

University of Nevada, Reno

**The Effects of General Acute Stress and Attachment Insecurity on Perceptions of
Infant Distress**

A thesis submitted in partial fulfillment of
the requirements for the degree of
Human Development and Family Science

By

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Abstract

This study examines caregiver-infant relationships, focusing on how caregivers' general stress levels and attachment insecurity influence their perceptions of infant distress. Infant cries serve as biological signals for care and support, but stress can hinder caregivers' ability to accurately interpret distress cues, potentially affecting their responsiveness. To investigate this, participants from a university campus engaged in a caregiving task using an infant simulator. Their caregiving behaviors, including feeding, diaper changing, and soothing, were observed and recorded. Insecure attachment qualities and self-reported stress measures were also recorded. Findings show that higher levels of general acute stress often impacted perceptions of infant distress; specifically, higher levels of general acute stress were associated with perceptions of the infant simulator as aversive. Higher levels of acute general stress were associated with greater feelings of frustration and less sympathy towards the infant simulator as well. Attachment insecurity did not seem to have major significant associations with perceptions of or reactions to infant distress. These findings highlight the importance of supporting caregiver stress management and providing additional resources to families facing stressful circumstances, as a means of promoting healthy infant development and more effective caregiving.

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Chapter 1: Introduction

Human development research emphasizes the evolving thoughts, interactions, and behaviors of individuals, with a key focus on the collective dynamics within families (Lerner, 2018). Caregiver-infant dynamics continue to be a key area of research, deepening our understanding of the importance of caregiver support when infants show signs of distress, particularly in early life experiences. Infants enter this world looking for trust and guidance; their initial caregiver interactions establish the foundation for future behaviors, perceptions, and interactions. These initial encounters pave the way for attachment qualities, positive internal working models, and healthy well-being. While research continues to expand our understanding of infant-caregiver interactions, it increasingly focuses on ways to promote healthy interactions despite the stressful challenges life may present. Barriers such as financial, psychological, or interpersonal stress, etc., have the potential to affect caregiver-infant interactions, standing in the way of psychological well-being and secure development (Ostlund et al., 2017). This study aimed to assess how general acute stress influences perceptions of infant distress. Additionally, it sought to explore whether insecure attachment qualities can serve as a risk factor against the effects of general acute stress, potentially resulting in more negative perceptions of infant distress, along with the presence of high general acute stress.

Stress and Caregiver-Infant Interactions

In research, the effects of stress on the family were observed as early as the Great Depression, when the financial crisis added additional uncertainty and pressure for parents (Bryant & Awosan, 2022). Financial strain and job insecurity left some parents

struggling to support and care for their families. The risks of stress, on infant-caregiver interactions continues to be assessed in today's world, particularly in relation to significant events like the COVID-19 pandemic. The pressure of a global pandemic, with health concerns, financial instability, and social isolation, impacted families and their children. These stressors affected caregiver-infant relationships, making it harder for parents to effectively tend and support their children (Barnett et al., 2022). Additionally, rising experiences of racism and discrimination have added consistent stress for parents of color. For example, mothers of color experienced a decline in their mental health during the pandemic, which negatively impacted their relationship with their children (Bogan et al., 2022). Research continues to emphasize the many ways stress impacts family systems, putting relationships, health, and mental well-being at risk. Stress negatively affects caregiver-infant interactions, primarily by impairing a caregiver's ability to recognize and respond to signs of infant distress (Bretherton, 2016). Infant cries are biologically designed to trigger arousal in caregivers, prompting them to provide care and support (Leerkes et al., 2009). However, when caregivers experience stress, they struggle to accurately assess and meet their infant's needs, which is crucial during the early stages of life (Laurent & Ablow, 2012).

In sum, stress has been known to affect families in different ways, affecting interpersonal relationships and caregiving. Building on previous research, the present study explores the impact of general acute stress over the past month, on young adult perceptions infant distress. While past studies have highlighted the detrimental effects of stress on infant-caregiver interactions, this study will employ innovative technology

(infant simulators) to investigate whether insecure attachment traits provide additional risk against these negative influences.

Attachment and Caregiver-Infant Interactions

Development continues across the lifespan, but critical periods during infancy are valuable, setting a long-standing foundation for qualities such as relationship security, and mental well-being (Ainsworth, 1985). This study seeks to evaluate if insecure attachment qualities act as a risk factor amplifying general stress; especially when it comes to infant caregiving in the face of personal challenges. A secure foundation in the earlier years paves the way for trust, safety, and even effective emotion regulation across the lifespan (Quintana et al., 2023). Caregiver attachment offers a stable and dependable foundation for infants, helping them carry these essential qualities into their later stages of growth. Using novel infant simulators (RealCare Baby 3), the study evaluated perceptions and attitudes towards fussy, distressed, and arousing cry patterns in a student population. The findings offer valuable insights into the crucial role of caregiver support and attentiveness in infant development. Additionally, the results may help us understand strategies for managing life's stressors without compromising secure development. Enhanced support systems and strategies could help caregivers provide their infants with a sense of security, promoting healthy and stable growth. Insights on caregiver attachment have the potential to inspire new perspectives and methods for assessing the impact of stress and reducing its harmful effects.

Overall, low attachment insecurity is essential in caregiver-infant interactions and plays a crucial role in early development. The novelty of RealCare simulators provide a unique opportunity to assess whether attachment influences caregivers' perceptions of

infant distress, even under high-stress conditions. Identifying risk factors associated with attachment insecurity can have significant benefits for caregivers, helping them better respond to infant cues for care, even in stressful situations.

The Present Study

The present study examines how general acute stress and insecure attachment traits influence adult perceptions of infant distress. Prior literature has examined the impacts of chronic stress on caregiving behaviors; therefore, this study aims to fill a gap by evaluating the effects of acute stress instead, in a young adult, university student population. This study is innovative in its design as it utilizes infant simulators to standardize infant distress across participants, enabling us to examine whether perceptions of infant distress differ based on participant-reported acute stress levels and attachment traits. The infant simulators were coded to display the same cry pattern to each participant, eliciting stress and theoretically tapping into attachment models as well (Fitter et al., 2022). Previous research indicates that infant simulators have proven to be an effective tool, particularly in situations in which working with real infants is not feasible. Infant simulators have been used by researchers to offer students practical, hands-on caregiving experiences (Julal, 2018), evaluate the importance of sensitive caregiving, and design preventative interventions for supportive parenting (Voorthuis et al., 2013). The simulators have also been used with undergraduate students, typically with limited direct parenting experience, to examine attitudes towards parenting (Voorthuis et al., 2013). Jang and Lin (2017) reported that undergraduate students in a family studies course found that interacting with the simulators made them think about parenting (e.g., responsibilities and practicalities). Researchers have also used infant

simulators to examine adult reactions to infant crying (e.g., Bruning & McMahon, 2009) and, more recently, attachment-related concepts such as caregiver sensitivity (e.g., Bakermans-Kranenburg et al., 2015; Voorthuis, et al., 2013).

In this study, undergraduate student participants reported on general acute stress over the past month, attachment insecurity, and then cared for an infant simulator for 20 minutes. Immediately after, participants rated their perception of the simulator's distress as aversive, manipulative, or urgent, as well as their own emotional reactions of frustration, alarm, and sympathy (Zeifman, 2003). The implications for this work include understanding how infant cries and signs of distress manifest psychologically in caregiver interactions. Findings may provide a deeper understanding of how infant cries are perceived differently, possibly eliciting sensitivity from some individuals but frustration or aversiveness from others. Broadly, study findings may assist in expanding resources to help stressed caregivers promote healthy and secure development for their infants, despite challenges, and gaining further insights into the effects of infant distress on caregiving behaviors. Research using infant simulators can also expand our knowledge on the importance of support and trust in early life experiences.

Research Questions

RQ1 Is general acute stress significantly associated with adult perceptions of infant distress?

I hypothesized that higher levels of general acute stress would be associated with more unfavorable perceptions of infant distress. This means that greater general acute stress would be positively associated with perceptions of the simulator as aversive and

urgent, and participant reactions of frustration and alarm, and inversely associated with feelings of sympathy.

RQ2 Is attachment insecurity significantly associated with perceptions of infant distress?

I hypothesized that greater attachment insecurity would be positively associated with more unfavorable perceptions of infant distress. This means that high avoidant and anxious attachment qualities would predict greater feelings of frustration or aversiveness, and lower feelings of sympathy, which in turn may lead to less positive perceptions of infant distress.

RQ3 Is greater attachment insecurity a risk factor for increased negative perceptions of infant distress when general acute stress is high?

I hypothesized that higher levels of avoidant and anxious attachment qualities would be positively associated with the most unfavorable perceptions of infant distress when general acute stress was high. Alternatively, the perceptions of infant distress for those with low levels of insecure attachment may be protected from high levels of stress. Or, despite the effects of stress, participants may reveal aversive and negative perceptions of infant distress, fostered by insecure attachment.

