ADAPTATION TO STRESS AMONG MOTHERS OF CHILDREN WITH AUTISM SPECTRUM DISORDER: THE ROLE OF POSITIVE AFFECT AND PERSONALITY FACTORS

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Abstract

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Raising a child with autism spectrum disorder is a challenging experience that can impact maternal well-being. This daily diary study investigates (1) the relationship between daily stress, general life stress as well as stress related to the child’s characteristics, and daily negative affect, (2) the role of daily positive affect in promoting resistance to stress and recovery from daily stress, (3) the moderating effects of optimism and perceived control on the relationships between daily stress, daily positive affect, and daily negative affect, and (4) whether daily positive affect serves to mediate both relationship between optimism and daily negative affect, as well as the relationship between perceived control and daily negative affect. Results from hierarchical linear models (HLM) revealed that higher levels of perceived stress were associated with decreased well-being, both within and across days. Daily positive affect buffered the immediate and longer-lasting negative impact of perceived stress; however, this occurred
only one days of low to moderate levels of stress. Although optimism and perceived control did not explain differences in the daily relationships previously described, each of these personality characteristics helped explain the degree to which positive affect is generated. Implications of the present study are discussed with regard to theoretical models of positive affect and the development of intervention programs. Directions for future research are also discussed.
This dissertation is dedicated to all of my family.
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INTRODUCTION

Families who have a child with autism spectrum disorder (ASD) face a challenge unlike that confronted by most families. Previous research has consistently found that mothers of children with ASD exhibit greater psychological distress compared to mothers of typically developing children (Koegel et al., 1992; Olsson & Hwang, 2001) or children with other disabilities (Holroyd & McArthur, 1976). Despite a consistent pattern of increased negative outcomes, there may be considerable individual differences in how mothers of children with ASD respond to the challenges they face. For example, some mothers may report elevated levels of stress and depression whereas other parents have reported an increase in well-being as a result of raising a child with a developmental disability (Taunt & Hastings, 2002). In recent years, research has sought to identify the factors that promote resilience among mothers of children with ASD.

Resilience is the process by which individuals exhibit successful adaptation despite experiencing adversity (Masten, Best & Garmezy, 1990). There have been several studies conducted to identify factors that serve to protect against the adverse effects of stress and promote resilience. Several specific factors, such as social supports (Bishop, Richler, Cain, & Lord, 2007; Boyd, 2002; Dunn, Burbine, Bowers, & Tantleff-Dunn, 2001), religiosity and spirituality (Ekas, Whitman, & Shivers, in press; Tarakeshwar & Pargament, 2001), and personality characteristics (Dunn et al., 2001), have been
identified as directly, or indirectly, reducing the negative psychological effects of raising a child with ASD.

One factor that has been relatively neglected is the role of positive affect in promoting psychological resilience. Two prominent models that explain why positive affect might serve as an important factor in resilience processes guide the current research. The dynamic model of affect (Zautra, Smith, Affleck, & Tennen, 2001) and the broaden-and-build theory of positive emotions (Fredrickson, 1998) each suggest mechanisms by which positive affect promotes immediate and long-term adaptation to stress. Recently, studies have found empirical support for both of these models (e.g. Ong, Bergeman, Bisconti, & Wallace, 2006). The current study incorporates these dynamic conceptualizations to explore the role of positive affect in promoting resistance to and recovery from stress.

Although positive affect may be an important factor in resilience processes, not all individuals experience positive affect during stressful times. Researchers have begun to investigate personality factors that might explain for whom these resilience processes operate. Optimism and perceived control are two such characteristics that have been associated with increased well-being (e.g. Scheier & Carver, 1992). The present study utilizes both global and daily assessments to investigate the dynamic relationship between stress and well-being and to explore the factors that might protect mothers of children with ASD from the adverse effects of stress. The current study also explores the hypothesis that resilience processes are only present among individuals high in optimism or perceived control.
Autism spectrum disorder (ASD) is a developmental disorder that is characterized by social interaction and communication deficiencies, restricted and repetitive behavior patterns, and, frequently, a wide variety of other symptoms (American Psychiatric Association, 2000). Recent reports from the Center for Disease Control and Prevention (2007) estimate that as many as approximately 1 in 150 children have an ASD diagnosis. Raising a child with ASD is typically a challenging experience for parents that begins early in the child’s life, is long lasting, and associated with a host of personal, familial, and vocational problems (Whitman, 2004). These challenges include, but are not limited to, obtaining the initial diagnosis, finding appropriate treatment and intervention services, establishing appropriate parenting practices, and coping with substantial financial burden of paying for services. Many of these challenges are unique to the disability and are not shared by parents of typically developing children or parents of children with other disabilities (Holroyd & McArthur, 1976; Koegel et al., 1992; Stoneman, 1997).

As a result of the challenges that parents of children with ASD face, it is not surprising that many experience negative psychological outcomes. Because mothers typically have the major caretaking responsibility, they are particularly vulnerable to the challenges associated with their child’s disability (Gray & Holden, 1992). A review of the research in this area indicates a general pattern of stress among mothers who are primary caretakers of children with autism (Moes, 1995). Mothers of children with autism have been found to exhibit clinical levels of parenting stress, depression, and anxiety (Davis & Carter, 2008; Ekas, Whitman, & Shivers, in press). In a recent study, Ekas and colleagues (in press) reported that, among mothers raising a child with ASD,
the mean score on a depression measure exceeded the cutoff for clinical levels of depression. Moreover, Davis and Carter (2008) found that 39% of their sample, mothers caring for a toddler with ASD, scored above the cutoff for clinical levels of parenting stress, 33% reported clinical levels of depression, and 6% of mothers reported clinically significant levels of anxiety.

These rates of negative psychological outcomes are greater for mothers of children with ASD than mothers of typical children and mothers of children with other disabilities. In a large population-based study, mothers of children with autism reported higher stress and poorer psychological outcomes compared to mothers in the general population, even after accounting for the child’s social skills and demographic variables (Montes & Halterman, 2007). Furthermore, Olsson and Hwang (2001) found that mothers of children with autism were more depressed than mothers of children with intellectual disabilities who did not have autism, who in turn were more depressed than mothers of typically developing children. Similarly, mothers of children with autism have reported lower levels of psychological well-being, including higher parenting stress and depression compared to mothers of children with Down’s Syndrome (Abbeduto, Seltzer, Shattuck, Krauss, Orsmond, & Murphy, 2004; Holroyd & McArthur, 1976), cystic fibrosis (Bouma & Schweitzer, 1990), and Fragile X Syndrome (Abbeduto et al., 2004). Parents of children with autism have also reported higher aggravation (e.g. child does things that bother parent, feeling angry with child) compared to parents of children with developmental disabilities or special health needs (Schieve, Blumberg, Rice, Visser, & Boyle, 2007). Taken together, these results suggest that parents, particularly mothers of children with ASD, are at an increased risk for various forms of negative psychological
outcomes. These studies, however, did not investigate the factors that contribute to the elevated levels of negative psychological outcomes.

*Autism Spectrum Disorder as a Source of Stress for Parents*

The available research suggests that there may be something unique to having a child with ASD that produces elevated levels of distress. In an attempt to isolate the specific factors producing stress in this population, researchers have examined the relationship between child characteristics and maternal functioning. For example, Tomanik, Harris, and Hawkins (2004) found that mothers of children with ASD reported higher levels of stress when their children exhibited irritability, lethargy, hyperactivity, and self-care, communication, and social interaction deficiencies. Moreover, Davis and Carter (2008) found that children’s deficits in social skills were predictive of parenting stress for mothers of toddlers with ASD. In addition, higher levels of repetitive behaviors and lower levels of adaptive behavior were related to higher levels of perceived negative impact in mothers of children with ASD (Bishop et al., 2007). The frequency with which children display ASD symptoms also contributes to the mother’s negative psychological outcomes (Benson, 2006; Ekas & Whitman, provisional acceptance). Researchers have also shown that increased levels of behavior problems (e.g. self-regulation problems and externalizing problems) are significantly related to increases in parenting stress (Davis & Carter, 2008; Lecavalier, Leone, & Wiltz, 2006). Moreover, Ekas and Whitman (provisional acceptance) found that the frequency with which children exhibited behavior problems was a better predictor of maternal well-being as compared to the frequency and level of other ASD symptoms. In sum, these studies have shown that raising a child with
ASD is associated with elevated levels of stress and depression that, in turn, may be a direct result of the unique characteristics associated with this disability. Further research is needed, however, to explores whether these psychological outcomes are enduring and, also, how stress related to these characteristics may impact daily well-being.

Currently, there are only two known studies examining the daily well-being of mothers of children with ASD. Pottie and colleagues (Pottie, Cohen, & Ingram, in press; Pottie & Ingram, 2008) conducted biweekly assessments of daily affect among parents raising a child with ASD. Participants completed questionnaires each Wednesday and Sunday evening for 12 consecutive weeks assessing negative and positive affect. In addition, parents also completed a global assessment of child symptomatology and disruptive behaviors. Results revealed that, in contrast to previous studies (e.g. Tomanik et al., 2004), the global assessment of children’s ASD symptomatology was not significantly associated with daily affect. Using the same sample and study design (i.e. biweekly assessments), however, Pottie, Cohen, and Ingram (in press) found that global ratings of children’s disruptive and oppositional behaviors were significantly related to daily affect. Specifically, higher levels of disruptive behaviors were associated with greater daily negative affect, but were not significantly related to positive affect.

The results of these studies provide an important first glimpse into the daily lives of parents raising a child with ASD. It may be, however, that research employing consecutive daily measures of perceived stress and affect, as opposed to only biweekly assessments, would provide a greater opportunity to capture the daily experiences as they are occurring and, thus, provide greater insight into the dynamic relationship between perceived stress and well-being. Studies could explore both how stress and well-being are
related both within as well as across days, including whether the stress experienced on one day spills over and affects well-being the next day?

The Relationship Between Daily Stress and Psychological Functioning

Research on stress and well-being has not been confined to the area of autism and, in fact, has a long history. Although too numerous to review here, research on the relationship between stress and psychological adjustment has been explored in many populations, such as children and adolescents (e.g. Luecken, Kraft, Appelhans, & Enders, 2009), cancer survivors (e.g. Park, Edmondson, Fenster, & Blank, 2008), and parents of children with cancer (e.g. Vrijmoet-Wiersma et al., 2008), to name a few. Past research has predominantly focused on the experiences of stress as a result of major life events such as death of a loved one (e.g. Pfefferbaum et al., 2000) or divorce (e.g. Weyer & Sandler, 1998). In recent years, however, stress research has shifted from an emphasis on understanding how these single measures of global, major life events impact psychological functioning to focusing on the dynamic impact of these experiences across time (Affleck, Tennen, Urrows, & Higgins, 1994; Stawski, Sliwinski, Almeida, & Smyth, 2008). New daily diary methodologies have allowed researchers to examine the effects of daily hassles as they are actually occurring (e.g. Ong et al., 2006). This shift allows researchers to begin to unravel the complex processes underlying the broader stress-and-coping process and to expand upon the results found with single life events.

Research in the area of stress and well-being has also focused on a wide variety of outcomes. Studies have investigated the effects of stress on physiological outcomes such as cardiovascular reactivity (e.g. Luecken et al., 2009) as well as psychological outcomes
such as depression (e.g. Skitch & Abela, 2008). An increasing amount of research in the daily stress and well-being area has focused on negative affect as an indicator of psychological well-being. Although there is considerable debate surrounding the definition of psychological well-being, Diener and colleagues suggest that well-being encompasses three components, (1) low levels of negative emotionality, (2) high levels of positive emotionality, and (3) life satisfaction (Diener, Suh, Lucas, & Smith, 1999). In addition, Diener and colleagues (1999) argue that each component of well-being differentially relates to adaptation and, therefore, should be studied individually. In the present study the dynamic relationship between perceived stress and negative affect, as one component of well-being is explored.

Examples of studies assessing the relationship between daily stressors and negative affect have increased in recent years and include multiple populations, ranging from community samples to chronically ill samples. Marco and Suls (1993) measured the occurrence of acute stressors, perceived distress related to each stressor, and negative affect, among a community sample of adult males, several times a day for 8 consecutive days. Results from this micro-analytic study found that the presence of acute stressors accounted for 15% of the variability in negative affect and was a significant predictor of negative affect, even after taking into account dispositional negative affectivity and previous affect. In other words, higher levels of stressors were associated with greater negative affect. In a similar study, Bolger and colleagues (1989) assessed the differential influence of various daily stressors on daily negative affect in a community sample of married adults. Participants individually completed questionnaires for 42 consecutive days. Results indicated that daily stressors explained 19% and 20% of the variance in
daily affect, for men and women respectively. When examining the influence of different stressors, the authors found that interpersonal conflicts, such as arguing with spouse, were more upsetting than other daily stressors, such as financial or work problems.

The relationship between daily stressors and negative affect has also been explored in populations experiencing chronic physical and/or psychological problems. Affleck and colleagues (1994) reported on the association between daily stressors and daily negative affect in a population suffering from a chronic physical illness, rheumatoid arthritis. Participants completed questionnaires assessing undesirable events and negative mood each evening for 75 consecutive days. Findings from this study confirmed previous results regarding the significant positive association between daily stressors and daily negative affect. Taken together, these studies suggest that objective characteristics of daily stressors, such as the presence of acute stressors or number of daily hassles, are associated with daily well-being. Individuals, however, appraise stressors in terms of perceived severity and how much the stressor disrupts daily functioning (Almeida, 2005). These subjective characteristics may, in turn, influence daily well-being.

Studies assessing the subjective characteristics of daily stressors, such as the perceived stress related to occurrence of a stressor, have generally found associations with negative affect. Ong and colleagues (2006) assessed perceived stress and negative affect, for 98 consecutive days, among a group of bereaved women whose spouse had recently passed away. This study found a significant positive association between perceived daily stress and daily negative affect. In sum, studies examining daily stress, whether assessing the objective or subjective characteristics, have found that in addition to coping with the chronic stressors associated with physical illness (i.e. rheumatoid
arthritis) and a major life event (i.e. loss of a spouse), individuals are also faced with daily stressors that can impact their psychological functioning. Mothers raising a child with ASD may be similar to chronically ill populations in that they have to cope with stressors associated with their child’s disability, as well as everyday stressors.

Although studies have been conducted examining the relationship between global measures of child characteristics and daily well-being among parents of children with ASD (e.g. Pottie & Ingram, 2008), there is a paucity of research examining daily perceived stress and daily negative affect among this population. To date, there has been only one set of studies conducted by Pottie and colleagues (Pottie & Ingram, 2008; Pottie et al., in press) focusing on the relationship between perceived stress and daily affect among mothers of children with ASD. Similar to other populations, the results from these studies found that on days in which parents reported higher levels of perceived daily stress they also reported greater negative affect. Studies assessing daily stress and well-being highlight the importance of going beyond global assessments. By utilizing daily measures of stress and well-being, researchers can assess the within-person processes that are taking place and capture the day-to-day variability that may be taking place (Almeida, 2005). Prospective studies of daily stress and well-being may also approach criteria for causal inference by establishing the temporal ordering of stress and negative affect.

Despite research establishing a link between daily stress and daily negative affect reported on the same day, the results do not allow for any causal interpretations. For example, it is not only possible that stress is leading to increased negative affect, but it is also possible that negative affect leads to increased stress. When assessing stress and negative affect once a day it is possible that the experience of negative affect in the
morning leads to increased stress in the evening or that negative affect in the evening might lead to experience of stress the next morning (Affleck et al., 1994; Stone, Kessler, & Haythornwaite, 1991). One way to test the temporal ordering of these associations is to test the “lagged” effects of stress on the next day’s negative affect.

In one of the first studies to test lagged effects, Affleck and colleagues (1994) found no significant overall association between stressors experienced one day and next day negative affect, controlling for concurrent negative affect, in a population of rheumatoid arthritis patients. There were, however, considerable individual differences in lagged associations. Specifically, individuals with less social support showed a stronger relation between stress and next day negative affect. In contrast, Ong and colleagues (2006) found a significant, positive association between perceived stress and next day’s negative affect, also controlling for concurrent affect, in two samples of older adults, as well as a sample of widowed older adults. Although not conclusive, these studies suggest that daily stress may be the cause of daily negative emotions. Further work is needed, especially in different populations, to provide support for the temporal relations between stress and negative affect. Although stress may predict negative affect, both within and across days, there may be considerable individual differences in these relationships. Indeed, there may be those who seem to fare well in the face of stress and it is important to investigate the factors that promote successful adaptation to stress.

