, 2009; Ekman, 1992; Fredrickson, 1998). Positive emotions are more likely to co-occur than are negative emotions, and they are more difficult than negative emotions to categorize into distinct types (Cohn & Fredrickson, 2009). Thus, there is little agreement on how to define or identify specific subtypes of positive emotion such as glee, happiness, or elation (Watson & Naragon, 2009). Adding to these difficulties, the term 'positive emotion' is used as both an umbrella term and as its own unique subcategory of emotion. As an umbrella term it includes positive emotions (state-like reactions to an event), positive affect (an experience of a feeling or emotion) and positive mood (trait-like emotions which are temporally remote from an antecedent) while as a subcategory it refers solely to state-like events. Consistent with the former usage, the current studies use the term positive emotion or positive emotionality as a larger umbrella term without differentiating among emotion, affect and mood. Other popular

conceptualizations of emotion are not considered here, such as emotion knowledge, emotion regulation, or general positive characteristics such as warmth. Although these dimensions of emotion are important contributors to behavior, they are fundamentally different constructs than positive emotional experiences and expressions, and are likely to relate to development in unique ways (Lengua, 2003).

1.1.2 Individual and developmental differences in children's positive emotion

Across individuals there is variability in the frequency and intensity of emotions even in similar situations (Davidson, 1998). Within individuals there is also daily variability in positive emotionality following circadian rhythms while across individuals there is variability in daily peak positive emotion and plateau (Clark et al., 1989). Individual variability can be attributed to both genetic and environmental influences. Heritability estimates for positive emotion range from .2 - .6 (Eid, Riemann, Angleitner & Borkenau, 2003; Finkel & McGue, 1997; Jang, Livesley & Vemon, 1996; Jang, McCrae, Angleitner, Riemann & Livesley, 1998; Saudino, 2005), and relative to negative emotion, positive emotion is influenced more by shared environment (Plomin et al., 1993). Parenting is a particularly important source of shared environmental effects.

Little research is dedicated to understanding the developmental course of positive emotion across childhood. Early emerging positive emotion includes reflexive smiling and laughter. With age these behaviors transition from being endogenous to elicited and become more differentiated, dynamic, specific to the situation, and socially bound (Sroufe & Waters, 1976). The development of positive emotion can be considered in terms of mean-level stability i.e. consistency or change in expressivity over time, or in terms of rank-order stability, i.e.

consistency or change in individuals' expressivity relative to other individuals. Positive emotion exhibits rank-order stability over infancy via maternal report, and lab and home observation (Lemery, Goldsmith, Klinnert & Mrazek, 1999; Rothbart, 1986; Rothbart, Derryberry & Hershey, 2000; Sallquist et al., 2010). Additionally, positivity at age 12-13 months predicts positivity at 18-20 months (Belsky, Hsieh & Crnic, 1996). Thus, infants remain stable relative to other infants in their positive emotion. However, mean-level expressivity increases during infancy (Denham, Lehman, Moser & Reeves, 1995; Malatesta, Grigoryev, Lamb, Albin & Culver, 1986; Rothbart et al., 2000; Sallquist et al., 2010). As a group infants become more positive over time, while individual children remain more or less positive compared to other children.

During childhood, positivity has been found to be longitudinally stable in terms of rank-order stability, with moderate to high correlations across home, lab and parent report (Durbin, Hayden, Klein & Olino, 2007; LaFreniere & Sroufe, 1985; Sallquist et al., 2009; 2010), although stability is greater at the extremes of positivity (Durbin et al., 2007). Thus, there is some evidence of greater rank order stability at the poles of positivity as compared to the middle, during childhood. However, positivity is not stable between infancy and childhood. Smiling and laughter at 13.5 months, as measured through maternal report and a laboratory elicitation task, did not relate to maternal report of smiling and laughter at 7 years (Rothbart, Derryberry & Hershey, 2000). From 3- 48 months of age stability in smiling and laughter was found only between intermediate measurement points (Lemery et al., 1999). Thus, stability over long periods such as between infancy and childhood may be limited, found only when sampled at close successive ages.

With respect to mean-level patterns of positive emotion in childhood, trajectory research has found mixed results, with some finding linear increases or decreases in positivity, and others curvilinear relationships. Olino et al. (2011) and Bridgett, Laake, Gartstein, and Dorn (2013) found linear increases in observed positive emotion, in laboratory tasks from late infancy through age 9 (Olino et al., 2011) and in parent reported smiling and laughter from 4-12 years (Bridgett et al., 2013). Additionally, Bridgett et al. (2013) found significant residuals, suggesting individual differences. Sallquist et al. (2010) found that development of positive emotion from 18 to 54 months was best represented by curvilinear growth. However, the direction of growth differed across tasks/interaction partners. Positive expressivity measured during play with mothers increased then decreased slightly, while expressed positivity during bubble blowing with an experimenter decreased then increased slightly. With older children, Sallquist et al. (2009) found negative trajectories in mean levels of overall expressivity over six years with children who started the study in kindergarten to 3rd grade. However, their measures of expressed emotion included both positive and negative emotions, thus, it is unknown whether the decline in expressivity was driven by negative or positive emotion or the combination. These studies appear to agree that early in development positive emotionality increases, but find differing patterns later in childhood. Analyses that can identify multiple trajectory classes from early to later childhood might be particularly useful in clarifying developmental patterns as change over time might follow different patterns in different periods and for different groups of children. Previous research provides support for the existence of multiple unique developmental pathways of children's emotions including multiple trajectory groups of mother-son conflict and warmth (Trentacosta, Criss, Shaw, Lacourse, Hyde & Dishion, 2011), children's loneliness (Qualter et al., 2013) and impulsivity, fearfulness, and helpfulness (Côté, Tremblay, Nagin, Zoccolillo, &

Vitaro, 2002), suggesting that emotional development is heterogeneous and by extension that multiple developmental trajectories might exist for positive expressed emotions. Additionally, multiple trajectory groups have been identified for psychological disorders associated with emotions such as anxiety (Feng, Shaw, & Silk, 2008) and aggression (e.g. Broidy et al, 2003; Campbell, Spieker, Burchinal, Poe, 2006).

In sum, individual differences in positive emotion exhibit rank-order stability in infancy and in childhood, although possibly less so between infancy and childhood. At a mean level, positive emotion has been found to increase over time in infancy, while later in development findings are inconsistent. However, little research is dedicated to understanding emotion development during the toddler years, which mark the transition from infancy to childhood. Thus, little is known about stability and change during this period. Furthermore, no researchers to date have looked for multiple trajectory groups of positive emotion. Considering multiple trajectories may reveal unique developmental patterns that are lost when only single trajectories are modeled, thereby highlighting developmental heterogeneity. Additionally, specific emotion trajectories may relate to predictors of emotions (like parental emotions) differently and may differentially predict other aspects of children's behavior. The following section reviews research on the predictive relationships between children's positive emotion and their socially competent behavior.

1.1.3 Associations between children's positive emotion and behavior

Positive emotion influences behavior starting early in development (Campos & Barrett, 1983), but does not map on to specific behavioral tendencies as readily as negative emotion (Cohn & Fredrickson, 2009; Fredrickson, 1998). Instead, positive emotion expands behavioral

possibilities, invites other-oriented social interactions and potentially mitigates risk for negative behaviors (Cohn & Fredrickson, 2009; Fredrickson, 1998). The influential Broaden and Build Theory (Fredrickson, 1998; 2001; 2004), developed to explain the effects of positive emotionality in adults, suggests that positive emotion influences behavior by broadening one's attention and momentary thought–action repertoire, thereby expanding novel and creative actions, and promoting better use of physical, intellectual, and psychological resources. Positive emotion promotes self-regulation (Aspinwall, 1998), problem solving and cognitive flexibility (Greene & Noice, 1988; Hirt, Melton, McDonald & Harackiewicz, 1996; Isen, 1999), opening individuals up to a greater number of possible behavioral outcomes. Positive emotion also enhances future orientation. It promotes optimism (Cialdini et al., 1982) and increase feelings of personal control and power (Forest, Clark, Mills & Isen, 1979), making people more likely to believe good things will happen in the future (Frijda et al., 1989). Positive emotion is also associated with behavioral changes, including increased goal directed behavior (Watson, Wiese, Vaidya & Tellegen, 1999), approach (Cacioppo, Gardner & Berntson, 1999; Fredrickson, 2001; Watson et al., 1999) and persistence (Carver & Scheier, 1990; Clore, 1994). In sum, positive emotion opens individuals up to the potential for positive psychological and behavioral outcomes and promotes the kinds of cognitions and behaviors likely to produce such outcomes.

Positive emotion is particularly important to social interactions as it serves as an invitation to engage with others (Sroufe, Schork, Motti, Lawroski & LaFreniere, 1984), provides meaning in communication, and both creates and is created by positive interactions with others (Campos, Campos & Barrett, 1989; Halberstadt, Denham & Dunsmore, 2001). In adults, positive emotion is associated with improved scores on social cognition tasks (Cohn & Fredrickson, 2009) and other-oriented feelings (Cialdini et al., 1982). This includes greater

perceived overlap between oneself and friends (Waugh & Fredrickson, 2006), reduced psychological distance, increased trust (Dunn & Schweitzer, 2005), and greater inclusiveness in one's social group (Dovidio, Gaertner, Isen, Rust & Guerra, 1995). Through these processes positive emotion promotes attachment, increased liking, affiliation and security (Berridge & Winkielman, 2003; Mikulincer, Shaver, Gillath & Nitzberg, 2005).

Emotions also play a large role in the development of social competence (Eisenberg & Fabes, 1992; Hubbard & Coie, 1994). Many researchers have found that children's positive expressivity is associated with social competence in childhood (e.g. Denham, McKinley, Couchoud & Holt, 1990; Eisenberg et al., 1992, 2001; Halberstadt et al., 2001; Sroufe et al., 1984) across different methods of measurement including observations, and parent, teacher and peer reports; measurement in different settings including the home, lab and school; and with differing definitions of social competence. For example, beginning in infancy, anticipatory smiling at 9 months correlated positively with social competence scores at 30 months (Parlade et al., 2009). Preschoolers with a higher balance of positive to negative emotion were rated higher on concurrent friendliness and assertiveness by teachers, responded more prosocially to peers' emotions, and were more likable by peer report (Denham, Mitchell-Copeland, Strandberg, Auerbach & Blair, 1997). Preschoolers' positive emotion with peers correlated positively with teacher reported social competence (Jones, Eisenberg, Fabes & MacKinnon, 2002; LaFreniere & Sroufe, 1985), and sharing positive emotions with peers related positively to likability measured concurrently (Denham et al., 1990; Sroufe et al., 1984). Finally, teacher ratings of children's happiness in first and second grade correlated positively with concurrent peer reports of likability (Schultz, Izard, Stapleton, Buckingham-Howes & Bear, 2009). There also is evidence that these childhood relationships remain stable across short periods of time, as positive emotion

concurrently related to teacher/peer rated social competence during kindergarten and remained associated a year later (Isley, O'Neil, Clatfelter & Parke, 1999).

As a primary aim of developmental research is to identify developmental pathways leading to competence, understanding longitudinal associations between positive emotion and social competence is important to our understanding of positive developmental outcomes. Thus, additional work is needed that looks at longitudinal relationships between positive emotion and the development of social competence. In particular, analyses identifying trajectory clusters of positive emotion development would help shed light on whether different patterns of emotional development differentially relate to social outcomes. While Sallquist et al. (2010) predicted teacher rated social competence from a longitudinal trajectory of children's emotion expressivity and found no relationship, their measure included both positive and negative expressivity. Thus, there is no previous research relating longitudinal patterns of positive emotionality to social competence. As a result hypothesized relationships are based on conjecture. Because expressed positive emotion such as smiling and laughter serve as signals for friendly interactions (Izard & Ackerman, 2000), children who show high levels of positivity over time (but are not dysregulated) might develop more effective peer relationships than children who have low levels of positivity or who substantially decrease in positivity over childhood. The first group is more likely to invite positive peer relationships while children in the latter groups are more likely to have difficulties attracting social partners or become more socially withdrawn.

Positive emotion also protects against the development of behavior problems. In adults, positive emotion mitigates problem behavior through a number of mechanisms including supporting coping (Fredrickson, 2000) and reducing the effects of adversity (Aspinwall, 2004). For example, positive emotion promotes the acquisition of physical, intellectual and social

resources such as self-regulation (Aspinwall, 1998), feelings of personal control and power (Forest et al., 1979), goal directed behavior (Watson et al., 1999), and persistence (Carver & Scheier, 1990; Clore, 1994), which can be called upon under adverse conditions (Fredrickson, 2000) to protect against behavior problems and support competent behavior. Starting in the first year of life, positive emotion has been shown to predict maternal ratings of fewer conduct problems across childhood, although the effect size was small (Hayden, Klein, & Durbin, 2005; Rothbart, Ahadi, & Hershey, 1994). Conversely, deficits in expressed positive emotion during childhood have been linked to depression (Clark & Watson, 1991; Clark, Watson & Mineka, 1994; Davidson, 1993; Dietz et al., 2008; Dougherty, Klein, Durbin, Hayden & Olino, 2010; Heller, 1990; Kim, Walden, Harris, Karrass & Catron, 2007; Mineka, Watson & Clark, 1998; Watson, Gamez & Simms, 2005) especially in combination with high levels of negative emotion (Joiner & Lonigan, 2000). Furthermore, the relationship between depression and low positive affect exists even when overlap in measurement is accounted for (Dougherty et al., 2010; Lengua, West & Sandler, 1998) and occurs longitudinally across childhood (Dougherty et al., 2010; Hayden, Klein & Durbin, 2005). For example, low positivity at age 3 predicted more helplessness and less positive information processing biases at age 7 (Hayden et al., 2005) and depressive symptoms at age 10 (Dougherty et al., 2010).

Interestingly, a positive relationship also exists between expressed positive emotion and disruptive school behaviors (Hayden et al., 2005), aggression (Rothbart, Ahadi & Hershey, 1994) and externalizing problems (Stifter et al., 2008). These associations may reflect more intense positive emotion bordering on dysregulation; children's inappropriate positive emotionality, for example laughter in the face of another's pain; different operational definitions of positive emotion; or in the case of questionnaire data, misreporting disruptive behaviors as positive

expressivity (Hayden et al., 2005). One likely possibility is that moderate levels of positive emotion relate negatively to behavior problems whereas extreme levels of positive emotionality (high and low) relate positively to behavior problems. There might also be differential relationships based on both the initial level of positive emotion (high; medium; low) and change in level over time (stability vs. change). For example, children who start low in positivity, but increase over time may be less likely to develop behavior problems, while children who start out extremely high or low in positivity and remain so or drastically decrease in positivity over time might be more likely to develop behavior problems. It is possible children who increase in positivity over time or who remain stable at a moderate level of positivity have the regulatory abilities and emotion coping strategies which contribute to positive behavioral outcomes and buffer against negative outcomes (Davidson, 2000; Green & Noyce, 1988). This social success may in turn create a positive cycle. Longitudinal work is needed that identifies trajectory clusters of positive emotion as predictors of behavior problems to test these possibilities.

In sum, extant research indicates that children's positive expressivity is associated with both social competence and problem behaviors. Additionally, there is evidence of a possible non-linear relationship between positive emotion and behavior, as moderate levels of positive emotion relates to lower levels of behavior problems while extremes of positivity, both high and low levels, relate to more behavior problems. This pattern may also exist for social competence such that moderate levels of positive emotion relate to higher social competence while extremes of positivity relate to lower levels of social competence. However, there is very little longitudinal research on associations between children's positivity and social competence, and there are no studies that look for unique subgroups of children with similar developmental patterns in positive emotion. If multiple unique trajectory groups of positive emotion exist, then

it is likely that they differentially predict behavioral outcomes. They would also shed light on the impact of stability versus change in positive emotionality over time on behavior; relationships to outcomes may differ for children who remain stable in their positivity over time in contrast to those whose positivity changes. Given predictive relations between positivity and social competence, it is important to know what predicts the growth or stability of children's positive emotionality. The review now turns to predictors of children's positive emotion, with a specific focus on maternal positive emotion.

1.1.4 Associations between maternal positive emotion and children's positive emotion

The family provides an emotional climate within which early attachments develop, temperament solidifies, and emotion regulation emerges and consolidates. Thus, it is an important context within which children are exposed to and learn about emotions (Denham & Kochanoff, 2002; Lewis & Michalson, 1983; Morris, Silk, Steinberg, Myers & Robinson, 2007). Adults and children are more likely to express emotions to family members than other individuals (Matsumoto, Takeuchi, Andayani, Kouznetsova & Krupp, 1998; Zeman & Garber, 1996). Parental positive emotion is relatively stable over time and in general parents express more positive than negative emotions with their children (Denham & Kochanoff, 2002; Eisenberg et al., 2003; Malatesta & Haviland, 1982). Specifically, within the parent-child relationship positive emotional interactions occur 2.5 times more frequently than negative emotional interactions (Dix, 1991).

Research indicates rank order stability in mothers' positive emotionality during infancy (Eisenberg et al., 2003), but research on mean level stability of positive expressivity is inconclusive and indicates both stability and change in mothers' positive emotion with their

infants. However, research is consistent in showing stability in maternal positive expressivity during later childhood (for a review see Feng, Shaw, Skuban & Lane, 2007; Sallquist et al., 2010). As children spend a large portion of their time with their mothers, maternal emotions may contribute to children's emotional environment and may help to mold children's emotions.

Parental positive emotion influences children's positive emotion through multiple mechanisms including both genetic and environmental influences. Direct influences include modeling and socialization, discussing emotions, and contagion (Eisenberg, Cumberland & Spinrad, 1998; Halberstadt & Eaton, 2002). Indirect mechanisms include provision of a safe environment in which feelings can be expressed (Halberstadt & Eaton, 2002) and support for children's emotion regulation (Eisenberg et al., 2003). Maternal positive emotion may also increase the child's felt positive emotion and self-esteem by communicating positivity and approval of the child (Morris et al., 2007).

Consistent with this conceptualization, empirical research has demonstrated consistent associations between mothers' and children's positive emotions across studies and ages (for reviews see Halberstadt et al., 1999; Halberstadt & Eaton, 2002). The relationship between parents' and children's positive emotions is reciprocal as parents who are more expressive have children who are more expressive and vice versa (Cassidy, Parke, Butkovsky & Braungart, 1992). The strength of correlations between mothers' and children's expressivity declines from the infant/toddler years to preschool, stabilizing in adolescence through college (Halberstadt & Eaton, 2002). While there is clear evidence that mothers' and children's positive emotions are related, the majority of studies have been cross-sectional and conducted either in preschool/toddler age children or in college students. Thus, although the results are strongly

suggestive, we cannot draw firm conclusions about associations over time or the direction of effects from these studies.

However, a handful of researchers have tested for stability in associations over time in longitudinal models. Sallquist et al. (2010) did not find evidence that mothers' positive affect predicted children's affect, or vice versa, from 18 months to five years. However, Feng et al. (2007) found that mothers' positive expressivity at 2-3 years predicted children's positive expressivity at 4-5 years, whereas children's positive expressivity at 2-3 years did not predict mothers' positive expressivity at 4-5 years. Malatesta et al. (1986) found similar results in infancy as mothers' expressed positive affect at 5 months predicted infants expressed positive affect 2.5 months later, but not vice versa. Although somewhat inconsistent, this research suggests that mothers' positive emotion may have a stronger influence on children's positive emotion across time than children's emotion have on mothers' emotion across time.

The research described above measured children's and mothers' positive emotions in the same context, the mother-child interaction. Overlap in measurement contexts increases the chance that method-specific relationships are found, and measuring both mothers' and children's emotions in the same setting does not provide information on how the influence of maternal positive emotion translates across settings. Correlational research provides some support for a positive relationship between mothers' and children's emotions across contexts. Maternal happiness significantly correlated with toddlers' happiness when children independently interacted with an experimenter (Denham, 1989); children of positive mothers tended to display more positive affect with their peers (Denham et al., 1997); and children's and parents' positive facial expressivity to viewing slides were significantly related (Eisenberg et al., 2001). Thus, in

addition to being robust to measurement type, this relationship appears to be consistent across context, at least in correlational studies.

Finally, with respect to developmental patterns, Bridgett et al. (2013) found that higher parental positive emotion predicted higher intercepts for trajectories of children's positive emotion across the first year, but did not predict the slope. Olino et al. (2011) found that children of mothers with unipolar depression had lower levels of initial positive emotion at 3 years of age than controls, but did not differ in slope. In sum, extant research shows consistent associations between maternal and child positive expressivity. However, some research finds that mothers influence children's positive emotionality over time more than the reverse. In contrast, longitudinal trajectories of children's positive emotion do not appear to relate to mothers' positivity. The longitudinal research is sparse however, and the picture of how mothers' and children's positive emotions relate to each other is incomplete.

In addition to being correlated with and possibly contributing to the development of children's positive emotion, mothers' positive emotion is likely to influence other aspects of children's behavior and developing competence. Indeed, such relationships may operate through the effects of mothers' emotion on children's emotion. The review now turns to evidence for these relationships.

1.1.5 Associations between mothers' positive emotions and children's behavior

There is a large body of literature relating positive, responsive parenting to positive social-emotional outcomes in children (Laible, Thompson & Froimson, 2007; Sheridan & Burt, 2009). In contrast, negative, unresponsive parenting is associated with the development of psychopathology and problem behaviors (Campbell, Shaw & Gilliom, 2000; Cytryn & McKnew,

1998; Shaw, Bell & Gilliom, 2000). However, there has been less work on the influence of mothers' positive emotionality more specifically. Although part of responsive parenting, positive emotion may serve particular functions and contribute in unique ways to children's behavior, not least through influencing children's own positive emotionality. For example, parents' positive emotion in response to children's behavior may both model and reinforce positive behavior (Dahl, Schuck, Hung, Hsieh & Campos, 2012; Eisenberg et al., 2003; Eisenberg, Wolchik, Goldberg & Engel, 1992; Waugh, Brownell & Pollock, 2015), especially positive social interactions such as prosocial sharing, helping, and comforting. Parents' emotion expressiveness may also give children the opportunity to practice interpreting other's emotions (Denham & Kochanoff, 2002; Dunn, Brown, Slomkowski, Tesla & Youngblade, 1991) which in turn influences how children interact with others and their social competence more generally (Eisenberg et al., 1998). Parents' positive emotion may also influence children's regulation of positive affect and their understanding of display rules, which are important aspects of social competence (Eisenberg et al., 2003). Finally, parents' positive emotion may broaden their own attention and momentary thought-action repertoire (Fredrickson, 1998; 2001; 2004), thereby improving the quality and positive nature of the parent-child interaction, which in turn influences children's behavior. Parental positive emotionality may have particular influence on children's behavior during early childhood when children spend the majority of their time with caregivers who have a vested interest in encouraging positive development.

In line with this conceptualization, parental positive emotion has been found to relate to children's positive social behaviors across contexts (Halberstadt et al., 1999). For example, preschoolers of happier mothers scored higher on teacher reports of social competence (Denham & Grout, 1992); and parents' positive reinforcement of children's emotions predicted teacher

reported social competence (Denham et al., 1997); and mother and teacher reported social competence (Blandon, Calkins, & Keane, 2010; Boyum & Parke, 1995; Eisenberg et al., 2001). There is also evidence of child gender differences in this relationship. Parke and colleagues (in Parke, Cassidy, Burks, Carson & Boyum, 1992) found that mothers' positive expressiveness correlated with more prosocial behavior and less disruption in preschool girls and with girls' peer acceptance, but not boys' acceptance. However, it was associated with less shyness in boys. Additionally, Boyum and Parke (1995) found that the frequency of mothers' positive emotion correlated with ratings of kindergarten girls' likeability, but not boys'. In contrast, Isley et al. (1999) found that mothers who expressed more positive affect had daughters who were rated by their teachers and peers as less socially competent in kindergarten and first grade (which they attribute to non-contingent and perhaps inappropriate affect), whereas mothers' positive affect was unrelated to boys' first grade social competence. Thus, gender may moderate associations between parents' positive emotion and developmental outcomes, and is controlled in the following studies.