Chapter 2: Literature Review

This literature review provides an overview of stress, exploring its impact on individuals, specifically caregiver-infant interactions. The foundational work of Mary Ainsworth and John Bowlby, highlights the importance of attachment security. Next, the chapter explains how insecure attachment may pose risks, even against low general stress. Lastly, the chapter reviews previous research utilizing infant simulators in greater detail.

Stress and Caregiving

Effects of General Stress in Families

Stress continues to be a widely studied subject, particularly due to its significant impact on individuals, both physically and mentally. The experience and perception of stress vary from person to person; regardless, when intense, stress affects many areas of daily life. The definition of stress varies, but it is commonly defined as pressure on a system's status quo (Boss et al., 2017). When pressure or stress surpasses individual coping mechanisms or resources, mental health and well-being are at risk. Elevated stress levels can trigger both physiological and behavioral reactions in response to changes or challenges in the environment (Trousselard, 2025). The stress response can be expressed in cognitive ("I can take on the challenge"), behavioral (automatic movements to separate from or cope with the stressor), and emotional ("I'm anxious") terms (Curtiss et al., 2021). The changes and burden can disrupt an individual's homeostasis, pushing for a return to balance. Based on how quickly balanced is achieved, and how impactful the strain was perceived to be, stress can be categorized as chronic or acute (Bryant & Awosan, 2022). Chronic stress involves long-term exhaustion, in which an individual

battles consistent pressure (Trousselard, 2025). Long-term stress also involves the constant hurdle of returning to homeostasis. This challenge triggers our fight-or-flight response, causing a dysregulated nervous system that remains constantly alert for threats and potential strain (Dhabhar, 2018). Alternatively, acute stress is experienced in short-term, and homeostasis may be achieved quicker (Trousselard, 2025). Although acute stress may not be as harmful, it still has the potential to impact a person physically (increase heart rate, chest pain, sleep disturbances, etc.) and psychologically (anxiety, depression, etc.).

From a Family Systems theoretical perspective, individuals are interconnected (Broderick, 1993), so stress experienced by one member will affect the rest of the family as well (Cowen et al., 2015; Broderick, 1993). Therefore, the topic of stress is continuously studied within families to better understand how people influence each other in reciprocal interactions and develop collectively. Historically, the study of family stress revolved around negative economic circumstances, specifically, following The Great Depression. Financial burden and loss of stability increased stress, in turn impacting interpersonal interactions within families (Elder, 2018). How stress impacts family life is a long-studied topic, with Rubin Hill (1949) being one of the first researchers to evaluate the impacts of crisis on overall family dynamics. Hill's ABC-X model offered a framework that helped researchers understand how families approach and overcome challenges. The triggering event or stressor (A) prompts the family to utilize their resources and strengths and (B) to navigate the challenge. Each individual links the stressor to various emotions and contexts, attributing meaning to the experience (C). Ultimately, the result (X) is either a return to balance or an ongoing struggle with the

stressor. This model emphasizes the transitions families undergo concerning strains and distress, taking current resources and context into account (Hill, 1949). Given Hill's model, there is a greater understanding of how stress is felt and evaluated by individuals, including shifts in behaviors and interactions.

Caregiver Stress and Infant Interactions

In the context of caregiver-infant interactions, the stress experienced by parents (or caregivers more broadly) is a crucial issue with far-reaching consequences. Early caregiving experiences are key to infant development, as they lay the groundwork for socioemotional development, regulation, and overall well-being (Quintana et al., 2023). Because family members reciprocally influence each other (Baptist & Hamon, 2022), when caregivers experience significant stress, it has a negative effect on child development. For instance, among mothers with 18 to 72-month-old infants, parental stress stemming from worries about parenting skills and negative feelings toward their infant, has been shown to affect various aspects of parenting practices and mother-child interactions (Santelices et al., 2021). Mothers experiencing high levels of stress may engage less with their children, hindering their ability to respond to infant cues and provide adequate support and care. Additionally, maternal stress can affect behaviors, such as those related to diet, physical activity, and sedentary habits, which may, in turn, influence their child's behavior through maternal modeling (Gelfand & Teti, 1990). Maternal psychopathology, such as depression during pregnancy, can also have a direct effect on internalizing and externalizing child behaviors at age 6, but also an indirect effect through increased parental stress (Santelices et al., 2021). Symptoms of depression are difficult to overcome and prevent caregivers from attending to other aspects of life,

including caring for an infant. These challenges add additional layers of stress, which may in turn, affect child behaviors in the long run.

Caregiver sensitivity, as defined by appropriate responsiveness to infant cues and signals, also plays a crucial role in shaping infant emotion regulation and overall well-being (Ainsworth, 1985). For example, Leerkes and colleagues (2009) found that maternal sensitivity to distress was related to fewer behavioral problems and higher social competence in children at 24 and 36 months old. In addition, for temperamentally reactive infants, maternal sensitivity to distress was associated with less emotional dysregulation. Finally, sensitivity to non-distress only prevented emotional dysregulation when sensitivity to distress was also high, suggesting that consistent sensitivity, regardless of whether the infant showed signs of distress, plays a key role in fostering healthy emotion regulation. Maternal sensitivity appears as trust in caregiver-infant interactions, a vital quality that infants depend on during their early years. Therefore, a lack of consistency when matching an infant's needs can often disrupt a sense of trust, placing qualities such as emotion and behavior regulation at risk (Leerkes et al., 2009). A caregiver's ability to accurately perceive and interpret infant signals, while responding to them consistently, is impaired under the effects of stress (Bretherton, 2016).

Previous studies have also examined the impact of stress on the perception of infant cues using fMRI imaging (Kim et al., 2021). Results revealed a link between stress exposure for first-time mothers and brain responses to infant cries as well as maternal behaviors. Self-reported stress across various domains, including socioeconomic, environmental, and psychosocial factors, was associated with diminished brain activity in response to infant cry sounds. There was reduced activity in regions such as the right

insula/inferior frontal gyrus and superior temporal gyrus, areas essential for processing emotional and social information. This reduced brain activation was further connected to lower caregiver sensitivity during mother-infant interactions. These findings indicate that higher levels of stress exposure may result in reduced brain responses to an infant's cry, reflecting less social and emotional attention to the infant's cues (Kim et al., 2021). This reduced brain activity may contribute to challenges in forming positive caregiver-infant relationships.

In sum, stress can have harmful effects on families, particularly on caregiver-infant interactions. To care for an infant effectively, caregivers must be able to recognize and respond to cues, especially signs of distress. A better understanding of how stress affects infant caregiving will assist caregivers in accurately interpreting and responding to infant distress, even in high-stress situations.

Adult Perceptions of Infant Distress

In the earliest stages of life, infants rely on crying as a form of social communication (Bell & Ainsworth, 1972; Hinde, 1991). Cries are a built-in survival mechanism for infants, and when they feel discomfort, they should be biologically arousing to adults. The cries serve the purpose of eliciting a response, and these caregiving responses shape all aspects of development (Leerkes et al., 2009; Laurent & Ablow, 2012). The many ways adults perceive and respond to infant distress is important for understanding healthy child development.

Infant cries are composed of different pitches and tones, indicating various needs. Previous research shows that voice pitch influences judgments of emotional and motivational states, and caregivers often use these cues to gauge infant needs (Hernández

et al., 2022). When caregivers listen to the different pitches of a baby's cry, they can distinguish between levels of distress (e.g., cries ranging from mild discomfort: cries recorded during baths and high distress: cries recorded during vaccinations) and respond appropriately (Koutseff et al., 2017). These findings have significant implications, highlighting that adults are very sensitive to infant distress and that research in this area is an important part of infant-caregiver dynamics.

Previous research has often used audio or video recordings of infant crying to evaluate adult perceptions of infant distress (Parsons et al., 2012). Findings show that participants with self-reported depression demonstrated lower discriminative acuity after listening to 15 audio recordings of infant cries, ranging from low to high distress. Meaning, individuals with depression had a difficult time differentiating between infant cries, hindering their abilities to perceive and respond to infant distress properly. Individuals with depression had a harder time labeling high-pitched cries as sounding distressed (Parsons et al., 2012). De Pisapia and colleagues (2013) also used audio recordings of infant cries, and their findings highlight the gender differences in brain activity in response to infant hunger cries. Researchers found that the brains of men and women, independent of parental status (parent or nonparent), reacted differently to infant cries in the dorsal medial prefrontal and posterior cingulate areas, known to be involved in mind wandering. Brain responses demonstrate that infant hunger cries disrupted mind wandering for women, eliciting care responses. Conversely, men carry on without mind wandering interruption. These results demonstrate sex-dependent variations in brain responses to infant feeding cues.