The Construct of Resilience

In general, the experience of elevated stress has consistently been related to increases in negative psychological outcomes, including negative affect; however, there
are individuals for whom this relationship is not as strong or long-lasting. Indeed, there are those who display successful adaptation and exhibit psychological well-being despite being exposed to high levels of stress (Masten et al., 1990). This process is referred to as resilience and is defined as “the process of, capacity for, or outcome of successful adaptation despite challenging or threatening circumstances” (Masten et al., 1990, p. 426). This definition implies that two critical conditions must be met: (1) there must be exposure to significant adversity; and (2) there must be successful adaptation despite threats to well-being. In other words, resilience cannot occur without exposure to some level of risk; however, the level of risk that is necessary to deem an individual’s positive adaptation as resilient is unclear (Cummings, Davies, & Campbell, 2000; Luthar, Cichetti, & Becker, 2000). Early resilience research initially characterized those identified as resilient as being remarkable, rare, extraordinary, or special (e.g. Masten, 2001). Recent research, however, has shown that resilience in the face of loss (e.g. death of loved one) or severe trauma (e.g. September 11, 2001 terrorist attacks) is more common than previously thought (Bonanno, 2004). Furthermore, successful adaptation can be achieved through a variety of different resilience processes.

Masten and colleagues (1990) have identified three different types of resilient phenomena: (1) resilience as overcoming the odds, (2) resilience as stress-resistance, and (3) resilience as recovery. Resilience as overcoming the odds refers to successful adaptation despite the odds against such adaptation. In this process, individuals have been identified as having some type of risk factor (e.g. SES) that would typically predict maladaptation, but they have been able to achieve better-than-expected outcomes despite that risk factor (Luthar et al., 2000). Resilience as stress-resistance implies the process
wherein individuals are faced with acute or chronic stressors but are able to effectively maintain equilibrium under short-term significant strain. Finally, resilience as recovery occurs when individuals are exposed to prolonged or severe threat, and show a decrease in functioning, but are able to recover quicker than most when the threat is no longer present. Current conceptualizations do not imply that resilience is absolute or unchanging, but instead argue that resilience as a dynamic process of positive adaptation where new strengths emerge as life circumstances change (Luthar et al., 2000).

Although resilience may just be “ordinary magic” (Masten, 2000), this “magic” is not well understood. Researchers continue to search for factors that might promote or enhance resilience processes. Such factors have been commonly labeled as protective. *Protective factors* moderate the effects of risk or adversity such that adaptation is “more positive than would be the case if the protective factor were not operational” (Masten et al., 1990). Protective factors can be characteristics of the individual and/or their environment (Luthar et al., 2000). Some protective factors may only operate at certain levels of adversity (Masten et al., 1990). More recently, research has shifted from conducting descriptive studies that simply identify factors involved in resilience to a process-oriented framework that attempts to understand how these factors contribute to successful adaptation (Luthar et al., 2000). The present study focuses on understanding how particular individual characteristics - positive affect and personality characteristics - operate to promote successful adaptation to daily stress among mothers of children with ASD. Specifically, the current study examines whether positive affect promotes resistance to, and recovery from, daily stress, and how personality characteristics, such as optimism and perceived control, influence those dynamic resilience processes.
Positive Affect as a Protective Factor

Increasingly, research has shown that individuals can experience both positive and negative affect with the same frequency (Folkman, 1997; Fredrickson, Tugade, Waugh, Larkin, 2003). One might wonder why one would even want to try to muster positive emotions during times of stress? What benefits would one experience as a result of generating positive affect? Lazarus and colleagues (1980) were one of the first to explicate the role that positive affect can play during times of stress. They proposed that during times of stress, positive affect can serve as a psychological breather, provide support for coping efforts, and help to restore resources that have been adversely affected by stress. Since these early efforts, researchers have continued to explore the effects of positive affect on areas of physical health, psychological health, and cognitive functioning.

There have been a multitude of studies conducted that highlight the benefits of positive experiences and positive affect. In a review of the literature, Ryff and Singer (1998) reported that positive experience (e.g. positive life outlooks, high self-esteem, positive affect) is associated with increases in survival time, quicker wound healing, and increases in immune functioning. In a comprehensive review of the influence of positive affect on physical health, Pressman and Cohen (2005) also cited evidence that positive affect was associated with lower morbidity, decreased symptoms and pain, and increased longevity. Numerous studies have also shown that happy individuals (i.e. those who frequently experience positive affect) are successful in many areas, including job success, marriage, and friendships (for review, see Lyubomirsky, King, & Diener, 2005).
Positive affect can also have an influence on various aspects of cognitive functioning. Several studies have provided evidence for a broadened scope of attention among individuals with positive emotional traits (for review, see Fredrickson, 1998). In addition, studies show that positive affect facilitates learning and mastery (for review, see Fredrickson, 1998). Isen and colleagues have provided evidence that positive affect promotes cognitive flexibility (Isen & Daubman, 1984), facilitates creative problem solving (Isen, Johnson, Mertz, & Robinson, 1985), and promotes flexible strategy use in decision-making tasks (Isen, Rosenzweig, & Young, 1991). Ashby and colleagues (1999) propose these increases in creative problem solving may be due to increased dopamine released in the anterior cingulate that improves cognitive flexibility. The increase in dopamine is assumed to be the result of increases in positive affect. Taken together, the results of these studies highlight the beneficial role that positive affect has on physical health, psychological health, and cognitive functioning. Given the high levels of stress that mothers of children with ASD experience one might wonder whether they too might be able to generate positive affect and reap the benefits that positive affect provides.

In recent years, Hastings and colleagues (Hastings & Taunt, 2002; Taunt & Hastings, 2002) have called on researchers to shift from focusing on the negative impact that children with developmental disabilities may have on families to investigating the positive impact that these children might have. Hastings and Taunt (2002) argue that parents do have positive perceptions of their children and their lives. These positive perceptions may be seen as an effective coping mechanism that can help to buffer, or protect, against the experience of stress. Taunt and Hastings (2002) explored whether families experienced positive outcomes associated with raising a child with a
developmental disability. Common themes emerged from interviews with parents, including their focus on the positive aspects of their child, a changed perspective on life, increased sensitivity and tolerance toward others, increased opportunities to learn, improved family dynamics, an expanded social network, increased confidence, and strengthened religious faith. Although results from this study are descriptive, they provide further support for the notion that parents raising a child with a developmental disability, such as ASD, may experience positive emotions. Further research is needed to elucidate the processes by which positive affect influences adaptation to stress. What is the role of positive affect in resilience processes? Does, as Lazarus and colleagues (1980) proposed, positive affect and the benefits associated with experiencing positive affect, serve to protect against the adverse effects of stress?

The Role of Positive Affect in Resilience Processes

Positive affect can serve as an important factor in two of the resilience processes previously discussed: (1) resilience as stress-resistance; and (2) resilience as recovery (Folkman & Moskowitz, 2000a; Ryff & Singer, 1998). Positive affect may help to buffer and promote resistance to or recovery from the adverse effects of stress. Two models are important in this regard. The dynamic model of affect (DMA) was developed to explain how changes in the relationship between negative and positive affect during times of stress influence resistance to stress (Zautra et al., 2001). This groundbreaking model has received increasing attention and has considerable empirical support (e.g. Coifman, Bonanno, & Rafaeli, 2007; Ong et al., 2006). A second model, the broaden-and-build model of positive emotions, suggests that positive affect may serve to broaden an
individual’s thought-action repertoire and build personal resources, which may, in turn, help in the recovery from stressful experiences (Fredrickson 1998, 2001). Together, these models may explain why positive emotions might be an important protective factor in resilience processes. Furthermore, empirical tests of these models allow researchers to move beyond descriptive identification of positive affect as a protective factor and explain the complex processes that are taking place.

The DMA provides one framework for understanding how positive affect can protect against the negative effects of stress and exemplifies the resilience as stress-resistance phenomena (Zautra et al., 2001). The DMA predicts that during ordinary circumstances, positive affect and negative affect are relatively independent of one another and each has its own event-emotion relationship. For example, positive events are typically related to positive affect and not negative affect, and negative events are related to negative affect and not positive affect. Keeping positive affect and negative affect separate allows for greater information processing and more adaptive responding (Reich, Zautra, & Potter, 2001). Under stressful conditions, however, an inverse correlation between positive and negative affect develops. The experience of stress is likely to create feelings of uncertainty, which places increased demand on information processing and competes for resources. The increased demand and competition leads to a narrowing of attention and simplified cognitive processing that, in turn, also leads to simplified emotional processing wherein negative and positive affect collapse to a single, unidimensional construct (Reich, Zautra, Davis, 2003; Reich et al., 2001; Zautra et al., 2001). During times of stress this cognitive and emotional simplification is important.
because it allows individuals to focus on the important, salient aspects of the environment.

One implication of the DMA is that when experiencing high stress, positive affect may diminish the experience of negative affect. Conversely, the DMA also predicts that low levels of positive affect promote vulnerability to the adverse effects of stress. Support for the DMA has been found in multiple populations, including patients with chronic pain (Davis, Zautra, & Smith, 2004; Zautra, Affleck, Tennen, Reich, & Davis, 2005; Zautra et al., 2001; Zautra, Johnson, & Davis, 2005;), college students (Reich & Zautra, 2002), adult males (Zautra, Berkhof, & Nicolson, 2002), older adults (Ong et al., 2006), and recently bereaved adults (Coifman et al., 2007; Ong, Bergeman, & Bisconti, 2004; Ong et al., 2006; Zautra, Reich, Davis, Potter, & Nicolson, 2000). To my knowledge, however, these processes have not been examined in adults encountering the chronic and acute stressors associated with raising a child with a developmental disability.

One way to determine whether differentiation of affective states is occurring, and test the DMA, is to examine the interaction between stress and positive affect and its impact on negative affect (Zautra et al., 2001). If a significant interaction is found this could mean that individuals are able to experience positive affect during times of stressful negative events and that positive affect may be serving as a buffer against the effects of stress on negative affect. In recent years there have been numerous studies conducted to test this resilience process using intensive daily diary studies. In one study, Ong and colleagues (2004) collected 98 days of daily diaries from a sample of recently bereaved older adult widows. Results of multilevel models yielded a significant Daily Stress x Daily Positive Affect interaction when predicting depressive symptoms suggesting that
there was less of an increase in depressive symptoms on days of greater stress when positive affect was also higher. In other words, during times of stress, higher levels of positive affect were associated with lower negative affect (i.e. greater stress resistance). Ong and colleagues (2006) have since replicated these results with older adults experiencing everyday stressors. It is possible that if mothers of children with ASD are able to experience positive affect on days in which they are experiencing high stress, including normative daily hassles and stress related to their child’s symptoms, they may be better able to resist the adverse effects of these stressful days.

In addition to promoting stress resistance, positive affect may play an important role in the resilience as recovery phenomena. Negative emotions generate action tendencies that are specific to the emotion being experienced (Frijda, 1986). Fredrickson (1998, 2000) argues that these specific action tendencies narrow our thought-action repertoires to produce adaptive behaviors that are necessary in life-threatening situations. Positive emotions, on the other hand, broaden an individuals’ thought-action repertoire, allowing them to pursue novel and creative thoughts and actions. Support for this hypothesis has been found in studies assessing the influence of positive emotions on cognition (for review, see Isen, 2000), attention (Fredrickson & Branigan, 2005), and thought-action repertoires (Fredrickson & Branigan, 2005). This broadened thought-action repertoire also allows individuals the ability to create and build resources. For example, being playful can build physical resources, social resources, and intellectual resources, such as physical skills and friendships. Fredrickson and Joiner (2002) found that positive affect and broad-minded coping enhanced one another. Individuals experiencing positive emotions were able to engage in broad-minded coping, which helps
to promote and build greater emotional well-being. This is known as the broaden-and-build theory of positive emotions.

The broaden-and-build theory of positive emotions has important implications for adaptation to stress and the resilience as recovery phenomena. If positive emotions can broaden an individuals’ thought-action repertoire, they might also have an influence on the effects of negative emotions, which narrow an individuals’ thought-action repertoire. In other words, positive emotions might be able to undo the effects of negative emotions, which is referred to as the undoing hypothesis (Fredrickson & Levenson, 1998). In separate studies, Fredrickson and colleagues (Fredrickson & Levenson, 1998; Fredrickson, Mancuso, Branigan, & Tugade, 2000; Tugade & Fredrickson, 2004) tested whether positive emotions would help to speed up cardiovascular recovery from negative emotions. In one study, participants were shown a fear-eliciting film and then randomly assigned to view a second film that elicited positive affect, negative affect, or neutrality. Results indicated that participants who viewed the positive films returned to baseline cardiovascular levels quicker than those who viewed negative and neutral films (Fredrickson & Levenson, 1998). In the second study, participants viewed a film known to elicit sadness. Interestingly, those participants who were able to spontaneously smile during the film recovered quicker, as evidenced by returning to baseline levels of cardiovascular reactivity, than those who did not smile (Fredrickson & Levenson, 1998).

Yet another study provided further support for the undoing hypothesis (Fredrickson et al., 2000). In the study, participants were exposed to an anxiety-eliciting task, in contrast to the fear and sadness-eliciting films described in the previous study, designed to elicit cardiovascular reactivity. Participants were then randomly assigned to
view films evoking positive emotions, negative emotions, or neutral feelings. Results, in support of the undoing hypothesis, found that participants who were exposed to the positive film exhibited faster cardiovascular recovery. Using a similar experimental paradigm, Tugade & Fredrickson (2004) found that individuals who reported experiencing positive emotions during the anxiety-inducing task exhibited quicker cardiovascular recovery. Taken together, these studies suggest that experiencing positive affect during, or immediately after, times of stress may aid in the process of recovery.

Support for the undoing hypothesis and, by consequence, the broaden-and-build theory has also been found in non-experimental studies. Ong and colleagues (2006) conducted a series of daily diary studies testing the undoing hypothesis in different populations. Researchers tested whether positive affect mediated the relationship between stress experienced on day one and negative affect experienced the next day. If, when positive affect is include in the analyses, the association between stress and next day’s negative affect becomes non-significant then it can be concluded that positive affect is aiding in the recovery from stress by undoing the lingering effects of stress. Results confirmed that positive affect mediated the relationship between stress and next day’s negative affect. This study, however, does not provide insight into the complex processes taking place between the experience of stress and positive affect. For example, there may be important physiological systems interacting to produce positive affect during the stressful experience or individuals may utilize coping mechanisms that enhance positive affect. Moreover, assessing stress and positive affect at the same time each day means that the temporal order of emotional experiences cannot be established.
Nonetheless, these results provide further support for the undoing hypothesis and show that these processes are taking place at a daily level.

The broaden-and-build theory and undoing hypothesis may have important implications for mothers of children with ASD. If mothers are able to experience positive affect on days in which they are experiencing high stress they may be able to undo the negative effects associated with stress and recover quicker. Investigating both resilience processes (i.e. resilience as stress resistance and resilience as recovery) in this population could be critical to the development and implementation of programs for helping mothers cope with the stress associated with raising a child with ASD. In particular, research is needed that investigates factors that contribute to individual differences in each of these processes.

*Personality Characteristics and Their Influence on Resilience Processes*

Successful adaptation in the face of stress is a process that is beneficial for all individuals; however, not everyone can produce positive affect during stressful times. Therefore, an important task for researchers is to determine whether there are certain psychological factors that might serve to promote positive affect and these resilience processes. Indeed, research has begun to focus on trait-like personality characteristics that might engender the positive emotions that help individuals resist and recover from stress. One characteristic that received extensive attention is trait psychological resilience. Psychological resilience is a relatively stable personality characteristic that is thought to be characterized by the ability to bounce back and adapt to negative experiences (Block & Block, 1980; Block & Kremen, 1996).
Research has consistently shown that resilient individuals have optimistic outlooks on life, are open to new experiences, and have higher positive emotionality (Block & Kremen, 1996). Resilient individuals use positive emotions more frequently and may be able to access these emotions during times of stress (Tugade & Fredrickson, 2007). It is possible, then, that highly resilient individuals may be more likely to use positive emotions in resilience processes. Empirical support for this proposition has been found in recent years. Fredrickson and colleagues (2003) assessed trait resilience among college students before the terrorist attacks of September 11th, 2001 and positive affect and depressive symptoms following the attacks. Results indicated that positive affect mediated the relationship between self-reported trait resilience and depressive symptoms. In other words, individuals high in trait resilience also reported higher levels of positive affect that, in turn, predicted lower levels of depressive symptomatology.