Mothers' positive emotion also relates to children's behavior problems. Positive parenting has been shown to mitigate children's behavior problems (Campbell, 2006; Dishion et al., 2008; Gardner, Shaw, Dishion, Burton & Supplee, 2007; Linville et al., 2010; Pettit, Bates & Dodge, 1997; Shaw, Keenan & Vondra, 1994) and to foster positive social behaviors, but the specific mechanisms involved have been less fully studied. A positive family emotional climate, created by maternal positive expressivity may be one such mechanism (Eisenberg et al., 2003). Cross-sectional research indicates that positive parental emotion relates negatively to problem behaviors in children both within and across reporters: parents' positive expressiveness relates negatively to aggression in children and adolescents (Halberstadt et al., 1999), children's

maladjustment (Cumberland-Li, Eisenberg, Champion, Gershoff, & Fabes, 2003), and to children's externalizing problems (Eisenberg et al., 2001; Eisenberg et al., 2005; Foster, Garber, & Durlak, 2008), but not their internalizing problems (Eisenberg et al., 2001). However, specific internalizing behaviors have been significantly related to positive parental emotion as parents of children with anxiety use fewer positive emotion words (Suveg, Zeman, Flannery-Schroeder, & Cassano, 2005). There is also some evidence for gender differences as Boyum and Parke (1995) found a negative relationship between both the frequency and clarity of mothers' positive emotion and kindergarten aged girls' physical aggression, but not boys'.

Longitudinal findings relating mothers' positive emotion and children's behavior problems are few and inconsistent. In line with previous research, observed maternal happiness with their 4-year-olds correlated negatively with children's self-reported externalizing behavior scores at ten years; however, it did not relate to parent or teacher-reported externalizing behaviors (Denham et al., 2000). Additionally, low maternal happiness at four years was more important in predicting behavior problems at age ten for children with initially low levels of behavior problems, indicating that maternal happiness operates jointly with child behavior to predict outcomes (Denham et al., 2000). Relative to control children, children of mothers with a lifetime of unipolar depression, which is associated with low positive emotion, had consistently lower levels of positive affect from late infancy through age 9, even controlling for current maternal depression and affect state (Olino et al., 2011).

Understanding factors that contribute to the developmental course of behavior problems starting early in development is a major challenge to the field of developmental psychopathology (Campbell, 1994, 2006; Campbell et al., 2000; Denham et al., 2000; Haapasalo & Tremblay,

1994; Kendziora & O'Leary, 1993; Shaw et al., 1994) and positive emotion is an understudied factor that may ameliorate or prevent behavior problems while building social competence.

1.1.6 Gaps in previous research

While there is a growing body of research on the development of positive emotion over childhood as well as research on the interrelationships among children's positive emotion, maternal positive emotion, and children's behavioral outcomes, the current literature has a number of limitations. To date, no study has considered these associations together in a single model. As a consequence, a cohesive developmental picture is missing and questions remain about how the aforementioned factors inter-relate to influence the development of positive emotion over time. Thus, a primary goal of the current research is to examine these separate associations in a single model to provide a more comprehensive picture of the development of positive emotion than was previously available. Importantly, the current research aims to do so while studying the unique impact of positive emotion, specifically, utilizing only pure measures of positive emotion rather than reverse scoring measures of negative emotion.

Additionally, research on each of these sets of associations is incomplete, inconsistent, and/or limited by methodological shortcomings. In particular the majority of research is cross-sectional and limited in sample size, restricting our understanding of change over time and constraining the ability to conduct more sophisticated analyses that could reveal developmental patterns. Research on the bidirectional influence of children's and mothers' positive emotions over time is also limited and inconclusive. Finally, while some research has considered developmental trajectories of positive emotion over time, extant research considers single trajectories of emotion rather than searching for multiple trajectory groups. Thus, questions

remain as to unique patterns of development over time, and how specific patterns of positive emotional development may relate to predictors and outcomes. The second main goal of the current project is to address these empirical limitations with a larger sample and longitudinal data, as well as testing for bidirectional effects between mothers' and children's positive emotionality, stability and change in the development of positive emotion, and whether unique clusters of developmental change in positive emotionality exist. Doing so will provide a more complete, robust, and nuanced understanding of both the developmental patterns in children's positive emotionality, and the predictors and outcomes of individual differences in positive emotionality.

1.1.7 Mothers' negative emotion

Although the primary aim of this research is to elucidate patterns of change and influence in children's and mothers' positive emotions, the role of parents' negative emotion in predicting children's social competence and/or psychopathology has a long and well-established history. A critical question, then, is whether and how positive emotion functions as a predictor of behavior when considered together with negative emotion. Accordingly, negative emotion was included in an alternative model to determine if positive emotion accounts for unique variance in the specified relationships or if those relationships are better accounted for by negative emotion.

The review now turns to a brief overview of the current literature on the stability of maternal negative emotion; the relationship between maternal negative emotion and mothers' and children's positive emotions; and the relationship between mothers' negative emotion and children's behavioral outcomes. This brief review is presented to provide an understanding of how maternal negative emotion may impact the relationships tested in Study 1.

1.1.8 Mothers' negative emotion and mothers' and children's positive emotions

Research indicates stability in reports of adults' negative emotion (Diener & Larsen, 1984; Epstein, 1980; Tellegen, 1985) and mothers' expressed negative emotion during childhood (Denham & Kochanoff, 2002; Izard, Libero, Putnam, & Haynes, 1993). Although some forms of mothers' negative emotion such as disgust, contempt, shyness, and shame decrease over the first six months from childbirth (Izard et al., 1993), in naturalistic interactions with their children, specifically face-to-face play, mothers rarely express negative emotion (Malatesta et al., 1989; Malatesta & Haviland, 1982). As for the relationship between mothers' positive and negative emotions, a number of studies have found a small to moderate, but significant negative relationship between these variables in Western adult samples (Bagozzi, Wong, & Yi, 1999; Green, Goldman, & Salovey, 1993) and for mothers' expressed positive and negative emotions specifically (Cassidy, Parke, Butkovsky, & Braungart, 1992).

Research on the relationship between mothers' negative emotion and children's positive emotion is mixed. A number of studies have found a negative relationship, including meta-analytic reviews (Denham, 1989, 1993; Garner & Power, 1996; Garner, Robertson, & Smith, 1997; Halberstadt, Crisp, & Eaton, 1999; Halberstadt & Eaton, 2002), while a few studies indicate a positive relationship or no relationship (Denham, 1993; Halberstadt et al., 1999). Study design might explain these inconsistencies. Studies using contingent emotional reactions do not find relationships between mothers' negative emotion and children's positive emotion (Denham, 1993), while studies that look for a broader relationship indicate a negative association. The type and frequency of the expressed emotion may also influence results (Eisenberg, Cumberland, & Spinrad, 1998).

1.1.9 Mothers' negative emotion and children's behavior

Negative parental emotion has been associated with insensitive, hostile/abusive and coercive parenting practices, which are associated, in turn, with poor behavioral outcomes in children (e.g. Ainsworth, Blehar, Waters, & Wall, 1978; Dallaire et al., 2006; Harrist, Pettit, Dodge, & Bates, 1994; Lahey, Conger, Atkenson, & Treiber, 1984; Vasta, 1982). Multiple studies have found negative relationships between mothers' expressed negative emotion during interactions with their children and children's social competence (Boyum & Parke, 1995; Denham, 1989; Denham & Grout, 1993; Eisenberg et al., 1998; Gottman & Katz, 1989; Halberstadt et al., 1999; Katz & Gottman, 1994). Relationships have also been found between social competence and indirect exposure to negative affect through marital conflict and negative affective exchanges between adults (Cummings & Davies, 1994; Gottman & Katz, 1989). Hostile and hurtful parental negativity, in particular, are associated with negative social outcomes as these emotions may dysregulate children and fail to assist children in learning about normative emotion expression (Eisenberg et al., 1998; Eisenberg et al., 2001). While the majority of research finds a negative relationship between mothers' negative emotion and social competence, some researchers have failed to do so (Boyum & Parke, 1995; Carson & Parke, 1996; Denham & Grout, 1992; Halberstadt et al., 1999). This has been attributed to the frequency, context, clarity or type of negative emotion studied (Carson & Parke, 1996; Halberstadt et al., 1999).

As with the relationship between mothers' negative emotion and children's social competence, the relationship between mothers' negative emotion and behavior problems is influenced by the type, quality, intensity and clarity of the emotion, and the type of behavior problem (Boyum & Parke, 1995; Eisenberg, Valiente, et al., 2003). Hostile, harsh, over-

controlling, inconsistent and negative parenting have repeatedly and consistently been related to child psychopathology (Campbell, March, Pierce, Ewing, & Szumowski, 1991; Campbell, Pierce, Moore, Marakovitz, & Newby, 1996; Campbell, Shaw, & Gilliom, 2000; Dallaire et al., 2006; Hollenstein, Granic, Stoolmiller, & Snyder, 2004; Kochanska, Clark, & Goldman, 1997; Kurdek, 2003; McLoyd, 1998; Morris et al., 2002; Rubin, Hastings, Chen, Stewart, & McNichol, 1998). Children's exposure to parents' negative emotion by way of anger-based marital conflict and parental mutual hostility have also been associated with peer, maternal and teacher reports of children's aggression, short-term anger expression and externalizing disorders (Jenkins, 2000; Katz & Gottman, 1993), while relations with internalizing symptoms are mixed and may depend on children's temperament (Gordis, Margolin, & John, 2001; Jenkins, 2000; Shaw, Keenan, Vondra, Delliquardi, & Giovannelli, 1997; Tschann, Kaiser, Chesney, Alkon, & Boyce, 1996).

Additionally, a number of studies relate mothers' expressed negative emotion to children's maladjustment (Cumberland-Li et al., 2003), and internalizing and externalizing behaviors (Jonh-Seed & Weiss, 2002; Peris & Baker, 2000; Vostanis & Nicholls, 1992; Vostanis, Nicholls, & Harrington, 1994). Parental expressed emotions that are critical predict children's depression concurrently and a year later (Asarnow, Goldstein, Tompson, & Guthrie, 1993; Asarnow, Tompson, Hamilton, Goldstein, & Guthrie, 1994), as well as concurrent measures of ADHD, ODD, aggression (Peris & Hinshaw, 2003) and disruptive behaviors (Stubbe, Zahner, Goldstein, & Leckman, 1993; Vostanis et al., 1994). Other research has linked maternal expressions of anger and stress to children's behavior problems. Maternal anger when children were 55 months correlated with teacher- and parent-reported externalizing behaviors at both 7 years and 9 years (Denham et al., 2000). Coercive cycles of anger between parent and child relate to conduct disorders in children (Patterson, Reid, & Dishion, 1992). Additionally,

maternal stress relates to children's externalizing behavior (Baker, Heller, & Henker, 2000; Campbell et al., 2000) and anxiety disorders (Hudson & Rapee, 2001).

Finally, there is a large body of research relating maternal depression to children's behavior problems, concurrently and longitudinally (Beardselle, Versage, & Giadstone, 1998; Beardslee, Bemporad, Keller, & Klerman, 1983; Campbell, Morgan-Lopez, Cox, & McLoyd, 2009; Coyne & Thompson, 2011; Silk, Shaw, Forbes, Lane, & Kovacs, 2006; Weissman, Warner, Wickramaratne, Moreau, & Olfson, 1997; Weissman et al., 2006), although many of these studies did not speak specifically to the mood-related criteria of depression. However, multiple studies have found higher levels of negativity in depressed mothers (Cohn, Campbell, Matias, & Hopkins, 1990; Field, 1984; Foster et al., 2008; Jacob & Johnson, 1997; Lovejoy, Graczyk, O'Hare, & Neuman, 2000), and Foster et al. (2008) found a positive relationship between observed maternal negativity and children's externalizing, but not internalizing scores across their sample of depressed and non-depressed mothers. Thus, while there is some variability in the relationship between mothers' negative emotion and children's behavior problems depending upon qualities of the negative emotion and the type of behavior problem, the majority of research indicates that mothers' negative emotion predicts children's behavior problems.

1.1.10 Integrated models of positive and negative emotions

A handful of studies have considered how positive emotion functions as a predictor of behavior when considered within a model containing negative emotion, thereby accounting for overlapping variance between positive and negative emotions. However, no study tests all the relationships considered in the current studies. Boyum and Parke (1995) found more support for

relationships between mothers' positive emotion and kindergarteners' social competence than between negative emotion and social competence. Eisenberg et al. (2001) predicted 4.5 - 8 year olds social competence, internalizing, and externalizing behaviors from their mothers' concurrently measured positive and negative emotions. They found that both mothers' positive and negative emotions predicted social competence and externalizing behaviors while only mothers' negative emotion predicted internalizing behaviors, suggesting that negative emotion may better account for internalizing behaviors than positive emotion. In a follow-up study, Eisenberg et al. (2003), tested these children 2 years later and found no direct relationships between positive or negative maternal expressivity and concurrently measured reports of children's internalizing behaviors or externalizing behaviors, but did find a significant negative pathway from maternal negative expressivity to children's social competence. In a longitudinal model, they found that mothers' time 1 positivity predicted their time 2 positivity, but they do not appear to have tested relationships to child outcomes (social competence, internalizing and externalizing behavior), despite their inclusion in the model. Additionally, in regression analyses they found that maternal positive emotion predicted children's social competence, internalizing and externalizing behaviors when time 1 levels of these variables were controlled. Regressions were not significant when mothers' negative emotion was used as a predictor of the child outcomes. The authors attributed the inconsistent results between SEM and regression analyses to differences in weighting and simultaneous estimation. Finally, Isley, O'Neil, Clatfelter, and Parke (1999) related mothers' positive and negative emotions to concurrent and longitudinally measured social competence. They found a negative relationship between positive emotion in kindergarten and teacher rated social competence in both kindergarten and first grade, but only for girls. Additionally, the direction of the effects varied by reporter, as the relationship between

mothers' negative emotion and peer ratings of social competence was negative and the relationship with teacher ratings was positive. For boys a negative relationship between mothers' negative affect and 1st grade teacher-reported social competence was significant. Thus, while there are inconsistencies in the direction and significance of these relationships, previous research does suggest that mothers' positive emotion accounts for unique variance in predicting children's behavioral outcomes, above and beyond mothers' negative emotion.

1.2 THE CURRENT STUDIES

Two studies were conducted. The first study tested a conceptual model of associations between mothers' and children's positive emotions from 24 to 36 months, and relationships between emotions at 36 months and outcomes in 1st grade. The second study identified multiple trajectory groups of children's positive emotion from 24 months to fifth grade. Maternal positive emotion when the child was 24 months and children's social competence and problem behavior in sixth grade were then related to trajectory group membership. Both studies used only direct measures of positive emotion (i.e. not reverse scored negative emotion measures) to enable inferences specific to positivity. Positive emotion and behavioral outcomes were assessed across multiple settings, reporters and methods of measurement, providing converging evidence and reducing shared measurement variance. Because the studies were based on secondary data analysis of an existing dataset, participants were the same across the two studies. Aims, methods, analyses and results are presented for each study in turn.

2.0 STUDY 1

The first study tested a model of the relationships between children's and mothers' positive emotions over toddlerhood (24 and 36 months) and their prediction of social competence and behavior problems at the transition to school (1st grade). Each of these associations has been previously empirically verified at a number of ages in childhood, as reviewed above, but this is the first study to integrate and test the relationships among children's positive emotion, mothers' positive emotion, and children's behavioral outcomes in a single model at the transition from infancy to childhood. Using SEM, concurrent, longitudinal, and cross-lagged associations between mothers' and children's positive emotions were tested. Additionally, children's social competence and problem behaviors in first grade were longitudinally predicted from their own and their mothers' positive emotions at 36 months. (See Figure 1, p. 57 for conceptual model).

2.1 AIMS

2.1.1 Aim 1

The first aim was to examine the longitudinal stability of, and bidirectional effects between, children's positive emotion and mothers' positive emotion across toddlerhood (24-36

months). The current study included a younger age range than has been tested in previous models, measuring emotion at 24 and 36 months. Understanding stability over 24 and 36 months is important as this period marks the transition from infancy to early childhood during which positivity is hypothesized to stabilize (Cole et al., 1994). Narrowing the age range allowed for a detailed description of continuity or change during this transitional period. Based on previous research, rank ordering of individuals' positivity was predicted to remain stable for both mothers and children from 24 to 36 months (Sallquist et al., 2010).

Previous research also provides support for hypothesizing concurrent bidirectional relationships between mothers' and children's positive emotions (Feng et al., 2007; Sallquist et al., 2010). There is less support for children's earlier positive expression predicting change in maternal positive expression than the reverse (Feng et al., 2007; Malatesta et al., 1986; Sallquist et al., 2010). Therefore, mothers' positive emotion at 24 months was expected to positively predict the change in children's positive emotion from 24 to 36 months. Children's positive emotion at 24 months was not expected to significantly predict the change in mothers' positive emotion from 24 to 36 months.

2.1.2 Aim 2

The second aim was to test mothers' and children's positive emotions as predictors of children's social competence and problem behaviors in 1st grade. First grade marks a transition to full time schooling when children are spending more of their time with peers in the school context and less time with parents at home. As this transition marks a change in the demands placed on children and the environments in which they interact, it is a particularly relevant period to test the strength of children's and parents' positive emotions as promoters of positive

behaviors and protection from risk. Children's positive emotion is likely to play an important role in the early development of social competence as it serves as a signal for friendly interactions (Izard & Ackerman, 2000), maintains and promotes positive interactions with others (Campos et al., 1989; Halberstadt et al., 2001), and is associated with prosocial behavior (e.g. Sallquist et al., 2009; Terwogt, 2002; Volbrecht, Lemery-Chalfant, Aksan, Zahn-Waxler & Goldsmith, 2007; Young, Fox & Zahn-Waxler, 1999). Thus, this study related mothers' and children's positive emotionality at 36 months to social competence and problem behaviors in first grade to determine if early positivity predicts later behaviors. Mothers' and children's positive emotions at 36 months were expected to predict children's social competence and internalizing/externalizing behavior in 1st grade. Positive relationships were expected with social competence, while negative relationships were expected with problem behaviors.

2.1.3 Aim 3

The third aim was to test an alternative model, which includes mothers' negative emotion. Specifically, the alternative model tested all pathways included in the original model, but also related maternal negative emotion at 24 and 36 months to mothers' and children's positive emotion at both time points, and mothers' negative emotion at 36 months to first grade social competence and behavior problems. The goal was to determine if the relationships tested in Aims 1 and 2 remain significant with the inclusion of negative emotion in the model. As there is evidence that positive and negative emotions are independent of each other and are separate dimensions (Belsky, Hsieh & Crnic, 1996; Watson & Clark, 1997) it was predicted that the relationships tested in the main model should be robust to the inclusion of negative emotion in the alternative model. Additionally, it was predicted that mothers' negative emotion at 24 and 36

months would negatively relate to mothers' and children's positive emotions at both 24 and 36 months; would positively relate to each other over time; and that mothers' negative emotion at 36 months would negatively relate to children's social competence in first grade and positively relate to children's internalizing and externalizing behaviors.

2.2 METHOD

2.2.1 Participants

Participants were generally the same for Study 1 & Study 2, however Study 2 utilized 165 fewer participants as these individuals did not have any positive emotion data and FIML was not possible. Both studies used data from the NICHD Study of Early Child Care and Youth Development, an existing longitudinal dataset from birth to adolescence, with a demographically diverse sample of children and families collected across 10 locations in the United States. Data were collected in Little Rock, AR; Irvine, CA; Lawrence, KS; Boston, MA; Morganton, NC; Philadelphia, PA; Pittsburgh, PA; Seattle, WA; Madison, WI; and Charlottesville, VA. During selected 24-hour sampling intervals, 8,986 women who had given birth in one of 24 study hospitals were screened for eligibility and willingness to be contacted. 5,416 (60%) met the following eligibility criteria: mother was more than 18 years old; mother spoke English; mother was in good health; the family lived within an hour of the study site; the family did not plan to move within three years; the neighborhood was safe to visit as verified by police; the child was a single birth and not up for adoption; the child was not hospitalized for more than 7 days; the child did not have obvious disabilities; the mother did not have a known substance abuse problem; and the mother agreed to be called in 2 weeks. A total of 3,015 families were called

two-weeks later. For the first 3-4 months of enrollment families were called at random, while for the remainder family characteristics were monitored to increase representation of subgroups of family characteristics. Of those called at 2 weeks, a total of 1,525 eligible families agreed to an interview at 1 month of which 1,364 completed a home interview when the infant was 1 month to become study participants.

Children were followed from age 1 month through adolescence across multiple phases of the study. A subsample of the larger database is used for this project, focused on assessments when children were 24, 36, and 54 months old, and in 1st, 3rd, 5th and 6th grades. Retention rates were generally high across the multiple phases of the study (NICHD ECCRN, 2001). 1364 children participated in phase I (0-3 years) of which 131 families dropped out by the end of phase I. By the end of phase II (42 months to 1st grade) an additional 133 families dropped out of the study. 1061 families were enrolled in phase III (2nd through 6th grade) of the study. Additional information about the samples of children used in each study is detailed in the individual study sections (See tables 1 (p. 39), 2 (p. 41), 10 (p. 83), 11 (p. 84) and 13 (p.87)).

The study sample was diverse, including 25% ethnic minority children, 10.4% of mothers with less than a high school education, and 14% single mothers. Mothers had an average of 14.4 years of education and the average family income was 3.6 times the poverty threshold. Additionally, of the enrolled mothers 53% were planning to work full time, 23% were planning to work part time, and 24% were not planning to be employed. While the families in the study come from a range of socioeconomic and cultural backgrounds the sample is not nationally representative. Specifically, the sample over-represents white, non-Hispanic children. Additionally, the sample has a higher mean household income and maternal education level than the average US population.

Measures of children's and mothers' positive emotionality were available at multiple ages. However, there were some restrictions on measure availability for the particular analyses planned. Thus, different measures are used in Study 1 (conceptual model of children's and mothers' positive emotionality and children's behavioral outcomes) and Study 2 (trajectory analyses). Specifics about the measures used in each study are detailed separately.

2.3 MEASURES

2.3.1 Emotion measures

Because the NICHD study did not include standard assessments of positive emotionality, individual items from observational scales and questionnaire measures were used to create latent variables and composites. Items were included only if they initially measured positivity; measures of negative emotion were not reverse-scored to create positive emotion variables. For children, measures of expressed emotion were used. However, for mothers, items measuring both felt and expressed emotions were included. See table 1 (p. 38) for the measures with means, standard deviations and percentages of missing data.

2.3.1.1 Children's positive emotionality

Children's positive emotionality was measured during a 5-minute toy cleanup after a mother-child play episode when the children were 24 and 36 months old. Mothers were instructed to involve their child in picking up the toys in the manner most comfortable for them. Trained coders rated children's "positive affect" from videotapes on a 5-point Likert scale from 1

= very uncharacteristic to 5 = very characteristic. Inter-observer reliability (Pearson correlation) was good to excellent (24 months = .89; 36 months = .65). Data were available for 1167 children at 24 months and 1156 children at 36 months.

2.3.1.2 Mothers' positive and negative emotionality

Maternal expressed and felt positive emotions were measured during observations of mother-child interaction and through parent self-report when children were 24 and 36 months old.

2.3.1.2.1 Mothers' expressed emotion

Mothers' positive and negative expressed emotions were measured during a 5-minute toy cleanup following mother-child interaction, during which the mother was instructed to involve her child in picking up the toys, and trained coders rated mothers' "positive regard for the child" and mothers' "negative regard for the child" from videotapes on a 5 point Likert scale from 1 = very uncharacteristic to 5 = very characteristic. Inter observer reliability (Pearson correlation) was good (positive regard: 24 month = .68; 36 month = .77; negative regard: 24 month = .60; 36 month = .80). Data were available for 1167 mothers at 24 months and 1156 mothers at 36 months.

2.3.1.2.2 Mothers' felt emotion

Mothers' felt emotion was measured via maternal report on a modified version of the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977) when the child was 24 and 36 months old. This measure was used to assess both positive and negative emotions. Mothers answered the following emotion questions on a 5 point Likert scale from 1 =

Rarely or none of the time (less than once a week) to 4= Most or all of the time (5-7 days a week): positive emotion: “I felt happy,” “I felt hopeful,” and “I enjoyed life,” and negative emotion: “I felt sad,” “I felt fearful,” and “I felt lonely”. The negative emotion items were selected to parallel the positive emotion items. Data were available from 1114 to 1118 mothers at 24 months and 1199 to 1201 mothers at 36 months. Cronbach's alpha for the full CES-D at 24 months =.91; 36 months = .90.

