EXAMINING THE ROLE OF EARLY ADVERSITY AND TEMPERAMENT IN COGNITIVE DEVELOPMENT AND HAIR CORTISOL LEVELS OF INFANTS

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ABSTRACT

EXAMINING THE ROLE OF EARLY ADVERSITY AND TEMPERAMENT IN COGNITIVE DEVELOPMENT AND HAIR CORTISOL LEVELS OF INFANTS

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Although early adversity, including being reared in institutional care or a low socioeconomic environment, influences children's development negatively, not all children are affected at the same level. This thesis aims to examine the role of early adversity and temperament in infants' cognitive development and their stress regulation systems. Study I longitudinally examined the cognitive development of infants 3 to 15 months old reared in institutional care (N = 75). Their development was compared with that of infants in a biological family group (N = 65). In Study II, infants' cognitive development in institutional care (N = 63) was compared with that of infants reared in low-socioeconomic status (SES) family environments (N = 60) at one-time point. The moderating role of temperament was also examined in both Study I and Study II. Study III examined the association between hair cortisol levels of the infants, SES levels of their families, cognitive development, and temperament.

Findings from Study I showed that infants in institutional care had lower cognitive development in wave 1, and they could not catch up with their age-mates in family groups in wave 3. Study II showed that infants with low levels of falling reactivity had lower attention skills than infants in the low-SES family group. However, there was no group difference for infants with high levels of falling reactivity. According to the

findings in Study III, a mediating role of hair cortisol was not found, but infants' temperament significantly moderated the effects of SES on infants' hair cortisol levels.

Keywords: Cognitive Development, Early Adversity, Hair Cortisol, Institutional Care, Temperament.

ÖZ

ERKEN DÖNEM YAŞAM STRESİNİN VE MİZACIN BEBEKLERİN KORTİZOL DÜZEYLERİ VE BİLİŞSEL GELİŞİMLERİ ÜZERİNDEKİ ETKİSİ

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Erken dönem yaşam stresi, çocukların gelişimini olumsuz etkilese de, her çocuk aynı düzeyde etkilenmiyor. Bu tez, erken dönem yaşam stresinin (korunma altında büyümek ve düşük sosyo-ekonomik çevre), ve mizacın, bebeklerin bilişsel becerileri ve stres düzenleme sistemleri üzerindeki rolünü incelemeyi amaçlamaktadır. Birinci çalışmada, kurum bakımda büyüyen (N = 75) 3-15 aylık bebeklerin bilişsel becerileri boylamsal olarak incelenmiştir, ve aile yanında büyüyen bebeklerin (N = 65) gelişimleri ile karşılaştırılmıştır. Ayrıca, mizacın düzenleyici rolü de farklılaşan hassasiyet teorisi çerçevesinde incelenmiştir. İkinci çalışmada ise kurum bakımındaki bebeklerin bilişsel becerileri (N = 63), düşük SED aile yanında büyüyen bebeklerin (N = 60) gelişimleri ile karşılaştırılmıştır. Yine mizacın düzenleyici rolü de incelenmiştir. Çalışma III'te ise, bebeklerin kortizol düzeylerinin, ailenin ekonomik düzeyi ve bilişsel gelişim arasında aracı rolü incelenmiştir. Mizacın SED ve kortizol seviyesi arasındaki düzenleyici rolüne de bakılmıştır.

Birinci çalışmanın bulgularına bakıldığında, kurum bakımında büyüyen bebeklerin bilişsel gelişimlerinin aile yanında büyüyen bebeklere göre daha düşük olduğu, ve zaman içinde bu bebeklerin hala aile yanında büyüyen bebekleri yakalayamadığı bulunmuştur. İkinci çalışmada ise mizacın düzenleyici etkisi bulunmuştur. Mizaç

olarak sıkıntılı durumlardan kolay toparlanan bebeklerde gruplar arası fark bulunmazken, kendini toparlamakta sıkıntı yaşayan bebekler eğer kurum bakımında ise bilişsel gelişim puanlarının düşük SED aile yanındaki bebeklere göre daha düşük olduğu bulunmuştur. Çalışma III'te, bebeklerin kortizol seviyesinin, ailenin SED ve bilişsel gelişimleri arasındaki aracı rolü anlamlı çıkmamıştır. Fakat, olumsuz duygulanım düzeyi yüksek olan bebeklerin kortizol düzeyleri, düşük SED ortamında düşükken, aynı bebeklerin sosyo-ekonomik düzeyi daha iyi olan aile yanında kortizol seviyelerinin yüksek olduğu bulunmuştur.

Anahtar Kelimeler: Bilişsel Gelişim, Erken Dönem Yaşam Stresi, Kortizol Kurum Bakımı, Mizaç.

To my grandfather, Kadir Ertekin

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CHAPTER 1

INTRODUCTION

1.1. Overview

Early adversity includes poverty, neglect, and poor prenatal experiences and affects children's developmental outcomes (Pechtel & Pizzagalli, 2011). How children are affected might depend on the level of exposure, type of stress, and duration of exposure to stressful situations (Teicher, Samson, Polcari, & McGreenery, 2006). The institutional setting is considered a nonoptimal context for the raising of a child compared to the family environment. Children raised in institutions are more likely to have developmental delays, including cognitive skill problems, than children in the family environment (Loman et al., 2009). Thus, the first aim of the present thesis was to examine infants' cognitive development and compare infants residing in institutions to infants in family homes. For this purpose, in Study I, growth rates of the cognitive development of institutionalized infants (including novelty preferences, focused attention, and object permanence) were compared with those of family-reared infants. In Study II, infants in institutions and infants in low-socioeconomic status (SES) family homes were compared in terms of cognitive development.

Besides this group comparison, one of the aims of this thesis was to examine the moderating role of infants' temperament in the association between environment and cognitive development. In both Study I and Study II, falling reactivity was examined as a temperamental characteristic of children in light of the differential susceptibility theory (Pluess & Belsky, 2009). Study II includes the manuscript accepted for publication in *Infancy*.