Furthermore, using a daily diary design, Ong and colleagues (2006) found that self-reported trait resilience contributed to both stress resistance and recovery processes. As previously discussed, stress resistance in these studies was conceptualized as the interaction between daily stress and daily positive affect. To investigate whether trait resilience influences this relationship a three-way interaction, Daily Stress x Daily Positive Affect x Trait Resilience, was tested and found to be significant. For individuals high in trait resilience, positive affect served as a protective factor to help resist the negative effects of stress, and this effect was found on both high- and low-stress days. For individuals low in trait resilience, positive affect did not provide the same benefits. The study also investigated whether trait resilience impacted recovery processes. Results indicated that trait resilience was associated with higher daily positive affect that, in turn,
predicted recovery from stress. Together, these studies provide evidence for the importance of trait resilience as a characteristic that can explain individual differences in resilience processes. Further research is needed, however, that examines whether specific components of trait resilience, such as optimism and perceived control, contribute to resilience.

One important characteristic of trait resilience is having an optimistic outlook on life (Block & Kremen, 1996). As a component of trait resilience, it is possible that dispositional optimism may also influence resilience processes in a similar manner. For example, individuals high in trait optimism may be more likely to generate positive affect during stressful experiences that, in turn, can be utilized to bolster resistance to, and recovery from stress. Indeed, there is growing evidence that optimism is associated with greater physical and mental health (Achat, Kawachi, Spiro, DeMolles, & Sparrow, 2000; Scheier & Carver, 1992; Segerstrom, Taylor, Kemeny, & Fahey, 1998). Optimistic patients exhibit faster recovery from cardiac bypass surgery (Scheier et al., 1989), and are more likely to employ positive health practices (Scheier & Carver, 1992). To my knowledge, the role of optimism in the relationship between daily stress, positive affect, and negative affect has not been systematically examined.

Another personality characteristic that may be especially important for promoting resilience processes is control. *Perceived control* has been defined as “the belief that one can determine one’s own internal states and behaviour, influence one’s environment and/or bring about desired outcomes” (Wallston, Wallston, Smith, & Dobbins, 1987 p.5). Perceived control is further divided into *primary control*, defined as attempts to change the environment so that it fits the needs of the individual, and *secondary control*, defined
as attempts by the individual to fit in with the world (Heckhausen & Schulz, 1995; Rothbaum, Weisz, & Snyder, 1982). In other words, primary control involves controlling the external environment and secondary control involves controlling internal attributes (Heckhausen & Schulz, 1995). There is an extensive body of literature demonstrating that those with higher perceived control report better health, fewer symptoms, faster recovery from illness, as well as greater life satisfaction and longevity (Lachman, 1986; Lachman & Weaver, 1998; Lachman, Ziff, & Spiro, 1994; Rodin, 1986). Moreover, perceived loss of primary control has been shown to lead to increased distress and lower well-being (e.g. Krause & Baker, 1992). These findings may be especially relevant for mothers of children with ASD because the characteristics and behaviors of their child is something they do not have direct control over. Therefore, it is possible that the personality characteristic of perceived control may influence the resilience processes of stress resistance and recovery from stress.

Delineating the precise characteristics that may explain individual differences in resilience processes is another important step for researchers and may have further implications for the development of intervention programs. For example, if optimism and control influence resilience processes then clinicians can focus not only on increasing the generation of positive emotions, but they can also focus on the development of characteristics that promote this generation. This may be especially important among mothers of children with ASD since they experience considerable amounts of stress, possibly on a daily basis.
The Current Study and Hypotheses

The present study is the first to systematically examine the relationship between perceived stress, negative affect, and positive affect on a daily basis, among mothers of children with ASD. The current study draws on two conceptual models to explain the role of positive affect in multiple resilience processes: (1) resilience as stress resistance; and (2) resilience as recovery. The DMA (Zautra et al., 2001) was used as a guiding framework for understanding how positive affect and negative affect are interrelated during times of stress and how positive affect can promote stress resistance. The broaden-and-build model and the complementary undoing hypothesis (Fredrickson, 1998) served as a conceptual model for examining the role of positive affect in the recovery from stress. In addition, two components of trait resilience, optimism and perceived control, were examined as possible characteristics that explain individual differences in the resilience processes. The current study serves to not only complement research that has been conducted with other chronically stressed populations (e.g. Ong et al., 2006), but also extends this research by examining different types of perceived stress and multiple components of trait resilience, such as optimism and perceived control. The current study is an important contribution for the autism literature as well as the broader stress and coping literature.

The current study is the first to utilize daily diary methodologies with mothers raising a child with ASD. Daily diary methods have increased in popularity in recent years and have been used in many different research areas. One of the primary benefits of using daily diaries is that they allow researchers to examine experiences as they are naturally occurring (Bolger, Davis, & Rafaeli, 2003). In addition, daily diary methods
avoid problems associated with retrospection because individuals are completing the
diaries close to the actual time the event was experienced (Bolger et al., 2003). Moreover,
using daily diaries allows researchers to capture dynamic aspects of adaptation to stress
that might otherwise by missed when utilizing cross-sectional or other longitudinal
assessments.

Research Question 1: To what extent are perceived stress and negative affect
related to one another within the same day? Consistent with previous research using
similar populations (e.g. Pottie & Ingram, 2008) It is hypothesized that higher levels of
perceived stress would be associated with higher levels of negative affect. The current
study utilizes ratings of perceived stress pertaining to common daily hassles as well as
perceived stress related to their child’s symptoms. There is limited research exploring the
effects of different types of stressors on well-being; however, Marco and Suls (1993)
found that certain types of stressors were more upsetting. Therefore, the present study
will explore the unique contribution of the perceived stress related to each type of stressor
(daily life stress and child stress), as well as the interaction of the two stressors, to daily
negative affect. It is hypothesized, however, that the strongest association will be found
on days in which both everyday stressors and child stressors are elevated.

Research Question 2: Does perceived stress have a carry-over effect and
influence negative affect on subsequent days? When assessing the relationship between
perceived stress and negative affect within the same day it is not possible to disentangle
the temporal ordering of associations. Examining lagged relationships, however, provides
greater support for the argument that perceived stress may be leading to increased
negative affect (Affleck et al., 1994). Consistent with previous research (e.g. Ong et al.,
2006), it is hypothesized that days in which perceived stress is elevated will be followed by higher levels of negative affect, even after controlling for the current day’s negative affect. Similar to the previous research question, the relative contribution of each type of stressor will be explored. These effects are hypothesized to occur for each category of stressors (i.e. daily life stress and child stress); however, the effect is hypothesized to be especially salient following days in which both types of perceived stress are elevated. Finally, the present study will also test the reciprocal relationship between stress and negative affect. It is hypothesized that although stress will impact next day’s negative effect, negative affect will not predict stress on the following day. Testing this hypothesis will help provide strength for the general assumption that stress leads to increased negative affect.

*Research Question 3: Does positive affect promote resistance to stress?* Positive affect may play an important role during times of stress (Lazarus et al., 1980). Consistent with the DMA (Zautra et al., 2001) it is predict that on days when perceived stress is above average, the experience of positive affect will serve to decrease the relationship between perceived stress and negative affect. In other words, positive affect will serve as a protective factor promoting stress resistance. In addition, using a mediation framework, the current study will also explore whether positive affect reduces or eliminates the positive relationship between perceived stress and negative affect.

*Research Question 4: Does positive affect promote recovery from stress?* In addition to interrupting the experience of negative affect within the same day, positive affect may also aid in disrupting this process across days. Consistent with the broaden-and-build theory of positive emotions (Fredrickson, 1998) it is predicted that the impact
of perceived stress on next day’s negative affect will be less salient for those who exhibit higher levels of positive affect. Further, in an attempt to unravel the role of positive affect in recovery processes, it is also predicted that positive affect will mediate the relationship between perceived stress and next day’s negative affect. That is, the presence of positive affect promotes recovery from highly stressful days. Given the lack of research, the effects of positive affect on recovery from the two different stressors (daily life stress vs. child stress) will also be explored.

**Research Question 5: Do dispositional optimism and control explain individual differences in the resistance and recovery processes?** The resilience processes described in the preceding research questions may exhibit considerable variability. Recent research has identified trait resilience as an important characteristic to explain individual differences in these processes (e.g. Ong et al., 2006); however, there has been no research investigating specific components of trait resilience, such as optimism and control. It is hypothesized that dispositional optimism and perceived control will explain individual differences in the stress resistance and recovery processes being explored in research questions three and four. Specifically, these processes are hypothesized as being more likely to occur for individuals with higher optimism and greater perceived control.

**Research Question 6: Does daily positive affect mediate the relationship between optimism/control and daily negative affect?** In addition to personality characteristics explaining differences in resilience processes, previous research has also shown that positive affect may mediate the relationship between these characteristics and well-being (e.g. Tugade & Fredrickson, 2004). It is hypothesized that optimism and perceived
control will be positively associated with positive affect which, in turn, will be associated with decreased negative affect.
METHOD

Participants

Participants were part of a larger study examining stress and well-being in families of children with ASD. One hundred and nineteen participants were contacted and invited to participate in the current daily diary study. Forty-six participants agreed to take part in the 30-day study. Mothers included in the present study had at least one child younger than 18 years of age who had been diagnosed with an ASD. The majority of mothers were married (87%); the remaining mothers were divorced (6.5%), widowed (2.2%) or single (4.3%). Mothers were predominantly Caucasian (95.7%) and middle class; specifically, 2.3% had annual household incomes below $24,999, 59.1% earned $25,000 to $74,999, and 38.7% made $75,000 or more annually. The majority of mothers had some college or completed college (67.4%) or completed postgraduate training (21.7%), while a smaller percentage of mothers had a high school degree or less (10.9%). Mothers ranged in age 29 to 61 (\(M = 40.98, SD = 6.58\)). Children were between the ages of 2 and 18 (\(M = 10.17, SD = 4.28\)), and were predominantly male (78.3%). Four of the families had at least one other child who was also diagnosed with an autism spectrum disorder.

Tests of differences between the individuals who participated in the current study (\(n = 46\)) compared to the remainder of the total sample (\(n = 73\) of 119) revealed no significant differences between groups. Specifically, no significant group differences
with regard to marital status, household income, race, maternal age, child age, or child
gender were found. Participants did not receive compensation for their participation.

*Procedures*

Participants were recruited with the assistance of local autism support groups and
a regional autism service center. A total of 119 mothers, who completed questionnaires in
Phase I of the study, were contacted with a letter explaining the daily diary portion of the
study. Mothers who did not wish to participate in the study returned a prepaid postcard
indicating their decision. A total of 50 mothers expressed interest in Phase II of the study,
resulting in a 42.0% response rate. The daily diary data was collected over a period of 30
consecutive days. Participants received 10-, 15- or 20-day packets of diaries containing
several questionnaires, which were counterbalanced both across and within participants.

Participants were instructed to respond to the daily items each evening and return
the completed diaries at the end of each designated period (i.e. day 10, day 15, day 20,
and day 30). One of the mothers was not included in the final data analysis because she
did not meet the study requirements of having a child under the age of 18 who was
diagnosed with an ASD, and three mothers were not included because they did not
complete measures utilized in the current study. The total number of days participants
were in the study ranged from 9 to 30 ($M = 25.70$, $SD = 7.15$). The total number of days
in the study for all participants was 1,380 (46 participants x 30 days). The total number of
days of data the participants provided was 1,182 for an 85.6% completion rate. Problems
of missing data on trait measures were minimal, as follow-up correspondence was sent to
participants to obtain missing information. For individual items missing on a scale score,
for daily and trait measures, a mean score was imputed if 80% of the items on the scale had been completed.

Measures

Questionnaire Measures (Phase I)

Optimism. The Life Orientation Test (LOT; Scheier & Carver, 1985) was designed to measure dispositional optimism as it relates to outcome expectancies. The LOT contains 8 items asking participants to indicate their agreement using a 4-point Likert-type scale (1 = strongly agree to 4 = strongly disagree). Sample items included: “In uncertain times, I usually expect the best,” and “I hardly ever expect things to go my way.” Items were reverse coded and a total score was created with a high score indicating greater optimism and lower pessimism. Possible scores ranged from 8 to 32. Cronbach’s alpha for this measure in the current study was .87, indicating high internal consistency. Adequate internal consistency and test-retest reliability has been previously established (Scheier & Carver, 1985).

Perceived Control. The Environmental Mastery Scale (EMS; Ryff & Keyes, 1995) was used to measure the degree to which participants feel they have a sense of mastery and competence in managing the environment and controlling external activities. The EMS contains 14 items asking participants to indicate their agreement using a 5-point Likert-type scale (1 = strongly agree to 5 = strongly disagree). Sample items included: “In general, I feel I am in charge of the situation in which I live,” and “My daily life is busy, but I derive a sense of satisfaction from keeping up with everything.” Selected items were reverse coded. A total score was created with a high score indicating
greater perceived control. Possible scores ranged from 14 to 70. Cronbach’s alpha for this measure in the current study was .93, indicating high internal consistency. Previous studies have found moderate to strong associations between this measure and measures of positive affect, negative affect, life satisfaction, and depression (Ryff & Keyes, 1995).

Daily Measures (Phase II)

*Positive and Negative Affect.* The Positive and Negative Affect Schedule (PANAS; Watson, Clark, & Tellegen, 1988) is a 20-item questionnaire designed to measure two dimensions of mood, 10 items reflecting positive mood and 10 items reflecting negative mood. Participants were instructed to indicate the extent to which they experienced each mood state during that day, using a 7-point Likert-type scale (1 = not at all to 7 = extremely). A total score was created for the two mood dimensions with a high score indicating high levels of that emotion. Possible scores ranged from 10 to 70 for each domain. On Day 1, Cronbach’s alphas were .92 for negative mood and .93 for positive mood. High internal consistency, adequate test-retest reliability, and external validity with measures of distress and psychopathology have been reported (Watson, Clark, & Tellegen, 1988).

*Daily Life Stress.* The Small Life Events Scale (Zautra, Guarnaccia, & Dohrenwend, 1986) was used to evaluate how stressful mothers found events that were not directly related to their child or their role as a parent. For this study, 16 events were chosen from several domains including friend/acquaintance, spouse, family member other than spouse, and health. Participants were asked to indicate if the event had occurred during that day. If the event did occur, participants used a 7-point Likert-type
scale to indicate how stressful the event was (1 = not at all to 7 = extremely). One item representing ‘other events not previously described’ was omitted due to a low response rate. A total score was computed for each day with a high score indicating higher perceived stress. Possible scores ranged from 0 to 105.

*Daily Child Stress.* The Child-Related Stress measure is an 8-item inventory developed for this study to assess the stress experienced by mothers in response to various autism-related symptoms. For each item, mothers indicated whether their child had manifested the specific symptom during that day; if the mother indicated yes, they were then instructed to indicate the degree of stress they experienced in response to that symptom using a 7-point Likert scale (1 = not at all to 7 = extremely). The scale was created by using symptom domains commonly associated with autism spectrum disorder. Symptoms included motor, emotional, sensory, cognitive, communication/comprehension, social interaction, self-regulation, and behavioral difficulties. A total score was computed with a high score indicating higher stress. Possible scores ranged from 0 to 56.

*Analysis Plan*

Hierarchical linear modeling (HLM; Raudenbush & Bryk, 2002) will be used to test all hypotheses in the current study. HLM is commonly used when data have a hierarchical structure, such as variables describing individuals, individuals grouped together, and these groups nested within a larger unit. HLM is appropriate for the current study because there are 30 daily diaries nested within each of the 49 participants. HLM allows the simultaneous estimation of two models, the within-person model and the between-person model. The Level 1 model (i.e. day-level model) addresses questions
pertaining to relationships between within-person variables. For example, on days in which individuals experience above average levels of stress, do they also report high levels of negative affect? Interactions between within-person variables can also be assessed at the day-level. The Level 2 model (i.e. person-level model) allows for the investigation of between-person variability in the day-level relationships (i.e. interindividual differences in intraindividual change). For example, is the role of positive emotions in the stress-negative affect relationship different for those who are high versus low in optimism?