Table 1. Means, Standard Deviations and Percent Missing for Measures of Children’s and Mothers’ Affect used in Study 1

Instrument	Source	Location of measurement	Item(s)	Age in Months					
				24			36		
				N	Mean (SD)	Percent Missing	N	Mean (SD)	Percent Missing
Child’s Positive Affect									
Toy Clean-Up Procedure	Observed	Lab	Child’s Positive Affect	1167	2.19 (.58)	14.4	1156	2.43 (.69)	15.2
Mothers’ Positive Affect									
Toy Clean-Up Procedure	Observed	Lab	Positive regard (for the child)	1167	2.98 (.92)	14.4	1156	3.05 (.90)	15.2
CES-D Questionnaire	Self-Report	Questionnaire	I felt happy	1117	3.41 (.78)	18.1	1199	3.40 (.75)	12.1
			I enjoyed life	1114	3.42 (.79)	18.3	1199	3.44 (.76)	12.1
			I felt hopeful	1116	3.2 (.92)	18.2	1199	3.23 (.91)	12.1
Mothers’ Negative Affect									
Toy Clean-Up Procedure	Observed	Lab	Negative regard (for the child)	1172	1.25 (.57)	14.1	1156	1.12 (.42)	15.2
CES-D Questionnaire	Self-Report	Questionnaire	I felt sad	1117	1.53 (.72)	18.1	1200	1.56 (.74)	12.0
			I felt fearful	1118	1.30 (.63)	18.0	1201	1.29 (.60)	12.0
			I felt lonely	1118	1.42 (.72)	18.0	1200	1.38 (.69)	12.0

2.3.2 Children's behavioral outcomes

For measures of children's social competence and behavior problems, mothers and teachers completed standard questionnaires during 1st grade. See table 2 (p. 40) for measures used, means, standard deviations and percent of missing data. See table 3 (p. 41) for correlation between all measures used in Study 1.

2.3.2.1 Social competence

Mothers and teachers completed the Social Skills Rating System (SSRS; Gresham & Elliott, 1990), a broad assessment of children's social competence. This study used the social skills dimension, which includes 30 items that document the frequency of behaviors that index the child's social competence and adaptive functioning (e.g., Asks sales clerk for information or assistance; cooperates with peers without prompting; is liked by others). Raters noted how often the child engaged in each behavior on a 3-point scale from 0 = never, 2 = very often. Available data ranged from 1029 maternal reports to 1000 teacher reports. The SSRS is widely used, and reliable and valid (Gresham & Elliott, 1990). Cronbach's alphas in the current sample range from .88-.94.

2.3.2.2 Problem behaviors

Problem behaviors were operationalized as internalizing and externalizing behaviors. They were measured via maternal report on the CBCL (CBCL; Achenbach, 1991a) and teacher report on the TRF (TRF; Achenbach, 1991b) in first grade. In both versions, 118 items are rated on a 3-point scale ranging from 0 = not true to 2= very true or often true to describe children's

behavior over the past six months. Only the externalizing and internalizing scales (65 items) are used in the current study. The externalizing scale contains 33 items from the delinquent and aggressive behavior subscales and the internalizing scale contains 32 items from the anxious/depressed, withdrawn/depressed, and somatic complaints subscales. Higher scores represent higher levels of problem behavior. Data were available from 1028 maternal reports and 1007 teacher reports. The CBCL and TRF are widely used instruments that are highly reliable and internally consistent (Cronbach's alphas in this sample range from .87- .95).

Table 2. Child Outcomes Measured in the First Grade used in Study 1

Construct	Instrument	Measurement Type	Source	N	Mean (SD)	Percent Missing
Social Competence						
General Social Competence	Social Skills Rating System (SSRS)	Questionnaire	Mother	1029	105.25 (14.93)	24.6
			Teacher	1000	103.21 (13.65)	26.7
Behavior Problems						
Internalizing Problems	Child Behavior Checklist (CBCL)	Questionnaire	Mother	1028	48.27 (8.94)	24.6
	Teacher Report Form (TRF)	Questionnaire	Teacher	1007	49.21 (9.18)	26.2
Externalizing Problems	Child Behavior Checklist (CBCL)	Questionnaire	Mother	1028	48.64 (9.79)	24.6
	Teacher Report Form (TRF)	Questionnaire	Teacher	1007	50.68 (8.72)	26.2

Table 3. Correlation Among Measures used in Study 1

	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
1 Child Positive Affect 24 M															
2 Mom Enjoyed Life 24 M	.061*														
3 Mom Happy 24 M	.056	.690**													
4 Mom Hopeful 24 M	.075*	.470**	.532**												
5 Mom Positive Regard 24 M	.259**	.019	.053	.129**											
6 Child Positive Affect 36 M	.115**	.019	.020	.032	.141**										
7 Mom Enjoyed Life 36 M	.085*	.369**	.375**	.273**	.019	.044									
8 Mom Happy 36 M	.084*	.343**	.356**	.243**	.055	.079*	.639**								
9 Mom Hopeful 36 M	.076*	.278**	.301**	.366**	.126**	.094**	.493**	.577**							
10 Mom Positive Regard 36 M	.077*	.062*	.138**	.118**	.329**	.263**	.033	.069*	.105**						
11 SSRS Mother Grade 1	.079*	.156**	.203**	.230**	.109**	.089*	.138**	.191**	.213**	.156**					
12 SSRS Teacher Grade 1	.078*	.053	.110**	.115**	.078*	.135**	.045	.075*	.072*	.152**	.276**				
13 CBCL Internalizing Grade 1	-.062*	-.120**	-.130**	-.148**	-.060**	-.049	-.136	-.154**	-.154**	-.058	-.288**	-.100**			
14 CBCL Externalizing Grade 1	-.040	-.146**	-.159**	-.202**	-.094*	-.032	-.136**	-.167	-.182**	-.125**	-.470**	-.238**	.579**		
15 TRF Internalizing Grade 1	-.023	.022	.000	-.012	.005	-.063	.002	-.020	.003	-.019	-.133**	-.400**	.148**	.083*	
16 TRF Externalizing Grade 1	-.066*	-.099*	-.171**	-.116**	-.090*	-.058	-.060	-.099*	-.102*	-.122**	-.224**	-.574**	.066*	.336**	.296**

* = Significant $p < 0.05$ level (2-tailed).

** = Significant $p < 0.001$ level (2-tailed)

2.3.3 Covariates

Several covariates were controlled based on conceptual or empirical grounds (See table 4 (p. 44)), or because they related to data missingness (See section below on missing data and table 6 (p. 49)). Site was controlled, as there were site differences on several of the measures. Gender was controlled, as there is some empirical evidence for different relations between mothers' positive emotion and children's social competence as a function of the child's gender, as noted above. Demographic measures were controlled given that SES (e.g., income, education) and sometimes race/ethnicity may be associated with mothers' or children's positive emotionality and/or with children's social competence. Because it is possible that individual differences in infant temperament, especially negative emotionality, may evoke more or less positive affect in mothers which may then continue to influence infants' emotional expression bidirectionally, infant difficult temperament was controlled. Finally, the classroom emotional climate was controlled to account for possible school influences on children's positive emotionality.

Mothers reported on children's race (white/non-white) and gender, and their own education (highest level of education in years) at 1 month of age. The family's income-to-needs ratio (self-reported family income divided by the poverty threshold for its household size) was assessed at 24 and 36 months and 1st grade, and controlled for at the relevant ages (see below). Infant difficult temperament was measured at 6 months using the Early Infant Temperament Questionnaire (EITQ; Medoff-Cooper, Carey, & McDevitt, 1993), completed by mothers. Internal consistency ranges from .42 to .76 and test retest scores range from .43-.87 for this measure (Medoff-Cooper et al., 1993). An overall classroom quality score was obtained from the COS (see study 2 for measure details, p.81) in 1st grade, and included ratings of classroom

climate, management strategies, and the teacher's behavior toward individual children, including sensitivity and intrusiveness/over control.

Table 4. Significant Differences in Measures of Interest by Covariates

Measure	Site	Gender	Race	Income *	Maternal Education	Temperament	Classroom Environment
Child Positive Affect 24 M	NS	NS	F (1, 1165) = 72., p = .072	r = .079, p < .007	NS	NS	NS
Enjoyed Life 24 M	NS	NS	F (1, 1112) = 6.09 p = .014	r = .14, p < .001	r = .13, p < .001	r = -.075, p = .013	NS
Happy 24 M	NS	NS	F (1, 1115) = 28.37, p < .001	r = .17, p < .001	r = .18, p < .001	r = -.14, p < .001	NS
Hopeful 24 M	NS	NS	F (1, 1114) = 12.36, p < .001	r = .16, p < .001	r = .21, p < .001	r = -.12, p < .001	r = .069, p = .38
Positive Regard 24 M	F (9, 1106) = 4.48, p < .001	NS	F (1, 1165) = 25.57, p < .001	r = .18, p < .001	r = .25, p < .001	r = -.065, p = .028	r = .13, p = .38
Sad 24 M	NS	NS	F (1, 1115) = 7.18, p = .008	r = -.17, p < .001	r = -.13, p < .001	r = .086 p = .004	NS
Fearful 24 M	NS	NS	NS	r = -.14, p < .001	r = -.13, p < .001	r = .082, p = .007	NS
Lonely 24 M	NS	NS	F(1, 1116) = 25.40, p < .001	r = -.18, p < .001	r = -.20, p < .001	r = .12, p < .001	r = -.068, p = .042
Negative Regard 24 M	F(9, 1162) = 3.59, p < .001	NS	F(1, 1170) = 69.92, p < .001	r = -.19, p < .001	r = -.27, p < .001	r = .06, p = .043	r = -.075, p = .023
Child Positive Affect 36 M	NS	F(1, 1154) = 3.85, p = .05	F(1, 1154) = 8.83, p = .003	NS	r = .10, p = .001	NS	NS
Enjoyed Life 36 M	NS	NS	NS	r = .07, p = .016	r = .067, p = .021	r = -.10, p < .001	NS
Happy 36 M	NS	NS	F(1, 1197) = 12.70, p < .001	r = .12, p < .001	r = .14, p < .001	r = -.12 p < .001	NS
Hopeful 36 M	NS	NS	F(1, 1197) = 27.44, p < .001	r = .14, p < .001	r = .20, p < .001	r = -.15, p < .001	NS
Positive Regard 36 M	F(9, 1146) = 4.14, p < .001	NS	F(1, 1154) = 47.28, p < .001	r = .14, p < .001	r = 268, p < .001	r = -.10, p < .001	r = .11, p = .001
Sad 36 M	NS	NS	NS	r = -.13, p < .001	r = -.13, p < .001	r = .095, p = .001	NS
Fearful 36 M	NS	NS	NS	r = -.089, p = .002	r = -.092, p = .001	r = .085, p = .004	NS
Lonely 36 M	NS	NS	F(1, 1198) = 4.32, p = .038	r = -.19, p < .001	r = -.13, p < .001	r = .104, p < .001	r = -.074, p = .022
Negative Regard 36 M	F(9, 1146) = 2.62, p = .005	NS	F(1, 1154) = 44.88, p < .001	r = -.099, p = .001	r = -.15, p < .001	NS	NS
SSRS Mother	NS	F(1, 1027) = 8.02, p = .005	F(1, 1027) = 35.02, p < .001	r = .19, p < .001	r = .23, p < .001	r = -.21, p < .001	NS

Grade 1							
SSRS Teacher Grade 1	NS	NS	F(1, 998) = 27.88, p < .001	r = .15, p < .001	r = .26, p < .001	NS	r = .097, p = .003
CBCL Internalize Grade 1	F(9, 1018) = 2.86, p = .002	NS	NS	r = -.11, p = .001	r = -.064, p = .042	r = .11, p < .001	NS
CBCL Externalize Grade 1	F(9, 1018) = 2.21, p = .019	NS	F(1, 1026) = 4.46, p = .035	r = -.19, p < .001	r = -.19, p < .001	r = .13, p < .001	r = -.069, p = .034
TRF Internalize Grade 1	NS	NS	NS	r = -.083, p = .011	r = -.081, p = .01	NS	NS
TRF Externalize Grade 1	F(9, 997) = 2.19, p = .021	NS	F(1, 1005) = 33.74, p < .001	r = -.12, p < .001	r = -.19, p < .001	NS	r = -.075, p = .02

* Income was assessed at the age at which the measured variable was assessed

2.4 ANALYSES

2.4.1 Missing Data

Percentages of missing data ranged from 14.4% for measures of children's positive affect and mother positive regard for the child to 26.7% for teacher ratings of general social competence. 1112 children had positive emotion data at 24 and 36 months, 99 children only had data at one of these time points and 153 children were missing both data points. 1044 children had positive emotion data at 24 months of which 995 children had data at 36 months (95.3%). Comparisons for significant mean differences between children with 24 and 36 month positive emotion data versus children who only had data at 24 months indicated that those children who had data at both time points had mothers who reported more felt and expressed positive emotions at 24 months and who reported less felt and expressed negative emotions at 24 months. There were no differences on maternal emotion variables at 36 months between the groups. Additionally, children with both data points also had mothers with a higher level of education, were themselves more likely to be white and had higher teacher SSRS scores in first grade. See table 5 (p. 47) for more detail.

Table 5 Significant Mean Differences On Variables of Interest and Covariates for Children with Positive Emotion Data at 24 and 36 Months Versus Those With only 24-Month Data.

Measure	Mean Missing (SD)	Mean Retained (SD)	F/ χ^2 , p
Child Positive Affect 24 M	2.16 (.82)	2.19 (.58)	NS
Enjoyed Life 24 M	3.15 (.96)	3.43 (.78)	F(1, 975) = 5.26, p = .022
Happy 24 M	3.05 (1.02)	3.43 (.76)	F(1, 975) = 9.35, p = .002
Hopeful 24 M	3.12 (.87)	3.2 (.92)	NS
Positive Regard 24 M	2.69 (.82)	3.01 (.92)	F(1, 975) = 5.42, p = .020
Sad 24 M	1.88 (.95)	1.51 (.70)	F(1, 975) = 10.49, p = .001
Fearful 24 M	1.63 (.99)	1.28 (.61)	F(1, 974) = 12.21, p < .001
Lonely 24 M	1.80 (.92)	1.40 (.71)	F(1, 974) = 12.12, p = .001
Negative Regard 24 M	1.27 (.49)	1.23 (.55)	NS
Child Positive Affect 36 M	--	2.45 (.69)	NA
Enjoyed Life 36 M	3.19 (.92)	3.44 (.76)	NS
Happy 36 M	3.28 (.78)	3.41 (.75)	NS
Hopeful 36 M	3.06 (.86)	3.24 (.90)	NS
Positive Regard 36 M	--	3.08 (.89)	NA
Sad 36 M	1.72 (.70)	1.55 (.74)	NS
Fearful 36 M	1.34 (.77)	1.29 (.60)	NS
Lonely 36 M	1.56 (.84)	1.37 (.67)	NS
Negative Regard 36 M	--	1.12 (.41)	NA
SSRS Mother Grade 1	102.06 (17.12)	105.73 (14.71)	NS
SSRS Teacher Grade 1	96.82 (16.17)	104.01 (13.50)	F(1, 975) = 7.58, p = .022
CBCL Internalize Grade 1	47.5 (9.53)	48.16 (8.90)	NS
CBCL Externalize Grade 1	48.13 (10.36)	48.36 (9.73)	NS
TRF Internalize Grade 1	51.00 (9.81)	49.29 (9.10)	NS
TRF Externalize Grade 1	52.39 (7.97)	50.27 (8.51)	NS
Site	4.94 (2.28)	5.01 (2.62)	NS
Gender	1.51 (.51)	1.49 (.50)	NS
Race	1.35 (.48)	1.66 (.37)	$\chi^2 (1) = 10.64, p = .003$
Income-to-Needs 24	3.41 (4.07)	3.88 (3.06)	NS
Income-to-Needs 36	2.96 (2.94)	3.75 (3.10)	NS
Temperament	3.26 (.39)	3.15 (.39)	NS
Maternal Education	13.43 (2.61)	14.52 (2.45)	F(1, 1042) = 9.19, p = .002
Classroom Environment	18.19 (1.75)	18.05 (2.53)	NS

Little's MCAR test indicated that data were not missing completely at random ($\chi^2(513) = 668.02, p < .001$). There were systematic differences in race, maternal education and income between individuals with missingness versus no missing data on the variables of interest. There were systematic differences in temperament related to missingness of emotion data but not first grade outcomes. There were systematic gender differences related to missingness in some first grade outcome measures, but no systematic relationships to missingness in emotion variables. Site and classroom environment did not systematically relate to missingness. To correct for bias in model parameter estimates caused by the nonrandom nature of missing data, covariates associated with missingness were included in the model (Widaman, 2006; See table 5, p 47). This enabled full information maximum likelihood (FIML) to be used to retain participants who had missing data (Schafer & Graham, 2002). FIML has been shown to give unbiased estimates (Arbuckle, 1996) and to be superior to imputation and deletion methods (Enders & Bandalos, 2001; Wothke, 2000).

Table 6. Significant Differences in Missingness by Covariates

Measure	Site	Gender	Race	Income*	Maternal Education	Temperament	Classroom Environment
Child Positive Affect 24 M	NS	NS	F(1, 1362) = 5.85, p = .016	NS	F(1, 1361) = 29.47, p < .001	F(1, 1277) = 7.07, p = .008	NS
Enjoyed Life 24 M	NS	NS	F(1, 1362) = 13.92, p < .001	F(1, 1185) = 7.02, p = .008	F(1, 1361) = 52.65, p < .001	F(1, 1277) = 9.90, p = .002	NS
Happy 24 M	NS	NS	F(1, 1362) = 13.50, p < .001	F(1, 1185) = 8.19, p = .004	F(1, 1361) = 56.82, p < .001	F(1, 1277) = 11.39, p = .001	NS
Hopeful 24 M	NS	NS	F(1, 1362) = 15.95, p < .001	F(1, 1185) = 8.62, p = .003	F(1, 1361) = 54.52, p < .001	F(1, 1277) = 9.62, p = .002	NS
Positive Regard 24 M	NS	NS	F(1, 1362) = 5.55, p = .016	NS	F(1, 1361) = 29.47, p < .001	F(1, 1277) = 7.07, p = .008	NS
Sad 24 M	NS	NS	F(1, 1362) = 13.50, p < .001	F(1, 1185) = 7.37, p = .007	F(1, 1361) = 54.16, p < .001	F(1, 1277) = 11.26, p = .001	NS
Fearful 24 M	NS	NS	F(1, 1362) = 13.81, p < .001	F(1, 1185) = 7.31, p = .007	F(1, 1361) = 52.93, p < .001	F(1, 1277) = 10.26, p = .001	NS
Lonely 24 M	NS	NS	F(1, 1362) = 13.81, p < .001	F(1, 1185) = 7.31, p = .007	F(1, 1361) = 52.93, p < .001	F(1, 1277) = 10.26, p = .001	NS
Negative Regard 24 M	NS	NS	F(1, 1362) = 8.04, p = .005	NS	F(1, 1361) = 28.68, p < .001	F(1, 1277) = 6.03, p = .014	NS
Child Positive Affect 36 M	NS	NS	F(1, 1362) = 15.95, p < .001	NS	F(1, 1361) = 30.35, p < .001	F(1, 1277) = 4.69, p = .030	NS
Enjoyed Life 36 M	NS	NS	F(1, 1362) = 15.47, p < .001	NS	F(1, 1361) = 17.19, p < .001	NS	NS
Happy 36 M	NS	NS	F(1, 1362) = 19.00, p < .001	NS	F(1, 1361) = 21.34, p < .001	F(1, 1277) = 5.79, p = .016	NS
Hopeful 36 M	NS	NS	F(1, 1362) = 17.19, p < .001	NS	F(1, 1361) = 19.80, p < .001	F(1, 1277) = 5.03, p = .025	NS
Positive Regard 36 M	NS	NS	F(1, 1362) = 23.40, p = .016	NS	F(1, 1361) = 30.35, p < .001	F(1, 1277) = 4.69, p = .030	NS
Sad 36 M	NS	NS	F(1, 1362) = 15.88, p < .001	NS	F(1, 1361) = 20.76, p < .001	F(1, 1277) = 5.93, p = .015	NS
Fearful 36 M	NS	NS	F(1, 1362) = 18.08, p < .001	NS	F(1, 1361) = 20.80, p = .012	F(1, 1277) = 5.34, p = .021	NS
Lonely 36 M	NS	NS	F(1, 1362) = 15.88, p < .001	NS	F(1, 1361) = 20.45, p < .001	F(1, 1277) = 6.32, p = .012	NS
Negative Regard 36 M	NS	NS	F(1, 1362) = 23.40, p < .001	NS	F(1, 1361) = 30.35, p < .001	F(1, 1277) = 4.69, p = .030	NS
SSRS Mother Grade 1	NS	F(1, 1362) = 5.06, p = .025	F(1, 1362) = 12.74, p < .001	NS	F(1, 1361) = 32.00, p < .001	NS	F(1, 964) = 4.45, p = .035

SSRS Teacher Grade 1	NS	NS	F(1, 1362) = 13.74, p < .001	NS	F(1, 1361) = 33.19, p < .001	NS	NS
CBCL Internalize Grade 1	NS	F(1, 1362) = 4.23, p = .040	F(1, 1362) = 13.65, p < .001	NS	F(1, 1361) = 33.19, p < .001	NS	NS
CBCL Externalize Grade 1	NS	F(1, 1362) = 4.23, p = .040	F(1, 1362) = 13.65, p < .001	NS	F(1, 1361) = 33.19, p < .001	NS	NS
TRF Internalize Grade 1	NS	F(1, 1362) = 4.65, p = .031	F(1, 1362) = 12.98, p < .001	F(1, 980) = 7.34, p = .007	F(1, 1361) = 25.09, p < .001	NS	NS
TRF Externalize Grade 1	NS	F(1, 1362) = 4.65, p = .031	F(1, 1362) = 12.98, p < .001	F(1, 980) = 7.34, p = .007	F(1, 1361) = 25.09, p < .001	NS	NS

*Income was assessed at the age at which the measured variable was assessed

2.4.2 Substantive Analyses

Analyses were conducted using structural equation modeling (SEM) in *Mplus 7* (Muthén & Muthén, 1998-2012). All indicators were continuous and normally distributed. Model fit was assessed using Chi-square goodness of fit, root-mean square error of approximation, comparative fit index, and Tucker Lewis index. For Chi-square, non-significant values indicate good model fit, but this statistic is highly influenced by sample size and is more likely to estimate poorer model fit (Bollen, 1989) so other indicators were prioritized. For root-mean-square error of approximation, acceptable model fit is defined by values below .08 and good fit is indicated by values below .06 (Hu & Bentler, 1999). For the comparative fit index (CFI) and the Tucker Lewis index (TLI), values of .90 - .95 were used for acceptable fit, and greater than .95 for good fit (Hu & Bentler, 1999; McDonald & Ho, 2002). When comparing successive models for improvements in fit, the chi square difference test ($\Delta\chi^2$) is commonly used for direct comparison of nested models. However, $\Delta\chi^2$ is highly sensitive to sample size and recent work has suggested that changes in CFI may be a more accurate assessment of measurement equivalence.

A change in CFI of .01 or less indicates measurement equivalence (Chen, Sousa, & West, 2005; Cheung & Rensvold, 2002). Both the $\Delta\chi^2$ and ΔCFI are presented.

Model building proceeded in steps. Initially all 7 latent variables (mothers' 24 month positive emotion; mothers' 36 month positive emotion; children's 24 month positive emotion; children's 36 month positive emotion; 1st grade social competence; 1st grade internalizing behaviors; and 1st grade externalizing behaviors) were created separately to confirm factor structure. Then a full measurement model was constructed with all 7 latent factors and their 16 measured indicator variables. All latent constructs were allowed to covary freely. Single indicator latent factors of children's positive emotion at both 24 and 36 months were created in order to accommodate missing data. In order to achieve model identification, indicators of each latent construct were constrained to equality and error terms were each set to 0.

Latent factors of mothers' positive emotion at 24 months and mothers' positive emotion at 36 months each had 4 measured indicators. At each age, indicators consisted of positive regard for the child from the mother-child interaction and 3 indicators of mothers' felt emotion from the CES-D ("I felt happy," "I felt hopeful" and "I enjoyed life"). To account for indicator-specific variance over time, error terms for each measured variable were allowed to covary across time (Kenny & Kashy, 1992; Thomson & Williams, 1984).