Other studies use both infant simulators and audio recordings to determine which method provides a greater understanding on caregiver-infant interactions (Bartlett & McMahon, 2015). In a randomized study, half of the participants view a video of a crying infant while the other half interact with a crying simulator. In comparison to those in the video condition, participants exposed to the crying simulator showed lower self-efficacy beliefs, experienced greater feelings of irritation and a greater change in heart-rate responses. The findings suggest that interactions with a simulator may offer a deeper understanding of the effects of infant distress in caregiver interactions, compared to video stimuli alone.

Stress and Perceptions of Infant Distress

Stress affects our autonomic nervous system (Dhabhar, 2018). Our autonomic nervous system is responsible for functions such as controlling heart rate, digestion, and alertness. When stress interferes with the nervous system's balance, these qualities are thrown off to protect an individual against potential or perceived threats. The autonomic nervous system is responsible for the fight-or-flight response, which triggers reactions such as alertness and hypervigilance (Dhabhar, 2018). Prior research suggests that infant cries activate female autonomic nervous system responses, capturing processes that affect their parenting behaviors (Speck et al., 2023). Previous research indicates that mothers who showed more activated autonomic system responses (such as increased skin conductance or respiratory arrhythmia) to infant cry videos, had infants who exhibited higher levels of attachment insecurity during a dyadic free-play interaction (Speck et al., 2023). There are several explanations for these findings. A caregiver's autonomic reactions to an infant's cries engage psychological processes that influence how parents

interact with their babies. If a caregiver is inconsistent or absent in support and care, their relationship is at higher risk for developing attachment insecurity. An alternative possibility is that infant cries elicit different autonomic responses, such as alertness, since they are biologically arousing and signal for care (Bell & Ainsworth, 1972). If the cries are perceived as stressful or aversive, due to stress, caregivers are less likely to respond appropriately to their infants' needs. Conversely, consistent parental sensitivity and care in early life experiences provide infants with a foundation of trust, paving the way for secure development.

In addition to stress, previous studies have delved into different personality characteristics that affect variations in adult perceptions of infant distress (Zeifman, 2003). After listening to infant cries, ranging from mild to vigorous distress, participants were instructed to indicate when they would intervene and pick up the infant. Relatively high levels of empathy and extraversion were associated with more sensitive responses to infant distress, regardless of the intensity of distress. These findings provide further support for the wide-spread belief that empathy is integral to sensitive caregiving and secure attachment (Ainsworth, 1985). Conversely, high levels of conscientiousness and neuroticism were associated with perceiving cries as aversive, spoiled or manipulative (Zeifman, 2003). These personality traits can be understood as a susceptibility to negative emotions and hypersensitivity to negative stimuli, leading to more negative perceptions of infant distress.

Infants use crying to seek support from their caregivers, yet perceptions of infant distress can vary by characteristics of the caregiver. Differences in gender and

psychological characteristics influence how distress is perceived, but general stressors also impact caregiver perceptions of infant distress.

Attachment Security as Protective

While understanding how stress impacts caregiver-infant interactions is important, it is equally crucial to explore the protective factors that help combat these challenges. Previous literature has addressed the importance of attachment, including the presence of trust and support in early caregiver experiences. Mary Ainsworth and John Bowlby were the first researchers to explore caregiver attachment in early infancy; specifically, the interaction between caregivers and their infants, including qualities such as sensitivity, care, and support (Bretherton, 2013). There is continued interest in the role caregivers play in nurturing a secure and healthy bond with their infants. John Bowlby's work examined these factors, uncovering the importance of early maternal connection and internal working models on later personality development (Bowlby, 1982). He provided an initial blueprint of infant and caregiver attachment; specifically, how the loss or deprivation of a caregiver in the early stages of life can pose obstacles for an individual across their entire lifespan (Bowlby, 1982). Ainsworth expanded on Bowlby's work incorporating additional critical components for a secure infant and caregiver bond; qualities such as maternal sensitivity and caregivers acting as a secure base and safe haven (Bretherton, 2016). Both Bowlby and Ainsworth laid the foundation for understanding how a caregiver's early emotional and physical bond can have lasting effects throughout a person's life. Given this work, attachment histories continue to impact adult caregivers' own interactions with infants.

Whittenburg and Colleagues (2023) found that attachment security poses as a protective factor in caregiver-infant relationships, particularly for mothers with depressive symptoms. Findings show that child attachment moderated the association between maternal depressive symptoms (MDS) and child internalizing behaviors. Meaning, MDS predicted greater child internalizing problems when attachment security was low, and the effect was reduced when attachment security was high (Whittenburg et al., 2023). Attachment security amongst a caregiver and their infant provides a foundation built on trust, care, and support; so, these qualities may protect against the stress and strain that come with feelings of depression.

The Importance of Internal Working Models

Caregiver interactions are internalized by infants at an early age (Bretherton & Munholland, 2008), shaping their internal working models. Bowlby (1982) suggests that the development of attachment orientation in childhood is shaped by numerous interactions with caregivers, which gradually form a mental framework of stable expectations and concerns. These models act as mental representations of relationships that are either supportive, trustworthy, and reliable, or insecure, depending on the care received. When an infant lacks proper guidance, love, and care, their internal working models reflect insecure relationships, often characterized by anxiety or avoidance (As observed in the Strange Situation experiment). Inconsistent support tends to foster insecure beliefs and perceptions, while consistent care and trust lead to the development of a secure internal working model (Bailham & Harper, 2004). These models persist throughout life, influencing future relationships and interactions. When early caregiving is unreliable, it can be challenging to establish healthier, more supportive relationships

later in life. Thus, early caregiver interactions appear to influence the internal working models of infants, which then shape their adult relationships.

Attachment Security and Insecurity

Ainsworth is particularly well-known for her contributions to understanding attachment patterns. She developed the Strange Situation Procedure to examine how caregivers interact with their infants (Bretherton, 2013). This observational method looked at how infants behaved when their caregiver left the room, how they engaged with a stranger in the caregiver's absence, and how they responded upon being reunited with the caregiver. The Strange Situation provided valuable insights, particularly in understanding how attachment manifests developmentally in the earliest years of life. The procedure involved a 20-minute observation during which Ainsworth examined both attachment and exploratory behaviors. Specifically, she observed how infants balanced these behaviors in the presence of their caregiver and a stranger. By manipulating conditions-removing the caregiver, introducing a stranger, and facilitating reunions-Ainsworth was able to see how infants responded to different situations.

Secure Attachment

Securely attached infants, as observed by Ainsworth, felt comfortable exploring their environment in the presence of their caregiver. They would cry when the caregiver left the room but were quickly soothed upon the caregiver's return (Ainsworth, 1985). These infants showed distress when separated but felt secure enough to explore on their own and were easily comforted by the caregiver's presence. This behavior forms the basis of a secure attachment style. Attachment security is understood as a balance between attachment-seeking and exploratory behaviors. The infant shows distress when

separated from their caregiver but feels confident exploring unfamiliar surroundings. Upon reuniting with the caregiver, the infant experiences comfort, knowing their primary source of support is nearby to offer care and reassurance. When qualities like trust, guidance, and sensitivity are demonstrated to infants early in life, they are more likely to carry these traits into future relationships throughout their lifespan (Ainsworth, 1985).

Consistent positive interactions with caregivers paves the way for infants to grow and eventually develop favorable representations or internal working models of others and even their own self as well (Mikulincer & Shaver, 2020). They are more likely to trust that others around them will provide comfort and assistance and that they themselves are deserving of that love and support. Previous research shown that secure attachment predicts relationship satisfaction and well-being, is associated with more adaptive forms of coping with stress and provides a resilience resource that reduces the likelihood of developing psychological disorders (Mikulincer & Shaver, 2020). Additionally, research has explored how Ainsworth's attachment theory applies to intimate relationships. Studies consistently show that a secure attachment style is linked to greater relationship interdependence, commitment (Simpson, 1990). These findings collectively demonstrate the benefits of having a secure attachment style, suggesting that attachment qualities can protect against the risks of stress for infant-caregiver interactions.

Insecure Attachment-Anxious

Ainsworth also identified insecure attachment, with anxious qualities representing one type of insecure attachment (Ainsworth, 1978). During the Strange Situation, infants with anxious attachment display distress when separated from their caregiver. They seek

contact upon reunion but also resist comfort and show ambivalence towards the caregiver at the same time. In this case, the infant seeks support but is uncertain whether their caregiver will respond to their needs in the right way. Anxious attachment is defined as uncertainty regarding the availability of supportive and attentive caregivers (Bowlby, 1969; Campbell & Marshall, 2011). Anxious attachment is seen when infants do not receive consistent care, making it harder to develop a sense of trust and security in caregiver relationships. In interpersonal adult relationships, anxious attachment can be seen as insecurity about partner availability and the self's inherent value (Campbell & Marshall, 2011). Anxiously attached individuals have an internal working model that makes them fear abandonment by their partner, rejection, or relationship instability. Anxious attachment leads the individual to constantly monitor and assess their environment for signs of potential neglect or loss of care, much like how an infant may feel a lack of trust in an attachment figure in early life (Fraley & Shaver, 2000).