Using HLM provides many benefits compared to other statistical techniques. First, HLM can easily handle missing data. If participants are missing one or more days of data they are not removed from the analyses, as is commonly the case with other methods that employ listwise deletion. HLM takes into account the amount of data available for each person, so that more weight is given to persons with complete data than those with missing data. Thus, HLM uses all available data for each participant. Second, HLM allows for the simultaneous estimation of day- and person-level effects. In each of the HLM models, all day-level variables were centered on individuals’ means, and all person-level variables were centered on sample means (Raudenbush & Bryk, 2002).

In HLM models the researcher specifies whether a given effect is random or fixed. A random effect implies that the relationship is different for individuals in the study, whereas a fixed effect states that the relationship is the same across individuals (Raudenbush & Bryk, 2002). In the present all models will begin by specifying each effect to be random. However, each random effect that is specified increases the number of parameters that are estimated and may affect the power to determine the true
relationship (Raudenbush & Bryk, 2002). Conversely, specifying all effects as fixed may also introduce bias. Following the suggestions of Raudenbush and Bryk (2002) the current study will utilize the following method to determine the specification of random versus fixed effects: (1) if the fixed effects and random effects components of a specific variable are significant, then the variable will continue to be specified as random in that model and all subsequent models; (2) if the fixed effects component is significant and the random effects component is non-significant, then the effect will continue to be specified as random in that model and all subsequent models; (3) if the random effects component is significant and the fixed effects component is non-significant, then the effect will continue to be specified as random in that model and all subsequent models; and (4) if both the fixed and random effects are non-significant then the effect will be specified as fixed in that model and all subsequent models. If the effect is still non-significant after specifying it as fixed, then it will be removed from that model and all subsequent models.
RESULTS

Data analyses proceeded in several steps. First, descriptive analyses and correlations between daily diary measures and trait measures were examined as a preliminary indication of the overall degree of association between variables. Second, analyses were conducted to determine whether any potential covariates, such as maternal or child demographics needed to be included in further analyses. Third, HLM analyses were conducted to test each of the research questions. Models were specified in an iterative fashion, building from unconditional models to day-level conditional models, and then, finally, testing person-level models.

Descriptive Statistics

Descriptive statistics and correlations between day-level and person-level variables were conducted. Scores for the daily measures were averaged across time to create a composite variable reflecting each participant’s mean level of negative affect, positive affect, life stress, and child stress (see Table 1). A repeated measures ANOVA was conducted to test for differences between positive affect and negative affect, and also between life stress and child stress. In general, mothers reported higher levels of positive affect, as compared to negative affect ($F(1, 45) = 83.01, p < .001$), and greater perceived stress related to their child as compared to perceived life stress ($F(1, 45) = 16.72, p < .001$). Mothers were reporting similar ranges of positive affect and negative affect scores, as well as similar ranges for life stress and child stress; however, it is important to note that the possible range for life stress (0 – 105) was much greater than that for child stress.
(0 – 56), providing further support that child stress levels were elevated compared to life stress.

### TABLE 1

DESCRIPTIVE STATISTICS

<table>
<thead>
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<th>Variable</th>
<th>Range</th>
<th>Mean</th>
<th>SD</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Negative Affect</td>
<td>10.3 – 58.5</td>
<td>18.29</td>
<td>8.33</td>
</tr>
<tr>
<td>2. Positive Affect</td>
<td>11.2 – 57.1</td>
<td>38.58</td>
<td>10.57</td>
</tr>
<tr>
<td>3. Life Stress</td>
<td>.00 – 27.5</td>
<td>5.97</td>
<td>5.66</td>
</tr>
<tr>
<td>4. Child Stress</td>
<td>.03 – 32.6</td>
<td>10.42</td>
<td>8.42</td>
</tr>
<tr>
<td>5. Perceived Control</td>
<td>26.0 – 66.0</td>
<td>46.80</td>
<td>10.16</td>
</tr>
<tr>
<td>6. Optimism</td>
<td>16.0 – 30.0</td>
<td>22.64</td>
<td>3.58</td>
</tr>
</tbody>
</table>

As shown in Table 2, correlation analyses indicated that daily negative affect was associated with increased perceived life and child stress. Daily positive affect, however, was not significantly associated with any of the daily measures. Daily negative affect and perceived life stress were each associated with lower levels of perceived control and lower optimism. Daily child stress, however, was not significantly associated with dispositional personality characteristics. Daily positive affect, on the other hand, was associated with higher levels of perceived control and higher optimism. All tests involving demographic variables and questionnaire variables were non-significant. Therefore, all subsequent analyses will be conducted without controlling for demographic variables.
### TABLE 2
**CORRELATIONS**

<table>
<thead>
<tr>
<th>Variable</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Negative Affect</td>
<td>--</td>
<td>--</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. Positive Affect</td>
<td>-.27</td>
<td>--</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>3. Life Stress</td>
<td>.64***</td>
<td>-.15</td>
<td>--</td>
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<td></td>
<td></td>
</tr>
<tr>
<td>4. Child Stress</td>
<td>.40**</td>
<td>-.02</td>
<td>.51***</td>
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<td>5. Perceived Control</td>
<td>-.46**</td>
<td>.45**</td>
<td>-.37*</td>
<td>-.19</td>
<td>--</td>
<td></td>
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<tr>
<td>6. Optimism</td>
<td>-.36*</td>
<td>.46***</td>
<td>-.32*</td>
<td>-.19</td>
<td>.61***</td>
<td>--</td>
</tr>
</tbody>
</table>

* p ≤ .05; ** p ≤ .01; *** p ≤ .001

**Unconditional Models**

The first set of analyses examined the variance in the outcome measure across people without regard to time or any other predictor and is referred to as the *unconditional means model* (Singer & Willett, 2003). The day-level unconditional means model is as follows:

\[ NA_{ij} = \beta_{0j} + r_{ij}. \]

This model specifies that \( NA_{ij} \) is a daily negative affect score for person \( j \) on day \( i \), \( \beta_{0j} \) refers to the random coefficient representing the mean of negative affect for person \( j \) (across the \( i \) days for which each person provided data), and \( r_{ij} \) represents the residual. The day-level residual is a within-person deviation and the variance is also within-person. The person-level unconditional means model is as follows:

\[ \beta_{0j} = \gamma_{00} + u_{0j}. \]
This model specifies that $\gamma_{00}$ is the grand mean of the person-specific means ($\beta_{0j}$) from the day-level model, and $u_{0j}$ represents the residual. The person-level residual is a between-person deviation and the variance is also between-person.

The purpose of testing an unconditional means model is to estimate the variance components and assess the amount of variation in the outcome variable that exists at each level. The hypothesis tests associated with this model determine whether there is any variation at each level that could be explained by the inclusion of additional predictors. If the variance component at a given level is zero, this indicates that there is no variation to be explained and no further predictors should be added to that level. If the variance component at a given level is non-zero, then there is some variation that could possibly be explained by adding predictors to the model (Singer & Willett, 2003). This model also allows for the examination of the relative magnitude of the within-person and between-person variance components. The intraclass correlation coefficient, $\rho$, can be used to describe the proportion of the total outcome variation that lies between people (Singer & Willett, 2003). As shown in Table 2, each of the daily diary measures consisted of both considerable within-person and between-person variability that were significantly different from zero. Therefore, the addition of variables at both the day-level and person-level was appropriate.

The second unconditional model is referred to as the *unconditional growth model* (Singer & Willett, 2003). This model describes and partitions the variance in the outcome measure with respect to people and time. The day-level unconditional means model is as follows:
### TABLE 3

**VARIANCE COMPONENTS, INTRACLASS CORRELATIONS, AND RELIABILITIES OF DAILY DIARY MEASURES**

<table>
<thead>
<tr>
<th></th>
<th>Mean</th>
<th>Between-Person Variance</th>
<th>Within-Person Variance</th>
<th>$\chi^2$ ($df = 45$)</th>
<th>Intraclass Correlation ($\rho$)</th>
<th>Reliability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative Affect</td>
<td>18.23</td>
<td>64.38 (57%)</td>
<td>48.95 (43%)</td>
<td>1114.31***</td>
<td>.57</td>
<td>.97</td>
</tr>
<tr>
<td>Positive Affect</td>
<td>38.55</td>
<td>109.03 (65%)</td>
<td>59.10 (35%)</td>
<td>2171.07***</td>
<td>.65</td>
<td>.98</td>
</tr>
<tr>
<td>Life Stress</td>
<td>5.91</td>
<td>29.28 (46%)</td>
<td>34.21 (54%)</td>
<td>803.38***</td>
<td>.46</td>
<td>.95</td>
</tr>
<tr>
<td>Child Stress</td>
<td>10.40</td>
<td>69.25 (64%)</td>
<td>39.32 (36%)</td>
<td>2098.07***</td>
<td>.64</td>
<td>.98</td>
</tr>
</tbody>
</table>

*** $p < .001$

$NA_{ij} = \beta_{0j} + \beta_{1j}(\text{day}) + r_{ij}$.

This model specifies that $NA_{ij}$ is a daily negative affect score for person $j$ on day $i$, $\beta_{0j}$ refers to the random coefficient representing the intercept of negative affect for person $j$ (across the $i$ days for which each person provided data), $\beta_{1j}(\text{day})$ is a random coefficient representing a slope for negative affect, and $r_{ij}$ represents the residual. The day-level residual is now the within-person deviation from the true change trajectory and the residual variance represents the within-person variation around his or her unique trajectory. The person-level unconditional means model is as follows:

$\beta_{0j} = \gamma_{00} + u_{0j}$.

$\beta_{1j} = \gamma_{10} + u_{1j}$.
This model specifies that the individual growth parameters ($\beta_{0j}$ and $\beta_{1j}$) are the sum of an intercept ($\gamma_{00}$ or $\gamma_{10}$) and a person-level residual ($u_{0j}$ or $u_{1j}$). The person-level residual now represents between-person variability in initial status and rates of change.

Similar to the previous model, the primary purpose of testing an unconditional growth model is to estimate the variance components and assess the amount of variation in the outcome variable that exists at each level; however, this model also involves comparison to the unconditional means model to determine whether the inclusion of time is necessary. If the trajectory is linear, then the unconditional growth model will do a better job of predicting the outcome as compared to the unconditional means model. This will result in a small day-level residual and a smaller day-level residual variance. Comparing the variances of the two models allows the specification of the within-person variance associated with linear time. Similar to the previous model, if the variance component at a given level is zero, this indicates that there is no variation to be explained and no further predictors should be added to that level. If the variance component at a given level is non-zero, then there is some variation that could be explained by adding predictors to the model (Singer & Willett, 2003).

Unconditional growth models were conducted for each of the daily diary measures. For all models, the time variable was centered on individuals’ means. Results indicated that negative affect significantly decreased across the course of the study, $\gamma_{10} = -.12$, $t (45) = -2.23$, $p < .05$. For each day the study progressed, negative affect decreased .12 units. The variance component was significantly different from zero ($\chi^2(45) = 218.74$, $p < .001$), and the inclusion of day of the study explained 14% of the variance in negative affect. Life stress also significantly decreased across the 30 days of the study, $\gamma_{10} = -.11$, $t$
(45) = -2.69, \( p < .05 \), indicating that life stress decreased .11 units each day of the study.

The variance component was significantly different from zero (\( \chi^2(45) = 150.70, \ p < .001 \)), and the inclusion of day of the study explained 10% of the variance in daily life stress. No significant linear trend was found for positive affect or child stress; however, the variance components of each variable were significantly different from zero (positive affect: \( \chi^2(45) = 148.76, \ p < .001 \); child stress: \( \chi^2(45) = 121.77, \ p < .001 \)), and the inclusion of day of the study explained 8% and 6% of the variance in positive affect and child stress, respectively. Given the results of the unconditional growth models, all subsequent models include day of the study as a control variable.

**Research Question 1: To what extent are perceived stress and negative affect related to one another within the same day?** Day-level negative affect was estimated using the following equation:

\[
NA_{ij} = \beta_{0j} + \beta_{1j}(\text{Day}) + \beta_{2j}(\text{Life Stress}) + \beta_{3j}(\text{Child Stress}) + \beta_{4j}(\text{Life Stress} \times \text{Child Stress}) + r_{ij}
\]

where \( NA \) is a daily negative affect score for person \( j \) on day \( i \), \( \beta_{0j} \) is a random coefficient representing the intercept of \( NA \) (a person’s average negative affect) for person \( j \) (across the \( i \) days for which each person provided data), \( \beta_{1j}(\text{Day}) \) is a random coefficient for day of study, \( \beta_{2j}(\text{Life Stress}) \) is a random coefficient for perceived stress related to daily negative life events, \( \beta_{3j}(\text{Child Stress}) \) is a random coefficient for perceived stress related to child events, \( \beta_{4j}(\text{Life Stress} \times \text{Child Stress}) \) is a random coefficient representing the interaction between stress related to life events and stress related to the child, and \( r_{ij} \) represents the residual.
To determine if day-level relationships were significant, day-level slopes were analyzed at the person level with the following model:

Intercept: $\beta_{0j} = \gamma_{00} + u_{0j}$.

Day: $\beta_{1j} = \gamma_{10} + u_{1j}$.

Life Stress: $\beta_{2j} = \gamma_{20} + u_{2j}$.

Child Stress: $\beta_{3j} = \gamma_{30} + u_{3j}$.

Life Stress X Child Stress: $\beta_{4j} = \gamma_{40} + u_{4j}$.

In this model, $\gamma_{00}$ represents the mean intercept, $\gamma_{10}$ represents the mean day of study slope, and $\gamma_{20}$, $\gamma_{30}$, and $\gamma_{40}$ represent the mean life stress, child stress, and stress interaction slopes, respectively. The significance of these terms indicated that, on average, the day-level relationships were significantly different from zero. The results of this model are presented in Table 4.

As hypothesized, daily perceived stress was significantly associated with daily negative affect. The $\gamma_{20}$ and $\gamma_{30}$ coefficients were significantly different from zero. The coefficients can be interpreted as unstandardized regression coefficients. Therefore, on days of above average life stress, negative affect was also greater, $\gamma_{20} = .31$, $t(45) = 3.78$, $p < .01$. For every unit increase in daily life stress, mean daily negative affect increased .31 units. A similar relationship was found for daily child stress (see Table 4). The interaction between the two types of perceived stress was non-significant.

*Research Question 2: Does perceived stress have a carry-over effect and influence negative affect on subsequent days?* In order to test this hypothesis, lagged
Table 4

Parameter Estimates for the Within-Day Relationship Between Perceived Stress and Negative Affect

<table>
<thead>
<tr>
<th>Parameter</th>
<th>B(SE)</th>
<th>t</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>17.47(1.06)</td>
<td>16.50</td>
<td>45</td>
<td>.001</td>
</tr>
<tr>
<td>Day</td>
<td>-.07(.05)</td>
<td>-1.35</td>
<td>45</td>
<td>ns</td>
</tr>
<tr>
<td>Life Stress</td>
<td>.31(.08)</td>
<td>3.78</td>
<td>45</td>
<td>.01</td>
</tr>
<tr>
<td>Child Stress</td>
<td>.22(.06)</td>
<td>3.61</td>
<td>45</td>
<td>.01</td>
</tr>
<tr>
<td>Life Stress X Child Stress</td>
<td>.01(.00)</td>
<td>1.94</td>
<td>45</td>
<td>ns</td>
</tr>
</tbody>
</table>

Associations between daily stress and daily negative affect were examined. The current study assessed lagged effects for only one day. Thus, daily stress on day \( t \) is hypothesized to affect change in daily negative affect from day \( t \) to day \( t + 1 \). To rule out the possibility that any lagged effect of stress on negative affect might be an artifact of initial negative affect, initial affect was included in the model as a control variable. In such a model the dependent variable can be interpreted as residualized change in negative affect from day \( t \) to day \( t + 1 \) (Kessler & Greenberg, 1981). The model testing for changes in negative affect as a result of daily stress can be written as follows:

\[
NA_{t+1} = \beta_{0j} + \beta_{1j}(Day) + \beta_{2j}(NA_t) + \beta_{3j}(Life Stress_t) + \beta_{4j}(Child Stress_t) + \beta_{5j}(Life Stress_t \times Child Stress_t) + r_{t+1},
\]

where \( NA_{t+1} \) is the residualized change in negative affect scores between day \( t \) and day \( t + 1 \), \( \beta_{0j} \) is the regression intercept for person \( j \), \( \beta_{1j}(Day) \) is a random coefficient.
representing the day of the study, \( \beta_2(\text{NA}_t) \) is a random coefficient representing an individual’s negative affect on day \( t \), \( \beta_3(\text{Life Stress}_t) \) represents an individual’s perceived stress related to life events on day \( t \), \( \beta_4(\text{Child Stress}_t) \) represents an individual’s perceived stress related to child events on day \( t \), \( \beta_5(\text{Life Stress}_t \times \text{Child Stress}_t) \) is a random coefficient representing the interaction between life event stress on day \( t \) and child related stress on day \( t \), and \( r_{t+1} \) is a residual component of change in negative affect.