A number of studies suggest that early adversity may alter the stress regulation of infants and children. For instance, it was shown that exposure to poverty and socioeconomic problems was related to elevated cortisol levels in children (Chen, Cohen, & Miller, 2010; Clearfield, Carter-Rodriguez, Merali, & Shober, 2014). There are also studies suggesting that cortisol might be related to the cognitive development of children. Forns et al. (2014) reported that higher basal cortisol levels were positively associated with better cognitive skills in infants from middle-SES families. However, a lower basal cortisol level was associated with better executive functioning skills in low-SES infants (Blair, Berry, & FLP Investigators, 2017). Thus, the third aim of this thesis was to examine whether cortisol level mediates the link between SES and cognitive development. For this purpose, in Study III, infants from disadvantaged SES backgrounds were recruited, their cortisol levels were assessed through hair samples, and SES and its associations with cortisol and cognitive development were examined. Study III includes the manuscript published online in *Developmental Psychobiology* (2020).

In Chapter One, a literature review related to early environmental stress and its association with cognitive development, temperament, and cortisol levels of children will be given. All research questions are presented at the end of Chapter One. There are three studies in the current thesis, and each of them will be presented consecutively in separate chapters. A brief introduction, methodology, results, and discussion will be provided for each study. Finally, in Chapter Five, all results will be discussed in light of the literature.

1.2. Early Adversity

Poverty, violence, neglect, physical and emotional abuse, social deprivation, disasters, and poor prenatal experiences are commonly studied types of early adversity that cause stress (Brown et al., 2009; Raznahan, Greenstein, Lee, Clasen, & Giedd, 2012). Early life stress (ELS) is defined as being exposed to one or multiple risk factors during early childhood while not having enough resources to cope with them (Pechtel & Pizzagalli,

2011). “Early life stress” and “early adversity” will be used interchangeably in the following text.

Variations in the effects of ELS depend on the type and severity of adversity, the timing of the adversity, and the duration of the exposure (Pechtel & Pizzagalli, 2011; Teicher et al., 2006). Exposure to adversity may differentially affect each child depending on the time of exposure. For instance, children exposed to sexual abuse between the ages of 3 and 5 and 11-13 years were found to have smaller hippocampal volumes, while children exposed between the ages of 9 and 10 had reduced corpus callosum area and exposure to abuse at the ages of 11-14 was found to be associated with problems in the prefrontal cortex (Andersen et al., 2008). Thus, timing of exposure is decisive for the developmental outcomes of children. Duration of exposure is also important for child outcomes. Studies related to institutional care can be given as an example of work on the effects of duration. For instance, children who stayed longer in institutions had lower performance in executive functioning tasks compared to children who stayed for shorter periods (Colvert et al., 2008). Similarly, children who were adopted earlier from institutions had better school achievement and better brain development than children who were adopted later (Beckett et al., 2007; Hodel et al., 2015).

Being exposed to multiple types of stressors also affects the development and mental health of children. For example, in a study of adults who were exposed to early childhood stressors including family stressors such as physical abuse, sexual abuse, and neglect showed that mental health scores of the participants negatively associated with the total number of stressors that experienced in their childhood (Edwards, Holden, Felitti, & Anda, 2003). It was also found that neglected children had lower reading ability, mathematical skills, IQ, and cognitive skills compared to nonneglected children, but if the neglect was comorbid with post-traumatic stress disorder, the outcomes were worse than in other cases (De Bellis, Hooper, Spratt, & Woolley, 2009).

Although there are many types of early life stress, two main adversities will be focused on in the present study, which are being reared in institutions and in low-SES family homes. Specific literature about these two early rearing environments will be explained in the next two sections.

1.2.1. Institutions

Not all children have a chance to live with their biological parents. Some children are homeless and living in shelters, or are cared for by social services, foster parents, or relatives. Although in recent years the number of institutions has decreased in Turkey (Erdal, 2014), a considerable number of children are still living in residential care around the world (McCall, 2013). The reasons why these children are taken into care vary and are not always well documented. Some of the reasons are parental loss, physical or psychiatric health problems of parents, abuse, neglect, poverty, imprisonment, economic difficulties, single parenting, having children out of wedlock, and abuse (Ertekin & Berument, 2019; Muñoz-Hoyos et al., 2001; Zeanah et al., 2003). Together with the reasons for care placement, little is known about the prenatal experiences of these children, including birth weight and drug usage in pregnancy (McCall, 2013). According to the Bucharest Early Intervention Project, children in the institutionalized group had lower birth weights (Nelson et al., 2007; Smyke et al., 2007), suggesting that these children were already in a risky environment before being placed in institutions.

The characteristics of institutions change from country to country or even within a country. However, there are still some common features. First, children are living with other children of the same age in large groups within large buildings. The number of children in groups varies from 9 to 16 and is higher in some countries. Children are frequently changing wards while they grow (St. Petersburg-USA Orphanage Research Team, 2005). Second, the number of caregivers is high and not consistent. There are at least 6-8 caregivers for each group, and this number increases with turnovers, holidays, and shifts (McCall, 2013; St. Petersburg-USA Orphanage Research Team, 2008). In Turkey the situation in institutions was similar, with 12-15 children in each

ward and 8-9 caregivers, excluding other staff. However, with the introduction of new care models like care villages or group homes, the number of children in groups has been decreased, and currently, each group resides in either a house or a flat with more consistent caregivers (Erdal, 2014). Finally, although physical conditions of institutions have generally improved around the world, some institutions still have poor nutrition, poor sanitary conditions, and a lack of resources (Nelson et al., 2007).

Although conditions in institutions vary even within countries, these are some universal characteristics that might be helpful in understanding why children in institutions are delayed developmentally. In the following sections, the developmental outcomes of institutionalized children will be given in more detail after explaining low-SES environments.

1.2.2. Low-SES Homes

The socioeconomic status of families can be described by looking at some particular indicators. Family income, occupational status, parental education level, and income-to-needs ratio are the primary determinants of SES (Karaoğlan & Saraçoğlu, 2018). Besides these factors, the number of people living in the house, the physical environment of the family and neighborhood, materials and stimulators at home, and housing quality (e.g., having clean tap water or not) are some other determinants of SES (Fahmy et al., 2015). Although indicators may vary in each study, they all show that SES has a decisive role in child development, either directly with lack of resources or indirectly through parenting (Bøe et al., 2014; Evans, 2004).