Insecure Attachment- Avoidant

Ainsworth also categorized avoidant attachment within the insecure category (Ainsworth, 1978). Infants displaying avoidant attachment will show little distress upon separation from their caregiver and may actively avoid or ignore them upon reunion. Instead, they focus on their surrounding environment and show minimal interaction. In adult relationships, people with avoidant attachment qualities tend to be less invested in their interpersonal connection and yearn to remain psychologically and emotionally independent of their partners (Hazan & Shaver, 1994). Their internal working model is built upon a sense of discomfort with relational closeness and the reliance. Instead, they prefer to avoid any dependence by feeling a sense of security in themselves.

The Use of Infant Simulators in Research

The caregiving simulation was designed around the Leiden Infant Simulator Sensitivity Assessment (LISSA; Voorthuis et al., 2013). LISSA is a standardized tool to assess caregiver sensitivity by experimentally testing the effect of a difficult baby on the caregiver's responsiveness. In the LISSA, sensitivity is assessed using a 'life-like' infant simulator with pre-recorded cry sounds. The "RealCare" infant simulator was originally developed as a parenting teaching aid for high school students. After caring for the infant simulator, high school students had significantly more realistic attitudes towards parenting and towards interacting with a persistently crying infant (Roberts & McCowan, 2004; Strachan & Gorey, 1997). Voorthuis et al. (2013) found the LISSA to be a reliable and valid tool to assess sensitivity in a sample of undergraduate, largely female, students - none of whom were parents but had some caregiving experience with a young child.

In a previous study with the LISSA, researchers showed that young female participants experienced caretaking of the infant simulator as realistic (face validity). To add on, sensitive caregivers interacted with the infant simulator in home settings, addressing it by the simulator's given name, a behavior that reflects the sensitivity criterion identified in Ainsworth's Maternal Sensitivity Scale (criterion validity) (Bakermans-Kranenburg et al., 2015; Ainsworth et al., 1974). Findings indicated that the infant simulator was effective in eliciting sensitive caregiving behaviors, while mimicking a realistic scenario as well.

Infant simulators, proven to be an effective research tool in previous studies, are utilized in the present study to assess the impact of general acute stress on perceptions of infant distress. High levels of stress pose risks to both physical and mental health, which

can, in turn, influence how caregivers perceive and respond to infant distress. However, secure attachment has been shown to provide a positive foundation for infants, fostering trust and support early in life. Reversely, insecure qualities, such as anxious or avoidant attachment, pose a risk to the healthy development of infants. The unique nature of infant simulators allows us to explore whether insecure attachments lead to less favorable perceptions of infant distress, alongside the context of high general acute stress. These findings offer valuable insight into the impact of insecure attachment, particularly when considering factors such as general and acute stress.

Chapter 3: Methodology

The present study examined how general acute stress and insecure attachment traits influenced adult perceptions of infant distress. This section describes the sample, recruitment procedure, data collection, and study protocol.

Sample

Participants were $N = 60$ young adults, from a university campus, between the ages of 18 and 30. All participants had to meet study inclusion criteria: no biological or legal children of their own, not legally married (cohabiting with romantic partner okay), and had never used an infant simulator before. Data analyses first examined demographic characteristics such as reported gender, race/ethnicity, and university standing/majors. Ethical considerations were addressed by obtaining informed consent before participation, ensuring participant confidentiality, and following ethical guidelines through the Institutional Review Board.

Recruitment Procedures

Participants were recruited from a university campus using convenience sampling. Flyers and other advertisements were distributed, inviting students to play with a “baby robot” and receive a \$5 Starbucks gift card as an incentive. Faculty also advertised the study in their classrooms, with some offering extra credit as further incentive. Due to the readily available participants in these courses, participants were recruited primarily through Human Development and Family Science, Psychology, and Introductory Engineering courses.

Data Collection

Part 1

Participants completed an initial survey through the online platform, Qualtrics, to ensure they met study inclusion criteria. They reported on their demographic characteristics, attachment traits (Experiences in Close Relationships; Fraley et al., 2000), and general acute stress (Perceived Stress Scale; Cohen, 1983) as well as other knowledge about infants (Knowledge of Infant Inventory; MacPhee, 1981) and psychological characteristics (e.g., Self Efficacy; Teti & Gelfand, 1991; Social Desirability Scale; Marlowe-Crone, 1960) as part of the larger study.

Part 2

Researchers contacted individuals who completed the initial survey through provided emails or phone numbers, to schedule a time for the in-person caregiving task with an infant simulator. The second portion of the study involved the completion of a pre-simulation survey assessing various infant caregiving experiences as part of the larger study. Then, participants were left alone for 15 minutes to care for the infant simulator (described in more detail below). Researchers left the room and stayed directly outside, keeping track of 15 minutes on a timer while controlling the infant cries from the RealCare desktop program. Immediately after, participants completed a post-simulation survey assessing their perceptions of the simulator's distress (Adult Perceptions of Infant Distress, Zeifman, 2003). The second portion of the study took participants about 30-40 minutes. All survey results were captured in Qualtrics and were analyzed with SPSS.

Protocol

Infant Simulator Distress Task

Infant simulators (i.e., RealCare Baby 3 device) are realistic dolls resembling an infant in height (21ins), weight (7lbs), and physical appearance (Voorthuis et al., 2013). Like a real infant, the simulator vocalizes (e.g., cries and giggles) and its cries signal different needs (e.g., to be fed, changed, or comforted). The simulator is programmed with realistic cry sounds as well as burping and giggling. Cry episodes can be programmed to vary in intensity, ranging from low to mild to high fussiness. Since the simulators are primarily used for interactive purposes, they can also be programmed to signal and respond to caregiving actions like feeding, burping, or diaper changing. However, for the purpose of this study, the simulators were programmed to be unresponsive to standardize infant distress across participants. The novelty of the simulators allows us to explore whether perceptions of infant distress vary based on participants' reported stress levels and attachment qualities.

The infant simulator distress task for this study was based on the LISSA (Voorthuis et al., 2013) and Inconsolable Baby Task (Shai, 2019). During the laboratory visit, the researcher introduced the infant simulator to the participant in a small room set up for infant caregiving. Researchers used different tools within the lab to mimic a caregiving scenario. The room consisted of a couch with blankets, an infant boppy pillow, stuffed toys, and a child's lamp. The infant simulator also came with baskets containing infant diapers, bottles, clothing, books, and toys. The researcher demonstrated how to feed, change, and soothe the simulator and instructed the participant to care for the simulator as they would a real baby. Participants were deceived into thinking that the

simulator would respond to their caregiving actions (e.g., stop crying if fed, changed, rocked, etc.) but in reality, the simulator executed the same unresponsive cry pattern for every participant (consisting of alternate bouts of light fussing and cooing, eventually culminating in unconsolable screaming across 15 minutes as seen in Table 1). During the caregiving demonstration, the researchers used a specific cry pattern and timed intervals to ensure the infant stopped crying precisely when the researcher placed the bottle to the simulator's mouth (see Table 2). This made it seem as though the bottle immediately soothed the crying simulator, leading participants to believe that their caregiving efforts would be effective. Additionally, researchers gave each participant a fake caretaker bracelet, claiming it tracked caregiving behaviors through a sensor. In reality, the bracelet was not connected to the simulator and was included to create the illusion that the simulator was monitoring caregiving responses.

Table 1*Infant Simulator Cry Pattern*

Time	Behavior	Event	Quiet	Settings
Part 1: 6 minutes total				
First round: 2 min	Coo	60 sec	30 sec	This order Continuous
Second round: 2 min	Coo Cough	60 sec	15 sec	Random order Continuous
Third round: 2 min	Coo Burp	60 sec	15 sec	This order Play once
Part 2: 9 minutes total				
First round: 3 min	Coo Diaper	60 sec	15 sec	This order Continuous
Second round: 3 min	Diaper Cough	60 sec	15 sec	This order Continuous
Third round: 3 min	Rock	100 sec	30 sec	This order Play once Stop task at the end of the long rock cry. Take the baby from the participant and hand them the iPad for Survey 3.

Table 2*Cry Pattern for Deception Demonstration*

Time	Behavior	Event	Quiet	Settings
About 2 Minutes	Coo Diaper Cough	20 sec	10 sec	Random order Continuous

Inducing Participant Stress

Participants were left in the room alone while being video recorded. The procedure is designed to make participants feel like they are failing at taking care of the simulator, thereby increasing their stress levels and eliciting realistic reactions (Stephoe, 1983). Inducing stress is also important to identify variation in perceptions of infant distress. Different levels of stress can lead to different perceptions and, therefore,

different caregiving behaviors as well. This, combined with the added pressure of being video recorded, increases the participants' stress in ways that elicit more realistic reactions to the task (Steptoe, 1983). The added pressure may elicit stress by motivating participants to care for the infant in careful and supportive ways (social desirability).