To determine if day-level relationships were significant, day-level slopes were analyzed at the person level with the following model:

Intercept: \( \beta_{0j} = \gamma_{00} + u_{0j} \).

Day: \( \beta_{1j} = \gamma_{10} + u_{1j} \).

\( \text{NA}_t \): \( \beta_{2j} = \gamma_{20} + u_{2j} \).

Life Stress: \( \beta_{3j} = \gamma_{30} + u_{3j} \).

Child Stress: \( \beta_{4j} = \gamma_{40} + u_{4j} \).

Life Stress \( \times \) Child Stress: \( \beta_{5j} = \gamma_{50} + u_{5j} \).

In this model, \( \gamma_{00} \) represents the mean intercept, \( \gamma_{10} \) represents the mean day of study slope, and \( \gamma_{20}, \gamma_{30}, \gamma_{40}, \) and \( \gamma_{50} \) represent the mean negative affect on day \( t \), life stress on day \( t \), child stress on day \( t \), and stress interaction on day \( t \) slopes, respectively. The significance of these terms indicated that, on average, the day-level relationships were significantly different from zero. The results of this model are presented in Table 5.
In contrast to the within-day analyses described in research question one, the results of this model indicated that the effect of each type of perceived stress was non-significant whereas the interaction between life stress and child stress was significant, $\gamma_{50} = -.01$, $t(45) = -2.38, p < .05$. Each unit increase in life stress was associated with a .01 unit decrease in the child stress-next day negative affect slope. Aiken and West’s (1991) procedures for probing significant interaction effects were followed to generate separate stress and negative affect regression lines for days of high (one standard deviation above the mean) and low (one standard deviation below the mean) child stress. As shown in Figure 1, the relationship between perceived child stress and next day’s negative affect was negligible for days in which life stress was below average. In contrast, on days in which life stress was above average, there was an inverse relationship between child
stress and next day’s negative affect. In other words, negative affect was lower following days in which both child and life stress were above average.

Figure 1: Relationship between child stress and next day’s negative affect as a function of life stress.

To examine the reciprocal relationship between negative affect and next day’s stress, two separate models were tested. The equation for the first model was as follows:

\[
\text{Child Stress}_{t+1} = \beta_0 + \beta_1 \text{(Day)} + \beta_2 \text{(Child Stress}_t) + \beta_3 \text{(NA}_t) + r_{t+1}.
\]

where \( \text{Child Stress}_{t+1} \) is the residualized change in child stress scores between day \( t \) and day \( t + 1 \), \( \beta_0 \) is the regression intercept for person \( j \), \( \beta_1 \text{(Day)} \) is a coefficient representing the day of the study, \( \beta_2 \text{(Child Stress}_t) \) is a coefficient representing an individual’s perceived child stress on day \( t \), \( \beta_3 \text{(NA}_t) \) represents an individual’s negative affect on day \( t \), and \( r_{t+1} \) is a residual component of change in negative affect.

To determine if day-level relationships were significant, day-level slopes were analyzed at the person level with the following model:
Intercept: $\beta_{0j} = \gamma_{00} + u_{0j}$.

Day: $\beta_{1j} = \gamma_{10} + u_{1j}$.

Child Stress: $\beta_{2j} = \gamma_{20} + u_{2j}$.

NA: $\beta_{3j} = \gamma_{30} + u_{3j}$.

In this model, $\gamma_{00}$ represents the mean intercept, $\gamma_{10}$ represents the mean day of study slope, and $\gamma_{20}$ and $\gamma_{30}$ represent the mean child stress on day $t$ and negative affect on day $t$, respectively. The significance of these terms indicated that, on average, the day-level relationships were significantly different from zero. An identical model was tested for life stress. As shown in Table 6, when controlling for current day’s perceived stress, negative affect was not significantly associated with next day’s perceived life stress or child stress.

**Research Question 3: Does positive affect promote resistance to stress?** First, the direct relationship between positive affect and negative affect was explored. The following equation was analyzed:

$$NA_{ij} = \beta_{0j} + \beta_{1j}(Day) + \beta_{2j}(Positive \ Affect) + \beta_{3j}(Life \ Stress) + \beta_{4j}(Child \ Stress) + r_{ij}.$$  

where $NA$ is a daily negative affect score for person $j$ on day $i$, $\beta_{0j}$ is a random coefficient representing the intercept of NA (a person’s average negative affect) for person $j$ (across the $i$ days for which each person provided data), $\beta_{1j}(Day)$ is a random coefficient for day of study, $\beta_{2j}(Positive \ Affect)$ is a random coefficient for positive affect, $\beta_{3j}(Life \ Stress)$ is a random coefficient for perceived stress related to life events, $\beta_{4j}(Child \ Stress)$ is a random coefficient representing perceived stress related to the child, and $r_{ij}$ represents the residual.
**TABLE 6**

PARAMETER ESTIMATES FOR THE RELATIONSHIP BETWEEN NEGATIVE AFFECT AND NEXT DAY’S PERCEIVED STRESS

<table>
<thead>
<tr>
<th></th>
<th>(B(SE))</th>
<th>(t)</th>
<th>(df)</th>
<th>(p&lt;)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Child Stress</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>10.35(1.25)</td>
<td>8.28</td>
<td>45</td>
<td>.001</td>
</tr>
<tr>
<td>Day</td>
<td>.01(.03)</td>
<td>.21</td>
<td>45</td>
<td>ns</td>
</tr>
<tr>
<td>Child Stress,(^a)</td>
<td>.08(.03)</td>
<td>2.35</td>
<td>1111</td>
<td>.05</td>
</tr>
<tr>
<td>NA(_t), (^a)</td>
<td>.01(.03)</td>
<td>.20</td>
<td>1111</td>
<td>ns</td>
</tr>
<tr>
<td><strong>Life Stress</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Intercept</td>
<td>5.73(.81)</td>
<td>7.04</td>
<td>45</td>
<td>.001</td>
</tr>
<tr>
<td>Day(^a)</td>
<td>-.02(.02)</td>
<td>-.99</td>
<td>1111</td>
<td>ns</td>
</tr>
<tr>
<td>Life Stress,(^a)</td>
<td>.08(.03)</td>
<td>2.52</td>
<td>1111</td>
<td>.05</td>
</tr>
<tr>
<td>NA(_t)</td>
<td>.01(.04)</td>
<td>.15</td>
<td>45</td>
<td>ns</td>
</tr>
</tbody>
</table>

\(^a\) Effects specified as fixed.

Note: See Appendix for full description of decision-making process for specifying fixed effects.

To determine if day-level relationships were significant, day-level slopes were analyzed at the person level with the following model:

- **Intercept**: \(\beta_{0j} = \gamma_{00} + u_{0j}\).
- **Day**: \(\beta_{1j} = \gamma_{10} + u_{1j}\).
- **Positive Affect**: \(\beta_{2j} = \gamma_{20} + u_{2j}\).
- **Life Stress**: \(\beta_{3j} = \gamma_{30} + u_{3j}\).
Child Stress: $\beta_{4j} = \gamma_{40} + u_{4j}$.

In this model, $\gamma_{00}$ represents the mean intercept, $\gamma_{10}$ represents the mean day of study slope, and $\gamma_{20}$, $\gamma_{30}$, and $\gamma_{40}$ represent the mean positive affect, life stress, and child stress slopes, respectively. The significance of these terms indicated that, on average, the day-level relationships were significantly different from zero. The results of this model are presented in Table 7 and, within the same day, positive affect was inversely associated with negative affect, $\gamma_{20} = -0.17$, $t(45) = -3.74$, $p < .01$. For every unit increase in positive affect, negative affect decreased .17 units.

**TABLE 7**

<table>
<thead>
<tr>
<th></th>
<th>$B(\text{SE})$</th>
<th>$t$</th>
<th>$df$</th>
<th>$p&lt;$</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>18.27(1.21)</td>
<td>15.06</td>
<td>45</td>
<td>.001</td>
</tr>
<tr>
<td>Day</td>
<td>-.09(.06)</td>
<td>-1.70</td>
<td>45</td>
<td>ns</td>
</tr>
<tr>
<td>Positive Affect</td>
<td>-.17(.04)</td>
<td>-3.74</td>
<td>45</td>
<td>.01</td>
</tr>
<tr>
<td>Life Stress</td>
<td>.30(.05)</td>
<td>6.30</td>
<td>45</td>
<td>.001</td>
</tr>
<tr>
<td>Child Stress</td>
<td>.23(.05)</td>
<td>4.68</td>
<td>45</td>
<td>.001</td>
</tr>
</tbody>
</table>

The primary purpose of this research question was to assess whether positive affect serves to decrease the relationship between perceived stress and negative affect. In other words, this question tests whether positive affect moderates the relationship
between stress and negative affect. To test this research question the following equation was analyzed:

\[ NA_{ij} = \beta_{0j} + \beta_{1j}(\text{Day}) + \beta_{2j}(\text{Positive Affect}) + \beta_{3j}(\text{Life Stress}) + \beta_{4j}(\text{Child Stress}) + \beta_{5j}(\text{Life Stress X Child Stress}) + \beta_{6j}(\text{Life Stress X Positive Affect}) + \beta_{7j}(\text{Child Stress X Positive Affect}) + \beta_{8j}(\text{Life Stress X Child Stress X Positive Affect}) + r_{ij}. \]

where \( NA \) is a daily negative affect score for person \( j \) on day \( i \), \( \beta_{0j} \) is a coefficient representing the intercept of NA (a person’s average negative affect) for person \( j \) (across the \( i \) days for which each person provided data), \( \beta_{1j}(\text{Day}) \) is a coefficient for day of study, \( \beta_{2j}(\text{Positive Affect}) \) is a coefficient representing daily positive affect, \( \beta_{3j}(\text{Life Stress}) \) is a coefficient for perceived stress related to daily negative life events, \( \beta_{4j}(\text{Child Stress}) \) is a coefficient for perceived stress related to child events, \( \beta_{5j}(\text{Life Stress X Child Stress}) \) represents the interaction between stress related to life events and stress related to the child, \( \beta_{6j}(\text{Life Stress X Positive Affect}) \) represents the interaction between life events stress and positive affect, \( \beta_{7j}(\text{Child Stress X Positive Affect}) \) is the interaction between child events stress and positive affect, \( \beta_{8j}(\text{Life Stress X Child Stress X Positive Affect}) \) is the three-way interaction between daily stress and positive affect, and \( r_{ij} \) represents the residual.

To determine if day-level relationships were significant, day-level slopes were analyzed at the person level with the following model:

- Intercept: \( \beta_{0j} = \gamma_{00} + u_{0j} \).
- Day: \( \beta_{1j} = \gamma_{10} + u_{1j} \).
- Positive Affect: \( \beta_{2j} = \gamma_{20} + u_{2j} \).
- Life Stress: \( \beta_{3j} = \gamma_{30} + u_{3j} \).
Child Stress: $\beta_{4j} = \gamma_{40} + u_{4j}$.

Life Stress X Child Stress: $\beta_{5j} = \gamma_{50} + u_{5j}$.

Life Stress X Positive Affect: $\beta_{6j} = \gamma_{60} + u_{6j}$.

Child Stress X Positive Affect: $\beta_{7j} = \gamma_{70} + u_{7j}$.

Life Stress X Child Stress X Positive Affect: $\beta_{8j} = \gamma_{80} + u_{8j}$.

In this model, $\gamma_{00}$ represents the mean intercept, $\gamma_{10}$ represents the mean day of study slope, and $\gamma_{20}$, $\gamma_{30}$, $\gamma_{40}$, $\gamma_{50}$, $\gamma_{60}$, $\gamma_{70}$, and $\gamma_{80}$ represent the mean positive affect, life stress, child stress, stress interaction, and positive affect X stress interactions, respectively. The significance of these terms indicated that, on average, the day-level relationships were significantly different from zero. The results of this model are presented in Table 8. For the purposes of this research question, the primary coefficients of interest are $\gamma_{60}$, $\gamma_{70}$, and $\gamma_{80}$.

As shown in Table 8, several significant results emerged from this model. In support of hypothesis 3, a significant three-way interaction between life stress, child stress, and positive affect was found, $\gamma_{80} = .001$, $t(45) = 2.02$, $p < .05$. Aiken and West’s (1991) procedures for probing significant interaction effects were followed to generate separate stress and negative affect regression lines for days of high (one standard deviation above the mean) and low (one standard deviation below the mean) child stress. As shown in Figure 2, on days when life stress and child stress were below average (represented by line four in Figure 2), there was an inverse relationship between positive affect and negative affect. A similar relationship between positive affect and negative affect was found on days in which one type of stress was above average and the other type was below average (represented by lines two and three in Figure 2). Using a
computer program created by Dawson and Richter (2006), follow-up tests comparing the three slopes found no significant differences ($t(2 \text{ vs. } 3) = -0.14, p > .05; t(2 \text{ vs. } 4) = -0.77, p > .05; t(3 \text{ vs. } 4) = -0.44, p > .05$). In contrast, on days when both child stress and life stress were above average (represented by line one in Figure 2), there was a positive relationship between positive affect and negative affect. Follow-up tests comparing this slope (line one) with the remaining slopes were significant ($t(1 \text{ vs. } 2) = 2.84, p < .01; t(1 \text{ vs. } 3) = 2.47, p < .05; t(1 \text{ vs. } 4) = 2.49, p < .05$). Taken together, these results suggest that positive affect may only serve as a protective factor on days when neither, or only one type of stress is elevated.

![Figure 2: Within-day relationship life stress and negative affect as a function of child stress and positive affect.](image)
TABLE 8
PARAMETER ESTIMATES FOR THE WITHIN-DAY RELATIONSHIP BETWEEN NEGATIVE AFFECT, PERCEIVED STRESS, AND POSITIVE AFFECT

<table>
<thead>
<tr>
<th></th>
<th>B(SE)</th>
<th>t</th>
<th>df</th>
<th>p&lt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>17.89(1.16)</td>
<td>15.43</td>
<td>45</td>
<td>.001</td>
</tr>
<tr>
<td>Day</td>
<td>-.10(.05)</td>
<td>-2.12</td>
<td>45</td>
<td>.05</td>
</tr>
<tr>
<td>Positive Affect</td>
<td>-.17(.04)</td>
<td>-3.73</td>
<td>45</td>
<td>.01</td>
</tr>
<tr>
<td>Life Stress</td>
<td>.26(.05)</td>
<td>5.49</td>
<td>45</td>
<td>.001</td>
</tr>
<tr>
<td>Child Stress</td>
<td>.24(.05)</td>
<td>4.96</td>
<td>45</td>
<td>.001</td>
</tr>
<tr>
<td>Life Stress X Child Stress</td>
<td>.01(.00)</td>
<td>4.62</td>
<td>1160</td>
<td>.001</td>
</tr>
<tr>
<td>Life Stress X Positive Affect</td>
<td>-.002(.003)</td>
<td>-.71</td>
<td>1160</td>
<td>ns</td>
</tr>
<tr>
<td>Child Stress X Positive Affect</td>
<td>.001(.002)</td>
<td>.43</td>
<td>1160</td>
<td>ns</td>
</tr>
<tr>
<td>Life Stress X Child Stress X</td>
<td>.001(.0003)</td>
<td>2.02</td>
<td>45</td>
<td>.05</td>
</tr>
<tr>
<td>Positive Affect</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

*Effects specified as fixed.