First, more impoverished families have more chaos and noise at home and also have unstable family structures, which have critical roles in child development (Evans & Wachs, 2010). For instance, Vernon-Feagons et al. (2012) showed that disorganized family homes were negatively associated with the language development of children at the age of 3 after controlling for income and education levels of parents. Low-SES families also have more conflict at home and family members are less supportive of each other (Repetti, Taylor, & Seeman, 2002). In contrast, greater family wealth is

associated with better family communication and higher family support, which predicts a positive family atmosphere (Ramdahl, Jensen, Borgund, Samdal, & Torsheim, 2018).

Second, poorer parenting practices are more common in low-SES environments (Roubinov & Boyce, 2017). For instance, parents in low-SES environments are more likely to be harsher and use more punitive behaviors than parents in high-SES environments (Hoffman, 2003). They also have less parental knowledge about child-rearing practices, which may have a role in positive child outcomes (Morawska, Winter, & Sanders, 2009; Rowe, 2018). For instance, a recent study found that maternal practices mediated the association between maternal education and child literacy skills (Mendive, Lissi, Bakeman, & Reyes, 2017). Foster, Lambert, Abbott-Shim, McCarty, and Franz (2005) also found that parental practices mediated the association between SES (a composite score of income and education) and the language development of children.

Moreover, parental mental health is also affected by the socioeconomic conditions of the household, which in turn influence parenting quality. Mothers in lower-SES families are found to be more stressed and depressed than higher-SES mothers (Berger, Paxson, & Waldfogel, 2009). According to the Family Stress Model, economic strain causes parents' mental health problems, leading to poorer parenting outcomes (Conger et al., 2002). A recent study showed that economic stress increased parental depression and psychosomatic symptoms, and this was associated with decreased sensitivity and parental support (Newland, Crnic, Cox, & Mills-Koonce, 2013). In addition, parents who are living in low-SES environments experience a higher number of family stressors including stress about losing their jobs, illnesses, and household stress, which affects child outcomes negatively (Bøe, Serlachius, Sivertsen, Petrie, & Hysing, 2018). Gershoff, Aber, Raver, and Lennon (2007) also explained the positive association between income and positive parenting through parental stress. They showed that higher income decreases material hardships and parents' stress, which in turn increases the positive parenting behaviors that lead to positive child outcomes.

Overall, although the indicators of SES and its effects vary, SES shapes the mental health of children and their development either through parenting or directly through resources (Roubinov & Boyce, 2017). In the next section, the cognitive development of infants will be explained, and then the ways in which a low SES affects child development will be discussed.

In the next section, first, the importance of brain development for infants' cognitive development will be detailed and then normative cognitive development will be explained separately for each outcome of the study (novelty preferences, object permanence, and focused attention skills). After detailing the developmental processes, the ways in which their development is affected by adverse conditions will be explained.

1.3. Cognitive Development in Infants

Brain development during the prenatal period and the postnatal period including the cerebral cortex and hippocampus is significant for children's cognitive functioning, (Belsky & De Haan, 2011). The prefrontal cortex is located in the anterior premotor cortex, which comprises the quarter part of the cortex responsible for higher-order cognitive processes (Osaka et al., 2003) and working memory measured with A-not-B tasks in infants (Bell, 2001).

Cortical neurons are produced during the 18th week of conception, and then their migration to appropriate places shapes the brain in later phases (Rakic, 1988; Song et al., 2005). After neurons reach their final places in the cortex, they start to differentiate with the branching of dendrites, myelination, and synapse formation. Neural differentiation starts in the prenatal period, but differentiation of the brain cells continues after birth, too (Belsky & De Haan, 2011). For instance, the development of the prefrontal cortex continues until early adulthood (Huttenlocher, 1979). Neural migration contributes to the increase in gray and white matter in the brain, which is a sign of brain development in childhood. Gray matter increases rapidly in the first years of life, then gradually increases through childhood, but it starts to decrease after 8 years

(Knickmeyer et al., 2008; Wilke, Krägeloh-Mann, & Holland, 2007). For the postnatal period, the first 1000 days are critical for the development of the brain and nervous system (Bornstein, 2014). Children's interactions with their environment, and especially with their parents, help to shape their brain development (Belsky & De Haan, 2011; Kolb, Mychasiuk, & Gibb, 2013). The focus of the related literature has shifted from "nature or nurture" discussions to the interdependence of genes and environment (Bakermans-Kranenburg & van IJzendoorn, 2015). As Meaner (2001) argued, development is not like a rectangle where you can calculate the length and width; rather, it results from interlinked gene and environment interactions.

In the current thesis, novelty preference, object permanence, and focused attention skills are the main focuses in the study of infant cognitive development. First, developmental changes will be given separately for each task, and then how they are affected by the environment (e.g., early adversity) will be discussed.

1.3.1. Novelty Preference

Over 50 years ago, Fantz (1964) observed that infants show preferences for looking at novel stimuli. After repeated exposure to the same stimuli, infants' looking time decreases, and when a new stimulus is introduced looking time increases again (Oakes, 2010). According to Sokolov's comparator model (1963), infants remember the first stimuli and then compare those with the new stimulus. If their looking time decreases, it is taken as evidence of similarity detection, and when looking time increases for a novel stimulus, it is interpreted as novelty detection (as cited in Colombo & Mitchell, 2009, p. 227). Although there are some challenges in the administration of this task, researchers have developed standard procedures, especially with computers, to measure habituation and novelty preferences of infants starting from very early months of life (Oakes, 2010), and the task can pinpoint age differences between very young infants (3 months versus 6 months) (Domsch, Lohaus, & Thomas, 2009).

Infants' performance within the habitation/novelty paradigm is an important indicator of their cognitive functioning, which predicts later cognitive development. For

instance, Colombo, Shaddy, Richman, Maikranz, and Blaga (2004) followed 3- to 9-month-old infants over the course of 2 years. They found that the novelty preferences of infants were positively correlated with language development. They also differentiated infants into two groups: infants whose attention strongly decreased in habituation tasks versus infants whose attention increased. In their second year, infants in the first group showed higher index scores in the Bayley test and better communicative development. Moreover, it is claimed that the habituation paradigm might be a second-order predictor for later cognitive development in higher-order functioning, like learning and cognition. Infants who habituate effectively are those who scan and learn information efficiently and who construct memory better (Bornstein et al., 2006; Colombo & Mitchell, 2009). The relation between intelligence and habituation has also been studied in the literature. For instance, Bornstein et al. (2006) tested the habituation paradigm of 4-month-old infants as an indirect predictor for intelligence at 4 years old. They found a small but significant effect of habituation on children's cognitive development in a large sample. Thus, these studies have shown that the habituation/novelty paradigm is a key point of infancy for later cognitive outcomes.