Latent factors of children's first grade social competence, externalizing behaviors and internalizing behaviors consisted of 2 measured indicator variables each. Mother and teacher report on the SSRS served as indicators of the social competence construct; CBCL and TRF externalizing scores served as indicators of the externalizing behavior construct; and CBCL and TRF internalizing measures served as indicators of the internalizing behavior construct. To account for shared method variance, error terms were allowed to covary within reporter (Kenny

& Kashy, 1992; Thomson & Williams, 1984). To achieve model identification, indicators of each latent construct were constrained to equality. See Figure 1 (p. 57). To simplify presentation, the error covariances are not presented in the model figure.

To determine whether measures of mothers' positive emotion were similar at 24 and 36 months, measurement invariance was assessed during model building. Longitudinal measurement invariance determines whether the same construct is assessed at both time points (measured equivalently across occasions) to ensure that changes in scores can be attributable to changes over time rather than differences in the construct over time (Meredith, 1993). Conclusions about developmental stability or change in the positive emotion latent constructs can be made only after measurement invariance is established. Measurement invariance was tested using a series of nested models: configural, metric (weak) and scalar (strong) invariance models. Configural invariance determines whether the pattern of indicator loadings remains consistent over time. Metric invariance measures whether the strength of the relationships between the items and their respective underlying constructs remain the same across time. This is accomplished by constraining factor loadings to equality. Similar to metric invariance, scalar invariance also sets factor loading to equality and additionally sets intercepts to be invariant across time. In this model latent means are identified and can be compared across groups. Overall model goodness of fit and changes in model fit were conducted using the multiple indicators and criteria outlined above.

Next, a path model was conducted to test for relationships between children's and mothers' positive emotions within and across time as well as their relationships to child outcomes (social competence, internalizing behaviors and externalizing behaviors) in first grade. Specifically, mothers' positive emotion and children's positive emotion at 36 months were

regressed onto mothers' positive emotion at 24 months and children's positive emotion at 24 months. The correlations between mothers' positive emotion and children's positive emotion at both 24 and 36 months were each free to vary. Analyses on the 24-month data were conducted controlling for race, gender, site, maternal education, temperament and 24-month income-to-needs-ratio at the level of the latent variable. Analyses on the 36-month data were conducted controlling for race, gender, site, maternal education, temperament and 36-month income-to-needs ratio at the level of the latent variable. Additionally, social competence, internalizing and externalizing behaviors in first grade were regressed onto mothers' positive emotion and children's positive emotion at 36 months. This was done controlling for race, gender, site, temperament, maternal education, first grade income-to-needs ratio and first grade school environment at the level of the latent variable. Income-to-needs ratios at 24-months, 36-months and 1st grade were allowed to covary. To simplify model presentation covariates were not included in Figure 1 (p. 57). Finally, Wald's test was conducted to determine if there was a significant mean difference in children's positive emotionality from 24 to 36 months.

2.5 RESULTS

2.5.1 Main Model

2.5.1.1 Measurement model

To simplify presentation, only data for the full measurement model is presented although individual measurement models were initially constructed on all latent factors and all provided good fit to the data as well as significant indicator loadings. The measurement model with the 7

latent factors corresponding to mothers' positive emotion at 24 and 36 months, children's positive emotion at 24 and 36 months, social competence, internalizing behaviors and externalizing behaviors evidenced good fit to the data using RMSEA (RMSEA = .050) and adequate fit using the CFI and TLI (CFI = .947; TLI = .918). The χ^2 indicated poor model fit, but was not prioritized due to the large sample size ($\chi^2(78) = 319.738, p < .001$). For all latent variables factor loadings were significant, except for mothers' positive emotion at 24 months for which positive regard was not a significant factor. However, this factor was retained for the full model for conceptual reasons and because it was a significant indicator in all other steps of model building, including factor analysis and invariance testing. Correlations among latent factors were significant except for children's positive emotion at 36 months with mothers' positive emotion at 24 months and externalizing behaviors (see table 7, p. 54).

Table 7 Correlations Among Latent Variables used in Study 1

	1	2	3	4	5	6
1 Mothers' Positive Emotion 24m						
2 Children's Positive Emotion 24m	0.080*					
3 Mothers' Positive Emotion 36m	0.532*	0.103**				
4 Children's Positive Emotion 36m	0.031	0.115**				
5 Social Competence 1 st grade	0.337**	0.147*	0.304**	0.224**		
6 Internalize 1 st grade	-0.239**	-0.123*	-0.283**	-0.149*	-0.545**	
7 Externalize 1 st grade	-0.308**	-0.087*	-0.260**	-0.083	-0.781**	0.334**

* = Significant $p < 0.05$ level (2-tailed).

** = Significant $p \leq 0.001$ level (2-tailed)

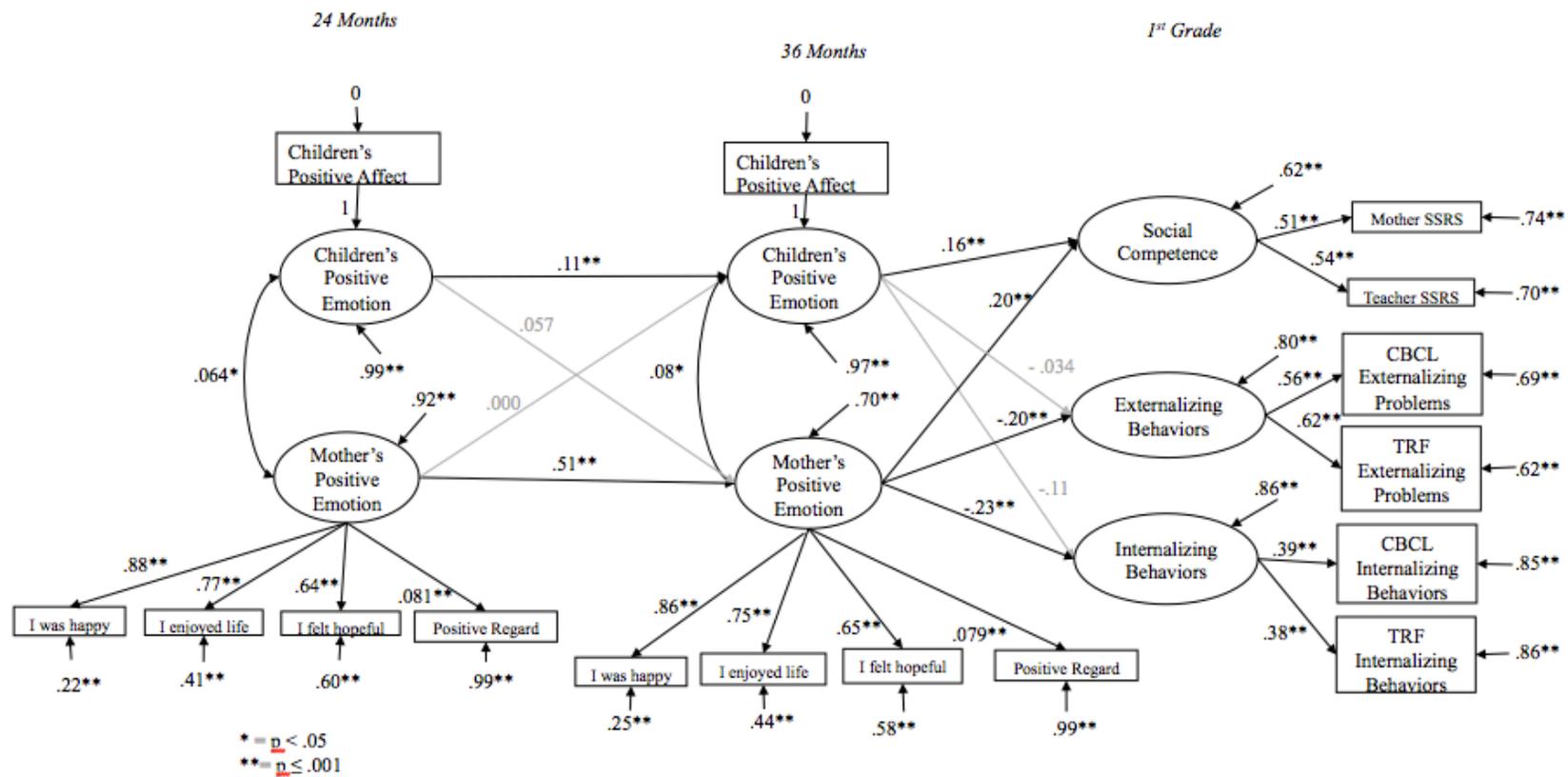
2.5.1.2 Longitudinal measurement invariance

The baseline models for the 4-factor latent variable of mothers' positive emotion at 24 and 36 months each provided good fit to the data on their own. Table 8 (p. 58) reports these results and the results of the series of nested models used to test measurement invariance. The configural invariance model yielded good fit to the data ($\chi^2(15) = 58.288$, $p < .001$; RMSEA = .048; CFI = .984; TLI = .971) indicating that both time points possess the same factor structure. The test of metric invariance, in which factor loadings were constrained to equality across time, indicated good fit to the data ($\chi^2(18) = 58.052$, $p < .001$; RMSEA = .047; CFI = .982; TLI = .972). Additionally, there was no statistical difference between configural and metric invariance models ($\Delta\chi^2(3) = .236$, chance probability = .9715; Δ CFI = .002). The scalar invariance model also provided good fit to the data ($\chi^2(21) = 74.397$, $p < .001$; RMSEA = .045; CFI = .981; TLI = .974) and a nonsignificant change from the metric model for Δ CFI (Δ CFI = .001), but not $\Delta\chi^2$ ($\Delta\chi^2(3) = 16.345$, chance probability = .0009). Finally, scalar invariance testing allowed for comparison of latent variable means, which indicated that maternal positivity remained stable from 24 to 36 months (Estimated Means 24 m = 0; 36 m = .013; $\beta = 0.022$, $p = .53$). As previously stated, due to the large sample size the nonsignificant Δ CFI is prioritized over the significant $\Delta\chi^2$ when comparing models. Therefore, the latent variable of mothers' positive emotion is measuring the same construct over time and differences using these variables can be interpreted as true changes in maternal positivity.

2.5.1.3 Path model

The full path model provided good fit to the data using RMSEA (RMSEA = .040) and adequate fit using the CFI and TLI (CFI = .945; TLI = .917). The χ^2 indicated poor model fit, but was not prioritized due to the large sample size ($\chi^2(197) = 629.36$, $p < .001$). Trimming

nonsignificant pathways did not improve model fit ($\chi^2(201) = 636.29$, $p < .001$; RMSEA = .040; CFI = .945; TLI = .918) and resulted in a nonsignificant change from the non-trimmed model ($\Delta\text{CFI} = 0$; $\Delta\chi^2(4) = 6.93$, chance probability = .14). Therefore, the full model without trimmed pathways was interpreted (see table 8 (p. 58) and figure 1 (p. 59)).



***Child and family covariates (site, race, gender, income and maternal education) are controlled at the level of each latent variable. Classroom control variables are controlled for at latent variables measured in 1st grade. Error covariances are not presented in the figure, see text.

Figure 1. Conceptual model of within and cross time associations between children’s and mothers’ positive emotion at 24 and 36 months, and predictions of 1st grade social competence and behavior problems from positive emotions at 36 months.

Table 8. Summary of Fit Statistics for the Primary Model

Model	N	χ^2	χ^2 df	p	RMSEA	90% CI	p	CFI	TLI	$\Delta\chi^2$ (df)	Chance probability	Δ CFI
24m Mother Positive	1195	16.915	2	.002	.079	.047 - .116	.066	.987	.961	--	--	--
36m Mother Positive	1212	7.317	2	.026	.047	.014 - .085	.482	.995	.986	--	--	--
Configural Invariance	1234	58.288	15	< .001	.048	.036 - .062	.556	.984	.971	--	--	--
Metric Invariance	1234	58.052	18	< .001	.047	.036 - .060	.613	.982	.972	Configural: .236 (3)	.9715	.002
Scalar Invariance	1234	74.397	21	< .001	.045	.034 - .057	.734	.981	.974	Metric: 16.345(3)	.0009	.001
Measurement Model	1235	319.738	78	< .001	.050	.044 - .056	.478	.947	.918	--	--	--
Full Model	1364	629.36	197	< .001	.040	.037 - .044	1	.945	.917	--	--	--
Full Model Trimmed	1364	636.29	201	< .001	.040	.036 - .043	1	.945	.918	Full Model: 6.93 (4)	.1396	0

As predicted, the relationship within time between mothers' and children's positive emotions significantly covaried at both 24 ($r = .064$, $p = .05$) and 36 months ($r = .08$, $p = .021$). Children's positive emotion at 24 months significantly predicted their positive emotion at 36 months ($\beta = 0.114$, $p < .001$). Similarly, mothers' positive emotion at 24 months significantly predicted their positive emotion at 36 months ($\beta = 0.512$, $p < .001$). As expected, mothers' positive emotion at 24 months did not significantly predict the change in children's positive emotion from 24 to 36 months ($\beta = 0.000$, $p = .992$). Nor did children's positive emotion at 24 months significantly predict the change in mothers' positive emotion from 24 to 36 months ($\beta = 0.057$, $p = .057$), contrary to expectations. Finally, Wald's test indicated a nonsignificant mean difference in children's positive emotion from 24 to 36 months ($\chi^2(1) = .436$, $p = .51$).

As predicted, for child outcomes in 1st grade, mothers' positive emotion at 36 months significantly predicted children's social competence ($\beta = 0.197, p < .001$), and significantly negatively predicted children's internalizing behaviors ($\beta = -0.232, p = .001$) and externalizing behaviors ($\beta = -0.198, p < .001$). Children's positive emotion at 36 months significantly predicted children's social competence in first grade ($\beta = 0.160, p < .001$), but did not significantly predict children's internalizing behaviors ($\beta = -0.107, p = .077$) or externalizing behaviors ($\beta = -0.034, p = .429$).

In sum, concurrent relationships between mothers' and children's positive emotions were found at both 24 and 36 months. Additionally, both children's and mothers' positive emotions at 24 months predicted their own positive emotion at 36 months. However, cross-lagged pathways were not significant for either mothers' or children's positive emotion at 24 months predicting change in the other's positive emotion across time. Finally, both mothers' and children's positive emotions at 36 months positively predicted social competence 1st grade, but only mothers' positive emotion also negatively predicted internalizing and externalizing behaviors.

2.5.2 Alternative model: Negative emotion

Because maternal negative emotion negatively correlate with maternal positive emotion and because we know from previous research that negative emotion predicts the behavioral outcomes targeted in the current study (e.g. Caspi et al., 2004; Eisenberg et al., 2001), an additional model was tested which built upon the previous model by including maternal negative emotion at 24 and 36 months (See Figure 2, p. 66).

Mothers' negative emotionality at both 24 and 36 months was indexed as a latent construct consisting of mothers' felt negative emotion ("I felt sad", "I felt fearful" and "I felt

lonely”) from the CES-D and observed “Negative regard for the child” during a toy clean up task. These measures were chosen because they directly parallel those used to index mothers’ positive emotion. While model fit was good for both latent variables, negative regard for the child at 36 months was not a significant indicator¹. In order to maintain consistency in the latent factor over time, negative regard for the child was trimmed from the latent variable at each time point. This resulted in 2 latent factors (mothers’ negative emotion at 24 and 36 month) each with 3 measured indicator variables (“I felt sad”, “I felt fearful”, “I felt lonely”).

As with the previous model, the measurement model was built in steps, with results from only the full measurement model presented. A measurement model was constructed containing all 9 latent variables and 22 measured variables (adding the 2 latent factors of mothers’ negative emotion to the measurement model described above). All latent constructs were allowed to covary freely. To account for indicator specific variance over time, the error terms of the measured variables that loaded onto the latent constructs of mothers’ negative emotion were allowed to covary across time with their respective partners (Kenny & Kashy, 1992; Thomson & Williams, 1984). See above for the other relevant details on model specification. The model provided good fit to the data using RMSEA and CFI (RMSEA = .037; CFI = .947) and adequate fit using the TLI (TLI = .947). The χ^2 indicated poor model fit, but was not prioritized due to the large sample size ($\chi^2(165) = 444.314, p < .001$). For all latent variables all factor loadings were significant, except for mothers’ positive emotion at 24 months for which positive regard was not a significant factor (consistent with model 1; see above). Correlations among all latent factors were significant except for children’s positive emotion at 36 months with mothers’ positive

¹ Positive regard for the child was retained in the primary model because it was a significant indicator in all steps except for the full measurement model. Negative regard, on the other hand, was never a significant indicator at 36 months.

emotion at 24 months, mothers' negative emotion at 24 months, mothers' negative emotion at 36 months and externalizing behaviors (See table 9 (p. 61)).

Table 9. Correlation Among Latent Variables used in the Alternative Model

	1	2	3	4	5	6	7	8
1 Mothers' Positive Emotion 24m								
2 Children's Positive Emotion 24m	0.078*							
3 Mothers' Negative Emotion 24m	-0.680**	-0.117**						
4 Mothers' Positive Emotion 36m	0.527**	0.102*	-0.378**					
5 Children's Positive Emotion 36m	0.029	0.114**	-0.026	0.098*				
6 Mothers' Negative Emotion 36m	-0.359**	-0.122**	0.523**	-0.658**	-0.047			
7 Social Competence	0.336**	0.142*	-0.350**	0.302**	0.224**	-0.205**		
8 Internalizing	-0.238**	-0.119*	0.320**	-0.283**	-0.147*	0.373**	-0.543**	
9 Externalizing	-0.307**	-0.084*	0.304**	-0.083**	-0.083	0.186**	-0.782**	0.332**

* = Significant $p < 0.05$ level (2-tailed).

** = Significant $p < 0.001$ level (2-tailed)

2.5.2.1 Longitudinal measurement invariance

Paralleling analyses for the two latent constructs of mothers' positive emotion, the two latent variables of mothers' negative emotion were tested for longitudinal measurement invariance. The configural invariance model yielded good fit to the data ($\chi^2(5) = 2.544$, $p = 2.544$; RMSEA = .00; CFI = 1; TLI = 1.004) indicating that the latent variable at both time points possess the same factor structure. The test of metric invariance in which factor loadings were constrained to equality across time, indicated good fit to the data ($\chi^2(7) = 11.153$, $p = .1321$; RMSEA = .030; CFI = .998; TLI = .996). Additionally, there was no statistical difference

between configural and metric invariance models for ΔCFI ($\Delta\text{CFI} = .002$), but not $\Delta\chi^2$ ($\Delta\chi^2(2) = 8.609$; chance probability = .0135). As previously stated, due to the large sample size the nonsignificant ΔCFI was prioritized. Finally, the scalar invariance model also provided good fit to the data ($\chi^2(9) = 18.819$, $p = .0268$; $\text{RMSEA} = .030$; $\text{CFI} = .995$; $\text{TLI} = .992$) and a nonsignificant change from the metric model for ΔCFI ($\Delta\text{CFI} = .003$), but not $\Delta\chi^2$ ($\Delta\chi^2(2) = 7.666$; chance probability = .0216). Therefore, the latent variable of mothers' negative emotion is measuring the same construct over time and differences using these variables can be interpreted as true changes in maternal negativity.

2.5.2.2 Alternative path model

Finally, mothers' negative emotion was added to the path model that was estimated above. All the previously described paths were included. The following describes the paths that were added to the model (see Figure 2, p. 66). Mothers' negative emotion at 24 months was allowed to covary with mothers' and children's positive emotions at 24 months, and mothers' negative emotion at 36 months was allowed to covary with mothers' and children's positive emotions at 36 months. Mothers' negative emotion at 36 months was regressed onto mothers' negative emotion at 24 months, children's positive emotion at 24 months and mothers' positive emotion at 24 months. Mothers' and children's positive emotions at 36 months were regressed onto mothers' negative emotion at 24 months. As in the previous model, analyses on the 24-month data were conducted controlling for race, gender, site, maternal education, temperament and a 24-month income-to-needs ratio at the level of the latent variable. Analyses on the 36-month data were conducted controlling for race, gender, site, maternal education, temperament, and 36-month income-to-needs ratio at the level of the latent variable. Finally, social competence, internalizing and externalizing behaviors in first grade were regressed onto

mothers' negative emotion at 36 months, controlling for race, gender, site, temperament, maternal education, first grade income-to-needs ratio and first grade school environment at the level of the latent variable. Income-to-needs ratios at 24-months, 36-months and 1st grade were allowed to covary. As with the previous model, these covariances were not included in Figure 2 (p. 66).

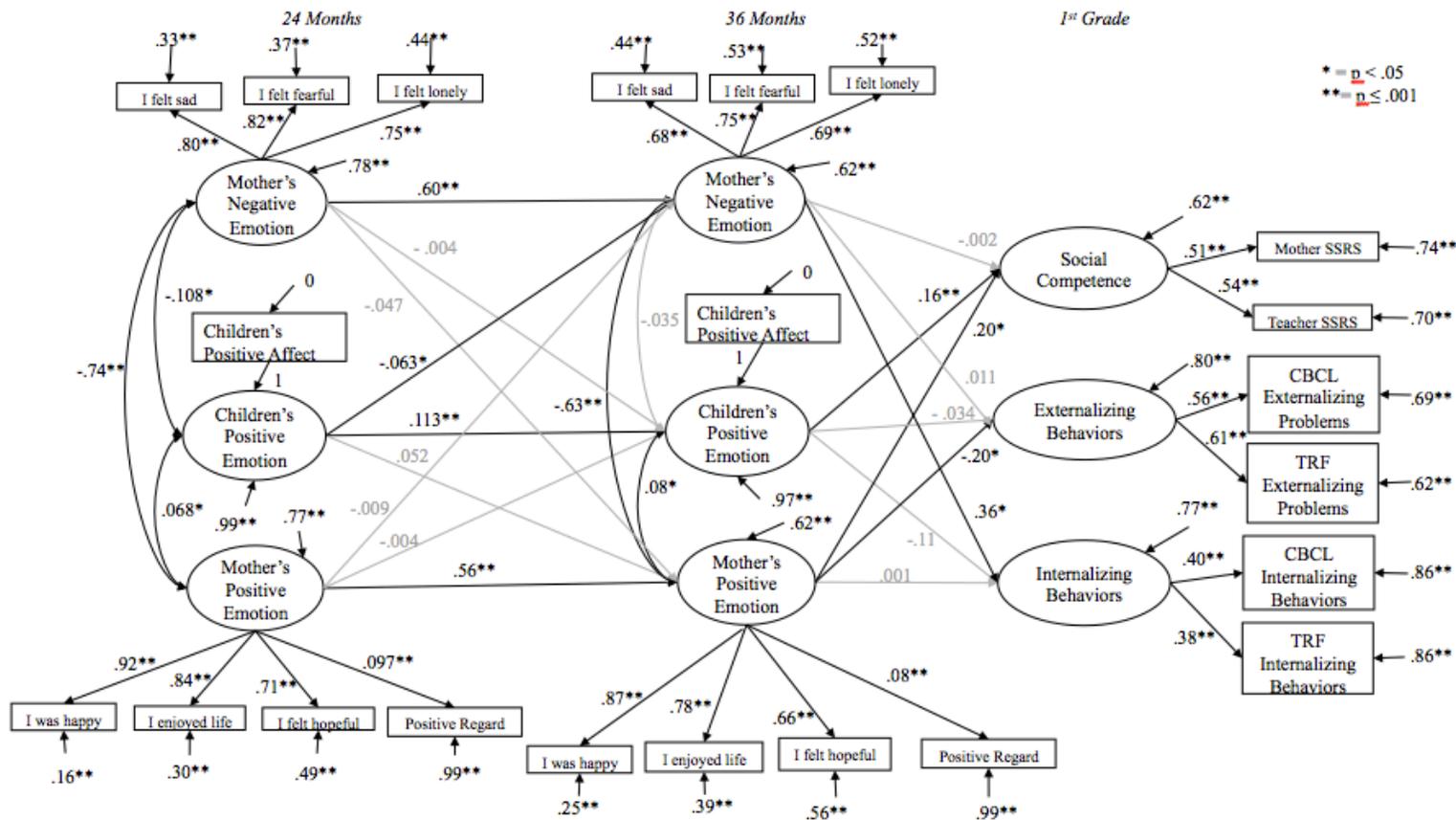
The full model provided good fit to the data using RMSEA (RMSEA = .047) and adequate fit using the CFI (CFI = .904), but poor fit using the TLI (TLI = .87). χ^2 indicated poor model fit, but was not prioritized due to sample size ($\chi^2(338) = 1095.983, p < .001$). As two out of three of the prioritized fit indices indicated that the model fit the data well, the model was retained. Trimming nonsignificant pathways did not improve model fit ($\chi^2(349) = 928.032, p < .001$; RMSEA = .049; CFI = .892; TLI = .857) and resulted in a nonsignificant change from the non-trimmed model ($\Delta CFI = 0$; $\Delta\chi^2(11) = 8.87$, chance probability = .6338). Therefore, the full model without trimmed pathways was interpreted. See table 10 (p. 67)

The alternative model provided results parallel to the primary model for relationships between mothers' and children's positive emotions. First, mothers' and children's positive emotions continued to significantly covary at both 24 ($r = .075, p = .03$) and 36 months ($r = .082, p = .02$). Children's positive emotion at 24 months also continued to predict their positive emotion at 36 months ($\beta = 0.113, p < .001$), and mothers' positive emotion at 24 months continued to predict their positive emotion at 36 months ($\beta = 0.558, p < .001$). Furthermore, children's positive emotion at 24 months remained a non-significant predictor of the change in mothers' positive emotion ($\beta = 0.052, p = .063$) and mothers' positive emotion at 24 months remained a non-significant predictor of the change in children's positive emotion ($\beta = -0.004, p = .950$).