In addition to testing whether positive affect moderated the relationship between perceived stress and negative affect, the present study also explored whether positive affect mediated the relationship between perceived stress and negative affect. For this research question all of the variables involved in the model were measured at the day-level. Therefore, this process is referred to as lower level mediation (Bauer, Preacher, & Gil, 2006; Kenny, Korchmaros, & Bolger, 2003). In lower level mediation all three of the effects being tested can be random. This means that these effects may later be explained
by the inclusion of person-level predictors. The lower level mediation model can be written with two equations:

\[ \text{PA}_{ij} = d_J + a_j \text{Life Stress}_{ij} + e_{Pij} \]
\[ \text{NA}_{ij} = d_Y + b_j \text{PA}_{ij} + c'_j \text{Life Stress}_{ij} + e_{Nij}. \]

where PA is a daily positive affect score for person j on day i, \( d_Mj \) is a random coefficient representing the intercept of PA (a person’s average positive affect) for person j (across the i days for which each person provided data), \( a_j \) is the effect of life stress on positive affect, NA is a daily negative affect score for person j on day i, \( d_Yj \) is a random coefficient representing the intercept of NA (a person’s average negative affect) for person j (across the i days for which each person provided data), \( b_j \) is the effect of positive affect on negative affect, \( c'_j \) is the direct effect of life stress on negative affect when positive affect is included in the model, \( e_{Pij} \) and \( e_{Nij} \) are day-level residuals for positive affect and negative affect, respectively. These two equations were combined and HLM software used to test the model. An identical model was tested separately for child stress.

As shown in Figure 3, each of the paths in the model involving life stress was significant. Specifically, higher levels of life stress were associated with lower levels of positive affect, which, in turn, predicted lower levels of negative affect. Higher levels of life stress were directly associated with increased negative affect. Given that the direct effect between life stress and negative affect remained significant, it was possible that positive affect only partially mediated this relationship. Following the suggestion of Bauer and colleagues (2006), the random indirect and total effects were calculated and 95% confidence intervals computed to determine whether full mediation or partial mediation was present. If the 95% confidence interval for the indirect effect contained
zero, then it was concluded that partial mediation was found. In the life stress model, the random indirect effect was .04 ($SE = .03$) and the 95% confidence interval contained zero (-.01 to .09). The random total effect was .43 ($SE = .05$) and the 95% confidence interval did not contain zero (.33 to .53). Sixty-six percent of the total effect was found to be indirect via positive affect. In sum, positive affect was found to partially mediate the relationship between life stress and negative affect.

![Diagram showing the relationship between life stress, positive affect, and negative affect]

Figure 3: Positive Affect as a Mediator of the Relationship Between Life Stress and Negative Affect. **$p<.01$ ***$p<.001$.

As shown in Figure 4, each of the paths in the model involving child stress was also significant. Specifically, higher levels of child stress were associated with lower levels of positive affect, which, in turn, predicted lower levels of negative affect. Higher levels of child stress were directly associated with increased negative affect. Given that the direct effect between child stress and negative affect remained significant, it was possible that positive affect only partially mediated this relationship. Following the suggestion of Bauer and colleagues (2006), the random indirect and total effects were calculated and 95% confidence intervals computed to determine whether full mediation or partial mediation was present. If the 95% confidence interval for the indirect effect contained zero, then it was concluded that partial mediation was found. In the child stress model, the random indirect effect was .01 ($SE = .01$) and the 95% confidence interval
contained zero (.004 to .03). The random total effect was .37 ($SE = .06$) and the 95% confidence interval did not contain zero (.25 to .49). Sixty-one percent of the total effect was found to be indirect via positive affect. In sum, positive affect was found to partially mediate the relationship between life stress and negative affect.

Figure 4: Positive Affect as a Mediator of the Relationship Between Child Stress and Negative Affect. *$p<.05$ **$p<.001$. 

**Research Question 4: Does positive affect promote recovery from stress?** To test this research question a similar set of analyses, as in research question three, were conducted; however, the outcome variable was next day’s negative affect and the current days’ negative affect was controlled for. First, the direct relationship between positive affect and next day’s negative affect was explored. The following equation was analyzed:

\[
NA_{t+1} = \beta_0 + \beta_{1j}(\text{Day}) + \beta_{2j}(NA_t) + \beta_{3j}(\text{Positive Affect}_t) + \beta_{4j}(\text{Life Stress}_t) + \beta_{5j}(\text{Child Stress}_t) + r_{t+1}.
\]

where $NA_{t+1}$ is the residualized change in negative affect scores between day $t$ and day $t+1$, $\beta_{0j}$ is the regression intercept for person $j$, $\beta_{1j}(\text{Day})$ is a random coefficient representing the day of the study, $\beta_{2j}(NA_t)$ is a random coefficient representing an individual’s negative affect on day $t$, $\beta_{3j}(\text{Positive Affect}_t)$ represents an individual’s
positive affect on day $t$, $\beta_{4j}(\text{Life Stress}_t)$ represents an individual’s perceived stress related to life events on day $t$, $\beta_{5j}(\text{Child Stress}_t)$ represents an individual’s perceived stress related to child events day $t$, and $r_{t+1}$ is a residual component of change in negative affect.

To determine if day-level relationships were significant, day-level slopes were analyzed at the person level with the following model:

- Intercept: $\beta_{0j} = \gamma_{00} + u_{0j}$.
- Day: $\beta_{1j} = \gamma_{10} + u_{1j}$.
- NA: $\beta_{2j} = \gamma_{20} + u_{2j}$.
- Positive Affect: $\beta_{3j} = \gamma_{30} + u_{3j}$.
- Life Stress: $\beta_{4j} = \gamma_{40} + u_{4j}$.
- Child Stress: $\beta_{5j} = \gamma_{50} + u_{5j}$.

In this model, $\gamma_{00}$ represents the mean intercept, $\gamma_{10}$ represents the mean day of study slope, and $\gamma_{20}$, $\gamma_{30}$, $\gamma_{40}$, and $\gamma_{50}$ represent the mean negative affect on day $t$, positive affect on day $t$, life stress on day $t$, and child stress on day $t$ slopes, respectively. The significance of these terms indicated that, on average, the day-level relationships were significantly different from zero. The results of this model are presented in Table 9; positive affect was positively associated with next day’s negative affect, $\gamma_{30} = .08$, $t(45) = 2.49$, $p < .001$. For every unit increase in positive affect, negative affect decreased by .08 units the following day.

The primary purpose of this research question was to assess whether positive affect serves to decrease the relationship between perceived stress and next day’s negative affect. In other words, this question tests whether positive affect moderates the
TABLE 9
PARAMETER ESTIMATES FOR THE RELATIONSHIP BETWEEN POSITIVE
AFFECT AND NEXT DAY’S NEGATIVE AFFECT

<table>
<thead>
<tr>
<th>Parameter</th>
<th>(B(\text{SE}))</th>
<th>(t)</th>
<th>(df)</th>
<th>(p&lt;)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
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<td>14.78</td>
<td>45</td>
<td>.001</td>
</tr>
<tr>
<td>Day</td>
<td>-.07(.03)</td>
<td>-1.97</td>
<td>45</td>
<td>(ns)</td>
</tr>
<tr>
<td>Negative Affect (_t)</td>
<td>.22(.05)</td>
<td>4.81</td>
<td>45</td>
<td>.001</td>
</tr>
<tr>
<td>Positive Affect (_t)</td>
<td>.08(.03)</td>
<td>2.49</td>
<td>45</td>
<td>.05</td>
</tr>
<tr>
<td>Life Stress (_t)</td>
<td>.09(.05)</td>
<td>1.90</td>
<td>45</td>
<td>(ns)</td>
</tr>
<tr>
<td>Child Stress (_t)</td>
<td>-.04(.04)</td>
<td>-1.01</td>
<td>45</td>
<td>(ns)</td>
</tr>
</tbody>
</table>

relationship between stress and next day’s negative affect. To test this research question the following equation was analyzed:

\[
\text{NA}_{t+1} = \beta_{0j} + \beta_{1j}(\text{Day}) + \beta_{2j}(\text{NA}_t) + \beta_{3j}(\text{Positive Affect}_t) + \beta_{4j}(\text{Life Stress}_t) + \beta_{5j}(\text{Child Stress}_t) + \beta_{6j}(\text{Life Stress}_t \times \text{Child Stress}_t) + \beta_{7j}(\text{Life Stress}_t \times \text{Positive Affect}_t) + \beta_{8j}(\text{Child Stress}_t \times \text{Positive Affect}_t) + r_{t+1}.
\]

where \(\text{NA}_{t+1}\) is the residualized change in negative affect scores between day \(t\) and day \(t+1\), \(\beta_{0j}\) is the regression intercept for person \(j\), \(\beta_{1j}(\text{Day})\) is a coefficient representing day of the study, \(\beta_{2j}(\text{NA}_t)\) is a coefficient representing an individual’s negative affect on day \(t\), \(\beta_{3j}(\text{Positive Affect}_t)\) is a coefficient representing positive affect on day \(t\), \(\beta_{4j}(\text{Life Stress}_t)\) represents an individual’s perceived stress related to life events on day \(t\), \(\beta_{5j}(\text{Child Stress}_t)\) represents an individual’s perceived stress related to child events on day \(t\), \(\beta_{6j}(\text{Life Stress}_t \times \text{Child Stress}_t)\) represents the interaction between stress related to life
events on day $t$ and stress related to the child on day $t$, $\beta_{7j}(\text{Life Stress}_t \times \text{Positive Affect}_t)$ represents the interaction between life events stress on day $t$ and positive affect on day $t$, $\beta_{8j}(\text{Child Stress}_t \times \text{Positive Affect}_t)$ is the interaction between child events stress on day $t$ and positive affect on day $t$, $\beta_{9j}(\text{Life Stress}_t \times \text{Child Stress}_t \times \text{Positive Affect}_t)$ is the three-way interaction between daily stress and positive affect on day $t$, and $r_{t+1}$ is a residual component of change in negative affect.

To determine if day-level relationships were significant, day-level slopes were analyzed at the person level with the following model:

- **Intercept:** $\beta_{0j} = \gamma_{00} + u_{0j}$.
- **Day:** $\beta_{1j} = \gamma_{10} + u_{1j}$.
- **Negative Affect:** $\beta_{2j} = \gamma_{20} + u_{2j}$.
- **Positive Affect:** $\beta_{3j} = \gamma_{30} + u_{3j}$.
- **Life Stress:** $\beta_{4j} = \gamma_{40} + u_{4j}$.
- **Child Stress:** $\beta_{5j} = \gamma_{50} + u_{5j}$.
- **Life Stress, X Child Stress:** $\beta_{6j} = \gamma_{60} + u_{6j}$.
- **Life Stress, X Positive Affect:** $\beta_{7j} = \gamma_{70} + u_{7j}$.
- **Child Stress, X Positive Affect:** $\beta_{8j} = \gamma_{80} + u_{8j}$.
- **Life Stress, X Child Stress, X Positive Affect:** $\beta_{9j} = \gamma_{90} + u_{9j}$.

In this model, $\gamma_{00}$ represents the mean intercept, $\gamma_{10}$ represents the mean day of study slope, and $\gamma_{20}$, $\gamma_{30}$, $\gamma_{40}$, $\gamma_{50}$, $\gamma_{60}$, $\gamma_{70}$, $\gamma_{80}$, and $\gamma_{90}$ represent the mean negative affect, positive affect, life stress, child stress, stress interaction, and positive affect X stress interactions on day $t$, respectively. The significance of these terms indicated that, on average, the day-level relationships were significantly different from zero. The results of this model are
presented in Table 10. For the purposes of this research question, the primary coefficients of interest are $\gamma_{70}$, $\gamma_{80}$, and $\gamma_{90}$.

As shown in Table 10, several significant results emerged from this model. In support of hypothesis 4, a significant three-way interaction between life stress, child stress, and positive affect was found, $\gamma_{90} = .001$, $t(1096) = 2.51$, $p < .05$. Aiken and West’s (1991) procedures for probing significant interaction effects were followed to generate separate stress and negative affect regression lines for days of high (one standard deviation above the mean) and low (one standard deviation below the mean) child stress. As shown in Figure 5, on days when child stress and life stress were below average (represented by line four in Figure 5), the relationship between positive affect and next day’s negative affect was negligible. Further, on days when one type of stress was above average and the other type was below average (represented by lines two and three in Figure 5), the positive affect-next day’s negative affect slope was also flat. Using procedures described by Dawson and Richter (2006), follow-up tests comparing the three slopes were non-significant ($t(2 \text{ vs. } 3) = -.83, p > .05; t(2 \text{ vs. } 4) = -.96, p > .05; t(3 \text{ vs. } 4) = .41, p > .05$), indicating there were no significant difference between the slopes. In contrast, on days when both child stress and life stress were above average (represented by line one in Figure 5) there was a positive relationship between positive affect and next day’s negative affect. Follow-up tests indicated that the positive slope was significantly different from the remaining slopes ($t(1 \text{ vs. } 2) = 5.02, p < .001; t(1 \text{ vs. } 3) = 4.22, p < .001; t(1 \text{ vs. } 4) = 4.63, p < .001$). Taken together, these results suggest that positive affect may only serve as a protective factor on days when neither, or only one type of stress is elevated.
TABLE 10
PARAMETER ESTIMATES FOR THE RELATIONSHIP BETWEEN PERCEIVED STRESS, POSITIVE AFFECT, AND NEXT DAY’S NEGATIVE AFFECT

<table>
<thead>
<tr>
<th></th>
<th>B(SE)</th>
<th>t</th>
<th>df</th>
<th>p&lt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Intercept</td>
<td>18.33(1.29)</td>
<td>14.19</td>
<td>45</td>
<td>.001</td>
</tr>
<tr>
<td>Day</td>
<td>-0.09(.04)</td>
<td>-2.32</td>
<td>45</td>
<td>.05</td>
</tr>
<tr>
<td>Negative Affect</td>
<td>0.21(.04)</td>
<td>4.81</td>
<td>45</td>
<td>.001</td>
</tr>
<tr>
<td>Positive Affect</td>
<td>0.05(.03)</td>
<td>1.71</td>
<td>1096</td>
<td>ns</td>
</tr>
<tr>
<td>Life Stress</td>
<td>0.12(.04)</td>
<td>3.14</td>
<td>1096</td>
<td>.01</td>
</tr>
<tr>
<td>Child Stress</td>
<td>-0.04(.03)</td>
<td>-1.26</td>
<td>1096</td>
<td>ns</td>
</tr>
<tr>
<td>Life Stress X Child Stress</td>
<td>-0.01(.00)</td>
<td>-2.65</td>
<td>1096</td>
<td>.01</td>
</tr>
<tr>
<td>Life Stress X Positive Affect</td>
<td>-.002(.002)</td>
<td>-.84</td>
<td>1096</td>
<td>ns</td>
</tr>
<tr>
<td>Child Stress X Positive Affect</td>
<td>.003(.002)</td>
<td>1.53</td>
<td>1096</td>
<td>ns</td>
</tr>
<tr>
<td>Life Stress X Child Stress X Positive Affect</td>
<td>.001(.00)</td>
<td>2.51</td>
<td>1096</td>
<td>.05</td>
</tr>
</tbody>
</table>

*Effects specified as fixed.*
In addition to testing whether positive affect moderated the relationship between perceived stress and next day’s negative affect, the present study also explored whether positive affect mediated the relationship between perceived stress and next day’s negative affect. For this research question all of the variables involved in the model were measured at the day-level. Therefore, this process is referred to as lower level mediation (Bauer et al., 2006; Kenny et al., 2003). In lower level mediation all three of the effects being tested can be random. This means that these effects may later be explained by the inclusion of person-level predictors. The lower level mediation model can be written with two equations:

\[ PA_{ij} = d_{pj} + a_{ij} \text{Life Stress}_{ij} + e_{p_{ij}} \]

\[ \Delta NA_{ij} = d_{nj} + b_{j}PA_{ij} + c'_{j} \text{Life Stress}_{ij} + e_{N_{ij}}. \]
where PA is a daily positive affect score for person \( j \) on day \( i \), \( d_{Mj} \) is a random coefficient representing the intercept of PA (a person’s average positive affect) for person \( j \) (across the \( i \) days for which each person provided data), \( a_j \) is the effect of life stress on positive affect, \( \Delta NA \) is the change in daily negative affect from day \( t \) to day \( t + 1 \) for person \( j \) on day \( i \) (calculated as \( NA_t - NA_{t+1} \)), \( d_{Yj} \) is a random coefficient representing the intercept of \( \Delta NA \) (a person’s average negative affect) for person \( j \) (across the \( i \) days for which each person provided data), \( b_j \) is the effect of positive affect on change in negative affect, \( c'_j \) is the direct effect of life stress on change in negative affect, \( e_{Pij} \) and \( e_{Nij} \) are day-level residuals for positive affect and change in negative affect, respectively. These two equations were combined and HLM software used to test the model. An identical model was tested separately for child stress. Due to constraints in the HLM software for estimating lower level mediation with the inclusion of covariates, the \( \Delta NA \) outcome variable was calculated before estimating models.