Infants' novelty preferences might be affected by the early care environment since external factors help to direct their attention (Graziano, Calkins, & Keane, 2011). If infants are born to a typical home environment, the mother is the first person to interact with them from the first days of their lives. However, if the environment is not typical, such as in cases of the mother having mental health problems, the children's development might be influenced. For example, infants with depressed mothers looked less at facial stimuli than others (Diego et al., 2004). Similarly, their habituated phase took longer compared to infants with nondepressed mothers (Hernandez-Reif, Field, Diego, & Largie, 2002). Since infants have fewer chances to interact with a caregiver in institutional settings, it is essential to examine the effects of that on their novelty preference skills. Therefore, a novelty preference task is included in the present study as one of the measures of cognitive development.

1.3.2. Attention

Attention is the ability to direct one's focus to a target stimulus, which involves orienting, selecting, and sustaining attention (Posner & Peterson, 1990; Ruff & Rothbart, 2001). The literature points to three attentional systems: alerting-staying awake, orienting, and executive attention (Posner, 2004; Rueda, Posner, & Rothbart, 2005). The first two attentional systems emerge during birth, and infants develop the ability to orient their attention within the first 6 months (Posner, 2004). The third attention system, executive control of attention, develops at the end of the second year, and infants start to control their attention, which contributes to self-regulation (Rueda et al., 2005). Sustained or focused attention is an essential mechanism in this third stage (Graziano et al., 2011). Sustained or focused attention is defined as an ability to maintain concentration on a target stimulus and in the literature these terms are interchangeably used (Bono & Stifter, 2003; Ruff & Rothbart, 1996). The ability to focus attention increases developmentally during early childhood, and children can sustain their attention for longer times (Kannass & Oakes, 2008; Ruff & Capozzoli, 2003).

Developing an ability to focus on something is an essential cognitive process for learning and memory; it plays a role in socialization (Ruff & Rothbart, 2001) and it also contributes to infants' self-regulation skills (Lawson & Ruff, 2004; Ruff & Rothbart, 2001). Thus, it is one of the primary developmental skills in infancy, which is associated with later developmental outcomes such as executive functioning skills (Garon, Bryson, & Smith, 2008). A recent study also showed that preschoolers' sustained attention skills positively predicted their inhibitory control skills (Reck & Hund, 2011).

During the first year of life, there are variations in attentional skills, which result in individual differences. In the development of attention skills, the infant's social environment plays a role. For instance, the parent's scaffolding abilities, including attention-directing behaviors and strategies in introducing objects to infants, play a role in the child's skills, supporting later cognitive abilities (Mendive, Bornstein, &

Sebastián, 2013; Suarez-Rivera, Smith, & Yu, 2019). A recent study examined 1-year-old infants' sustained attention to an object using an eye-tracker. The authors found that if the parent looked at the same object while the infant was directed toward it, those infants looked at the target object longer than the infants whose parents did not look at the object (Yu & Smith, 2016). Similarly, the family environment for early child care was found to be associated with the attention skills of preschoolers (NICHD Early Child Care Research Network, 2005). Inattentiveness in the early years might be a risk factor for later development (Lawson & Ruff, 2004). For instance, an early deficit in focused attention can play a role in later attention problems such as attention deficit hyperactivity disorder (ADHD) (Martin, Razza, & Brooks-Gunn, 2012). Sustained attention skills were also found to be associated with social competence in the preschool years (Murphy, Laurie-Rose, Brinkman, & McNamara, 2007). Moreover, deficits in sustained attention were associated with more behavioral problems in children (Andrade, Brodeur, Waschbusch, Stewart, & McGee, 2009), and the continuation of attention problems was associated with educational and occupational problems in adulthood (Barkley, 2002). Thus, it is essential to study the early development of attentional processes. A focused attention task was therefore included in the present study as one of the measures of cognitive development.

1.3.3. Object Permanence

One of the initial milestones in the cognitive development of infants is object permanence. Infants' inability to find hidden objects has been debated in the literature and is seen as a striking phenomenon of cognitive development (Kaufman, Csibra, & Johnson, 2005). Object permanence can be described as the ability to maintain a representation of an object even after it disappears from view (Prasad, Wood, & Wood, 2019).

According to Piaget (1954), infants' understanding of "object permanence" starts around 8 to 9 months by the result of maturation. Object permanence improves progressively depending on infants' exploration of their environments (Needham,

2000). Infants start to search for objects at around 8 months, and object permanence is accordingly mostly tested with the hidden object task (Prasad, Wood, & Wood, 2019).

However, recent studies have shown that object permanence develops in earlier months (Charles & Rivera, 2009). Some researchers claim that object permanence could be innate, underlined by the innate knowledge of the physical world (Spelke, & Kinzler, 2007), and this idea is mostly tested in infants by violation of expectations tasks. In these experiments, infants look longer at objects that violate their expectations (Bremner, Slater, & Johnson, 2015). However, it is hard to test this theory since, when infants come to the laboratory, they have already interacted with the environment in their first couple months of life (Prasad, Wood, & Wood, 2019). In a recent review, Bremner, Slater, and Johnson (2015) argued that object permanence is learned by the visual experiences in the early postnatal period. Essential development occurs in the first 6 months of life, where infants' perceptual abilities allow them to improve/understand later concepts in object permanence. The authors claimed that when an object is disappeared behind another occluding object, there are many cues about its continuity, but younger infants cannot interpret these cues yet. Around 6 months of age, they started to realize the persistence of the objects.

Similar to sustained attention skills, infants' object permanence skills are also affected by their social environments. One recent study tested 9-month-old infants with an A-not-B search task. When the experimenter looked at A, B, and the middle during the applications, infants showed better performance in searching behaviors if the experimenter looked at B. This study shows that infants can use social cues and the social environment to support their object permanence skills (Dunn & Bremner, 2019). Object permanence skills also predict later development. For instance, object search was positively associated with the inhibitory skills of toddlers (Baker, Gjersoe, Sibielska-Woch, Leslie, & Hood, 2011). Additionally, attainment in an object permanence task positively predicted the attentional regulation of low-birth-weight toddlers (Lowe, MacLean, Shaffer, & Watterberg, 2009). Thus, in the current study, an object permanence task was also chosen to measure infants' cognitive development.