Mothers' negative emotion at 24 months significantly covaried negatively with children's (r = -.108, p = .003) and mothers' positive emotions at 24 months (r = -.739, p < .001). Mothers' negative emotions at 36 months significantly covaried negatively with their own positive emotion at 36 months (r = -.626, p < .001), but did not significantly covary with children's positive emotion at 36 months (r = -.035, p = .360), indicating that the within-time relationship between children's positive emotion and mothers' negative emotion changes across early development. Mothers' negative emotion at 36 months was significantly predicted by mothers' negative emotion at 24 months ($\beta = 0.596$, p < .001). Interestingly, change in mothers' negative emotion from 24 to 36 months was significantly negatively predicted by children's positive emotion at 24 months ($\beta = -0.063$, p = .037); mothers with more positive 2-year-olds became less negative between 24 and 36 months. However, changes in mothers' negative emotion were not significantly predicted by mothers' own positive emotion at 24 months ($\beta = -.009$, p = .892). Additionally, mothers' negative emotion at 24 months did not significantly predict the change in children's positive emotion from 24 to 36 months ($\beta = -0.005$, p = .948) or the change in mothers' positive emotion from 24 to 36 months ($\beta = -0.044$, p = .495). Thus, with mothers' negative emotion in the model, relationships between mothers' and children's positive emotions remained consistent. Mothers' negative emotion related to mothers' concurrent positive emotion at both 24 and 36 months, but only related to children's concurrent positive emotion at 24 months. Of the tested cross-lagged pathways, only children's positive emotion at 24 months predicted change in mothers' negative emotion over time.

When child outcomes in 1st grade were considered, mothers' positive emotion at 36 months continued to predict children's social competence ($\beta = 0.201$, p = .013) with negative emotion in the model, and continued to negatively predict children's externalizing behaviors ($\beta =$

-0.198, $p = .009$). Children's positive emotion at 36 months also continued to significantly predict children's social competence in first grade ($\beta = 0.161$, $p < .001$) and remained a nonsignificant predictor of internalizing behaviors ($\beta = -0.109$, $p = .068$) and externalizing behaviors ($\beta = -0.034$, $p = .429$). In the one deviation from the primary model, mothers' positive emotion at 36 months no longer significantly predicted internalizing behaviors in the first grade ($\beta = 0.001$, $p = .994$) when negative emotion was added. Mothers' negative emotion at 36 months did not predict children's social competence ($\beta = -0.002$, $p = .980$) or externalizing problems ($\beta = 0.011$, $p = .939$) in first grade, but did significantly positively predict children's internalizing problems ($\beta = 0.362$, $p = .001$). Thus, with negative emotion in the model both children's and mothers' positive emotions continued to explain unique variance. Specifically, positive emotion described all the variance accounted for in this model in the predictive relationship between emotions and behavioral outcomes, except for internalizing disorders for which mothers' negative emotion explained the variance accounted for in the model.



***Child and family covariates (site, race, gender, income and maternal education) are controlled at the level of each latent variable. Classroom control variables are controlled for at latent variables measured in 1st grade.

Figure 2. Conceptual model of within and cross time associations between children's positive emotion and mothers' positive and negative emotions at 24 and 36 months, and predictions of 1st grade social competence and behavior problems from emotions at 36 months

Table 10. Summary of Fit Statistics of All Models from the Alternative Model with Mothers' Negative Emotions

Model	N	χ^2	χ^2 df	p	RMSEA		CFI	TLI	$\Delta\chi^2$ (df)	Chance probability	Δ CFI
					90% CI	p					
24m Mother Negative (4 indicators)	1196	5.286	2	.0711	.037	0 - .077	.642	.996	.989		
36m Mother Negative (4 indicators)	1212	2.073	2	.3547	.005	0 - .057	.903	1	1		
24m Mother Negative (3 indicators)	1119	0	0	0	0	0	0	1.00	1.00		
36m Mother Negative (3 indicators)	1202	0	0	0	0	0	0	1.00	1.00		
Measurement Model	1235	444.314	165	<.001	.037	.033 - .041	1	.962	.947		
Configural Invariance	1228	2.544	5	.7699	.00	.00 - .027	.999	1.00	1.00	--	--
Metric Invariance	1228	11.153	7	.1321	.022	.00 - .045	.981	.998	.996	Configural: 8.609 (2)	.0135
Scalar Invariance	1228	18.819	9	.0268	.030	.01 - .049	.961	.995	.992	Metric: 7.666 (2)	.0216
Full model	1364	1363.92	338	<.001	.047	.045 - .050	.962	.904	.869	--	--
Full model trimmed	1364	1372.79	349	<.001	.046	.044 - .049	.989	.904	.873	Full Model: 8.87 (11)	.6338

2.6 STUDY 1 DISCUSSION

Research disproportionately considers the impact of negative emotion rather than positive emotion on children's behavior, particularly psychopathology. Research that does consider both emotion categories generally treats positive and negative emotions as reciprocal, failing to account for different profiles of positive and negative emotionality. Different profiles may be particularly likely early in development when regulatory and other related capacities are first developing and behavioral patterns are less stable. Additionally, of the few studies on children's positive emotions and their behavior most were conducted cross-sectionally, failing to consider longitudinal relationships. The current study aimed to fill these gaps in the literature. It also aimed to provide a more comprehensive developmental picture of the inter-relationships between children's and mothers' positive emotions and their associations with later outcomes. While previous research has tested these relationships, this was the first study to integrate all of these distinct relationships into the same model, considering how they function in the context of the other associations.

2.6.1 Children's and mothers' positive emotions

The current study focused on the development of positive emotionality during toddlerhood (24 and 36 months) when children are transitioning from infancy to early childhood and when emotion expression can be especially challenging (or rewarding) for child and mother alike. Children's positive emotion at 24 months predicted their positive emotion at 36 months,

although the strength of the association was small. Most of the previous research on rank order positivity was conducted during infancy (Lemery et al., 1999; Rothbart, 1986; Rothbart, et al., 2000; Sallquist et al., 2010) or later childhood (Durbin et al., 2007; LaFreniere & Sroufe, 1985; Sallquist et al., 2009; 2010), thus, this study provided important information on stability in children's positive emotion during the transition out of infancy.

At a mean level, children's positivity was also stable across this period. There is little work on mean level differences in positivity during toddlerhood as research is also concentrated during the infancy period (Denham, Lehman, Moser & Reeves, 1995; Malatesta, Grigoryev, Lamb, Albin & Culver, 1986; Rothbart et al., 2000). Furthermore, trajectory research spanning childhood, but including the toddler period, is inconsistent, finding linear or curvilinear increases (Olino et al., 2011; Sallquist et al., 2010) or curvilinear decreases (Sallquist et al., 2010) dependent on the task in which positivity was assessed. However, these previous results reflect broader developmental trends across the age periods they assess, which may conceal patterns of stability and change over shorter periods of time as tested in this study. Similar to Lemery et al. (1999), the current results indicate mean level stability in early childhood over relatively closely spaced age points. Thus, while there may be day-to-day variation in emotionality during this age period and change across childhood, these data show that, on average, children's general positivity does not change dramatically during toddlerhood.

The current study found consistency in relative levels of mothers' positive emotion, paralleling previous research (Denham & Kochanoff, 2002; Malatesta & Haviland, 1982) and also found stability in mean levels of mothers' positive emotion. This indicates that the maternal positive emotional environment is stable during the toddler years when young children spend the majority of their time with their parents and learn about emotions in this home environment

(Denham & Kochanoff, 2002; Lewis & Michalson, 1983; Morris, Silk, Steinberg, Myers & Robinson, 2007).

This study took a novel approach to conceptualizing maternal positivity, using both positive expressivity toward the child and self-reported felt emotions. The measure of maternal positive regard during the mother-child interaction was a weak indicator of the latent construct of mothers' positive emotion. It was retained for conceptual reasons and to be consistent with previous research which has predominantly measured mothers' positive emotions in mother-child interactions (Denham & Kochanoff, 2002; Malatesta & Haviland, 1982). However, also measuring positivity outside the child-mother interaction reflects a broader range of maternal emotionality and accounts for positivity observed by the child indirectly, rather than caused by or in response to the child; in this sense it may represent the more general emotional climate experienced by the child. The current findings show that children are experiencing relatively consistent levels (on average) of both directly expressed and indirectly experienced maternal positivity in early childhood.

2.6.2 Bidirectionality of mothers' and children's positivity

Since the urging of Bell (1968), efforts have been made to conceptualize the parent-child relationships as bidirectional, with parents serving as part of children's environments and actively shaping and socializing children's behavior, and children actively participating in this environment, thereby shaping their own behavior and their parents. This relationship is also transactional (Sameroff, 1975, 2009) with both individuals acting and reacting cyclically over time, creating a dynamic emotional climate together. In the case of positive emotion, both mothers and children contribute to the emotional environment by expressing positivity, eliciting

positivity from the other, and sustaining their own positivity. In homes with positive individuals, cycles of positive emotion are fostered through shared positive affect. In contrast, in homes in which the child, the parent, or both are low on positive emotions opportunities for shared positivity and fostering positive emotion cycles are reduced.

The current study builds upon previous research (Cassidy, et al., 1992; Halberstadt et al., 1999; Halberstadt & Eaton, 2002) by considering bidirectionality at multiple age points. Positive relationships between mothers' and children's positive emotions at both 24 months and 36 months were found. Contrary to predictions, this relationship was small and mothers' and children's positive emotionality may be more reflective of the concurrent environment rather than the broader mother-child emotional environment. Genetic contributions may also account for a portion of the positive relationship found here, although research on the heritability of positive emotion is mixed (Eid, Riemann, Angleitner & Borkenau, 2003; Finkel & McGue, 1997; Jang, Livesley & Vemon, 1996; Jang, McCrae, Angleitner, Riemann & Livesley, 1998; Saudino, 2005). Shared environment effects are also possible, as noted above, both mother and child contribute their own positive emotion expression, and positive responses to each others' positive emotions which likely builds and reinforces mutual positivity (Eisenberg et al., 1998). Parents also contribute indirectly through socialization and modeling (Halberstadt & Eaton, 2002), provision of a safe environment (Halberstadt & Eaton, 2002) and emotional approval (Morris et al., 2007), while children indirectly contribute through reinforcing parental behavior and affect expression (Tronick, 1989).

Although mothers' and children's positive emotionality are related, the small size of the relationship should be noted. This could be a result of restricted range in children's positivity or because the latent variable of mothers' positive emotion is predominantly made up of mothers'

felt emotion. While the strength of the relationship in the current study was small, finding that a relationship exists when positivity is measured in different settings reinforces the extent of the mother-child emotional connection. Future research should further explore the extent of this relationship with a wider variety of measures of positive emotion across multiple interactive contexts.

2.6.3 Longitudinal relationships between mothers' and children's positivity

As expected, bidirectionality between mothers' and children's positive emotions was found concurrently at both 24 and 36 months; however, cross-lagged predictive relationships were not significant. Thus, earlier positivity in one individual did not predict change in the other individual's positivity across time. This finding is consistent with previous research that failed to find children's emotions predicted change in their mothers' emotions (Malatesta et al., 1986; Feng et al., 2007; Sallquist et al., 2010). On the other hand, previous research on maternal positive emotion predicting children's later emotion is inconsistent. Two studies found a positive relationship (Malatesta et al., 1986; Feng et al., 2007), but another failed to find a relationship (Sallquist et al., 2010). Whereas Feng et al. (2007) and Sallquist et al. (2010) both tested cross-lagged pathways, allowing them to draw conclusions about predicting change in emotionality over time, Malatesta et al. (1986) only accounted for positivity in individual A at time 1 and positivity in individual B at time 2, preventing conclusions about change in positivity over time. In the current study, the relationship between earlier maternal emotions predicting change in children's emotion neared significance. Measuring children's emotion in situations that elicit a larger variety of positive emotions, or contingent measures of mothers' and

children's emotions across multiple settings, may better represent their mutual influence and yield a more reliable picture of interdependence or lack thereof.

In summary, results do not support mothers' or children's positive emotions as a mechanism for stability or change in the other's positive emotionality across toddlerhood. The influence of mothers' and children's positive emotions is constrained to bidirectional concurrent relationships, which exist across toddlerhood. This supports further research into shared positive affect as a mechanism as it is likely to support bidirectional relationships (see above) between mothers' and children's positive emotions measured across short periods of time.

2.6.4 Positive emotionality and behavioral outcomes

The current study considered how positive emotionality during toddlerhood predicted children's later behavior during the early school years; specifically, how both mothers' and children's positive emotions at 36 months predicted children's social competence, internalizing and externalizing behavior in the first grade. Consistent with previous research conducted both within (e.g. Denham, McKinley, Couchoud & Holt, 1990; Halberstadt et al., 2001; Sroufe et al., 1984) and across ages (Isley, 1999), children's positive emotion at 36 months predicted social competence in first grade. Emotionally positive children are more likely to attract peers and to possess the social skills needed to sustain relationships. Additionally, emotionally positive interactions with others (Halberstadt, Denham & Dunsmore, 2001) create positive feedback cycles in which positive emotion reinforces and builds positive social relationships and vice versa. Thus, children who are emotionally positive early in life may benefit from more opportunities to engage positively with peers, may be more skilled at avoiding and repairing ruptures in relationships, and may experience greater success in social interactions. These early

social successes may in turn motivate children to seek out additional social opportunities, maintaining this positive cycle and feeding it forward into childhood.

The current study did not find the predicted negative associations between children's positive emotion and internalizing and externalizing behaviors (e.g. Dietz et al., 2008; Dougherty, Klein, Durbin, Hayden, & Olino, 2010; Lahey, Van Hulle, Keenan, Rathouz, D'Onofrio, Rodgers, & Waldman., 2008; Rothbart et al., 1994). A number of explanations are possible, although explanations of null effects are necessarily speculative. First, children's positive emotion better relate to more specific forms of internalizing and externalizing behavior. For example, Clark et al., (1994) indicate that low positive affect is relatively specific to mood disorders. Second, internalizing and externalizing behaviors may be best explained by children's high negativity rather than low positivity (e.g. Bates, Maslin, & Frankel, 1985; Egger & Angold, 2006; Goldberg, Corter, Lojkasek, & Minde, 1990; Goldsmith & Lemery, 2000; Shaw, Owens, Giovannelli, & Winslow, 2001). Third, the relationship between positive emotion and behavior problems might occur only when a child experiences *both* low positive and high negative emotion (e.g. Dougherty, et al., 2010; Joiner & Lonigan, 2000; Kim, et al., 2007). Thus, the relative and joint levels of children's positive and negative emotions may be more important than the absolute level of positivity for predicting problematic behavior. Fourth, as suggested in the earlier review, the relationship between positivity and problem behaviors might exist only at the poles of positivity, particularly dysregulation. However, extremely high or low positivity was not observed in mother-child interaction during the cleanup task used in the current study. Future research should measure children's positivity across settings, particularly those likely to elicit high positive and high negative emotions, to determine whether these null results represent the true state of affairs or result from particular measurement characteristics.

Lastly, behavior problems in first grade were better accounted for by mothers' earlier positive emotion, which significantly predicted both internalizing and externalizing behaviors, than by children's positive emotion. In addition, mothers' positive emotion at 36 months positively predicted children's social competence in first grade. Although children's own positivity also predicted their first grade social competence, the current study suggests that exposure to maternal positivity and perhaps socialization of positivity may be more influential in protecting children from later behavior problems than children's own positive emotion. Parental positivity, specifically positive expressivity, warmth and supportiveness, has been related to children's ability to regulate distress and build coping skills (Aldwin, 2007; Eisenberg et al., 2001; Hardy, Power, & Jaedicke, 1993), which may be especially important in buffering against problem behavior. A supportive and open emotional environment might also make children feel more comfortable seeking parental intervention when children need assistance or support navigating social interactions. Thus, children who grow up in positive emotional environments likely receive the emotional support they need to be more psychologically resilient and to seek assistance when they are unable to cope on their own, thereby buffering them from problem behaviors.

2.6.5 Negative emotion

The current study also tested whether the relationships found for positive emotion in the primary model were robust to the inclusion of mothers' negative emotion. To do so, an alternative model was estimated adding mothers' negative emotion at 24 and 36 months to the primary model. To the author's knowledge, this is the first study to test these unique relationships simultaneously within a longitudinal framework. Given the field's focus on the

relationship between negative emotion and behavior, the tendency to see positive and negative emotions as reciprocal, and the paucity of research simultaneously testing positive and negative emotions, little is known about how positive and negative emotions work together as predictors in an integrated model. Testing simultaneous relationships allows for the consideration of the unique variance accounted for by each relationship. It also more closely represents the real world contexts in which both positive and negative emotions contribute to the emotional environment and children's development.

Patterns of significance in the alternative model were almost identical to the primary model, indicating that positive emotion provides unique information not captured by negative emotion. The relationship between mothers' and children's positive emotions both within and across time did not change with negative emotion in the model. The addition of mothers' negative emotion to the model also did not change the relationships between mothers' and children's positive emotions and with most of the behavioral outcomes. All previously tested relationships remained consistent except for the negative relationship between maternal positive emotion and internalizing behavior, which became non-significant. These patterns are consistent with the cross-sectional results found by Eisenberg et al. (2001), who tested mothers' positive and negative emotions as predictors of children's concurrent social competence, internalizing and externalizing behaviors in children ages 4.5-8 years. In both Eisenberg et al., (2001) and the alternative model tested here, internalizing behaviors were better explained by higher maternal negative emotionality than by low levels of maternal positivity. This suggests that internalizing behaviors may result from the socialization of negative emotion, modeling of poor coping strategies, or children's inability to cope with mothers' negative emotion rather than from limited exposure to positive emotion. Children who are exposed to poor parental models of coping with

negative emotion and poor emotion regulation are more likely to develop negative coping strategies and be withdrawn, cautious and behaviorally inhibited, behaviors associated with internalizing disorders (Biederman et al., 2001; Eisenberg et al., 1998). Furthermore, children of negative mothers may not learn how to express their feelings appropriately. Mothers' depressive symptoms, in particular, have been associated with poorer parenting practices such as the inability to meet children's social and affective needs, modeling and socializing maladaptive behavior, harsher and more negative parenting practices, reduced responsiveness and reduced opportunities to develop positive parent-child relationships (e.g. Campbell & Cohn, 1999; Campbell, Cohn, & Meyers, 1995; Cohn et al., 1990; Errázuriz Arellano, Harvey, & Thakar, 2012; Gotlib & Goodman, 2002; Shaw et al., 2006; Silk et al., 2011). Thus, there is both theoretical and empirical support for negative emotion as a predictor of internalizing symptoms over and above positive emotion.

Interestingly, and contrary to previous research conducted only on negative emotion (see above for review), mothers' negative emotion did not predict social competence or externalizing behaviors when considered together with their positive emotion. Boyum and Parke (1995) similarly found more support for relationships between mothers' positive than negative emotion and kindergarteners' concurrently measured social competence, in an integrated model. Considering the fuller ecological context by including positive emotion in the model suggests that the presence of positive emotion is more important to the later emergence of socially competent behavior and protection from externalizing behavior than the lack of negativity.

It is important to recall that mothers express more positive than negative emotion in interactions with their children (Denham & Kochanoff, 2002; Malatesta & Haviland, 1982), thus, children may experience a smaller range of negative affect than positive affect. The current study

measured mothers' felt negative emotion, whereas the majority of the reviewed literature has utilized their expressed emotion, and it cannot be determined how much negativity children were actually experiencing from maternal reports of their felt negative affect.

In sum, while mothers' positive and mothers' negative emotions were moderately correlated within both time points, they each accounted for unique variance in predictive relationships, lending support for the perspective that positive and negative emotions function differently in children's development. The findings from the current study also underscore the importance of emotional positivity to positive developmental outcomes, and suggest that the field's focus on negative emotion and failure to consider both emotion types in integrated models obscures true predictive relationships. Thus, additional research should be dedicated to the influence of positive emotion, particularly mothers' positive emotion, as it is a unique and more robust predictor of behavior than mothers' negative emotion.

3.0 STUDY 2

Study 1 took an early developmental focus by considering positive emotion during toddlerhood and outcomes in preschool. Relationships were found between children's and mothers' positive emotions during this time period, and supported the hypothesis that positive emotion in both children and mothers predict later social competence and, in some cases, problem behavior. The second study expanded the age range to encompass early and middle childhood to generate a broader picture of the development of positive emotion. Developmental trajectories of children's positive emotion were examined with the aim of identifying subgroups of children with a common course of positive emotion development. Study 2 built upon Study 1 by considering the influence of mothers' positive emotion as a predictor of these developmental trajectories and examining positive emotion trajectory classes as predictors of social competence, internalizing and externalizing behaviors. An additional aim was to describe differences in child and family characteristics between the trajectory groups.

Children's positive emotion was measured in the childcare and school context. As children age they spend more time in the peer group, making peer relationships an important context for developing behavioral patterns. Teachers or peers may elicit and respond to children's positive emotion differently than mothers. In particular, children encounter more varied interactions when they interact with peers as opposed to scaffolded relationships with adults. Thus, patterns of positive emotionality might differ between the school context and the

parent-child context (Davis & Suveg, 2014). Predicting trajectory class membership in the childcare and school context from mothers' positive emotion measured early in the children's development permits inferences about the influences of mothers' emotion across contexts, and the importance of the early emotional climate on later behavior. Understanding how early positive maternal emotion predicts behavior across development will not only expand perspectives on the development of socioemotional competence, but could also serve early intervention and prevention efforts, especially if a relationship is found between trajectory group membership and behavioral outcomes.

3.1 AIMS

3.1.1 Aim 1

The first aim of study 2 was to determine whether developmental patterns in positive emotionality from 24 months to 5th grade were best represented by a single trajectory or by multiple trajectory classes. Considering sample level trajectories alone may obscure important developmental patterns and provide inaccurate estimates of associations with predictors and outcomes. Taking a trajectory class approach provides information about unique patterns of development over time. While trajectory analyses were exploratory in nature, based on previous studies, it was predicted that there would be clusters with positive linear growth (Bridgett et al., 2013; Olino et al., 2011) and clusters exhibiting nonlinear change (Sallquist et al., 2010). It is also possible that smaller groups of children remain stable with high or low positivity throughout development, possibly reflecting clinically relevant populations. Additionally, trajectory group

differences in child and family characteristics were examined to better understand the unique characteristics of the groups.

3.1.2 Aim 2

The second aim was to examine mothers' positive emotion at 24 months as a predictor of children's trajectory class membership. Children learn about emotions in the family context early in development (Denham & Kochanoff, 2002; Lewis & Michalson, 1983; Morris et al., 2007) and mothers serve as early models for emotion expression and regulation. Thus, as the results from Study 1 suggest, maternal positive emotion is likely to be foundational in the development of children's positive emotionality.

In much of the previous research, mothers' and children's emotions were measured while they were interacting with each other. In the current study children's positive expressed emotion was instead measured in the childcare/school context. Mothers' expressed positive emotion was measured during interaction with her child, but additionally measured by maternal report of felt positive emotion, as it is possible to feel an emotion and not express it (Branscombe, 1988). As children at this age are not reliable reporters of their emotions, their felt emotions were not assessed (Luby et al., 2007). Measurement of children's and mothers' positive emotions in different contexts permits inferences about the persistence of mothers' early influence on children's emotions into new settings with new partners.