Debriefing the Participants

In accordance with ethical guidelines, we debriefed participants after they completed the second part of the study. Since we used deception to induce stress, we followed IRB protocol and informed participants that the simulator was programmed to be unresponsive. We clarified that, in reality, their caregiving efforts would have been effective in soothing the infant simulator. However, we standardized the fussy cry patterns for all participants to accurately assess whether perceptions of infant distress vary based on overall stress levels.

Measures

Attachment Insecurity: During the initial survey, participants rated attachment avoidance and anxiety, as currently expressed through adult romantic relationships, with the Experiences in Close Relationships-Revised Questionnaire (Fraley et al., 2000). Participants indicated the level of agreement (1 = strongly disagree to 7 = strongly agree) on 18 avoidant traits (e.g., "I prefer not to be too close to romantic partners" and "I am nervous when partners get too close to me") and 18 anxious traits (e.g., "I worry a lot about my relationships" and "My desire to be very close sometimes scares people away"). Items were averaged to derive two scores that indicate attachment insecurity.

General Acute Stress: During the initial survey, participants rated their feelings and thoughts during the last month concerning stressful situations with the Perceived

Stress Scale (Cohen, 1983). There was a total of 10 questions with higher scores indicating higher levels of stress. Participants rated their feelings of stress (0 = never, to 4 = very often) to certain situations within the last month (e.g., “In the last month, how often have you been upset because of something that happened unexpectedly?”). Four items were reverse-coded, and all items were summed according to the measure. According to Cohen (1983), scores from 0-13 were considered low stress, scores ranging from 14-26 were moderate stress, and scores ranging from 27-40 were considered high acute stress.

Perceptions of Infant Distress: Immediately after the Infant Distress Task, participants rated their cry perceptions and emotional reactions towards the infant simulator with items adapted from Zeifman (2003). Cry perceptions included three categories of adjectives: aversive (grating, piercing, aversive), urgency (urgent, compelling), and manipulative (spoiled, manipulative). Participants rated their perception of the simulator’s distress in terms of each adjective (“How would you describe the infant's crying and fussing?”) from 1 (not at all) to 7 (extremely). We conducted principal component factor analyses with promax rotation before combining items. The seven perception items loaded onto three factors (determined by eigenvalues > 1.0) that aligned with Zeifman (2003). Mean scores were computed, with higher scores indicating the participant perceived the simulator as more aversive, urgent, and manipulative.

Emotional Reactions to Infant Distress: Emotional reactions to the simulator were also assessed (Zeifman, 2003). The three categories of emotional reaction adjectives consisted of frustration (irritated, annoyed), alarm (alarmed, upset, distressed), and sympathy (sympathetic, compassionate, tender). Participants indicated their emotional

reaction to the infant's distress ("How would you describe your reaction to the infant's crying and fussing?") and reported on each reaction adjective from 1 (not at all) to 7 (extremely). Factor analyses revealed a three-factor structure, but the items "upset", and "tender" were dropped because they were unrelated to any factor. Three mean scores were computed representing the participants' frustration (irritated, annoyed), alarm (distressed, alarmed), and sympathy (sympathy, compassion).

Chapter Four: Results

Demographic Descriptives

There was a total sample of 60 participants ($N=60$), 35% Male, 63.3% Female, and 1.7% Non-Binary from ages 18-30 ($M=20$, $SD=2.680$, $Min=18$ and $Max=29$). The participants reported their ethnicities, academic majors, academic standing (see Table 3). The full sample $N=60$ participants was used to investigate the relationship between general acute stress and attachment insecurity on perceptions of infant distress, as well as to explore correlations between individual perceptions and emotional reactions to infant distress.

Table 3

Sample Demographics

Category	Subcategory	N	%
College of Major	College of Business	2	3.3%
	College of Education and Human Development	11	18.3%
	College of Engineering	26	43.3%
	College of Liberal Arts	1	1.7%
	College of Science	7	11.7%
	School of Community Health Sciences	2	3.3%
	UNR School of Medicine	2	3.3%
	School of Social Work	1	1.7%
	Dual Major	3	5.0%
Race/Ethnicity	Asian	16	26.7%
	Black or African American	4	6.7%
	Hispanic, Latinx, or Spanish Origin	13	21.7%
	Native Hawaiian or Other Pacific Islander	3	5.0%
	White	21	35.0%
	Other / Prefer to Self-Describe	3	5.0%
Academic Standing	Freshman	16	26.7%
	Sophomore	10	16.7%
	Junior	14	23.3%
	Senior	10	16.7%
	Graduate Student	10	16.7%

Preliminary analyses considered associations between demographic variables, such as age and gender, and the main dependent variables; however, no significant associations were found.

Main Study Variable Descriptives

The independent variables were attachment insecurity (anxiety and avoidance scores) and perceived stress (acute stress scores over the past month). The dependent variables were perceptions of infant distress (aversive, manipulative, and urgent), and additional analyses incorporated reactions (sympathetic, frustrated, and alarmed) to infant distress as well.

Attachment Insecurity

Participant averages for anxious and avoidant attachment were relatively low considering the 1 to 7 measurement scale (see Table 4). Mean anxiety was 3.38 ($SD = 1.02$), and mean avoidance was 2.89 ($SD = .942$). The larger standard deviation for anxiety suggests greater variation in participants' attachment anxiety in comparison to their avoidance.

General acute stress

In terms of general acute stress, scores were relatively high (see Table 5), based on the measurement's scoring system (Cohen, 1983). The mean was 17.90 ($SD = 5.74$), which is categorized as moderate stress (Cohen, 1983). Scores ranged from 7 to 29, meaning that this specific sample had relatively moderate to high general acute stress ($M = 17.9, SD = 5.74, Min = 7, Max = 29$).

Perceptions of Infant Distress

In terms of participant perceptions of the simulator, there were higher reports of urgency ($M=4.64$, $SD=1.15$) and aversiveness ($M=3.56$, $SD=1.38$), with manipulative perceptions averaging the lowest ($M=1.68$, $SD=1.06$) (see Table 6).

Emotional Reactions to Infant Distress

In terms of participant reactions towards the simulator, participants reported the lowest average scores for feelings of frustration ($M= 2.29$ $SD= 1.29$). Participants reported greater feelings of alarm ($M=3.57$, $SD=1.31$), and the highest overall mean reported for feeling sympathetic ($M=4.59$, $SD=1.0$) (see Table 7).

Table 4

Descriptive Statistics for Attachment Insecurity (IV)

Variable	<i>N</i>	Min	Max	<i>M</i>	<i>SD</i>	Skewness	SE Skew	Kurtosis	SE Kurt
Avoidance	60	1.22	5.00	2.89	0.94	0.36	0.31	-0.75	0.61
Anxiety	60	1.06	5.06	3.38	1.02	-0.22	0.31	-0.77	0.61

Note. SD = standard deviation; SE = standard error; Min = minimum; Max = maximum.

Table 5

Descriptive Statistics for Perceived Stress Scale (IV)

Variable	<i>N</i>	Range	Min	Max	<i>M</i>	<i>SD</i>	Skewness	SE Skew	Kurtosis	SE Kurt
Acute Stress	58	22.00	7.0	29.0	17.90	5.74	0.27	0.31	-0.69	0.62

Note. SD = standard deviation; SE = standard error; Min = minimum; Max = maximum.

Table 6*Descriptive Statistics for Perceptions of Infant Distress Subscales (DV)*

Perception	N	Min	Max	M	SD	Skewness	SE Skew	Kurtosis	SE Kurt
The bot is Aversive	60	1.00	7.00	3.56	1.38	0.27	0.31	-0.36	0.61
The bot is Manipulative	60	1.00	5.50	1.68	1.06	1.96	0.31	3.65	0.61
The bot is Urgent	60	2.00	7.00	4.64	1.15	-0.20	0.31	-0.35	0.61

Note. SD = standard deviation; SE = standard error; Min = minimum; Max = maximum. Each subscale reflects a different perception dimension of infant distress.

Table 7*Descriptive Statistics for Participant Emotional Reactions to Infant Distress*

Reaction	N	Min	Max	M	SD	Skewness	SE Skew	Kurtosis	SE Kurt
I feel Frustration	60	1.00	5.50	2.29	1.29	1.09	0.31	0.46	0.61
I feel Alarm	60	1.00	7.00	3.57	1.31	0.38	0.31	0.01	0.61
I feel Sympathy	60	2.33	7.00	4.59	1.00	0.15	0.31	0.38	0.61

Note. SD = standard deviation; SE = standard error; Min = minimum; Max = maximum. Reactions reflect participant emotional reactions to perceived infant distress cues.