As discussed above, external factors like parent-child interaction and parenting guidance are also crucial for infants' cognitive development. Since the caregiver-child ratio is high and there is limited one-on-one interaction in institutions, infants who are residing in these settings are more likely to be in a disadvantaged position. Whether or not there is a sensitive period in development is still a core discussion, but findings indicate that children who were exposed to institutional care within the first 2 years of life had more negative consequences, which seemed to persist in the long run (McCall, 2012; Zeanah, Gunnar, McCall, Kreppner, & Fox, 2011). Thus, longitudinal studies that follow infants from the very beginning of life are necessary to examine whether there is a sensitive period, particularly for cognitive development. In the current study, cognitive development in infants reared in institutional care will be followed across three time points, starting from the early months of their lives (3 months of age).

The next section will discuss the association between early adversity and cognitive development for infants in both institutions and low-SES environments more broadly.

1.4. Early Adversity and Developmental Outcomes

Early life stress has both short- and long-term adverse effects on the development of children. It has been found that children who experience neglect and many types of maltreatment have poorer developmental outcomes (De Bellis, 2005; Lupien, McEwen, Gunnar, & Heim, 2009). Research about institutionalized children has shown clear examples of the effects of early life neglect on child development. It has been found that children who had a history of institutionalization had delays in physical growth and brain development (Cohen et al., 2008; Sonuga-Barke et al., 2008); even their bilateral coordination and balance skills were affected. It was found that adopted children with a history of institutions showed lower coordination skills than both children with a foster care history and children who were never institutionalized (Roeber, Gunnar, & Pollak, 2014). Furthermore, longer duration in institutions was found to be associated with low intelligence, more significant mental problems, and smaller head sizes in the English and Romanian Adoptees (ERA) study (Sonuga-Barke et al., 2008). Cognitive skills are also affected negatively. For instance,

children who were internationally adopted from foster care had poorer sustained attention scores and executive functioning skills than family-reared children (Loman, Wiik, Frenn, Pollak, & Gunnar, 2009).

Only a few studies were carried out with infant samples, but they yielded similar results. For instance, Smyke et al. (2007) reported that infants and toddlers reared in institutions had more deficient cognitive abilities based on the Bayley Scales. In terms of focused attention skills, the Bucharest Early Intervention Project showed that 30- to 42-month-old children in a usual care group had weaker attention skills compared to children who were placed into foster care (Ghera et al., 2009). To the best of our knowledge, object permanence and novelty preferences of infants currently living in institutions have not been examined yet. Object permanence and novelty preferences are the early precursors of children's cognitive development (Bornstein et al., 2006; Kaufman et al., 2005). Although brain maturation is necessary (and is also influenced by environmental interactions), external factors such as interactions with adults and various stimulations help to improve infants' cognitive development (Bremner et al., 2015; Dunn & Bremner, 2019). Since institutional care lacks individualized care, understanding how much this influences their cognitive development longitudinally starting from as early as 3 months old would contribute to the literature.

While testing the effects of institutional care, the choice of a comparison group is a serious concern (McCall, 2011). In the literature children in institutions have been compared with adopted children or children in foster care, or children never institutionalized (family care). Studies including a family group as a comparison do not always control for the families' SES levels (Merz, McCall, Wright, & Luna, 2013; Smyke et al., 2007). However, this might also be important to examine the pure effects of family context beyond economic reasons. Children reared in low-SES families might be an option for comparison since they may have similar family backgrounds with children in institutional care. Children are placed in institutions for several reasons, as explained in previous sections, but economic problems, poverty, and parents' mental health problems are particularly common (McCall, 2011; Muñoz-Hoyos et al., 2001), which are also challenges familiar to low-SES family

environments. Although physical conditions in institutions have improved with time, they are still not optimal. Children live in a group with one or two caregivers in a room, which might be the main difference from the family environment even in the low-SES context. Thus, children reared in a low-SES environment might be the closest option for comparison, but will still not provide an exact comparison.

Furthermore, studies conducted with children who had been living in low-SES family homes showed that these children lagged behind their age-mates who had been raised in economically better-off families (Blair et al., 2011; Raver, Blair, Willoughby, & FLP Investigators, 2013). Infants reared in economically disadvantaged families are particularly at risk (Markant, Ackerman, Nussenbaum, & Amso, 2016). For instance, one recent study compared the habituation/novelty preferences of 5- to 8-month-old infants in England and in The Gambia, a country with economic and health problems (Lloyd-Fox et al., 2019), reporting that more test trials were required for the infants in The Gambia to be habituated, which is a sign of poorer performance. Moreover, Gaultney, Gingras, Martin, and Debrule (2005) examined the habituation/novelty preference skills of infants who were exposed to cocaine prenatally. They found that those infants had more off-time from looking than other infants who were only exposed to cigarettes during the prenatal period.

Thus, in the current thesis, cognitive development of infants reared in institutions and low-SES families will be investigated comprehensively with novelty preference, focused attention, and object permanence tasks. This study will contribute to the literature in understanding the early precursors of cognitive development and the mechanism of interaction with the environment. The influence of adverse environmental conditions will be investigated starting from the beginning of infancy, which will add to the discussion of whether there is a sensitive period in life.

Moreover, poor environmental conditions not only affect cognitive development of infants but also their stress regulation systems. One of the explanations for why infants in early adversity conditions have poorer cognitive skills is the impact on the stress regulation system (Strüber, Strüber, & Roth, 2014; Suor et al., 2015). How early

adversity affects the stress regulation system of infants will be discussed in the following section, and then its association with cognitive development will be detailed in a separate section.

1.5. Early Adversity and Cortisol

Early adversity alters the biological response to stress via the hypothalamic-pituitary-adrenal (HPA) axis and the cortisol levels of children. Glucocorticoids (cortisol in humans) are secreted not only as a reaction to stress but also in basal conditions. Basal secretion has a circadian rhythm. Levels are low during sleep at night and increase near waking. Cortisol peaks in the morning and gradually declines during the day (Strüber et al., 2014; Walker, Terry, & Lightman, 2010). The HPA axis is also activated when a person is faced with a stressful event or experience to cope with. Chronic exposure to stressful life experiences may alter the healthy functioning of the HPA axis. Both hyperfunctioning (higher cortisol levels) and long-term hypofunctioning (lower basal cortisol levels and flatter diurnal patterns) of the HPA axis are found in children exposed to different types of ELS (Strüber et al., 2014). Cortisol is commonly measured by salivary samples. However, hair cortisol is a new method becoming more prevalent in studies for measuring an individual's cortisol level because it is less affected by day-to-day and hour-to-hour fluctuations in the hormone, and hair is easy to collect and store (Liu, Fink, Brentani, & Brentani, 2017; Russell, Koren, Rieder, & Van Uum, 2012). It gives cumulative cortisol levels for the preceding months. It is assumed that human hair grows approximately 1 cm each month, and so a 1-cm sample from the scalp gives the cortisol level of last month (LeBeau, Montgomery, & Brewer, 2011).