This was the first study to use mothers' positive emotion to predict trajectories of children's positive emotion across contexts. Correlational studies have shown positive relationships between mothers' and children's positive emotion across various contexts, such as in reaction to laboratory stimuli (Eisenberg et al., 2001), with peers (Denham et al., 1997) and

with an experimenter (Denham, 1989), providing some empirical support for expecting predictability across contexts. However, there were neither conceptual nor empirical grounds for predicting whether or how mothers' positive emotion would predict specific trajectory classes across development.

3.1.3 Aim 3

The third aim was to examine how positive emotion trajectories predict children's social competence and behavior problems as reported by teachers, peers, and mothers later in childhood (6th grade). It was predicted that trajectories at the extremes of positive emotion would relate more strongly to problem behaviors than trajectories of moderate positive emotion (Hayden et al., 2005). Groups with stable, moderately high positive emotion were expected to exhibit greater social competence while groups with stable low or very high levels of positive emotion were expected to exhibit lower social competence. It was also hypothesized that trajectories categorized by change might differentially relate to outcomes. Steep negative changes in positivity over childhood are likely to predict behavior problems and lower social competence. However, there is no empirical grounding for these predictions, so they were largely exploratory.

3.2 METHODS

3.2.1 Participants

Data were drawn from the full 1,364 participant NICHD Study (see Study 1 for details). The sample size reduced to 1,199 participants in the trajectory analyses as 165 children did not have any positive emotion data and were excluded.

3.3 MEASURES

3.3.1 Positive emotion measures

As in Study 1, measures of children's and mothers' positive emotion were included only if they initially measured positivity. That is, reverse score measures of negative emotion were not used.

3.3.1.1 Children's positive emotionality

Children's expressed positive emotion was assessed across multiple ages using developmentally appropriate measures including observation in childcare or school (See table 11 (p. 85) and 12 (p. 86)). Similar measures of positive affect in childcare and school were available at each assessment age beginning at 24 months, making them appropriate for trajectory analyses. Qualitative ratings of children's positive affect/mood were obtained in the childcare and school environment as part of the ORCE (Observational Record of the Care giving Environment) and

COS (Classroom Observation System; see NICHD SECCYD Network, 2002 for details on both), respectively. Trained observers conducted on-site observations over 2 days at 24 and 36 months, and one day at 54 months and 1st, 3rd and 5th grade. Qualitative ratings of several aspects of children's behavior in childcare were made after each 44-minute observation cycle and then averaged over cycles. In grades 1, 3, and 5, children's classroom and school environments and their behavior were observed for at least 6 hours, including the lunch period and classroom instructional time, and similar qualitative ratings of children's behavior were made. Ratings of "Child positive affect" at 24, 36 and 54 months were scored on a 4-point scale (1= Not at all characteristic; 4 = Highly characteristic). In 1st, 3rd and 5th grade ratings were scored on a 7-point scale (1 =Uncharacteristic; 7 = Extremely Characteristic). Inter-observer reliability (Pearson correlation) was high (24 months = .93; 36 months = .88; 54 months = .62; 1st grade = .88; 3rd grade = .83 and 5th grade = .87). See table 13 (p. 87) for inter-correlations among the scores. Scores at each time point were standardized for use in subsequent analyses.

Table 11. Means and Standard Deviations of Measures of Children’s Positive Emotion used in Study 2

Instrument	Age in months (m) or grade (g)											
	24 m		36 m		54 m		1 st g		3 rd g		5 th g	
	Mean (SD)	% Missing	Mean (SD)	% Missing	Mean (SD)	% Missing	Mean (SD)	% Missing	Mean (SD)	% Missing	Mean (SD)	% Missing
Observational Ratings of the Care giving Environment (ORCE)	2.42 ¹ (.52)	51	2.40 ¹ (.55)	48.2	2.46 ¹ (.56)	37.4	--	--	--	--	--	-
Classroom Observation System (COS)	--	--	--	--	--	--	4.32 ² (.81)	29.2	4.30 ² (.50)	28.8	4.33 ² (.55)	30

1 The ORCE is measured on a 4 point Likert Scale*

2. The COS is measured on a 7 point Likert Scale*

* Z-scores were used in all analyses.

Table 12. Participants with Missing ORCE or COS Scores

Number of missing data points	Number of Participants	Cumulative Percent
0	372	27.3
1	215	43.0
2	252	61.5
3	172	74.1
4	103	81.7
5	85	87.9
6	165	100.0

Table 13. Correlations Among Measures used in Study 2

	1	2	3	4	5	6	7	8	9	10	11	
1	Positive Emotion 24 Months											
2	Positive Emotion 36 Months	.312**										
3	Positive Emotion 54 Months	.119**	.142**									
4	Positive Emotion Grade 1	.030	.024	.086*								
5	Positive Emotion Grade 3	.105*	.045	.059	.170**							
6	Positive Emotion Grade 5	.063	.108*	.071	.179**	.235**						
7	Mother Positive Emotion Composite 24 Month	.093*	.084*	-.031	.056	.032	.064 ⁺					
8	SSRS Composite	.122*	.101*	.027	.120**	.172**	.239**	.265**				
9	Peer Group Functioning Composite	.033	.042	.044	.016	.080*	.143**	.271**	.635**			
10	Dyadic Friendship Quality Composite	.033	-.005	.064	.030	.015	.104*	.080*	.130**	.171**		
11	Internalizing Composite	-.014	-.027	-.053	-.130**	-.099*	-.199**	-.121**	-.406**	-.184**	-.105**	
12	Externalizing Composite	.005	.035	.008	-.020	-.058 ⁺	-.106**	-.230**	-.566**	-.434**	-.057	.484**

⁺ = marginally significant $p = .051$

* = significant $p < 0.05$ level (2-tailed).

** = significant $p \leq 0.001$ level (2-tailed).

3.3.1.2 Maternal positive emotionality

Maternal expressed positive emotion and maternal felt positive emotion were measured during observations of mother-child interaction and through parent self-report when their children were 24 months old. See table 13 (p. 87) for correlations among measures and table 14 (p. 89) for means, standard deviations and percentage of missing data.

Mothers' expressed positive emotion

Two contexts yielded measures of mothers' positive affect with their children at 24 months, a toy clean-up (Study 1 for details) and a semi-structured free play interaction. On the latter, trained observers rated "mothers' positive regard for the child" on a four-point scale (1=Not at all characteristic, 4= Highly characteristic), during a 15-minute videotaped mother-child free play (inter observer reliability = .75). For information on the toy clean up coding see Study 1. Both scores were standardized and averaged to create a mother's positive expressivity score.

Mothers' felt emotion

Mothers' felt emotion was measured via maternal report on a modified version of the Center for Epidemiological Studies Depression Scale (CES-D; Radloff, 1977) when the child was 24 and 36 months old (see p. 38, Study 1 for details). Mothers' ratings of "I felt happy," "I felt hopeful" and "I enjoyed life" were averaged and standardized to create a mothers' felt positive emotion score. Mothers' positive expressivity and felt emotion composite scores were averaged to create a mothers' positive emotionality measure for analyses.

Table 14. Means, SD and Percentage of Missing Data From Child Predictor and Outcome Variables used in Study 2

Construct	Instrument	Measurement Type	Source	Mean (SD)	Percent Missing
Maternal Positive Affect					
Positive regard for the child	Toy Clean-Up Procedure	Lab Observation	Experimenter Rating	2.98 (.92)	14.4
	Mother- Child Structured Interaction	Lab Observation	Experimenter Rating	2.83 (.70)	15.2
I was happy	CES-D Questionnaire	Self-Report	Questionnaire	3.41 (.78)	18.1
I enjoyed life				3.42 (.79)	18.3
I felt hopeful				3.2 (.92)	18.2
	Composite Score (Z-Score)			-.013 (.64)	12.3
Social Competence					
General Social Competence	Social Skills Rating System (SSRS)	Questionnaire	Mother	107.04 (15.95)	25.1
			Teacher	102.90 (14.27)	38.3
	Composite Score			105.40 (13.04)	23.8
Peer Group Functioning	Child's Behavior With Peers Questionnaire	Questionnaire	Mother	1.66 (.36)	25.1
			Teacher	1.43 (.46)	38.6
	Composite Score			1.57 (.34)	23.9
Dyadic Friendship Quality	Friendship Quality questionnaire	Questionnaire	Study Child	4.21 (.59)	26.8
			Child's Best Friend	4.22 (.54)	31.9
	Composite Score			4.21 (.46)	26.7
Behavior Problems					
Internalizing Problems	Child Behavior Checklist (CBCL)	Questionnaire	Mother	47.72 (9.99)	25.1
	Teacher Report Form (TRF)	Questionnaire	Teacher	50.16 (9.18)	37.3
	Composite Score			48.77 (8.18)	23.8
Externalizing Problems	Child Behavior Checklist (CBCL)	Questionnaire	Mother	45.94 (10.15)	25.1
	Teacher Report Form (TRF)	Questionnaire	Teacher	50.16 (9.12)	37.3
	Composite Score			47.77 (8.36)	23.8

3.3.2 Children's behavioral outcomes

Behavioral outcomes were measured in 6th grade. For measures of children's social competence and behavior problems, mothers, teachers, the children, and/or the children's friend completed standardized questionnaires. Social competence in 6th grade was operationalized at three levels: 1) general social skills, 2) peer group functioning, and 3) dyadic friendship quality. Problem behaviors were operationalized as internalizing and externalizing behaviors, measured via mother and teacher report. See table 13 (p. 87) for correlations among measures and table 14 (p. 89) for means, standard deviations and percentages of missing data.

3.3.2.1 General social competence

Mothers and teachers completed the Social Skills Rating System (SSRS; Gresham & Elliott, 1990) when the child was in 6th grade. See study 1 for measure details. Averaging mother and teacher reports on this measure created a general social competence score, which was used in the analyses.

3.3.2.2 Positive peer group functioning

Mothers and teachers completed the Child Behavior with Peers Questionnaire when the child was in 6th grade. This 43-item questionnaire was designed to measure the study child's relationships and behaviors with peers including aggressive behavior, prosocial behavior, asocial behavior and exclusion by peers (Ladd & Profilet, 1996), peer victimization (Kochenderfer & Ladd, 1996), and relational aggression (Crick, 1996). Behaviors were rated on a 3-point scale (0= not true, 1 = sometimes true, 2 = often true). To index peer competence, this study used the Prosocial with Peers subscale (Cronbach's alphas: .91-.92) a 9-item subscale with items such as

“Seems concerned when other children are distressed,” “Is cooperative with peers” and “Offers help or comfort when other children are upset.” Averaging mother and teacher reports on this measure created the positive peer group functioning score, which was used in the analyses.

3.3.2.3 Dyadic friendship quality

The study child and the study child’s best friend completed the Friendship Quality Questionnaire (Parker & Asher, 1993) in 6th grade. This is a 29-item questionnaire that assesses perceptions of the friendship (e.g.; this friend and I like to hang out together; this friend and I look out for each other) on a 5- point scale ranging from 1 = not at all true to 5 = really true. Higher scores represent better friendship quality. Cronbach's alpha for study child = .93; study child’s friend = .92. Averaging the child’s and their best friend’s reports on this measure created the dyadic friendship quality score, which was used in the analyses.

3.3.2.4 Problem behaviors

Internalizing and externalizing behaviors were measured via maternal report on the CBCL (CBCL; Achenbach, 1991a) and teacher report on the TRF (TRF; Achenbach, 1991b). See study 1, for measure details. To create internalizing and externalizing behavior scores mother (CBCL) and teacher (TRF) reports of these behaviors were averaged. These averages were used in the analyses.

3.3.3 Covariates

Trajectory groups were compared for differences in site, children’s gender, race, income-to-needs ratio (average of 15 and 24 month data), temperament and maternal education. See

study 1 for measure details. These child/family characteristics were also entered into regression analyses as covariates. See table 15 (p. 93) for differences in variables of interest for each covariate.

Table 15. Significant Differences in Measures of Interest by Covariates

Measure	Site	Gender	Race	Income*	Maternal Education	Temperament
Positive Emotion 24 m	F(9, 659) = 10.85, p < .001	NS	F(1, 667) = 5.36, p = .021	r = .13, p < .001	NS	NS
Positive Emotion 36 m	F(9, 697) = 13.72, p < .001	NS	NS	NS	NS	r = -.078, p = .04
Positive Emotion 54 m	F(9, 844) = 14.47, p < .001	NS	NS	NS	NS	NS
Positive Emotion Grade 1	F(9, 856) = 10.60, p < .001	NS	NS	NS	NS	NS
Positive Emotion Grade 3	F(9, 861) = 7.31, p < .001	NS	F(1, 969) = 4.43, p = .036	NS	NS	NS
Positive Emotion Grade 5	F(9, 845) = 7.28, p < .001	NS	NS	r = .13, p < .001	r = .16, p < .001	NS
Mother Positive Emotion Composite 24 m	F(9, 1186) = 2.56, p = .006	NS	F(1, 1194) = 62.54, p < .001	r = .31, p < .001	r = .35, p < .001	r = -.16, p < .001
SSRS Composite	NS	NS	F(1, 1038) = 57.75, p < .001	r = .23, p < .001	r = .26, p < .001	r = -.16, p < .001
Peer Group Functioning Composite	F(9, 1028) = 2.76, p = .003	F(1, 1036) = 54.93, p < .001	F(1, 1036) = 46.01, p < .001	r = .17, p < .001	r = .21, p < .001	r = -.095, p = .002
Dyadic Friendship Quality Composite	NS	F(1, 998) = 71.51, p < .001	NS	NS	NS	NS
Internalizing Composite	F(9, 1030) = 1.97, p = .04	NS	NS	r = -.10, p = .001	r = -.09, p = .004	NS
Externalizing Composite	NS	NS	F(1, 1038) = 19.42, p < .001	r = -.19, p < .001	r = -.25, p < .001	r = -.11, p < .001

* The family's income-to-needs ratio was used from the age at which the child/mother variable was measured

3.4 ANALYSES

3.4.1 Missing Data

Percentages of missing data for children’s positive emotion ranged from 28.8% participants in 3rd grade to 51% of participants at 24 months (Table 12, p. 86). Percentages of missing data on outcome variables ranged from 14.4% for measures of mother positive regard for the child at 24 months to 37.3% for TRF internalizing and externalizing scores (Table 14, p. 89).

Analyses were conducted to determine if missing positive emotion data in school or childcare related to the number of hours children were in school or childcare. At all ages, children who had ORCE or COS data were in childcare for more hours per week than those who were missing ORCE data (See table 16, p 94), although the magnitude of the mean difference attenuated with age.

Table 16 Mean Differences On Average Hours Per Week in Childcare/School for Children who Have Versus Are Missing Positive Emotion Data At Each Age of Interest

	Hours per week in child care or school		F, p
	Mean Missing (SD)	Mean Retained (SD)	
24 months	28.49 (20.95)	38.43 (14.74)	F (1, 902) = 66.17, p < .001
34 months*	25.95 (20.22)	38.18 (16.11)	F (1, 957) = 101.13, p < .001
53 months*	20.69 (21.67)	34.65 (16.95)	F (1, 1126) = 123.25, p < .001
1 st grade	31.84 (5.11)	32.93 (2.53)	F (1, 1060) = 22.56, p < .001
3 rd grade	31.63 (4.40)	32.63 (2.81)	F (1, 1072) = 11.43, p = .001
5 th grade	31.84 (2.53)	32.23 (2.53)	F (1, 1060) = 12.87, p < .001

* hours per week in child care was not measured at 36 or 54 months, as a result 34 and 53 month data was used

Analyses were conducted on measures of children's positive emotions to determine if there were differences in predictor, outcome and covariate variables between consecutive age periods for children who were retained versus were missing positive emotions data at the older time point (See table 17, p. 96). From 24 to 36 months, children who were missing positive emotion data at the second age point were of lower SES, were more likely to be minority and had more negative temperaments. From 36 to 54 months, children who were missing positive emotion data at the second age point were less positive in 5th grade, had poorer general social competence and dyadic friendship scores, more behavior problems, were more likely to be male and minorities, and had mothers with less education. From 54 months to 1st grade and from 1st to 3rd grade, children who were missing positive emotion data at the second age point were more likely to be minorities. Finally, from 3rd grade, to 5th grade, children who were missing positive emotion data at the second age point were more likely to externalizing problems and poor general social competence.

Table 17 Mean Differences On Variables of Interest and Covariates for Children who were Retained versus were Missing

Positive Emotion Data at the Second of Two Consecutive Ages.

Measure	24 to 36			36 to 54			54 to 1			1 to 3			3 to 5		
	Mean Missing (SD)	Mean retained (SD)	F/ X ² , p	Mean Missing (SD)	Mean retained (SD)	F/ X ² , p	Mean Missing (SD)	Mean retained (SD)	F/ X ² , p	Mean Missing (SD)	Mean retained (SD)	F/ X ² , p	Mean Missing (SD)	Mean retained (SD)	F/ X ² , p
Positive Emotion 24 m	-.089 (1.10)	.012 (.98)	NS	.082 (1.10)	.0071 (.96)	NS	-.19 (.93)	.018 (.97)	NS	-.23 (1.09)	.043 (.97)	NS	.053 (1.09)	.0058 (.97)	NS
Positive Emotion 36 m	--	--	--	-.054 (1.05)	.012 (.99)	NS	-.15 (.95)	.024 (.99)	NS	.072 (1.03)	.030 (1.00)	NS	.058 (1.01)	.15 (1.00)	NS
Positive Emotion 54 m	-.15 (1.21)	-.014 (.97)	NS	--	--	--	.017 (.91)	-.0017 (1.01)	NS	.11 (1.04)	-.013 (1.01)	NS	.075 (1.03)	-.027 (1.00)	NS
Positive Emotion Grade 1	.085 (.88)	.0038 (.99)	NS	.16 (.93)	-.018 (1.01)	NS	--	--	--	-.11 (1.03)	.012 (1.03)	NS	.11 (1.03)	.0023 (.99)	NS
Positive Emotion Grade 3	-.13 (1.04)	.053 (1.01)	NS	.043 (1.10)	.011 (.97)	NS	-.15 (1.05)	.005 (.98)	NS	--	--	--	-.11 (1.04)	.012 (1.00)	NS
Positive Emotion Grade 5	-.093 (.89)	.0088 (.96)	NS	-.23 (1.04)	.031 (.98)	F(1, 563) = 4.22, p = .04	.080 (.97)	.0031 (.99)	NS	-.045 (1.10)	-.004 (.99)	NS	--	--	--
Mother Positive Emotion Composite	.0027 (.58)	.061 (.62)	NS	-.05 (.67)	.074 (.64)	NS	-.11 (.71)	.045 (.64)	NS	-.048 (.67)	.015 (.65)	NS	.0047 (.69)	.003 (.65)	NS
SSRS Composite	104.15 (13.47)	106.15 (12.54)	NS	103.23 (12.43)	106.28 (12.78)	F(1, 603) = 3.86, p = .05	109.18 (14.36)	105.84 (12.75)	NS	107.23 (12.76)	105.46 (12.73)	NS	102.10 (14.08)	105.54 (12.76)	F(1, 922) = 4.21, p = .041
Peer Group Functioning Composite	1.59 (.34)	1.57 (.32)	NS	1.52 (.37)	1.58 (.33)	NS	1.63 (.36)	1.58 (.33)	NS	1.62 (.32)	1.57 (.33)	NS	1.52 (.41)	1.57 (.33)	NS

Dyadic Friendship Quality Composite	4.24 (.42)	4.20 (.45)	NS	4.11 (.54)	4.22 (.44)	F(1, 583) = 3.93, p = .048	4.22 (.40)	4.22 (.45)	NS	4.15 (.47)	4.23 (.45)	NS	4.20 (.50)	4.22 (.45)	NS
Internalizing Composite	49.08 (8.12)	48.61 (8.82)	NS	50.94 (9.54)	48.39 (7.75)	F(1, 603) = 6.78, p = .009	47.32 (.959)	48.65 (7.77)	NS	49.92 (8.07)	48.64 (7.80)	NS	49.69 (8.28)	48.6 (8.05)	NS
Externalizing Composite	48.40 (8.07)	47.49 (8.09)	NS	49.98 (8.73)	47.39 (8.25)	F(1, 603) = 6.53, p = .011	45.88 (7.85)	47.49 (8.20)	NS	48.11 (8.24)	47.67 (8.14)	NS	50.46 (10.20)	47.61 (8.08)	F(1, 992) = 7.01, p = .008
Site	4.18 (2.95)	4.51 (2.96)	NS	4.24 (3.02)	4.55 (2.94)	NS	4.39 (2.91)	4.54 (2.90)	NS	5.03 (2.91)	4.46 (2.85)	NS	4.40 (2.93)	4.48 (2.83)	NS
Gender	1.51 (.50)	1.5 (.50)	NS	1.42 (.50)	1.52 (.50)	X²(1) = 3.92, p = .048	1.53 (.50)	1.51 (.50)	NS	1.39 (.49)	1.50 (.50)	NS	1.45 (.50)	1.51 (.50)	NS
Race	1.24 (.43)	1.13 (.34)	X²(1) = 9.32, p = .002	1.24 (.43)	1.15 (.35)	X²(1) = 6.17, p = .013	1.25 (.43)	1.15 (.36)	X²(1) = 4.38, p = .036	1.23 (.42)	1.17 (.37)	X²(1) = 4.27, p = .039	1.21 (.41)	1.17 (.38)	NS
Income-to-Needs 15/24	6.60 (4.75)	8.70 (6.44)	F(1, 663) = 10.97, p = .001	7.13 (6.24)	8.25 (6.21)	NS	7.94 (6.74)	7.84 (6.01)	NS	6.60 (6.00)	7.47 (5.75)	NS	7.21 (6.59)	7.42 (5.66)	NS
Temperament	3.22 (.41)	3.12 (.38)	F(1, 659) = 6.52, p = .011	3.15 (.38)	3.13 (.38)	NS	3.18 (.35)	3.16 (.40)	NS	3.19 (.36)	3.17 (.41)	NS	3.22 (.41)	3.17 (.40)	NS
Maternal Education	13.92 (2.11)	14.94 (2.40)	F(1, 667) = 18.03, p < .001	14.15 (2.54)	14.77 (2.47)	F(1, 705) = 6.73, p = .01	14.13 (2.47)	14.63 (2.43)	NS	14.10 (2.64)	14.47 (2.43)	NS	1.76 (.43)	1.83 (.37)	NS

Additionally, Little's MCAR Test was used to determine if the positive emotion data used in the trajectory analyses met the criteria of missing completely at random and the data met the criteria for missing at completely random (Little's MCAR Test: $\chi^2(173) = 180.13, p = .34$).

3.4.2 Substantive Analyses

Analyses for Aim 1 were conducted in Mplus 5.21 (Muthén & Muthén, 1998-2009) using latent class growth analysis (LCGA; Nagin, 1999) a semi-parametric technique for identifying subgroups of individuals following similar patterns of change over time. Then, ANOVAS were conducted to compare trajectory groups on levels of positivity at each time point. T-tests were used to determine if trajectory group means at each time point differed from the grand mean and if there were significant differences between consecutive age points for each trajectory group. ANOVAS and Chi Squares were conducted to describe differences in covariates between the trajectory groups. Analyses for Aim 2 were conducted in SPSS using logistic regression to determine if early maternal positive emotion predicted membership in specific trajectory groups, with and without covariates in the model. Analyses for Aim 3 were conducted in SPSS using linear regression to determine if trajectory group membership predicted later behavioral outcomes, with and without covariates in the model.

3.5 RESULTS

3.5.1 Aim 1: Trajectory groups

LCGA assumes that populations are composed of distinct trajectory groups of homogeneous individual growth patterns. LCGA is a finite mixture in which within class variances are constrained to 0. Thus, in a given class all individual growth trajectories are homogeneous. LCGA uses multinomial modeling to identify trajectories of subgroups of individuals over time, and estimates parameters using maximum likelihood. Individuals are grouped into clusters based upon the degree to which their growth curves compare to estimated prototypical curves. A strength of this approach is that strong assumptions do not have to be made about population distributions (Burchinal & Appelbaum, 1991). LCGA is robust to missing data when it is missing at random (Nagin & Tremblay, 2005). Therefore, it allows for individuals with missing data to be retained.