Research Question Findings

Research Question 1: Is general acute stress significantly associated with adult perceptions of infant distress?

To analyze this question, bivariate correlations were conducted to evaluate the relationship between higher levels of general acute stress and perceptions of infant distress (see Table 8). In relation to my hypothesis, correlations helped determine if there was an association between higher general acute stress scores and each perception rating of infant distress (specifically, if higher general acute stress was related to more negative

perceptions of infant distress). There were no significant associations between higher levels of acute general stress and perceptions of infant distress at $p < .05$.

Table 8

Bivariate Correlations Among General Acute Stress and Perceptions of Infant Distress
($N = 58-60$)

Variable	1	2	3	4
1. Stress	—			
2. The Bot is Aversive	.24 ($p=.065$)	—		
3. The Bot is Urgent	-.04	.36*	—	
4. The Bot is Manipulative	-.19	.101	.09	—

Note. Pearson correlation coefficients are shown. * $p < .05$

Research Question 2: Is attachment insecurity security significantly associated with perceptions of infant distress?

To analyze the second question, bivariate correlations were conducted to determine if there was a possible relationship between attachment insecurity (anxiety and avoidance) and perceptions of infant distress (see Table 9). Specific to my hypothesis, bivariate correlations helped determine if higher insecurity scores were associated with more negative perceptions of infant distress. There was no association found between attachment insecurity scores and perceptions of the infant simulator at $p < .05$.

Table 9

Bivariate Correlations amongst Attachment Insecurity and Perceptions of Infant Distress (N=60)

Variable	1	2	3	4	5
1. The bot is Aversive	—				
2. The bot is Urgent	.36**	—			
3. The bot is Manipulative	.10	.09	—		
4. Avoidance	.05	.07	-.05	—	
5. Anxiety	.20 (<i>p</i> =.119)	.01	.03	.37**	—

*Note. Values are Pearson correlation coefficients. $p < .01$ ***

Additional bivariate correlations were conducted to evaluate the association between general acute stress and the three emotional reactions to the infant simulator (see Table 10). There was a significant positive association between general acute stress and frustration during the simulation, $r(56)=.37$, $p < .01$ as well as alarm, $r(56)=.26$, $p < .05$. This indicates that those with greater stress felt more frustration and alarm towards the simulator than those with lower stress.

Table 10

Bivariate Correlations Among General Acute Stress and Emotional Reactions

N = 58–60.

Variable	1	2	3	4
1. General Acute Stress	—			
2. I am Frustrated (irritated, annoyed)	.40**	—		
3. I am Alarmed (distressed, alarmed)	.26*	.28*	—	
4. I am Sympathetic (compassionate, sympathy)	-.03	-.26*	-.01	—

Note. Values are Pearson correlation coefficients $p < .05$. ** $p < .01$.*

The next set of bivariate correlations analyzed the potential association between attachment insecurity and reactions to the infant simulator (see Table 11). There was no association found between attachment insecurity and reactions to infant distress at $p < .05$.

Table 11

Correlations Among Emotional Reactions and Avoidance/Anxiety Measures

$N = 60$.

Variable	1	2	3	4	5
1. I am Frustrated	—				
2. I am Alarmed	.28*	—			
3. I am Sympathetic	-.26*	-.01	—		
4. Avoidance	.02	.08	-.18	—	
5. Anxiety	.07	.20	-.15	.37**	—

Note. Values are Pearson correlation coefficients * $p < .05$. ** $p < .01$.

Research Question 3: Is higher attachment insecurity security a risk factor for negative perceptions of infant distress when general acute stress is low?

To answer the third research question, six two-way ANOVAs were conducted to examine the effects of general acute stress and attachment insecurity (anxious and avoidant) on each of the three perceptions of infant distress (aversive, manipulative, and urgent). The median scores for general acute stress, and anxious and avoidance attachment scores were first determined to then create median splits. The new scores from the median splits were coded into new variables (1=low, 2=high) and used in all ANOVA analyses. Six additional ANOVA analyses included testing the effects of

general acute stress and attachment insecurity on reactions to infant distress (frustration, sympathy, alarm). Twelve total ANOVA analyses were conducted.

The Bot is Aversive

The effects of anxious attachment traits and general acute stress on aversive perceptions were first evaluated. There was a significant main effect of stress, $F(1, 57) = 3.94, p = .052$, partial $\eta^2 = .068$ (medium effect size), indicating that higher stress appeared to have an effect on perceiving the infant simulator as more aversive ($M = 4.27, SD = 1.40$) than those with lower stress ($M = 3.0, SD = 1.17$). The main effect of anxiety was not significant, $F(1, 57) = 2.41, p = .127$, partial $\eta^2 = .043$ (small to medium effect size) between groups of high anxiety ($M = 3.83, SD = 1.5$) and those with lower anxiety ($M = 3.27, SD = 1.19$). The interaction between anxious attachment qualities and stress was not significant, $F(1, 57) = .223, p = .639$. Despite this, it is important to note that participants with higher levels of anxious attachment and general acute stress reported the highest overall aversive perception ratings ($M = 4.28, SD = 1.4$), whereas those with lower anxious attachment and general acute stress reported the lowest ($M = 3.0, SD = 1.17$).

The effects of avoidant attachment traits and general acute stress on aversive perceptions were also evaluated. There was a significant main effect of stress, $F(1, 57) = 5.22, p = .026$, partial $\eta^2 = .088$ (medium to large effect size), indicating that higher stress appeared to play a role in perceiving the infant simulator as more aversive ($M = 3.9, SD = 1.43$) than those with lower stress ($M = 3.0, SD = 1.06$). The main effect of avoidant attachment was not significant, $F(1, 57) = .054, p = .818$. The interaction between avoidant attachment qualities and stress was not significant, $F(1, 57) = .484, p = .490$.

Although not significant, participants with low levels of general acute stress and avoidant attachment reported the lowest mean aversive perception scores ($M=3.0, SD =1.09$), whereas those with high acute stress but low avoidant attachment reported the highest ($M= 4.07, SD =1.36$).

The Bot is Manipulative

Next, the effects of anxious attachment traits and general acute stress on perceptions of the infant simulator as manipulative were examined. There was no significant main effect of stress, $F(1, 57) = .667, p = .418$, indicating that stress did not play a significant role in perceiving the infant simulator as manipulative. The main effect of anxiety attachment qualities was not significant, $F(1, 57) = .006, p = .940$. The interaction between anxious attachment qualities and stress was not significant, $F(1, 57) = .561, p = .457$. Although not significant, participants with lower levels of anxious attachment and low general acute stress reported the highest overall manipulative perception ratings ($M= 1.86, SD= 1.32$) whereas those with lower anxious attachment but higher general acute stress reported the lowest ($M= 1.41, SD= .92$).

The effects of avoidant attachment traits and general acute stress on perceptions of the infant simulator as manipulative were examined. There was no significant main effect of stress, $F(1, 57) = .714, p = .402$, indicating that stress did not play a big role in perceiving the infant simulator as manipulative. The main effect of avoidant attachment qualities was not significant, $F(1, 57) = .450, p = .505$. The interaction between anxious attachment qualities and stress was not significant, $F(1, 57) = .085, p = .771$, but participants with higher levels of avoidant attachment and lower general acute stress reported the highest overall manipulative perception ratings ($M=1.93, SD =1.52$)

whereas those with lower avoidant attachment but higher general acute stress reported the lowest ($M = 1.5, SD = .832$).

The Bot is Urgent

The effects of anxious attachment traits and general acute stress on perceptions of the infant simulator as urgent were examined. There was no significant main effect of stress, $F(1, 57) = .807, p = .373$, indicating that stress did not play a big role in perceiving the infant simulator as urgent. The main effect of anxious attachment qualities was not significant, $F(1, 57) = .064, p = .801$. The interaction between anxious attachment qualities and stress was not significant, $F(1, 57) = .147, p = .703$, but participants with lower levels of anxious attachment and higher general acute stress reported the highest overall urgent perception ratings ($M=4.91, SD = 1.2$) whereas those with lower anxious attachment and lower general acute stress reported the lowest ($M= 4.5, SD =1.47$).

Lastly, the effects of avoidant attachment traits and general acute stress on perceptions of the infant simulator as urgent were examined. There was no significant main effect of stress, $F(1, 57) = .700, p = .406$, indicating that stress did not play a big role in perceiving the infant simulator as urgent. The main effect of avoidant attachment qualities was not significant, $F(1, 57) = .070, p = .792$. The interaction between avoidant attachment qualities and stress was not significant, $F(1, 57) = .244, p = .624$, but participants with lower levels of avoidant attachment and higher general acute stress reported the highest overall urgent perception ratings ($M= 4.82, SD= 1.21$), whereas those with lower avoidant attachment and lower general acute stress reported the lowest ($M= 4.41, SD= 1.41$).