Cortisol levels obtained via different sampling methods (cortisol from hair or saliva) for different age groups have been compared but results are inconsistent. One of the early studies examined the association between hair cortisol and cortisol measured from urine, saliva, and blood samples in adults. There was a positive correlation between cortisol in hair and urine, but there was no association between cortisol levels in hair and cortisol in saliva or blood (Sauvé, Koren, Walsh, Tokmakejian, & Van

Uum, 2007). Flom, St. John, Meyer, and Tarullo (2017) collected both hair and saliva samples from infants. They found that hair cortisol was positively associated with morning and evening salivary cortisol levels and the area under the curve. Similarly, a positive correlation between hair cortisol concentration (HCC) and salivary cortisol has been found in pregnant women (D'Anna-Hernandez, Ross, Natvig, & Laudenslager, 2011).

Although cortisol levels from hair samples and salivary samples are found to be correlated, since hair cortisol shows the cumulative cortisol levels of the preceding days including daily fluctuations of the HPA axis, the association of early adversity, salivary cortisol levels, and hair cortisol levels will be discussed in the next section.

1.5.1. Early Adversity, Salivary Cortisol, and Hair Cortisol

A number of studies showed that exposure to poverty and socioeconomic problems were related to elevated cortisol levels in children. For instance, daily cortisol levels of children 9 to 18 years old were followed over 2 years, and it was found that children from low-SES families had higher cortisol levels than children from middle-SES families (Chen et al., 2010). Similarly, higher morning and evening cortisol levels were found in low-SES children compared to children in high-SES families (Evans and English, 2002; Lupien, King, Meaney, & McEwen, 2001). For infants, higher daily cortisol output was also found in low-SES families than high-SES families (Clearfield et al., 2014).

On the other hand, early adversity was also found to be related to low levels of cortisol in children (King, Mandansky, King, Fletcher, & Brewer, 2001). Lower cortisol levels were mostly found in cases of neglect (Fisher, 2017). For instance, Carlson and Earls (1997) examined the cortisol levels of 2-year-old children in an orphanage. They found decreased morning cortisol and stable levels over the day compared to home-reared children. Cortisol reactivity of post-institutionalized children to a stressful event in the laboratory was found to be lower than that of the never-institutionalized group (Hostinar, Johnson, & Gunnar, 2015). Similar findings were reported in adults who

had a history of neglect and were adopted in childhood (van der Vegt et al., 2009). However, there are studies conducted with previously institutionalized children that found increased salivary cortisol levels (Fries, Shirtcliff, & Pollak, 2008; Gunnar, Morison, Chisholm, & Schuder, 2001; Kertes, Gunnar, Madsen, & Long, 2008). The reason for different findings might be the sensitivity of the sampling technique. That is, salivary cortisol samples are sensitive to diet, sleep, and the timing of the samples (Russell et al., 2012). Hair samples might be good alternatives in measuring cortisol levels since they are not affected by daily routines.

Similarly, to salivary cortisol, the SES of the family environment and hair cortisol levels of children were negatively associated. Although the definition of SES may be slightly different in each study, negative associations between SES and HCC were found in various age groups such as in children (Vliegenthart et al., 2016; Vaghri et al., 2013) and in the early years of life including infancy (Bhopal et al., 2019; Kao, Tuladhar, Meyer, & Tarullo, 2019; Karlén et al., 2015). However, some studies did not find a direct association between SES and the HCC levels of infants (Flom et al., 2017).

The diversity of findings on cortisol levels might be because of the diversity of the exposure and severity of stressors (Strüber et al., 2014). However, chronic exposure to both high and low levels of cortisol is associated with various health and developmental problems (Bevans, Cerbone, & Overstreet, 2008) as well as lower performance in cognitive skills (Fernandez-Baizan, Nuñez, Arias, & Mendez, 2019; Neuenschwander et al., 2018). In Chapter Four, the association between HCC, SES, and cognitive development will be examined and detailed information will be given below in light of the literature.

1.5.2. Early Adversity, Cortisol, and Cognitive Development

As discussed in the previous section, chronic exposure to stressful life events may damage the healthy functioning of the HPA axis, which in turn affects children's development. For instance, hypocortisolism (flatter diurnal cortisol level and low

morning cortisol) was found to be a mediator between early adversity and attention and externalizing problems in adopted preschool children (post-institutionalization and post-foster care) (Koss, Mliner, Donzella, & Gunnar, 2016). Similarly, being adopted was associated with flatter cortisol patterns, associated in turn with more behavioral problems at the end of the second year (Koss, Hostinar, Donzella, & Gunnar, 2014).

The relationship between cortisol levels and cognitive functioning of children is not clear. The HPA axis secretes glucocorticoids (cortisol hormone in humans), and cortisol levels are associated with brain regions such as the hippocampus (Wiedenmayer et al., 2006). The hippocampus is an important area for cognitive functioning, like learning and memory (Lupien, Maheu, Tu, Fiocco, & Schramek, 2007). Neurocognitive development in early adversity has been widely examined, but the understanding of the role of the HPA axis in this association, particularly in infancy, is relatively new (Finegood et al., 2017). Since the low-SES family environment was associated with elevated cortisol levels and lower cognitive skills in children (Clearfield et al., 2014; Chen et al., 2010; Raver et al., 2013), the mechanism of environmental effect might be through the stress regulation system, and cortisol might mediate between environment and cognitive development. This might be one of the explanations for poor cognitive development of children in institutional care. With the use of biological samples from infants and children in care, the current study will examine the function of cortisol in infants' cognitive development in a low-SES context.