Model fit was assessed using the Bayesian Information Criteria (BIC), group prevalence, and posterior probabilities of group membership (Nagin, 2005). BIC is used to compare competing models. Model fit of progressively more complex models is compared until there is no substantial improvement in model fit. Lower BIC scores indicate stronger model fit. Changes in BIC of 0-2 are interpreted as weak evidence for the more complex model improving fit, 2-6 as moderate evidence, 6-10 as strong evidence and 10 plus as very strong evidence (Jones, Nagin, & Roeder, 2001). The current study required all groups to have at least 1% prevalence to be meaningful. Finally, posterior probabilities indicate how well individual children fit the assigned trajectory group and were considered when selecting the number of trajectory groups that best fit the data. Each participant is assigned to the group with the highest probability. Higher

estimates indicate closer fits between predicted and actual probabilities. The average posterior probability of group membership approximates the internal reliability for each trajectory and the current study uses the recommended threshold for assignment of .70 (Nagin, 2005) to determine if the trajectory group models individuals with similar patterns of development and discriminates between individuals with dissimilar patterns.

As a first step, the number and shape of developmental trajectories were ascertained. Multiple models with different numbers of groups were examined to determine the most appropriate way to characterize the data. Linear models were tested against quadratic models to determine which best fit the data.

Quadratic models presented with superior BIC scores to linear models. Of the quadratic models, a 2-group solution best fit the data. Specifically, the 2-group solution presented a superior BIC score compared to the 1 group solution. The 3-group solution resulted in a larger BIC score than a 2-group solution and poor posterior probabilities. Thus, the 2 group quadratic model was selected. Table 18 (p. 101) presents the model fit criteria for linear and quadratic growth curves; Figure 3 (p. 101) depicts the final 2-group trajectory model; Table 19 presents intercepts and slopes of the trajectory groups (p. 103); Table 20 (p. 104) presents the mean, SD and differences in positive emotionality across and within trajectory groups; Table 21 (p. 105) presents differences in consecutive ages within trajectory groups; and Table 22 (p. 105) presents mean, SD and difference in covariates between the trajectory groups.

Table 18. Model Fit Statistics for Study 2 LCGA

# Classes	BIC	Log-likelihood	Smallest Class %	Largest Class %
Linear Growth				
1	14,586.32	-7264.80	--	--
2	14,494.26	-7,208.14	21%	79%
3	14,478.02	-7,189.39	17%	45%
4	14,474.07	-7,176.77	4%	76%
5	14,487.66	-7,172.94	1%	77%
Linear and Quadratic Growth				
1	14,512.41	-7220.76	--	--
2	14,449.79	-7175.27	18%	82%
3	14,458.97	-7165.68	1%	81%
4	14,476.47	-7160.25	1%	81%

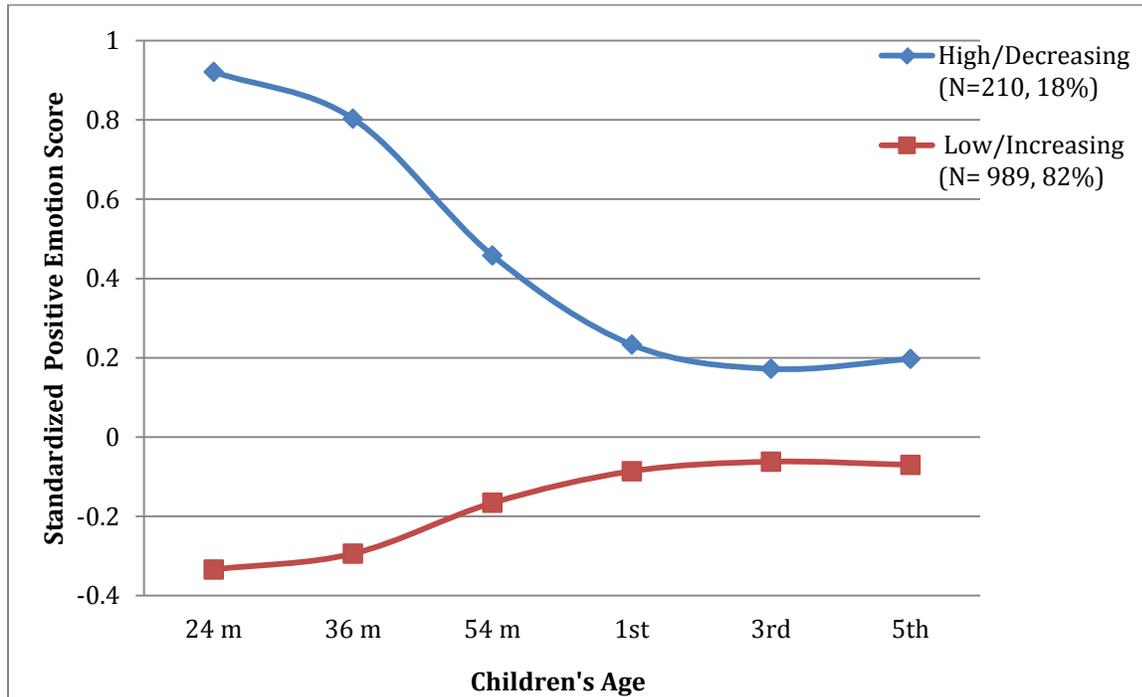


Figure 3. Trajectories of children's positive emotionality

The largest group (low/increasing group) accounted for 82% of the sample (989 children) and had an average posterior probability of .84. Children in this group began (at 24 months) with positive emotionality at .35 standard deviations below the mean (intercept = $-.35$, $p < .001$) and approached the mean of positivity over time (age slope = $.085$, $p = .008$; age slope² = $-.006$, $p = .056$). This group remained significantly below the mean at all time points, except in 3rd grade where they reached the mean of positivity ($t(988) = 189$, $p = .059$; table 21 (p. 105)). Overall this group increased in positivity over time, as shown by the positive slope, but paired sample T-tests of consecutive age means indicated that the only significant increase was from age 36 months to 54 months (See table 21, p. 105). Thus, positivity in this group remained stable during early toddlerhood and the school years, with increasing positivity in the preschool period.

The second group (high/decreasing group) represented 18% of the children (210 children) and had an average posterior probability of .75. Children in this group began (at 24 months) with positive emotionality almost a full standard deviation above the mean (intercept = $.95$, $p < .001$) and approached the mean of positivity until the school years when they began to stabilize (age slope = $-.23$, $p < .001$; age slope² = $.017$, $p = .007$; table 19, p. 103). This group remained significantly above the mean at all time points (table 20, p. 104). In this group, significant pairwise change occurred from 36 to 54 months and from 54 months to 1st grade (table 21, p. 105), indicating stability during early childhood and during the school years, with decreasing positivity across the preschool years.

Table 19. Trajectory Group Intercepts and Slopes

Trajectory Group	Intercept	Age slope	Age slope2
Low/Increasing	-.35**	.085*	-.006
High/Decreasing	.95**	-.23**	.017*

**= $p \leq .001$; * = $p \leq .05$

The two trajectory groups also remained significantly different in their levels of positivity at each time point despite both groups approaching the mean of positivity with age (See table 20, p. 106). The low/increasing group was significantly less positive than the high/decreasing group at all time points. The two groups did not differ in race, gender, temperament or maternal education, but the high/decreasing group had a higher family income-to-needs ratio (average of 15 and 24 month income-to-need) than the low/increasing group (See table 22, p. 107). Thus, LCGA identified 2 unique clusters of growth, which differed not only in direction and shape of change over time, but also consistently differed in positivity.

Table 20. Means, SD and Differences in Positive Emotionality across and within Trajectory Groups

Positive Emotion	Grand Mean	Trajectory Group				Mean Difference Between Trajectory Groups
		High/Decreasing (N=210)		Low/Increasing (N = 989)		
		Mean (SD)	Differences from grand mean (One sample t-test)	Mean (SD)	Differences from grand mean (One sample t-test)	
Positive emotion 24 months	-.008 (1.00)	.92 (.83)	t(209) = 16.20, p< .001	-.33 (.82)	t(988) = 12.35, p< .001	t(1197) = 20.02, p < .001
Positive emotion 36 months	-.005 (1.00)	.80 (.92)	t(209) = 12.68, p< .001	-.29 (.85)	t(988) = 10.54, p< .001	t(1197) = 16.63, p < .001
Positive emotion 54 months	-.002 (1.00)	.46 (1.01)	t(209) = 6.63, p< .001	-.17 (.94)	t(988) = 5.62, p< .001	t(1197) = 8.70, p < .001
Positive emotion grade 1	-.002 (1.00)	.23 (.97)	t(209) = 3.47, p < .001	-.086 (1.00)	t(988) = 2.64, p= .008	t(1197) = 4.18 p < .001
Positive emotion grade 3	-.003 (1.00)	.17 (1.03)	t(209) = 2.72, p = .007	-.062 (.98)	t(988) = 189, p = .059	t(1197) = 3.09, p = .002
Positive emotion grade 5	-.002 (1.00)	.20 (.94)	t(209) = 3.11, p = .002	-.07 (1.01)	t(988) = 2.18, p= .037	t(1197) = 3.56, p < .001

Note: Means are estimated means

Table 21. Consecutive Age Differences within Trajectory Groups

Positive Emotion	Trajectory Group	
	High/Decreasing (N=210)	Low/Increasing (N = 989)
Positive emotion 24 months vs. 36 months	t(1485) = .46, p = .65	t(666) = -.86, p= .39
Positive emotion 36 months vs. 54 months	t(2138) = 3.39, p = .001	t(797) = -3.22, p= .001
Positive emotion 54 Months vs. grade 1	t(1876) = 2.51, p= .012	t(1421) = -1.62, p= .65
Positive emotion grade 1 vs. grade 3	t(2296) = 1.82, p= .068	t(2068) = -.61, p= .54
Positive Emotion Grade 3 vs. Grade 5	t(1121) = .16, p= .87	t(1966) = -.11, p= .92

*Paired samples t-tests were conducted in SPSS using data estimated with 100 imputations. Analyses were also run on measured data, which were consistent with the presented results.

Table 22. Means, SD and Differences in Covariates between Trajectory Groups

Covariate	Trajectory Group		F/ χ^2	p
	High/Decreasing (N=210)	Low/Increasing (N = 989)		
Race	86.2% white	80.8% white	$\chi^2 (1) = 3.39$.066
Gender	44.3% female	49.3% female	$\chi^2 (1) = 1.77$.18
Temperament	3.14 (.39)	3.18 (.40)	F(1, 1170) = 4.88	.18
Maternal Education	14.55 (2.29)	14.37 (2.50)	F(1, 1197) = 4.88	.32
Income	4.16 (3.30)	3.66 (2.87)	F(1, 1175) = 4.93	.027

3.5.2 Aim 2: Predictors of trajectory group membership

Next, two logistic regressions were performed to determine if trajectory group membership was predicted by mothers' positive emotion at 24 months. Analyses were conducted first without covariates and then with covariates (site, race, gender, temperament, income-to-needs and maternal education). In the regression with covariates, all covariates were entered in the first step followed by mothers' positive emotion in the second step. Effect sizes are presented as odds ratios. See table 23 (p. 107) for means, standard deviations and logistic regression results.

The full model without covariates was statistically significant ($\chi^2(1) = 5.74, p = .017$, Nagelkerke $R^2 = .008$). Results indicated that a 1-unit increase in maternal positive emotion is associated with a .74-decreased odds of being in the low/increasing group ($\beta = -.30, Wald = 5.59, p = .018$). When the model was re-run with covariates entered in the first step and mothers' positive emotion in the second step, the model remained significant ($\chi^2(15) = 116.51, p = .042$; Nagelkerke $R^2 = .162$) and mothers' positive emotion remained a significant predictor of trajectory group membership. Once again, results indicated that a 1-unit increase in maternal positive emotion is associated with a .74-decreased odds of being in the low/increasing group ($\beta = -.30, Wald = 3.96, p = .047$). Thus, mothers' early positivity was a significant predictor of differences in the developmental course of children's positive emotion over childhood.

Table 23. Means, SD and Effect Size of Mothers' Positive Emotion for each Trajectory Group and Logistic Regression Predicting Trajectory Group Membership from Mothers' Positive Emotion

	Trajectory Group		Logistic Regression Results							
	High Decrease N=210 Means (SD)	Low Increase N=989 Means (SD)	β	SE	Wald (df)	Odds Ratio	χ^2 (df)	Log Likelihood	R^{2+}	
Mother Positive Emotion 24 m	.088 (.61)	-.027 (.63)	Model 1: Without Covariates	-.30	.13	5.59* (1)	.74	5.74* (1)	1068.83	.008*
			Model 2: With Covariates (step 2)	-.30	.15	3.96* (1)	.74	116.51* (15)	941.02	.162*

[†]Nagelkerke R^2 ; * $p < .05$

3.5.3 Aim 3: Behavioral outcomes predicted by trajectory group membership

A series of linear regressions was conducted to predict social competence measures (SSRS score, positive peer group functioning, and friendship quality), internalizing behaviors and externalizing behaviors from trajectory group membership. As with the logistic regressions conducted above, analyses were conducted twice, once without covariates and once with covariates (site, race, gender, income-to-needs, temperament, and maternal education). In the regressions with covariates, covariates were entered in the first step and trajectory group membership in the second step of the model. See table 24 (p. 110) for means, standard deviations, effect sizes and regression results.

The regression predicting 6th grade SSRS scores from trajectory group membership was significant ($F(1, 1028) = 8.03, p = .005; R^2 = .008$). The low/increasing group was associated

with a lower SSRS score ($\beta = -.088$). When covariates were entered in the first step of the model and group membership in the second step, group membership remained a significant predictor of SSRS score (Step 2: $F(7, 991) = 19.42, p < .001; \Delta R^2 = .006, p = .007$). The low/increasing group continued to be significantly associated with a lower SSRS score ($\beta = -.082$), indicating that the low/increasing group had lower overall social competence in 6th grade than the high/decreasing group.

The regression predicting positive peer group functioning from trajectory group membership was not significant ($F(1, 1026) = .45, p = .50; R^2 = 0$). When covariates were entered into the model, the two-step model became significant (Step 2: $F(7, 989) = 19.66, p < .001$; step 2 $\Delta R^2 = .001, p = .32$) because the covariates were significant predictors of positive peer group functioning. Trajectory group membership remained a nonsignificant predictor of positive peer group functioning. Thus, trajectory group did not predict later social competence with peers in 6th grade.

The regression predicting dyadic friendship quality from trajectory group membership was not significant ($F(1, 989) = 1.59, p = .21; R^2 = .002$). When covariates were entered into the model, the two-step model became significant (Step 2: $F(7, 957) = 11.34, p < .001; \Delta R^2 = .002, p = .12$) because covariates were significant predictors of friendship quality. Trajectory group membership remained a nonsignificant predictor of 6th grade friendship quality.

The regression predicting internalizing behavior from trajectory group membership was significant ($F(1, 1028) = 3.84, p = .05; R^2 = .004$). The low/increasing group was associated with a higher internalizing score ($\beta = .061$). When covariates were entered into the first step of the model and trajectory group in the second, the two-step model remained significant (Step 2: $F(7, 991) = 3.31, p = .026; \Delta R^2 = .003, p = .10$). However, trajectory group membership became a

nonsignificant predictor of internalizing behavior. Thus, trajectory group did not predict internalizing behavior in 6th grade over and above covariates.

The regression predicting externalizing behavior from trajectory group membership was not significant ($F(1, 1028) = .21, p = .65, R^2 = 0$). When covariates were entered into the model, the two-step model became significant (Step 2: $F(7, 991) = 11.61, p < .001; \Delta R^2 = 0, p = .70$). However, trajectory group membership remained a nonsignificant predictor of externalizing behavior, as the covariates were the only significant predictors. Thus, trajectory group membership did not predict later externalizing behaviors in 6th grade.

Table 24. Differences in Outcomes by Trajectory Group and Linear Regressions Predicting Outcomes from Trajectory

Group Membership

				Without Covariates				With Covariates						
Trajectory Group Means (SD)				Step 1				Step 1: Covariates		Step 2				
Outcome	High Decrease (N=210)	Low Increase (N=989)	Effect Size (Hedges' g)	B	β	F (df)	ΔR^2	F (df)	ΔR^2	B	β	F (df)	R ²	ΔR^2
SSRS Composite	107.94 (12.69)	104.85 (13.08)	.24	-3.09*	-.088*	8.03* (1,1028)	.008*	21.32** (6, 992)	.114**	-2.82	-.082*	19.42** (7, 991)	.12	.006*
Peer Group Functioning Composite	1.58 (.33)	1.57 (.34)	.030	-.019	-.021	.45 (1, 1026)	0	22.77** (6, 990)	.12**	-.027	-.03	19.66** (7, 989)	.12	.001
Dyadic Friendship Quality Composite	4.25 (.43)	4.2 (.46)	.11	-.049	-.040	1.59 (1, 989)	.002	12.81** (6, 958)	.074**	-.06	-.049	11.34** (7, 957)	.077	.002
Internalizing Composite	47.65 (7.74)	48.99 (8.24)	.16	1.34*	.061*	3.84* (1, 1028)	.004*	3.40* (6, 992)	.02*	1.14	.053	3.31* (7, 991)	.023	.003
Externalizing Composite	48.03 (8.45)	47.71 (8.35)	.038	-.32	-.014	.21 (1, 1028)	0	13.53** (6, 992)	.076**	-.26	-.012	11.61** (7, 991)	.076	0

*= significant at $p < .05$

** = significant at $p < .001$

3.6 STUDY 2 DISCUSSION

The current study furthers our understanding of individual differences in positive emotion development by identifying unique trajectory groups over the course of early and middle childhood. The person-centered approach yielded two distinct trajectory groups each representing children with different developmental patterns from 24 months to 5th grade. These trajectory groups were significantly different in their levels of positivity at all time points. Additionally, trajectory group membership was predicted by mothers' positive emotion at 24 months, with higher maternal positivity associated with membership in the high/decreasing trajectory group. Trajectory group membership also predicted children's behavioral outcomes in 6th grade, significantly predicting general social competence and internalizing behaviors prior to covariates. But, it did not predict peer group functioning, dyadic friendship quality or externalizing behaviors. Details and implications of these results are discussed below.

3.6.1 Trajectories of children's positivity over childhood

The current study found that two unique groups best captured the development of positivity over childhood, rather than a single trajectory. Groups differed in their direction, shape and rate of change. Specifically, the majority of children started slightly below the overall mean of positivity at 24 months, but with age increased in positivity approaching the overall mean. A smaller group of children began highly positive at 24 months, nearly a full standard deviation above the overall mean, and decreased in positivity with age, approaching the overall

mean of positivity through the school years. Change in the low/increasing group paralleled the linear increase found in two previous studies identifying only one trajectory (Bridgett et al., 2013; Olino et al., 2011), while change in the high/decreasing group paralleled the quadratic pattern found in another single-trajectory study (Sallquist, 2010). Thus, the current study clarifies developmental patterns found in previous research and indicates that change over time is best described by different patterns for different groups of children.

It is important to note that both groups of children were above a neutral affective state on the raw scale scores, indicating that positivity best described all children. That said, the high/decreasing group was significantly more positive than the low/increasing group at all time points, even though each group approached the overall mean of positivity with age. The high/decreasing group remained above the overall mean at all ages while the low/increasing group remained below the overall mean at all ages, except for 3rd grade when it reached the overall mean. Thus, group differences were enduring and were not just a result of the more extreme early differences in behavior.

The current study took a novel approach to measuring positive emotion as it was measured in the childcare and school contexts, including lunch/recess and instructional time at school. Previous research has primarily focused on parent report or laboratory observations of children's positivity during the mother-child interaction (Bridgett et al., 2013; Olino et al., 2011; Sallquist et al., 2010). Across development, children spend increasing amounts of time interacting with teachers and peers making school an increasingly important context to consider. Sallquist et al. (2010) found differences in the direction of change when positivity was measured in different tasks and with different interaction partners; one group increased then decreased while the other group decreased then increased. Thus, future research will need to determine if

the multiple trajectory groups found in this study are context dependent or reflect positive emotion development more broadly.

Results indicate that the development of positive emotion is best described by change over time, but distinct patterns of stability and change exist at different ages. Dramatic changes in positivity primarily occurred during the preschool years, while stability existed during toddlerhood and the school years. These findings are consistent with extant research that indicates changes in positive emotionality around preschool (Davis & Suveg, 2014), partially because of developments in emotion regulation (Cole, Michel & Teti, 1994) and emotion understanding (Bretherton et al., 1986; Saarni et al., 2006) that occur during this period. However, these previous studies have focused on mother-child or mother-experimenter interaction. The current study indicates that stabilization occurs in the peer context as well, likely reflecting a broader developmental phenomenon. The structured demands placed on the child during the school day might contribute to stability in this context as well as stability in peer groups. Furthermore, during preschool children begin to be able to mask external expressions of their internal emotional experiences (Cole, 1986) and they further refine these display rules during the school years (Saarni, 1979). Development and internalization of display rules coupled with developing emotion regulation might explain the reduction of the extreme differences between the two groups of children during the preschool period as well as stabilization of positivity during the school years. Additional empirical research is needed to confirm these patterns and explore specific mechanisms.

Contrary to hypotheses, the current study did not find groups of children with stably high or low positive emotion. Such children might represent a very small percentage of the population, which could be lost in group-based trajectory analyses. Over-sampling from clinical

populations might produce the theorized stable groups at the poles of positivity and would be worth exploring.

While the trajectory groups were significantly different in their levels of positivity, they were similar in a number of child/family characteristics, including race, gender, temperament and maternal education. The only significant correlate was income-to-needs ratio, which was higher in the more positive group. Nevertheless, even families of the low/increasing group were relatively advantaged, with an average income-to-needs ratio of 3.66. Why small differences in income-to needs ratio are related to differences in developmental patterns of children's positive emotion expression is unknown, although it is possible that the general home environment is more positive with fewer income related family stressors. Future research will have to determine if a similar two-trajectory model holds in a less advantaged sample and will also need to examine positive emotion development in children from different cultures.

3.6.2 Mothers' positive emotion and trajectory group membership

Mothers are early models of emotion expression and children learn about emotions in the family context (Denham & Kochanoff, 2002; Lewis & Michalson, 1983; Morris et al., 2007). Therefore, mothers' positivity early in children's development might engender children's positive emotion and be an early contributor to the course of children's positive emotion development. In the current study, mothers' positive emotion was a significant predictor of trajectory group membership above and beyond demographic and child level covariates. However, it should be noted that the strength of this prediction was small. Specifically, an increase in maternal positive emotion was associated with higher odds of being in the high/decreasing group. Thus, mothers who were more positive were more likely to have children

who were more positive across development, but especially so early in development. This is consistent with previous single trajectory research, which found that relative to control children, children of mothers with a lifetime of unipolar depression had consistently lower levels of positive affect, even controlling for current maternal depression and affect state (Olino et al., 2011). This speaks to the importance of the early emotional climate in contributing to children's later emotional and behavioral patterns. More positive mothers might themselves be better able to elicit and support children's positivity, contributing to early appearing developmental differences as well as differences across development.

It is important to recognize that the current study measured relationships between mothers' and children's positive emotion across contexts. Mothers' positive emotionality consisted of mother-reported felt positive affect and positive affect in the mother-child relationship while children's positivity was measured in the childcare/school context. Measurement in different contexts decreases the chance that method-specific relationships are found. It also permits conclusions to be drawn about the extent to which early maternal positive emotion more broadly influences children's positive emotion, although shared genetics may also contribute. Thus, mothers are not only contributing to early appearing developmental differences in positivity when interacting with their children, but maternal emotional influence also carries over to contexts in which mothers are not present. While cross-context measurement provides certain benefits for validity, it might also have contributed to the small effect sizes found in this study.

3.6.3 Trajectory group membership and behavioral outcomes

Trajectory group membership was used to predict children's behavioral outcomes in 6th grade, specifically general social competence, social competence with peers and friends, and internalizing and externalizing behaviors. While previous research (see literature review above) supports relationships between positive emotion and social competence as well as behavior problems, studies have not considered how longitudinal trajectories of positive emotion relate to differences in these behaviors. Furthermore, this was the first study to identify multiple trajectory groups as predictors of these outcomes.