I am Frustrated

The effects of anxious attachment traits and general acute stress on reactions of frustration were initially examined. There was no significant main effect of stress $F(1, 57) = 3.57, p = .064$. The main effect of anxious attachment was not significant $F(1, 57) = .007, p = .935$. The interaction between anxious attachment qualities and general acute stress was not significant, $F(1, 57) = .026, p = .873$, but participants with higher levels of anxious attachment qualities and higher general acute stress reported the highest overall frustrated reactions ($M = 2.62, SD = 1.57$), whereas those with higher anxious attachment and lower general acute stress reported the lowest ($M = 1.91, SD = .85$).

The effects of avoidant attachment traits and general acute stress on reactions of frustration were initially examined. There was a positive significant main effect of stress, $F(1, 57) = 3.92, p = .053$, indicating that stress played a role in frustrated reactions after the simulation ($M = 2.61, SD = 1.47$). The main effect of avoidant attachment qualities was not significant $F(1, 57) = .020, p = .888$. The interaction between avoidant attachment qualities and general acute stress was not significant, $F(1, 57) = 1.88, p = .176$, but participants with higher levels of avoidant attachment qualities and higher general acute stress reported the highest overall frustrated reactions ($M = 2.86, SD = 1.62$), whereas those with higher avoidant attachment and lower general acute stress reported the lowest ($M = 1.75, SD = .80$).

I am Alarmed

The effects of anxious attachment traits and general acute stress on reactions of alarm were also examined. The main effect of stress was significant, $F(1, 57) = 4.23, p = .044$, indicating that stress may have played a role in alarmed reactions after the

simulation. The main effect of anxious attachment qualities was not significant, $F(1, 57) = 2.64, p = .110$. The interaction between anxious attachment qualities and general acute stress was not significant, $F(1, 57) = .635, p = .422$. Participants with higher levels of anxious attachment qualities and higher general acute stress reported the highest overall alarm reactions ($M = 5.0, SD = 1.37$), whereas those with lower anxious attachment and lower general acute stress reported the lowest ($M = 3.57, SD = 1.2$).

The effects of avoidant attachment traits and general acute stress on reactions of alarm were also examined. The main effect of stress was significant, $F(1, 57) = 5.65, p = .021$, indicating that stress may have played a role in alarmed reactions after the simulation. The main effect of avoidant attachment qualities was not significant, $F(1, 57) = .0, p = .991$. The interaction between avoidant attachment qualities and general acute stress was not significant, $F(1, 57) = 1.87, p = .117$. Participants with lower levels of avoidance attachment qualities and higher general acute stress reported the highest overall alarm reactions ($M = 4.89, SD = 1.27$), whereas those with lower anxious attachment and lower general acute stress reported the lowest ($M = 3.44, SD = 1.08$).

I am Sympathetic

Finally, the effects of anxious attachment traits and general acute stress on reactions of sympathy were examined. There was no significant main effect of stress, $F(1, 57) = .041, p = .841$, indicating that stress did not play a role in sympathetic reactions after the simulation. The main effect of anxious attachment qualities was not significant $F(1, 57) = .543, p = .464$. The interaction between anxious attachment qualities and general acute stress was not significant, $F(1, 57) = .962, p = .331$. Participants with lower levels of anxious attachment qualities and lower general acute stress reported the

highest overall sympathetic reactions ($M= 5.08, SD= 1.34$), whereas those with higher anxious attachment and lower general acute stress reported the lowest ($M= 4.50, SD= 1.71$).

The effects of avoidant attachment traits and general acute stress on reactions of sympathy were also examined. There was no significant main effect of stress, $F(1, 57) = .086, p = .770$, indicating that stress did not play a role in sympathetic reactions after the simulation. The main effect of avoidant attachment was not significant, $F(1, 57) = 3.32, p = .074$. The interaction between avoidant attachment qualities and general acute stress was not significant, $F(1, 57) = .034, p = .855$. Participants with lower levels of avoidant attachment qualities and lower general acute stress reported the highest overall sympathetic reactions ($M= 5.16, SD= 1.12$), whereas those with higher avoidant attachment and higher general acute stress reported the lowest ($M= 4.46, SD= .99$).

Additional Analyses

Bivariate Correlations with Perceptions, Reactions, General Acute Stress, and Attachment Insecurity

Previous studies show that behavioral information can be activated by the perceptions of stimuli and context around us (Ferguson & Bargh, 2004). That context can subsequently influence reactions and behaviors. Therefore, although participant reactions were not part of the initial research questions, they can reveal critical information on how perceptions of infant distress influence caregiving behaviors and how caregivers may interpret their infant's behaviors. Bivariate correlations were conducted to examine the relationship between all three categories of perceptions and reactions, along with the main study variables (general acute stress and attachment insecurity) (see Table 12).

Table 12

Bivariate Correlations amongst main study variables and perceptions and reactions to infant distress

N = 58–60.

Variable	1	2	3	4	5	6	7	8
1. I am Frustrated	—							
2. I am Alarmed	.28*	—						
3. I am Sympathetic	-.26*	-.01	—					
4. Avoidance	.02	.08	-.18	—				
5. Anxiety	.07	.20	-.15	.37**	—			
6. General Acute Stress	.40**	.26*	-.03	.04	.29*	—		
7. The bot is Urgent	.02	.48**	.03	.07	.01	-.04	—	
8. The bot is Aversive	.55**	.63**	-.02	.05	.20	.24	.36**	—
9. The bot is Manipulative	.11	.21	-.33**	-.05	.03	-.19	.09	.10

Note. Values are Pearson correlation coefficients* $p < .05$. ** $p < .01$.

Higher levels of general acute stress were significantly associated with higher feelings of frustration $r(58)=.40, p = .002$. There was also a significant association between perceiving the bot as aversive and reacting with frustration $r(60)=.55, p = <.001$. Higher frustrated reactions were also significantly associated with lower sympathetic reactions $r(60)=-.26, p = .044$. Perceiving the bot as urgent $r(60)=.48, p = <.001$ and aversive $r(60)=.63, p = <.001$ were significantly associated with higher reactions of alarm. Higher alarmed reactions were also significantly associated with higher general acute stress $r(58)=.26, p = .047$. Perceiving the bot as manipulative had a significant association with less sympathetic reactions $r(60)=-.33, p = .009$. Higher levels of anxious attachment qualities had a significant association with higher levels of general acute stress $r(58)=.29, p = .030$.

Chapter 4: Discussion

This study examined the effects of stress and attachment insecurity on caregivers' perceptions of infant distress. Research suggests that infant crying is a biologically arousing signal intended to elicit care and support from caregivers (Leerkes et al., 2009). In response, caregivers interpret and react to these signals based on their perceptions of infant distress. Prior studies have shown that both chronic and acute caregiver stress can negatively affect infant development and may interfere with the accurate interpretation of distress cues (Barnett et al., 2022). Additionally, insecure attachment has been linked to difficulties in emotion regulation, trust, and a sense of security across the lifespan (Campbell & Marshall, 2011). To explore these findings further, this study used innovative robot simulators to assess how acute stress and attachment insecurity influence caregivers' perceptions and reactions to infant distress. Three research questions were developed to investigate whether higher stress levels and attachment insecurity are associated with more negative perceptions of infant distress. The findings are summarized and discussed, along with potential explanations, study limitations, and directions for future research.

Stress and Perceptions of Infant Distress

Regarding my first research question, I hypothesized that higher levels of general acute stress would lead to more negative perceptions of infant distress. Findings show a trend towards significance between higher levels of reported acute stress and perceiving the infant simulator as aversive ($p=.065$). However, there were no significant associations between higher levels of acute stress and perceiving the infant simulator as manipulative or urgent. The term “manipulative” may be challenging to apply to an infant simulator, as

it does not possess thoughts like a real infant. This could help explain why no significant associations were found between acute stress and perceptions of manipulateness.

Adding on, perceptions of urgency may rely on different variables, separate from stress, and these ideas can be explored further with a larger sample size and incorporating additional factors that can affect perceptions of infant distress.

Future studies could further investigate the potential association between stress and perceptions of aversiveness to determine whether the findings are consistent. One possible explanation for this association is the impact stress can have on an individual's mental health. The term aversiveness refers to something that provokes discomfort, dislike, or avoidance. As stress accumulates, naturally arousing stimuli, like infant cries, may be perceived as even more distressing and intolerable. If perceptions are negative, a caregiver's ability to tend to and support their infant are hindered. Therefore, these findings highlight the importance of stress management and the need for additional resources and support for caregivers experiencing elevated stress levels, even when that stress is acute, as reported by participants in this study.