Considering the association between cortisol level and cognitive development in the early years of life, the findings in the literature are mixed. Basal cortisol levels of low-SES infants and toddlers were negatively associated with their cognitive development and specifically executive functioning skills (Blair et al., 2011; Blair et al., 2017; Finegood et al., 2017). However, higher basal cortisol levels were positively associated with higher cognitive development as measured by the Bayley Scales of Infant Development at 14 months of age among infants from middle-SES families (Forns et al., 2014). Both elevated and low basal cortisol patterns were found to be associated

with poorer cognitive functioning at the age of 4 among children exposed to high familial risk (Suor et al., 2015).

Whether higher activation or hypoactivation of the HPA axis is associated with better cognitive development might depend on the environmental context. For instance, high levels of cortisol in preschool children were associated with better executive functioning skills in higher-SES families, while they predicted poorer executive functioning skills in lower-SES families (Obradović, Portilla, & Ballard, 2016). Besides, the functions of SES may change according to the age of the child, as higher levels of cortisol were associated with low SES in young children, but low levels of cortisol were associated in older children (Ursache, Noble, & Blair, 2015). Thus, the optimal levels of cortisol show differences for different environmental contexts and different age groups.

Moreover, how cortisol is measured is also a concern in comparing studies. Some studies measured cortisol levels as a reaction to a stressful situation, while some took basal cortisol levels (Meyer & Novak, 2012). However, salivary cortisol is sensitive to daily routines such as sleeping and eating habits, especially in the infancy period, when mother-related habits may also influence outcomes through breastfeeding (Neelon, Stroo, Mayhew, Maselko, & Hoyo, 2015). Recently, researchers have started to measure cortisol through hair samples. Hair cortisol involves both basal secretions and stress reactions and gives accumulated stress but is not affected by the immediate environment as much as salivary cortisol. Therefore, cortisol will be obtained through hair samples in the current study.

1.6. Theories Emphasizing Individual Differences

Although adverse conditions affect the development of children, not all are affected at the same level. Some children might be more vulnerable to environmental effects due to either their genetic makeup or their temperamental characteristics (Rutter et al., 2001). Three main theories emphasize the individual differences that may alter the level of environmental effects. First, the diathesis-stress model emphasizes that some

individual characteristics (e.g., difficult temperament) make people more sensitive to stressful situations (Monroe & Simons, 1991). According to the diathesis-stress model, which is also called the dual-risk model, susceptible children (e.g., children with difficult temperament) are already at risk due to how they are. At the same time, however, they are also more vulnerable to stressful life conditions, which creates an additional risk for their healthy development (Belsky, Bakermans-Kranenburg, & van IJzendoorn, 2007). In a recent review, it was summarized that frustrated children have a higher risk for developmental problems, and exposure to negative parenting increases this risk in terms of child adjustment (Kiff, Lengua, & Zalewski, 2011). Second, the vantage sensitivity theory emphasizes being sensitive to a positive environment (Manuck, 2011). It is claimed that children with certain genes or characteristics could take advantage of a supportive environment and adapt to adverse conditions (Pluess & Belsky, 2013). Third, the differential susceptibility theory combines both the diathesis-stress and vantage sensitivity theories and claims that susceptible children are sensitive to both positive and negative environments (Pluess & Belsky, 2010). Children with specific genes, reactive temperament characteristics, or physiological stress sensitivity take advantage of a favorable environment and show better developmental outcomes, while the same children are affected more by adverse environmental conditions (van IJzendoorn & Bakermans-Kranenburg, 2012).

Gene × environment studies support the differential susceptibility theory for various developmental outcomes (Brett et al. 2015; Drury et al. 2012). Gene × environment interaction has also been studied in the institutional care context. Results showed that children s/s carriers had increased risk in various developmental outcomes in more adverse conditions in institutions, but they also had fewer problems in better conditions (Baptista, Belsky, Mesquita, & Soares, 2017; Kumsta et al., 2010).

Besides specific genes, some temperament characteristics of children are studied as susceptibility markers from the differential susceptibility perspective. Difficult temperament has been widely tested as a susceptibility marker, since it is claimed to be a sign of a more sensitive nervous system (Ellis et al., 2011). Findings showed that difficult children are more susceptible to both positive and negative parenting, which

means that they are negatively affected by negative parenting and benefit from positive parenting (Pluess & Belsky, 2010; Slagt, Semon Dubas, & van Aken, 2016). For instance, children who were described as temperamentally difficult in infancy (i.e., infants who had higher scores in negative emotionality) showed higher socioemotional functioning in middle childhood if they experienced high parenting quality (higher maternal sensitivity) (Pluess & Belsky, 2010), and they also showed higher academic and social competence as teenagers if they experienced high parenting quality (high maternal sensitivity) (Roisman et al., 2012). Difficult temperament is a broad term that consists of several dimensions, such as effortful control, negative emotionality, anger-like traits, irritability, fearfulness, and high reactivity (Rothbart & Bates, 1998; Slagt, Dubas, Deković, & van Aken, 2016). These are sometimes taken as a composite score and have also been used separately (Vitaro, Barker, Boivin, Brendgen, & Tremblay, 2006; Paulussen-Hoogeboom, Stams, Hermanns, & Peetsma, 2008; Tung et al., 2019).

The literature on differential susceptibility is mainly based on the child's temperamental reactivity to stimulations (Dilworth-Bart, Miller, & Hane, 2012; Klein Velderman et al., 2006; van IJzendoorn & Bakermans-Kranenburg, 2012), but recovery from peak arousal/excitement or distress might also be a susceptibility marker. For the current study, falling reactivity/recovery from distress (Infant Behavior Questionnaire: IBQ; Gartstein & Rothbart, 2003) was used to test the infants' temperaments. It is defined as the ability to recover from peak arousal and distress and fall asleep easily. It is one of the subdimensions of negative emotionality and negatively loaded to the negative emotionality construct. It is also correlated with the other subdimensions of negative emotionality. It is positively correlated with soothability and negatively correlated with the distress-to-limitations subscale (Gartstein & Rothbart, 2003; Putnam, Gartstein, & Rothbart, 2006). Thus, falling reactivity/recovery from distress was taken as a temperament characteristic and a possible susceptibility marker in Study I and Study II. In Study III, negative emotionality was used as a composite score (including fear, distress to limitations, and falling reactivity/recovery from distress). In the next section, the association between temperament and environment for developmental outcomes will be discussed.