As shown in Figure 6, each of the paths in the model involving life stress was significant. Specifically, higher levels of life stress were associated with lower levels of positive affect, which, in turn, predicted lower levels of change in negative affect. Higher levels of life stress were directly associated with increased change in negative affect. Given that the direct effect between life stress and negative affect remained significant, it was possible that positive affect only partially mediated this relationship. Following the suggestion of Bauer and colleagues (2006), the random indirect and total effects were calculated and 95% confidence intervals computed to determine whether full mediation or partial mediation was present. If the 95% confidence interval for the indirect effect contained zero, then it was concluded that partial mediation was found. In the life stress
model, the random indirect effect was .02 \((SE = .01)\) and the 95% confidence interval did not contain zero (.01 to .04). The random total effect was .14 \((SE = .04)\) and the 95% confidence interval did not contain zero (.07 to .21). Only 37% of the total effect was found to be indirect via positive affect. Therefore, positive affect was found to mediate the relationship between life stress and change in negative affect. In contrast, positive affect did not mediate the relationship between child stress and change in negative affect. Specifically, the relationship between child stress and positive affect was non-significant \((a_j \text{Child Stress} = -.07, t(45) = -1.50, p > .05)\). Therefore, this model was not explored further.

![Figure 6: Positive Affect as a Mediator of the Relationship Between Life Stress and Change in Negative Affect. **\(p<.01\) ***\(p<.001\).](image)

**Research Question 5: Do dispositional optimism and control explain individual differences in the resistance and recovery processes?** Before examining whether optimism and perceived control explained individual differences in previously tested models, unconditional models were first tested. The following day-level and person-level models were specified:

\[
NA_{ij} = \beta_{0j} + r_{ij}.
\]

\[
\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Optimism}) + u_{0j}.
\]
In this model, $\beta_{0j}$ is a random coefficient representing the intercept of negative affect for person $j$ (across the $i$ days for which each person was in the study) and $r_{ij}$ represents the residual. The person-level model describes the day-level average negative affect using an intercept ($\gamma_{00}$), optimism ($\gamma_{01}$), and random error ($u_{0j}$). An identical model was tested for perceived control. In all person-level models, optimism and perceived control were grand mean centered.

The results of the unconditional optimism model indicated that dispositional optimism was inversely related to daily negative affect, $\gamma_{01}(\text{Optimism}) = -.82 \ t(44) = -2.55 \ p < .05$. For every unit increase in optimism, daily negative affect decreased .82 units. A similar result was found for the perceived control model. Perceived control was inversely related to daily negative affect, $\gamma_{01}(\text{Mastery}) = -.37 \ t(44) = -3.51 \ p < .01$. For every unit increase in perceived control, daily negative affect decreased .37 units.

To examine whether the day-level processes of stress resistance and recovery from stress vary as a function of individual differences in optimism and control, person-level models were specified. Separate person-level models were estimated for each of the personality variables. Recall that the day-level model for the resistance process was as follows:

$$\text{NA}_{ij} = \beta_{0j} + \beta_{1j}(\text{Day}) + \beta_{2j}(\text{Positive Affect}) + \beta_{3j}(\text{Life Stress}) + \beta_{4j}(\text{Child Stress}) + \beta_{5j}(\text{Life Stress X Child Stress}) + \beta_{6j}(\text{Life Stress X Positive Affect}) + \beta_{7j}(\text{Child Stress X Positive Affect}) + \beta_{8j}(\text{Life Stress X Child Stress X Positive Affect}) + r_{ij}. $$

The purpose of specifying the person-level model is to determine whether any of these day-level relationships vary as a function of dispositional optimism or control. The person-level model was estimated as follows:
Intercept: $\beta_{0j} = \gamma_{00} + \gamma_{01}(\text{Optimism}) + u_{0j}$.

Day: $\beta_{1j} = \gamma_{10} + \gamma_{11}(\text{Optimism}) + u_{1j}$.

Positive Affect: $\beta_{2j} = \gamma_{20} + \gamma_{21}(\text{Optimism}) + u_{2j}$.

Life Stress: $\beta_{3j} = \gamma_{30} + \gamma_{31}(\text{Optimism}) + u_{3j}$.

Child Stress: $\beta_{4j} = \gamma_{40} + \gamma_{41}(\text{Optimism}) + u_{4j}$.

Life Stress X Child Stress: $\beta_{5j} = \gamma_{50}$.

Life Stress X Positive Affect: $\beta_{6j} = \gamma_{60}$.

Child Stress X Positive Affect: $\beta_{7j} = \gamma_{70}$.

Life Stress X Child Stress X Positive Affect: $\beta_{8j} = \gamma_{80}$.

In these models, each person’s day-level coefficients was estimated by an intercept ($\gamma_{00} - \gamma_{80}$), dispositional optimism ($\gamma_{01} - \gamma_{81}$), and error ($u_{0j} - u_{8j}$). For example, the significance of $\gamma_{01}$ represents the relationship between dispositional optimism and the negative affect intercept for each person, and the significance of $\gamma_{11}$ represents the relationship between dispositional optimism and within-person perceived life events stress. The dispositional perceived control variable was analyzed in the same manner. Based on results from the day-level models, wherein selected variables were specified as fixed effects or examination of the random effects indicated there was no day-level variability to be explained by a person-level predictor, several of the person-level models do not include optimism/perceived control or a random error term. An identical model was examined for perceived control.

As shown in Table 11, the results of the optimism models were non-significant (with the exception of the intercept term described in the unconditional models above) suggesting that optimism did not moderate the within-day relationship between positive
affect, life stress, child stress, and daily negative affect. As shown in Table 12, the results of the perceived control models were somewhat different. Specifically, perceived control moderated the effect of life stress on negative affect, $\gamma_{31}(\text{Perceived Control}) = .01 \ t(44) = 2.35 \ p < .05$. Thus, the life stress-negative affect slope increases .01 units for every one unit increase in perceived control, suggesting as perceived control becomes greater, participants report lower negative affect on days of higher life stress.

The final models tested for this research question investigated how the mediational relationships vary as a function of person-level variables. For example, does the role of positive affect as a mediator between stress and negative affect vary as a function of dispositional optimism and perceived control? This question implies the process of *moderated lower-level mediation* (Bauer et al., 2006), wherein the mediational processes depend upon levels of optimism and/or perceived control. Recall that the lower level mediation model was specified as follows:

$$\text{PA}_{ij} = d_P^j + a \text{Life Stress}_{ij} + e_{Pij}$$

$$\text{NA}_{ij} = d_N^j + b \text{PA}_{ij} + c' \text{Life Stress}_{ij} + e_{Nij}.$$  

The purpose of specifying the person-level model is to determine whether any of these day-level relationships vary as a function of dispositional optimism or perceived control. The person-level model was estimated as follows:

Positive affect intercept: $d_P^j = \gamma_{dP0} + \gamma_{dP1}(\text{Optimism}) + u_{dPj}.$

Negative affect intercept: $d_N^j = \gamma_{dN0} + \gamma_{dN1}(\text{Optimism}) + u_{dNj}.$

Indirect effect of life stress on positive affect : $a^j = \gamma_{a0} + \gamma_{a1}(\text{Optimism}) + u_{aj}.$

Indirect effect of positive affect on negative affect: $b^j = \gamma_{b0} + \gamma_{b1}(\text{Optimism}) + u_{bj}.$

Direct effect of life stress on negative affect: $c'j = \gamma_{c'0} + \gamma_{c'1}(\text{Optimism}) + u_{c'j}.$
TABLE 11
PARAMETER ESTIMATES FOR THE INFLUENCE OF OPTIMISM ON THE
WITHIN-DAY RELATIONSHIP BETWEEN PERCEIVED STRESS, POSITIVE
AFFECT, AND NEGATIVE AFFECT

<table>
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<th>$\gamma$(SE)</th>
<th>$t$</th>
<th>df</th>
<th>$p&lt;$</th>
</tr>
</thead>
<tbody>
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<td>Intercept</td>
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<td>-2.65</td>
<td>44</td>
<td>.05</td>
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<tr>
<td>Day</td>
<td>.01(.01)</td>
<td>.39</td>
<td>44</td>
<td>ns</td>
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<td>Positive Affect</td>
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<td>44</td>
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<td>Life Stress</td>
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<td>ns</td>
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<td>Child Stress</td>
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<td>-.52</td>
<td>44</td>
<td>ns</td>
</tr>
<tr>
<td>Life Stress X Child Stress</td>
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<td>N/A</td>
<td>N/A</td>
<td>N/A</td>
</tr>
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N/A used to indicate models that were not estimated due to specification of fixed effects or lack of variability.
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<th>( t )</th>
<th>( df )</th>
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<td>.01</td>
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<tr>
<td>Day</td>
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<td>1.05</td>
<td>44</td>
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</tr>
<tr>
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<td>.05</td>
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N/A used to indicate models that were not estimated due to specification of fixed effects or lack of variability.

In these models, each person’s day-level coefficients was estimated by an intercept, dispositional optimism, and error. The dispositional control variable was analyzed in the same manner.

In previous analyses, the present study found that positive affect significantly mediated the within-day relationship between life stress and negative affect, as well as
the within-day relationship between child stress and negative affect. Therefore, four separate moderated mediation models were conducted. The results of the life stress-negative affect models indicated that optimism and perceived control did not significantly moderate the mediational relationships previously found. Specifically, the personality characteristics did not moderate any of the paths in the mediation models. Similar results were found for the child stress-negative affect mediation models. Thus, although each of the mediation models had non-zero day-level variability (i.e. there was variability left over to be explained by person-level variables), the personality variables in the current study did not explain that variability.

The present study originally intended to test similar models for the recovery models presented in research question four. The day-level moderation models, however, were constrained to include several fixed effects and the remaining variables did not contain variability to be explained by person-level variables. The mediation models did contain significant variability and moderated lower-level mediation models, similar to those described above, were conducted. Similar to the within-day models, optimism and perceived control did not moderate any of the stress-positive affect-next day’s negative affect mediation models.

Research Question 6: Does daily positive affect mediate the relationship between personality characteristics and daily negative affect? To explore the factors that might promote positive affect, the present study conducted a series of mediation analyses. Specifically, the role of daily positive affect as a mediator of the relationship between optimism and daily negative affect, as well as the relationship between perceived control and daily negative affect, was examined. In the current study, the models being tested are
referred to as *cross-level mediation* (Krull & MacKinnon, 2001) or 2 -> 1 -> 1 mediation. This is because the independent variable (optimism/perceived control) is a level 2 (person-level) variable, whereas the mediator (positive affect) and outcome variable (daily negative affect) are level-1 (day-level) variables.

The following set of equations were specified to test cross-level mediation in the current study:

**Equation 1:** \[ NA_{ij} = \beta_0 + \beta_c\text{Optimism}_j + r_{ij} \]

Day-Level: \[ NA_{ij} = \beta_0 + r_{ij} \]

Person-Level: \[ \beta_0 = \gamma_{00} + \gamma_c\text{Optimism}_j + u_{0j} \]

**Equation 2:** \[ NA_{ij} = \beta_0 + \beta_c\text{Optimism}_j + \beta_b\text{Positive Affect}_j + r_{ij} \]

Day-Level: \[ NA_{ij} = \beta_0 + \beta_b\text{Positive Affect} + r_{ij} \]

Person-Level: \[ \beta_0 = \gamma_{00} + \gamma_c\text{Optimism}_j + u_{0j} \]

**Equation 3:** \[ \text{Positive Affect}_{ij} = \beta_0 + \beta_a\text{Optimism}_j + r_{ij} \]

Day-Level: \[ \text{Positive Affect}_{ij} = \beta_0 + r_{ij} \]

Person-Level: \[ \beta_0 = \gamma_{00} + \gamma_a\text{Optimism}_j + u_{0j} \]

Therefore, to test each of the mediation models three separate HLM models were specified. In addition to examining the individual path coefficients, the \( \beta_a\beta_b \) point estimate of the mediated effect was calculated as well as the standard error associated the mediated effect, in order to determine the significance of the indirect effect.

The first set of equations examined the role of daily positive affect as a mediator of the relationship between optimism and daily negative affect. As shown in Figure 7, higher levels of optimism were associated with increased daily positive affect that, in turn, predicted lower levels of daily negative affect. The direct effect between optimism
and daily negative affect remained significant, suggesting that daily positive affect partially mediates the relationship. The total indirect effect ($\beta_a\beta_b = -0.24$, $SE = 0.11$, 95% CI: -0.02 to 0.46) provided further support for partial mediation.

Figure 7: Daily Positive Affect as a Mediator of the Relationship Between Optimism and Daily Negative Affect. **$p<.01$

The next set of equations examined the role of daily positive affect as a mediator of the relationship between perceived control and daily negative affect. As shown in Figure 8, higher levels of perceived control were associated with increased daily positive affect that, in turn, predicted lower levels of daily negative affect. The direct effect between perceived control and daily negative affect remained significant, suggesting that daily positive affect partially mediates the relationship. The total indirect effect ($\beta_a\beta_b = -0.08$, $SE = 0.04$, 95% CI: 0.00 to 0.16) provided further support for partial mediation.
Figure 8: Daily Positive Affect as a Mediator of the Relationship Between Perceived Control and Daily Negative Affect. **p<.01 ***p<.001.

The present study also examined whether daily positive affect mediated the relationship between optimism and change in negative affect from day $t$ to day $t+1$. No direct relationship between optimism and change in negative affect, or between perceived control and change in negative affect was found. Due to the lack of a direct effect, and based on suggestions from previous research (e.g. Bauer et al., 2006), the present study did not explore these mediation models further.
DISCUSSION

The primary goals of this study were to examine the role of positive affect and personality characteristics in two resilience processes among mothers of children with autism spectrum disorder (ASD): (1) resilience as stress resistance; and (2) resilience as recovery. Using a daily diary design, a series of research questions were addressed: (1) To what extent are perceived stress and negative affect related to one another within the same day as well as across days? (2) Does positive affect promote resistance to stress and recovery from stress? (3) Do optimism and perceived control explain individual differences in resilience processes? and (4) Do optimism and perceived control promote increased positive affect and, in turn, increased well-being?

The results of the present study supported several of our hypotheses and three general patterns of results emerged: (1) higher levels of perceived stress were associated with decreased well-being, both within-days and across days; (2) in general, positive affect served to buffer the immediate and long-lasting negative effects of perceived stress, but only on days in which one type of stressor was elevated; and (3) optimism and perceived control did not explain differences in resilience processes; however, these characteristics helped explain the degree to which positive affect is generated. Taken together, the findings of the current study provide support for previous research that emphasizes the importance of positive affect in resilience processes (e.g. Ong et al.,
2006), and extends our knowledge to understanding these dynamic processes in a population experiencing heightened levels of stress.

*The Effects of Stress on Maternal Well-Being*

The present study was the first to examine the effects of perceived stress related to general daily life events and child behaviors, on the well-being of mothers of children with ASD. It was hypothesized that higher levels of perceived stress would be related to increased negative affect, on the same day, which this was supported in our findings. More specifically, on days characterized by high levels of perceived stress related to life events and child events, mothers also reported increased negative affect. In general, although these results are consistent with previous studies that have found child characteristics to be predictive of parental stress (e.g. Davis & Carter, 2008), this study is the first to suggest that daily hassles are also stressful for mothers. Future studies are needed to disentangle the unique effects of each type of stressor. The current study was the first, however, to investigate these processes on a daily basis and suggests that day-to-day well-being may be the result of typical daily hassles as well as the unique experience of raising a child with ASD.

It was also hypothesized that perceived stress would impact next day’s negative affect. More specifically, that negative affect would be at its highest when both types of stress were elevated. Examination of the relationship between each of the types of perceived stress (life stress and child stress) and next day’s negative affect indicated that the effects of one type of stressor depended on the level of the others. On days of below average life stress, the relationship between child stress and next day’s negative affect was negligible. In contrast, on days of above average life stress, there was an inverse
relationship between child stress and next day’s negative affect. Moreover, on days when both life stress and child stress were above average, there was a decrease in negative affect the following day. These results are counter to what was hypothesized, however, suggesting that the carry-over effects of stress operates differently when multiple types of stress are present. It is possible that when mothers experience high levels of stress in multiple domains of their life, they are immediately mobilized to seek out supports and resources to cope and thus seek relief. It is also possible that members of mothers’ support networks recognize that mothers are distressed and provide supports, thus, the negative effects of stress do not carry over to the next day (Affleck et al., 1994). Future studies should examine whether high levels of stress can be buffered by personal coping, or social support, mechanisms that subsequently lead to reductions in distress.