Trajectory group membership predicted children's general social competence. The high/decreasing group was associated with a higher SSRS score in 6th grade than the low/increasing group, indicating that higher positive emotion is important to general social success. Furthermore, the significant difference found in this study remained when covariates were accounted for indicating that the effects were specific to positive emotion. It is important to highlight that social competence was in the normal range for both trajectory groups. Thus, children in the low/decreasing group were socially adept, just less so relative to their high/decreasing peers. Results complement previous studies, which have found a significant positive relationship between positive emotion and social competence (e.g. Denham, McKinley, Couchoud & Holt, 1990; Eisenberg et al., 1992, 2001; Halberstadt et al., 2001; Sroufe et al., 1984), but the current study extended them to include the childhood years.

General social competence reflects children's ability to both initiate and maintain socially relevant behaviors with multiple interaction partners including peers, teachers, family members, and strangers. Positive emotion supports positive social interactions by signaling openness for friendly interactions (Izard & Ackerman, 2000) and serving as an invitation to engage with

others (Sroufe et al., 1984). Children who are more positive across development, particularly early in development, might have more experience successfully engaging in social interactions with a variety of people and in a variety of settings. Positive children's early social engagement may have provided them with important foundational social skills, which served them across development as they engaged with different individuals and applied their social skills to diverse situations. Additionally, greater success in social interactions early in development may have reinforced higher levels of positivity across development and fostered additional social successes over time. Additionally, happier children may have experienced more mutual positive expressivity, which is correlated with social competence (Denham, 1986; Sallquist et al., 2012; Sroufe et al., 1984). Thus, the relationship between trajectory group membership and social competence might result from transactional relationships among multiple systems over the course of development. Importantly, positivity is embedded in success across multiple relationships and settings, which equips children with the experiences and abilities needed to be socially competent later in life when their social relationships expand from the home to the school setting.

While trajectory group membership predicted children's general social competence, it did not predict more specific measures of social competence including dyadic friendship quality and positive peer group functioning. Compared to the SSRS, the other measures of social competence reflect a more limited set of interaction partners and behaviors. The relationship with one's best friend is a unique social relationship and is likely to be a child's most socially complex and enduring peer relationship. This relationship is built over time and reflects multiple interactions with the same person, rather than interactions with multiple people over time. Thus, it is a reflection of social skill, but also past history and compatibility. While the developmental

course of positivity does not predict the degree of success in these relationships, positivity might be particularly important when forming these very close relationships through increasing perceived emotional overlap between the self and friend (Waugh & Fredrickson, 2006). We might expect positivity to relate to friendship formation, then, even if not to friendship quality.

Additionally, the three social competence measures differ in the domains of social competence they reflect. The general social competence measure, the SSRS, assesses social competence in interactions across 5 domains: cooperation, assertion, responsibility, empathy, and self-control. This provides a broad measure of children's behavior including social behaviors of both action (e.g. responsibility, assertion) and restraint (self-control). Contrastingly, the other measures assess primarily action-oriented behaviors; peer group functioning measures prosocial behavior and dyadic friendship quality measures validation and caring, conflict resolution, conflict and betrayal, help and guidance, companionship, recreation, and intimate exchange. Finally, if future research were to measure positive emotion solely with the best friend or in the peer group rather than in more general school interactions, then the predicted relationships might be found. That is, positivity might be expressed differently in specific social contexts than in the general school context.

When behavior problems were predicted from group membership, externalizing behaviors were not significantly predicted while internalizing behaviors were. The high/decreasing group was associated with lower internalizing behaviors than the low/increasing group, although only prior to the inclusion of covariates. Clark, Watson, and Mineka (1994) hypothesized that low positive emotionality is a specific predisposition to depression and other theorists have hypothesized that deficits in behavioral activation and approach, associated with low positivity, are etiological factors in the development of early onset depression (Davidson,

1998; Depue & Iacono, 1989), thus, relationships with group membership might be stronger for mood related internalizing behaviors rather than the scale as a whole. Additionally, the hypothesized relationships between changing trajectories and behavior problems might be more likely in clinical samples for which positivity may be lower and the rate of change greater than that found in the current study. The emotion in the trajectory groups in the current study, despite change over time, remained descriptively positive.

Furthermore, as in Study 1, children's negative emotion trajectories may better predict behavior problems than do their positive emotion trajectories and previous research has linked children's negative emotion to both internalizing and externalizing behaviors (e.g. Bates et al., 1985; Clark et al., 1994; Egger & Angold, 2006; Goldberg et al., 1990; Goldsmith & Lemery, 2000; Shaw et al., 2001). Thus, negative emotion trajectories may be more likely to predict internalizing behaviors than positive emotion trajectories. Additionally, higher positivity across development may buffer children against the behavioral risks associated with problem behaviors or counteract negative consequences, suggesting moderation, which should be examined in future research.

4.0 GENERAL DISCUSSION

The overarching aim of this pair of studies was to examine positive emotion's unique contribution to child development. Positive emotion is relatively independent from negative emotion (Belsky et al., 1996; Ekkekakis, 2012; Watson & Clark, 1997), and may follow its own developmental course and have distinct relationships to predictors and outcomes. Yet, the majority of research focuses on negative emotion and little research is dedicated to positivity. This may result from negative emotion being distressing, calling attention to the child, and being perceived as necessitating remediation. Conversely, positive emotion is a marker of wellbeing, seen as a baseline emotional state, and does not require remediation. Additionally, positive emotions are harder to categorize into distinct categories, making them more difficult to operationalize and study. Of the research that does exist, most considers positive emotion as the inverse of negative emotion rather than its own entity. Because of this assumption unique developmental patterns are not considered, nor are possible independent relationships to behavior. The small literature that does measure positive emotion as distinct from negative emotion primarily focuses on expressed positive emotion such as laughter and smiling. Most of this research is cross-sectional and limited in sample size, restricting the examination of change over time and limiting more sophisticated analyses that could reveal developmental patterns.

The current studies provide foundational knowledge about the developmental course of children's positive emotion, the relationship between mothers' and children's positive emotions,

and the relationship between positive emotion and later child behavioral outcomes. Two complementary studies were conducted which tested these relationships in distinct ways, to answer unique questions. They considered different age ranges, measured children's positive emotion in different contexts, and utilized different quantitative approaches. The use of more advanced analytic techniques provided a more nuanced view of development than previously available.

Study 1 examined the sequelae of positive emotion within the mother-child relationship. This study tested a conceptual model that examined associations between children's and mothers' positive emotion at 24 and 36 months, and relations of mothers' and children's positivity at 36 months to social competence, internalizing and externalizing behaviors in 1st grade. The first study also tested an alternative model, which included mothers' negative emotion, to determine if the relationships found in the main model were robust to the inclusion of negative emotion and to provide information on the relative contributions of both emotion types when considered together in a single model. While the associations tested in Study 1 have been individually tested in previous research, no study to date has considered them together in an integrated model. As a consequence, a coherent developmental picture was missing and questions remained about how mothers' and children's emotions operate together, over time, to influence developmental outcomes.

Study 2 expanded the age range to describe children's positive emotionality from 24 months to 5th grade. This was the first study to consider multiple developmental trajectories of positivity over childhood. Results of previous single trajectory studies are inconsistent (Bridgett et al., 2013; Olino et al., 2011; Sallquist, 2010), perhaps because single trajectories mask the multiple developmental patterns found in this study. Additionally, the current study predicted

trajectory group membership from mothers' positive emotion at 24 months, and used trajectory group membership to predict social competence, internalizing and externalizing behaviors in 6th grade. Study 2 was also the first study to follow the development of children's positive emotion in the school context. Finally, studying positive emotion outside of the mother-child interaction permitted Study 2 to test the cross-context influence of early maternal positivity on children's positivity.

The broader conclusions and implications from these complementary studies are discussed below, divided into the 3 domains discussed throughout this paper: 1) children's positive emotion; 2) mother's positive emotion and their relationship to children's positive emotion; 3) positive emotion and behavioral outcomes. Finally, future directions and limitations of the studies are addressed as well as clinical implications.

4.1 CHILDREN'S POSITIVE EMOTION

The current studies expand our understanding of children's positive emotion development by showing that development is best described by both stability and change. Little research has been dedicated to these processes and the research that does exist is focused on infancy or later childhood, preventing conclusions about change across development (Sallquist, 2009; 2010).

Both of the current studies found stability in positivity from 24 to 36 months. At the same time, in Study 2, mean differences between the two trajectory groups were greatest at 24 and 36 months. Thus, the toddler period is one of significant group differences in positivity, but little rank order change in positivity over time. While the two trajectory groups from Study 2 differed in their rate and direction of change over time, in both groups mean level changes in

positive emotion were greatest during the preschool period, from 36 months to 1st grade in the high/decreasing group and 36 months to 54 months in the low/increasing group. The preschool period is a time of growth and stabilization in long lasting behavioral patterns, including self-regulation (Sallquist et al, 2010), autonomous emotion regulation (Cole et al., 1994) and emotion understanding (Bretherton et al., 1986; Saarni et al., 2006). Development of these capabilities may contribute to changes in positivity over this time as children become better able to monitor and modulate their expressive behavior (Sallquist et al, 2010). Additionally, the scheduled and relatively routine school day may contribute to stability in positivity during the school years as the structured environment may produce more constant demand for affective expression, and may also scaffold children's developing emotion regulation.

Both studies indicated that children's level of positivity relative to same aged children remains fairly stable across development. Study 1 found rank order stability in children's positive emotionality in the toddler and preschool years and, in Study 2, children in the high/decreasing trajectory group were consistently more positive than the low/increasing group across development. This suggests that while children are changing in their mean levels of positivity across development, they remain relatively consistent as compared to their same aged peers.

Broader temperamental differences may result in relative stability across time, while developmental factors may result in mean level changes. Children's general tendency toward positivity may remain consistent across contexts, interaction partners and time even as they become progressively more or less positive overall with age. Mean level stability and change at different points in development likely results from an interaction between temperament and development of emotion regulation and other capabilities as discussed above.

4.2 MOTHER'S POSITIVE EMOTION AND ITS RELATIONSHIP TO CHILDREN'S POSITIVE EMOTION

In both of the current studies, greater maternal positive emotion was related to higher levels of children's positive emotion. This was true both when positivity was measured within the same interaction (Study 1) and when measured in different contexts (Study 2), confirming its general contributions to children's emotional wellbeing and showing that the relationship between mothers' and children's positive emotion is context independent. Furthermore, Study 1 indicated both mean and rank level stability in maternal positive emotion during the toddler and preschool years, from 24 to 36 months. Thus, children experience a relatively consistent maternal emotional environment early in development.

Study 1 also found concurrent bidirectional relationships between mothers' and children's positive emotions at both 24 and 36 months, although this relationship was weak. Both individuals contribute to the emotional environment, which is likely fostered through shared positive affect (or possibly shared genetic effects). Consistent with previous research, this association became more robust with age (Halberstadt et al., 1999; Nwokah, Hsu, Dobrowolska, & Fogel, 1994). However, Study 1 did not find that earlier positivity in one individual predicted change in the other's positivity over time, suggesting that exposure to positivity in one's partner is not a mechanism of change. Nevertheless, Study 2 found that mothers' positive emotion in early childhood was a predictor of trajectory group membership, suggesting that maternal positive emotionality early in life predicts and perhaps contributes to developmental patterns in positivity over the course of childhood. Future research should consider if maternal positive emotion measured later in childhood continues to predict trajectory group membership. Previous research has found stability in maternal positive emotion in later childhood (for reviews see Feng

et al. 2007; Sallquist et al., 2010) suggesting a consistent maternal emotional environment and the possibility that this predictive relationship remains significant.

There are multiple mechanisms through which maternal positivity could influence children's positivity (Davis & Suveg, 2007). Parents directly indicate expectations for emotion expression through modeling, socialization and dialogue about emotions (Eisenberg et al., 1998; Halberstadt & Eaton, 2002). Additionally, through their positive emotion expression, parents may induce positivity in their children and/or create an environment in which positive feelings are more likely to be expressed (Halberstadt & Eaton, 2002). Furthermore, they may assist children in managing their emotions, particularly young children who have yet to develop emotion regulation. More indirect mechanisms may include benefits to self-esteem as a result of maternal positive emotion communicating approval of the child (Morris et al., 2007). Future research will need to explore these shared environmental mechanisms and other possible mechanisms such as genetic and familial contributions as heritability cannot be ruled out with the study design of the data set used in the current study.

4.3 POSITIVE EMOTION AND BEHAVIORAL OUTCOMES

Both studies provided support for children's positive emotion as a predictor of later behavioral outcomes. Consistent with previous cross-sectional research (e.g. Denham et al., 1990; Eisenberg et al., 1992, 2001; Halberstadt et al., 2001; Sroufe et al., 1984), children with higher levels of positive emotion were more socially competent. Study 1 reflects rank order relationships over childhood, with children who are relatively more positive early in childhood becoming relatively more socially competent later in childhood. Additionally, this relationship

remained significant when mothers' negative emotion was included in the model, indicating that it is specific to positive emotion and not just a lack of exposure to negativity. Study 2 indicated that trajectory group membership predicted social competence although effect sizes were very small. Children in the high/decreasing group were more socially competent in sixth grade than children in the low/increasing group, even though the two groups approached the overall mean of positivity across development. Thus, higher positive emotionality consistently predicted higher social competence in both the mother-child and school context.

Early transactional relationships between social competence and positivity likely contribute to the enduring longitudinal relationships between positivity and social competence found here and by others, across methods of measurement, interaction partners and settings (Isley et al., 1999; Volbrecht et al., 2007; Young et al., 1999). Positive emotion both results from and produces positive social interactions (Campos et al., 1989; Halberstadt et al., 2001; Lennon & Eisenberg, 1987). Positive emotion serves as invitations for other-oriented interactions (Cohn & Fredrickson, 2009), engenders other-oriented feelings (Cialdini et al., 1982) and reduces psychological distance (Tomkins, 1962), all of which likely facilitate affiliation. Positive emotion also broadens momentary thought-action repertoires enabling individuals to problem solve in difficult social interactions (Fredrickson, 1998; 2004) and resulting in behavioral activation thereby motivating social behavior. Furthermore, the cognitive benefits of positivity, such as increased optimism (Cialdini et al., 1982), personal control, and power (Forest et al., 1979) may contribute to positive children's confidence in seeking out interpersonal interactions. Conversely, positive social experiences may result in higher individual positivity (Lennon & Eisenberg, 1987). Furthermore, with age, as children learn about the role of positive emotion in social relationships and develop metacognitive abilities and an understanding of

emotion display rules they may control their own emotion to attract peers and leverage social relationships to improve their mood. Thus, positive emotion likely contributes to social competence, but is also derived from socially competent interactions in a dynamic, transactional relationship.

In both studies, children's positive emotion was a poor predictor of behavior problems. Study 1 found no significant relationships between children's positive emotion and internalizing or externalizing behaviors while Study 2 found a significant albeit small relationship between trajectory group membership and internalizing problems, but only prior to controlling for covariates. Thus, evidence supports children's positivity as predictive of the later development of socially competent behavior, but indicates that positive emotion plays a lesser role in behavior problems.

Children's own negative emotion may contribute more to the development of problem behavior than their positive emotion. A substantial previous research has verified a robust relationship between negative emotion and behavior problems (e.g. Eisenberg et al., 2005; 2009; Nigg, 2006). In accordance with a multiple risk factor model (Sameroff et al., 1987), the relative and joint levels of children's positive and negative emotions might also be important. The relationship between positive emotion and behavior problems might occur only when a child experiences low positive and high negative emotion (e.g. Dougherty, et al., 2010; Joiner & Lonigan, 2000; Kim, et al., 2007). On the other hand, high positive emotion might buffer children against the negative behaviors associated with negative emotion by enabling them to generate solutions to immediate problems, better cope with negativity, and focus on the positives in life. Previous research supports this interaction. Children who were high on negative emotion and low on positive emotion experienced more depressive symptoms later in development, while

being high on both emotions was not associated with depression (Dougherty et al., 2010; Joiner & Lonigan, 2000). Future research could build upon the models presented here by including children's negative emotion to determine if patterns remain consistent in an integrated model.

As with negative emotions, the type, quality, intensity and clarity of the positive emotion, and the type of behavioral outcome (Boyum & Parke, 1995; Eisenberg, Valiente, et al., 2003) may influence whether or not positive emotions are predictive of behavioral outcomes. The relationship between positivity and problem behaviors might exist only at the poles of positivity, which weren't captured in the current studies. Intense or impulsive positive emotions bordering on dysregulation may result in behavior problems and a lack of socially competent behavior similarly to negative emotions. Additionally, while previous research indicates that positive emotion types are more difficult to differentiate than negative emotions, there may be different relationships between behavior problems and positive emotions like happiness and glee versus contentment. Furthermore, children's concurrent emotionality may be more predictive of behavior than positive emotionality earlier in development, and there is very little study of children's felt emotion, a decided deficiency in the literature.

Study 1 also tested maternal positive emotion at 36 months as a predictor of children's behavioral outcomes in first grade. Like children's positive emotion, maternal positive emotion positively predicted children's social competence. Unlike children's positivity, maternal positivity also predicted lower levels of internalizing and externalizing behaviors. Thus, maternal positivity early in development is an important predictor of both competent and problematic behavior. Interestingly, mothers' positive emotion was a stronger and more broadly encompassing predictor of children's later problem behavior than children's own positive emotion. The stability of maternal emotional reactions and the importance of mothers as

regulators of children's emotions might contribute to these patterns. Additionally, positive mothers may be more attuned to their children's emotions and better able to help their children cope with difficult emotions or situations, which could buffer against later problem behaviors. Conversely, mothers who are less positive may be less attuned to their children's needs, less supportive, and less likely to help their children regulate and cope with negative emotion.

Notably, the relationships between maternal positivity and social competence and externalizing problems remained significant when maternal negative emotion was included in the alternative model in study 1. Thus, maternal positivity provides unique predictive information. However, consistent with previous research (Eisenberg et al., 2001), maternal positive emotion did not predict internalizing behaviors when mothers' negative emotion was included. This suggests the intriguing possibility that internalizing behaviors may result from the inability to cope with or learn from mothers' negative emotion rather than limited exposure to maternal positive emotion, and the negative repercussions of a lack of a positive role model. Alternatively, as discussed in Study 1, children's internalizing behaviors may result from socialization of poor coping strategies and modeling of negative emotion by mothers, which may result in children's failure to express feelings appropriately, and internalization of negative emotion and the resultant negative behaviors.

4.4 LIMITATIONS AND FUTURE DIRECTIONS

The current studies benefited from the use of the NICHD Study database, a multisite longitudinal study with multiple measures assessed at multiple time points across development. The sample used in the current studies was large, with 1,364 participants followed longitudinally,

which permitted more advanced quantitative techniques that yield stronger inferences about developmental patterns. Participants represented a range of socioeconomic and cultural backgrounds, which contributed to generalizability. However, the sample was not nationally representative (NICHD ECCRN, 2001) limiting population-based conclusions. Results should be interpreted with this in mind. Additionally, patterns of positive emotionality and relationships to outcomes might differ in other cultures. For example, collectivist cultures are less emotionally expressive than individualistic cultures (Matsumoto & Juang, 2013).

This project faced traditional limitations associated with secondary data analysis including methodological constraints and limitations on variable selection. Both studies benefited from having measures of children's positive emotion, rather than reverse scoring measures of negative emotion. This provided a clear assessment of children's positive emotionality, rather than assuming that negative and positive emotions share an inverse relationship. Nevertheless, Study 1 was limited by the lack of multiple measures of children's positive emotion at the relevant ages. Additionally, the cleanup procedure might have elicited specific child behaviors and emotions, and may have restricted positive affect. On the other hand, an emotionally demanding situation like clean-up may be less likely to suffer from ceiling effects in positivity and/or may more accurately identify children who are truly emotionally positive. Assessing children's positivity in different settings and through multiple methods (e.g. observation, questionnaire measures), as was done with mothers' positive emotion, may capture a wider range of positive emotion and strengthen the inferences. To do so, future research could measure positivity in tasks proven to elicit ranges of positivity such as naturalistic interactions like play (e.g. Denham, 1986; Sallquist et al., 2010; Strayer, 1980), caregiver report (e.g. Miller and Jansen op de Haar, 1997; Sallquist et al. 2009), and exposure to stimuli intended to elicit

different emotions (e.g. Barnett, King & Howard, 1979; Olinio et al., 2010; Sallquist et al., 2010). Additionally, ecological momentary assessments could be used such as electronic diaries (Suveg et al., 2010), when studying older children or could be obtained from parents of younger children. While children's positive emotion in Study 2 was also assessed using one measure, it sampled children's behavior across the school day, compositing multiple data points at each age and observing behavior in different settings within the school, thereby providing a broader assessment of children's positive emotionality. It is important that future research considers how the measurement of positive emotion, and the type and strength of positive emotion may impact the relationships considered in these studies. Positive emotions may not always relate positively to positive developmental outcomes. Extreme positive emotions should be further studied (Diener & Biswas-Diener, 2009; Fredrickson & Losada, 2005) as positivity in children who are very high or low in positivity as in clinical samples may differentially relate to behavioral outcomes as compared to children at more moderate levels. These children may have more ridged behavioral outcomes, may engage in more risky behaviors and may neglect threat (See Gruber, Mauss,& Tamir, 2011). Furthermore, the type of positive emotion likely effects these relationships as mania and hedonistic positive emotions likely negatively relate to positive outcomes and positively relate to negative outcomes. There might also be contexts and/or cultures in which positive emotions are inappropriate and thus are maladaptive (Gruber et al, 2011). Which positive emotions, when and in which context positive emotions support positive outcomes should be further studied, particularly before these results are applied to specific clinical populations.

Future research should also consider how positive emotion predicts social weaknesses in addition to social strengths. The measures of social competence used in this study reflected

positive social behaviors and excluded subscales assessing negative social competence such as aggression, asocial behavior and exclusion. Thus, conclusions are specific to children's social strengths. Utilization of other measures of social competence will provide a fuller picture of relationships with positive emotion.

Research should also continue to disentangle negative and positive emotions by considering their interaction. Comparisons should be drawn between children who differ in their profiles of positive and negative emotions, e.g. children who are high or low on both positive and negative emotions as compared to children who are high on one and low on the other. Different profiles may differentially relate to behavioral outcomes. Potential moderators and mediators of the tested relationships should also be considered. Systematic gender differences were not found in the current studies, however, previous research supports gender differences in the relationships between positive emotion and outcomes (Isley et al. 1999; Parke, et al., 1992) and different emotion socialization practices for boys and girls (Chaplin & Aldao, 2013; Chaplin, Cole, & Zahn-Waxler, 2005; Harris, 1989). Emotion regulation should also be considered as a mediator of the relationships between mothers' positive and negative expressivity and children's social competence and problem behaviors (See Eisenberg et al., 2001). Finally, mechanisms should be tested, particularly relative contributions of shared environment versus genetic influences on mothers' positive emotions and their relationship with children's positive emotions.

4.5 CLINICAL IMPLICATIONS

The field is currently heavily skewed toward encouraging the regulation and reduction of negative emotional states as a means to promote positive outcomes. Importantly, as shown in

Study 1, positive and negative emotions make unique contributions to children's behavior. Fostering positive emotion might be a simple, strength-based addition to treatment packages that could provide additional, even if small, improvements in behavior. Within a broader multimodal treatment regimen, even small differences may sum to larger behavioral change. Moreover, positive emotion interventions could benefit anyone (Fredrickson & Cohn, 2010), as they would increase positive experiences generally rather than targeting disorder-specific problems. Such interventions may be particularly useful for individuals for whom traditional interventions fail. Furthermore, strength-based approaches provide a positive therapeutic experience by shifting the goals of therapy from improving weaknesses to building strengths. Increasing exposure to positive environments may be especially useful for children who have grown up in environments where they have had little exposure to positivity, such as those from abusive homes. The current studies expanded the understanding of the relationships between positive emotion and behavioral outcomes; research is now needed that considers the mechanisms involved and how they can be leveraged in supporting positive behavioral outcomes and preventing negative outcomes.

4.6 CONCLUSIONS

In conclusion, positive emotion is distinct from negative emotion and contributes unique predictive information about children's behavior. The current studies provide foundational knowledge on the development of positive emotion over time and relationships with both predictors and later outcomes. Additional research is needed that continues to elucidate positive emotion's unique contribution to development. Through continued study, the use of advanced statistical techniques, and careful consideration of methodologies, we can continue to improve

our understanding of positive emotion development and perhaps leverage positivity to improve developmental outcomes.

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