Attachment Insecurity and Perceptions of Infant Distress

For my second research question, I hypothesized that higher levels of attachment insecurity would lead to more negative perceptions of infant distress. These findings also seemed to show a trend towards significance between higher levels of anxious attachment and perceiving the infant simulator as aversive. ($p=.119$). However, analyses run with avoidant attachment were not significant. Future studies could build on these findings by using a larger sample size to determine whether the observed trend between perceptions of aversiveness and higher levels of anxious attachment remain consistent. Anxious

attachment is often characterized by fear of abandonment or a need for reassurance and closeness in a relationship (Campbell & Marshall, 2011). As a result, individuals with an anxious attachment style may become more hypervigilant to cues, ensuring they avoid rejection or isolation. Participants in the study with higher levels of anxious attachment may have been more hypervigilant towards the infant cries, potentially feeling that the infant simulator caused distress, was overwhelming, and may even interpret the cries as a sign of rejection or not being a “good enough caregiver”.

Stress as a Driving Factor

Lastly, for the third research question, I hypothesized that participants experiencing high stress, but lower levels of insecure attachment, would have fewer negative perceptions of infant distress, whereas those with both high stress and high levels of insecure attachment would perceive infant distress more negatively. Six two-way ANOVAs were conducted to examine the effects of general acute stress and each of the two insecure attachment styles on all three perception variables. An additional six two-way ANOVAs were conducted to evaluate general acute stress and attachment insecurity on all three emotional reactions to infant distress.

In the analyses, stress appeared to be a driving factor in both negative perceptions and reactions to infant distress, while attachment insecurity was not significant, contrary to expectations. These findings suggest that stress may be the driving factor influencing negative perceptions of the infant simulator, whereas attachment appears to have a less substantial effect. Whether stress overpowers the effects of attachment in a caregiving scenario is nuanced; however, prior literature explains that stress often disrupts accurate

perceptions of infant distress (Speck et al., 2023) and may therefore disrupt how certain attachment qualities are expressed or experienced.

There was a significant main effect of stress in terms of perceiving the infant simulator as aversive for both anxious and avoidantly attached individuals. Also, the effect of anxious attachment qualities on aversive perceptions was significant ($p=.052$). Similar to the findings from the bivariate correlations, stress appears to have a consistent effect on perceiving the infant cries as overwhelming and emotionally triggering (i.e., aversive), and participants with anxious attachment could be even more hyperaware of infant cries or emotionally more sensitive to distressed signals.

No significant associations were found between the main effects of stress or attachment insecurity for manipulative or urgent perceptions. These findings may be attributed to the challenge of applying the term "manipulative" to an inanimate object such as the infant simulator. Zeifman (2003) used "manipulative" as a rating, but their study consisted of real infants, making it easier to apply the term.

There was a main effect of stress trending towards significance ($p=.064$) in terms of frustrated reactions, suggesting that this association may be important in a larger sample. Previous literature shows that stress has a harmful impact on caregiving behaviors, including less tolerance and patience for cries and others signs of distress, leading to possible reactions such as frustration (Crnic & Low, 2002); therefore, the trend towards significance makes sense.

The effects of anxious attachment traits and general acute stress on reactions of sympathy were examined. The main effect of stress was not significant, indicating that stress did not play a role in sympathetic reactions after the simulation. Although

insignificant, this finding makes sense since higher levels of stress can make it difficult to show sympathy or tenderness towards a distressed infant (Santelices et al., 2021).

The main effect of avoidant attachment qualities had a positive association trending towards significance. Under certain stressful or unclear circumstances, such as a caregiving scenario, people with avoidant attachment qualities may feel a sense of responsibility, potentially leading to sympathetic reactions, even if they initially try to keep their distance emotionally (Hazan & Shaver, 1994). The interaction between avoidant attachment qualities and general acute stress was not significant, meaning that these two factors did not depend on each other regarding sympathetic reactions. To expand, it appears that avoidant attachment qualities on their own had a larger impact on sympathetic reactions compared to stress.

Emotional Reactions to Infant Distress

Previous literature shows that higher levels of stress place infant-caregiver relationships at risk, making it difficult for caregivers to support their infants in effective ways (Speck et al., 2023). Therefore, the significant association between higher levels of general acute stress and more frustration is theoretically sound. Those with higher levels of stress may have limited the amount of patience, care, and support participants could provide, resulting in more frustrated reactions. There was also a significant association between aversive perceptions and frustrated reactions. Perceptions of aversiveness relate to avoidance or a need to escape something discomforting (Ainsworth, 1978). If a caregiver sees an infant as difficult or unpleasant, especially after repeated efforts to soothe the child, it is understandable that they might react with frustration.

There were also significant associations between higher frustration but lower sympathetic reactions. When overwhelming emotions and irritation take over, it can be very challenging to feel sympathy for a fussy infant. Urgent and aversive perceptions were significantly associated with alarmed reactions. Participants were deceived into thinking that the infant simulator would respond to their efforts; however, since the simulator was coded to remain fussy, participants may have felt that they were “failing” at the caregiving task, resulting in perceptions of urgency (For example, “What can I do to calm the infant down immediately?”) or aversiveness (For example, “I need a break from the consistent fussiness”). These perceptions may have been startling, especially given the false expectation of a "calm baby," which could have triggered alarmed or shocked responses.

Higher levels of general acute stress were significantly associated with higher alarmed reactions, further supporting prior literature and emphasizing the harmful effects of stress on caregiving efforts. Viewing the infant simulator as manipulative was associated to fewer sympathetic responses, aligning with the idea that it's hard to offer support and care to something perceived as sneaky or controlling. Lastly, higher levels of anxious attachment qualities were associated with higher levels of general acute stress. Possible explanations can involve the stress that comes along with higher emotional reactivity, hyperawareness in interpersonal relationships, or fear of rejection- all common features of anxious attachment styles (Ainsworth, 1978).

Limitations and Future Research

One notable limitation of the study was the small sample size, which reduced both the generalizability of the findings and the statistical power of the analyses. With only 60 participants, the study was primarily capable of detecting larger effect sizes, making it more difficult to identify true effects that may exist. This limitation increases the risk of Type II errors, or false negatives, where differences or associations may be wrongly labeled as not significant (Akobeng, 2016). Additionally, the restricted sample size limits the applicability of the results to the broader population, and outcomes may be influenced by unique characteristics of the sample (i.e., such as the use of a college student population). A larger sample may help test and identify more significant associations between variables while increasing levels of generalizability as well.

Another limitation is that the study evaluated a small portion of individuals on a college campus. While this study offers a starting point, future studies can use a larger and more diverse sample to explore different and new associations between variables. Expanding the population may lead to even more diverse backgrounds, including caregiving backgrounds and provide additional components that can impact research questions.

The measure used to evaluate attachment insecurity also posed additional limitations. This specific attachment measure asked questions based on romantic relationships and therefore, participants had to draw from their own romantic experiences. However, participants may have had limited or no romantic experiences, making it difficult for those participants to answer those questions. Their answers may not provide an accurate or holistic representation of attachment insecurity. The specific

measure also evaluated attachment in limited ways, by only targeting insecure attachment rather than including secure qualities in the broader picture. As a result, the sample lacked variability in attachment insecurity to allow for meaningful testing.

This study also did not account for different caregiving experiences. While participants had the opportunity to describe previous experiences with young infants, the analyses and study design did not consider how these differences could lead to different perceptions and reactions towards infant distress. Future studies can evaluate how caregiving experiences (teachers, babysitters etc.) can lead to different results.

While the use of infant simulators is innovative and allowed for standardized cry patterns across participants, they also provide limitations. Findings showed that attachment qualities did not have overall strong significance with perceptions of and reactions to infant distress, and this could be due to the fact that participants were given a robot rather than a real infant. A real infant may tap into internal working models in a more effective way while infant simulators may not elicit those same attachment behaviors. Future studies can examine additional variables that may tap into internal working models, eliciting true attachment and caregiving behaviors. Future studies could also incorporate additional measures for both attachment and perceptions of infant distress. For instance, using terminology more applicable to infant simulators or employing attachment assessments that also capture secure attachment characteristics rather than just insecure qualities.

Lastly, the questionnaires relied on self-report measures. Self-report involves participant bias, especially since the provided answers came from one, limited source.

Future studies can evaluate additional social desirability scales or incorporate additional behavioral and physiological sources to account for this bias

Conclusion

This project aimed to explore how general acute stress and attachment insecurity influence perceptions of infant distress. Participants provided self-reports on both anxious and avoidant attachment styles, as well as their levels of acute stress experienced over the past month. To ensure consistency, innovative infant simulators were used to produce standardized crying patterns during a caregiving simulation. Following the simulation, participants rated the infant distress cues based on perceived aversiveness, urgency, and manipulateness, and assessed their own emotional reactions in terms of alarm, sympathy, and frustration. The findings underscore the critical role of managing acute stress to accurately interpret infant distress signals and offer appropriate support and care. Findings from this study can inspire future studies to expand on ideas using innovative technology and potentially discover additional factors that tie into caregiving and perceptions of infant distress.

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