The present study also explored the reciprocal relationship between negative affect and next day’s stress. Although previous research has suggested stress leads to decreased well-being, examining both stress and negative affect within the same day does not allow for any causal interpretations (Affleck et al., 1994). Results of the present study indicated that negative affect was not significantly associated with life stress or child stress on the following day. This suggests that the temporal ordering may indeed be that negative affect follows from the experience of stress rather than vice versa; however, it is also important to caution that these correlational, lagged relationships are not sufficient to make definitive conclusions regarding causality (Rogosa, 1979).

Positive Affect as a Protective Factor

The primary purpose of the present study was to explore the role of positive affect in promoting successful adaptation to stress. The benefits of positive affect on
psychological outcomes are numerous and have consistently been found (e.g. Fredrickson, 1998). Lazarus and colleagues (1980) proposed that, during times of heightened stress, positive affect serves as a psychological breather that allows for the restoration and rebuilding of important resources. Consistent with the dynamic model of affect (DMA; Zautra et al., 2001), it was hypothesized that on days of elevated stress, positive affect and negative affect would be inversely related. The results of the current study do not support this model. More specifically, an inverse relationship between negative affect and positive affect was found on days of below average life and child stress, on days of below average life stress and above average child stress, and on days of above average life stress and below average child stress. Surprisingly, a positive relationship between negative affect and positive affect was found on days when both life stress and child stress were above average. These findings were in striking contrast to the DMA, which predicts that an inverse relationship should only be found on days of elevated stress (Zautra et al., 2001). In the present study, an inverse relation was found for most days, with the exception of those characterized by extremely high levels of stress. Mothers of children with autism consistently experience elevated levels of stress when compared to other populations (e.g. Abeduto et al., 2004), and therefore even days of below average stress may be just stressful enough to lead to the narrowing of emotional experiences predicted by the DMA.

Interestingly, on days in which life stress, child stress, and positive affect were above average, mothers experienced the highest levels of negative affect. There are several possible explanations for these results. First, on days of extremely high stress, mothers may be trying everything that they possibly can to cope. They may be able to
generate positive affect on these stressful days, but it is not enough to afford protection and decrease negative affect. Second, the current study asked participants to rate their daily experiences at the end of each day. It is possible that mothers experienced stressful events and high levels of negative affect in the morning, continued through their day, and then experienced positive affect towards the end of the day. Studies utilizing multiple assessments through a day may be able to provide further insight into these relationships. Given that this is the first study to examine these relationships in this population, further research is needed to replicate the findings of the current study.

Positive affect may also have a long-term impact on well-being by promoting recovery from stress (Fredrickson & Levenson, 1998). In the present study, the relationship between perceived stress, positive affect, and next day’s negative affect was examined. Consistent with the within-day hypotheses, it was predicted that positive affect would buffer the long-term negative effects of stress. Although a significant interaction between perceived stress and positive affect emerged, the results were different from those previously described for the within-day relationships. More specifically, higher levels of positive affect did not appear to buffer the negative effects of stress on days when one type of stress was elevated. In contrast, on days in which child stress and life stress were above average, increased levels of positive affect were associated with increased negative affect the following day. It is possible that days of extreme stress, as indicated by above average levels of multiple types of stress, are so psychologically taxing that mothers are not able to recover even when positive affect is elevated.
Positive Affect as a Mediator of the Stress-Negative Affect Relationship

The present study also explored the mechanisms by which positive affect engendered greater well-being, within the same day. Separate mediation models suggested that increased levels of child stress and life stress were associated with lower levels of positive affect. Positive affect, in turn, was inversely related to negative affect, such that increased positive affect was associated with lower levels of negative affect. The direct relationship between stress and negative affect, however, remained significant. Therefore, the effects of stress on well-being may be direct, as well as indirect through positive affect. These results suggest that positive affect may interrupt the ongoing experience of stress. The precise mechanism by which this occurs, however, need to be explored further in this population. For example, psychobiological research suggests that the release of progesterone, associated with positive arousal, may down-regulate the stress response (Wirth, Meier, Fredrickson, & Schultheiss, 2007). Future studies that incorporate a multimethod approach, including a physiological component, would help to further delineate these processes in this population.

Similar to the within-day analyses, the present study also explored the process by which positive affect is responsible for undoing the negative effects of stress. Mediation models indicated that increased levels of life stress were associated with decreased positive affect. Positive affect, in turn, predicted less change in negative affect from one day to the next; however, the precise direction of the effect was unable to be ascertained. The direct relationship between life stress and change in negative affect remained significant, even when positive affect was present. Therefore, the effects of stress on well-being appear to be direct as well as indirect through positive affect. Although these
results suggest that positive affect may be undoing the lingering effects of stress, the present study did not investigate the precise mechanisms by which this process is occurring. Overall, the results of the present study suggest that positive affect may promote well-being via the process of stress resistance as well as recovery from stress. The benefits of positive affect, however, appear to function only when perceived stress levels are low to moderate.

The Influence of Personality Characteristics on Positive Affect and Resilience Processes

Consistent with previous research, the dynamic resilience processes of stress resistance and recovery from stress investigated in the current study were hypothesized to operate differently depending on the level of optimism and perceived control (e.g. Fredrickson et al., 2003). Individuals who are more optimistic or believe they have control over the external events they experience may be able to generate and sustain positive emotions during times of stress (Tugade & Fredrickson, 2007). In general, no support was found for this hypothesis. For example, although optimism and perceived control were inversely related to daily negative affect, these personality characteristics did not explain interindividual differences in the resilience processes, stress resistance and recovery from stress, previously described. In other words, these processes did not depend on the level of optimism or perceived control. There are several possible explanations for these findings. First, there may not have been enough variability in the resilience processes to be explained by the inclusion of additional variables. The day-level models that were specified may not have contained enough residual variability to be explained by the optimism and perceived control variables. Future studies should utilize larger samples in an attempt to increase the potential variability to be explained. Second,
the personality characteristics chosen in the current study may not be the only factors that could explain these processes. For example, the personality characteristic of trait resilience may better capture and explain individual differences in resilience processes (e.g. Ong et al., 2006).

Although optimism and perceived control did not explain individual differences in resilience processes, the present study found that each of these components of trait resilience were associated with increased daily positive affect which, in turn, predicted lower levels of daily negative affect. These results were only found for the within-day relationship between positive affect and negative affect. These findings suggest that specific components of the broader construct of trait resilience may help mothers of children with ASD mobilize daily positive affect which may help promote stress resistance. These results have implications for the development of programs aimed at helping mothers cope with the stress associated with raising a child with ASD. For example, intervention programs could focus on increasing mothers’ sense of perceived control and optimism as a way to increase levels of positive affect.

General Summary: Implications, Limitations, and Future Directions

This study was the first to investigate the role of positive affect in resilience processes among mothers of children with ASD. In addition, this study was the first to utilize daily diaries to capture mothers’ reactions as they are unfolding, and also employed trait measures to explain individual differences in daily processes. Moreover, the current study was also the first to examine perceived stress directly related to raising a child with ASD as well as the daily hassles adults typically encounter. Given the unique qualities of the present research the findings have several important implications.
The present study has several implications for theoretical conceptualizations of the role of positive affect in resilience processes. Notably, findings from the current study did not support the DMA (Zautra et al., 2001). The DMA predicts that, under ordinary circumstances, positive affect and negative affect are independent constructs. During times of stress, however, an inverse relationship between positive and negative affect is predicted to develop. In the current study, however, positive affect and negative affect were inversely related on days of low stress (i.e. both life stress and child stress below average) and on days of moderate stress (i.e. one type of stress below average and the other above average). On days in which mothers experienced the greatest stress (i.e. life stress and child stress above average) there was a positive relationship between positive and negative affect. It is possible that the current sample of mothers is experiencing chronic, sub threshold levels of stress and positive affect is always beneficial at these low to moderate levels; however, there is a certain level of stress at which positive affect does not operate as a protective factor.

Several implications for the broaden-and-build theory of positive emotions were also found. The broaden-and-build theory states that positive emotions broaden an individuals’ thought-action repertoire and may be able to undo the effects of negative emotions (Fredrickson, 1998). The present study found that while perceived stress carried over and impacted mothers’ well-being the following day, high levels of positive affect did not serve as a protective factor. Mediational analyses, however, indicated that positive affect directly impacted the experience of negative affect, both within-days as well as across days, such that higher levels of positive affect were associated with decreased negative affect. Taken together, the findings of the current study suggest that
positive affect may play an important role in promoting resistance to and recovery from stress, but these benefits may be limited to low or moderate levels of stress. It is possible that the experiences and adversities facing this population are so unique that positive affect may operate differently than in populations that experience more typical levels of stress.

The present study was also the first to systematically examine the effects of different types of stressors in this population. Previous research has shown that child characteristics are a major source of stress for mothers (e.g. Ekas & Whitman, provisional acceptance). Mothers, however, likely experience additional stress related to the daily hassles that most adults experience, but research has not examined whether these hassles are also perceived as stressful and impact well-being. Findings from the present study indicate that life stress and child stress each, after controlling for the effects of the other, adversely impact maternal well-being. Further, the protective benefits of positive affect disappear when levels of life stress and child stress are elevated. It is possible that one type of stressor spills over and increased stress related to the other type, which then impacts well-being. This process can occur within-days as well as across days. This is referred to as stress proliferation and has been found to operate among parents of children with ASD (Benson, 2006). Using daily diaries, future research should investigate whether high levels of child stress spill-over and impact mothers’ perceptions of stress in other domains of their life (e.g. marriage, financial, or work).

Finally, the present study has important clinical implications regarding the development of intervention programs. First, mothers experienced increased negative affect as a result of both general life stress as well as stress related to their child.
Although programs aimed at teaching mothers to cope with their child’s behaviors may reduce levels of stress and increase self-efficacy (e.g. Sofronoff & Farbotko, 2002), programs also need to implement components aimed at helping mothers generate strategies to cope with the daily hassles that frequently occur. Findings from the present study suggest that certain protective factors may not operate when stress related to both domains is elevated. Therefore, it may be especially important to teach mothers how to reduce stress in multiple domains.

In the present study, increased positive affect was generally associated with greater well-being for mothers of children with ASD. In light of this finding, intervention programs should be developed that teach mothers how to generate positive emotions or experiences during times of stress. Fredrickson (2000) has suggested that cognitive therapies aimed at teaching optimism may be especially beneficial. Indeed, the results of the present study suggest that optimism engenders higher levels of positive affect in this population. Teaching mothers to use coping strategies such as positive reappraisal may also be relevant (Folkman & Moskowitz, 2000). Programs that include relaxation therapies, such as meditation, massage, and muscle relaxation training, may also help mothers to generate positive affect (Fredrickson, 2000). Thus, a comprehensive intervention program for mothers of children with ASD would include components aimed at teaching strategies to reduce stress and enhance positive affect.

There are several limitations to the present study that warrant further discussion. Because the sample consisted of mainly Caucasian, upper-middle class families, the generalizability of the results are limited. Sociocultural research has suggested that disability is not viewed the same across cultural and ethnic groups (Skinner & Weisner,
2007). For example, mothers of certain ethnic groups may not rate the behaviors of their child as stressful whereas mothers of other groups might state that the same behavior is very stressful.

The relatively small sample size and low number of days in the current study raises concerns regarding statistical power. This may be especially problematic for the complex models that were tested in the current study. Increasing either the sample size or number of days, or both, would help to eliminate the need to specify certain day-level effects as fixed which would have allowed for the inclusion of the personality characteristics into more of the models. Future studies would benefit from including mothers of diverse backgrounds, increasing the overall sample size, and also adding more days to the study.

Although daily diary designs have many benefits compared to cross-sectional and other longitudinal designs, there are also several disadvantages. One of the biggest limitations is participant burden (Bolger et al., 2003). In the current study, however, problems of missing data were minimal and comparable to that of studies including community sample of adults (e.g. Ong et al., 2006). Another potential limitation is that individuals may not complete the daily diaries at the designated time. There is no way to test whether mothers adhered to the rules to fill out diaries in the evening or if they completed them at some other time. Finally, as the study progresses the participants may develop a habituated response style which could lead to the possibility of the participant not completing portions of the questionnaire that do not normally apply to them. In addition, a habituated response style may also reduce variability in the responses that were recorded. More recently, daily diary studies have utilized electronic data collection
devices, such as PDAs and cell phones, that allow researchers to sample experiences and reactions in real-time, and even multiple times per day (Bolger et al., 2003). The use of these devices would eliminate many of the concerns discussed above. The present study also relied on maternal self-report for all measures employed. Thus, the issue of shared source variance is a valid concern. Future studies should employ a multimethod approach by including physiological assessments in addition to self-report measures of stress.

Finally, the current study examined the influence of two characteristics, optimism and perceived control, on resilience processes. There are, however, several other variables that could have been included that might explain individual differences in stress resistance and recovery from stress. For example, including an assessment of global trait resilience may have been a better choice. Previous research has consistently found this construct to be associated with resilience processes (e.g. Ong et al., 2006). It is possible that individual components of trait resilience, such as optimism or perceived control, may not be sufficient to explain the variability in these processes. In addition to intrinsic influences on resilience processes, there are also extrinsic factors that may be equally important. For example, research has shown that social support may play an important role in promoting successful adaptation to stress (e.g. Nezlek & Allen, 2006). For example, mothers with greater formal (i.e. support groups, financial support, etc.) and informal (i.e. spouse, friends, family, etc.) support networks may be better able to cope with daily stress. Therefore, future studies should incorporate measures of other intrinsic and extrinsic factors that could promote daily adaptation to stress.

Despite the increased research documenting that mothers of children with ASD experience decreased levels of psychological well-being (e.g. Olsson & Hwang, 2001),
there has been a lack of research investigating resilience processes in this population. The present study examined the role that several potential protective and promotive factors play in two resilience processes, stress resistance and recovery from stress. The results of the current research broke new ground by suggesting that the experience of positive affect is important for mothers of children with ASD because it can protect against the immediate and long-term effects of low to moderate stress; however, when stress reaches extremely high levels the benefits of positive affect disappear. Although optimism and perceived control did not explain differences in resilience processes, each of these characteristics explained how positive affect is generated. Specifically, increases in optimism and perceived control led to increased levels of positive affect. The present study has important theoretical implications for two empirical models of positive affect, the DMA and the broaden-and-build theory, as well as implications for the development of intervention programs aimed at providing mothers with strategies to cope with daily stress and generate positive affect during stressful situations.
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APPENDIX

For each of the HLM models tested in the present study a series of decisions was made regarding specifying effects as fixed versus random. Although the decision-making process was described in the method section, the purpose of this appendix is to provide a specific example of how these decisions were applied to the HLM models tested in the present study. The model described on p. 49 tested the reciprocal relationship between negative affect and daily stress and several, but not all, of the effects were specified as fixed. Therefore, the decision-making process for this model will be described in detail below.

The equation for this model was as follows:

\[ \text{Child Stress}_{t+1} = \beta_0 + \beta_1(Day) + \beta_2(\text{Child Stress}_t) + \beta_3(NA_t) + r_{t+1}. \]

Each of the coefficients from this model was originally specified as random. The fixed effects component of \( \beta_1 \) (coefficient = 0, \( p > .05 \)), \( \beta_2 \) (coefficient = .05, \( p > .05 \)), and + \( \beta_3 \) (coefficient = 0, \( p > .05 \)) were non-significant. The random effects component of \( \beta_1 \) (variance component = .02, \( p < .01 \)) was significant; however, the random effects component of \( \beta_1 \) (variance component = .02, \( p > .05 \)), \( \beta_2 \) (variance component = 0, \( p > .05 \)) were non-significant. Since both the random and fixed effects components of \( \beta_2 \) and \( \beta_3 \) were non-significant the model was run again with these effects specified as fixed. Given that the fixed effects component of \( \beta_1 \) was non-significant, but the random effects component was significant, this coefficient remained specified as random. The results of
the newly specified model are presented in Table 6 on p. 51 of the current study. This decision-making process was followed for all HLM models specified in the present study.