1.6.1. Environment, Temperament, and Developmental Outcomes

Temperament may have a decisive role in child development through interaction with the environment. For instance, children with difficult temperaments had more behavior problems during school years if exposed to a poor child care environment in their early years. However, they showed fewer behavior problems if raised in a relatively better care environment (Pluess & Belsky, 2009). Temperament and environment interactions have also been widely examined in light of parenting. For instance, infants who had difficult temperaments were more likely to show externalizing behaviors when they became toddlers if they experienced maternal negative control and lack of maternal sensitivity (Bradley & Corwyn, 2008; van Aken, Junger, Verhoeven, van Aken, & Deković, 2007; Lengua, 2008). A meta-analytic study also reported that negative emotionality measured during infancy is a susceptibility marker for later developmental outcomes in showing the effects of parenting (Slagt et al., 2016).

Temperamental susceptibility in nonparental care has not been examined, but research conducted with previously institutionalized children showed that susceptible children (children with high levels of negative emotionality) benefitted more from adoption and showed a greater decrease in problem behavior (Barone, Ozturk, & Lionetti, 2019). In the current study, the functions of temperament in institutional care will be examined. Whether children who have difficulty in recovery from peak stress are more susceptible to institutional care will be investigated in light of the differential susceptibility theory.

Furthermore, temperament characteristics of children not only influence the level of environmental effect but also influence their reactions to the stressors through the HPA axis (Blair et al., 2008; Dettling, Parker, Lane, Sebanc, & Gunnar, 2000). Thus, the temperament of infants will also be considered while examining the association between SES, cortisol, and the cognitive development of the infants in the current study. In the next section, the association of cortisol and temperament will be discussed more broadly.

1.7. Early Adversity, Cortisol, and Temperament

In the previous section, the association between temperament, environment, and child outcomes was discussed. Temperament not only defines the level of environmental effect on child development but also changes the physiological stress regulation system. For instance, one of the earliest studies followed preschool children's morning cortisol levels during the first weeks of the school year and several weeks later. The researchers found that children with higher negative affectivity showed increased cortisol levels from the initial school weeks to later weeks compared to children with lower negative affectivity (Gunnar, Tout, de Haan, Pierce, & Stansbury, 1997). Negative emotionality was also found to moderate the effects of child care on diurnal cortisol levels and was associated with increased cortisol levels (Dettling et al., 2000). Moreover, negative affectivity measured at the age of 3 was associated with higher levels of evening cortisol at the age of 6. However, children who had mothers with depression had decreased cortisol levels in the morning (Dougherty et al., 2013).

Regarding the association of hair cortisol and temperament, there is only one study with preschool children. There was no direct association found between emotional reactivity and HCC; however, the interaction between SES and temperament was significant for the HCC level, where children with higher emotional reactivity had higher cortisol levels in lower SES environments (Kao et al., 2019).

As seen from these findings, the association between temperament and cortisol is not clear yet. Most of these findings involved salivary cortisol samples and were obtained at different periods of the day. Thus, more research is needed to understand temperamental differences and their effects on the HPA axis. Therefore, the aim of Study III is to investigate the moderating role of temperament in the relationship between cortisol, early adversity, and cognitive developmental outcomes.

1.8. The Current Study

There are three interrelated studies in the current thesis.

- **In Study I,** the cognitive development of infants in institutional care will be compared with that of infants in a family group longitudinally with the moderating role of temperament. Details will be given in Chapter Two.

- **In Study II,** the cognitive development of infants in institutional care will be compared with infants in low-SES families with the moderating role of temperament, which will be explained in Chapter Three.

- **In Study III,** the mediating role of cortisol levels between SES and infants' cognitive development will be examined with the moderating role of temperament, which will be explained in Chapter Four.

CHAPTER 2

STUDY I: LONGITUDINAL COMPARISON OF INSTITUTIONAL CARE AND FAMILIES IN TERMS OF COGNITIVE OUTCOME: THE MODERATING ROLE OF TEMPERAMENT

2.1. Brief Introduction

Institutional care is a care type whereby children stay within large groups with other children of the same age. Although physical conditions of institutions have improved over the years, institutionalized children still do not have chances for one-on-one interaction and individual care, which is crucial for child development. Thus, there are developmental delays in terms of various outcomes for institutionalized children, as shown by various researchers (Leiden Conference on the Development and Care of Children without Permanent Parents, 2012; Smyke et al., 2007). Research about children with a history of institutional care has shown that the effects of institutionalization persist even in later years (Bos, Fox, Zeanah, & Nelson, 2009; McDermott et al., 2013). Looking at cognitive development in the infancy period, the literature focusing on the effects of institutional care is limited. In the Bucharest Early Intervention Project, 30- and 42-month-old toddlers in institutions at the beginning of the study were assigned to either a "care as usual" group or a foster care group and their development was compared (Ghera et al., 2009). In a cross-sectional comparison, the researchers found that toddlers in the usual care group (i.e., still in institutions) had lower attention scores than toddlers in the foster care group. However, longitudinal rather than cross-sectional designs are essential to examine the actual effects of being in institutions. Infants and children are taken into care at different ages in their lives and their pre-institution experiences vary, including prenatal conditions, which may also affect their outcomes, especially cognitive development. Thus, the present study

aimed to follow infants who were still residing in institutions across three time points. Their cognitive development was examined comprehensively, including novelty preferences, attention skills, and object permanence skills. Object permanence is an important milestone in the first year indicating infants' ability to have mental representations (Kaufman et al., 2005). Similarly, novelty preferences and attention skills are crucial predictors for the later cognitive skills of children (Bornstein et al., 2006; Colombo & Mitchell, 2009). Understanding early cognitive development in institutional care compared to home settings is critical for taking the necessary actions for prevention and intervention studies.

However, not all children in institutions are affected negatively. Children with some characteristics are more susceptible to the environment compared to children without those characteristics. One of the theories that explain the interaction between individual differences and environmental effects is the differential susceptibility theory. According to this theory, some children are more susceptible to their environment and affected more (Pluess & Belsky, 2010). For instance, children with some genotypes are more susceptible and affected differentially by their environments. Gunnar et al. (2012) tested this hypothesis with previously institutionalized children while focusing on attention problems and showed that adolescents who had the Met allele were more sensitive to the duration in the institution before adoption; they showed fewer attention problems if they were adopted earlier and more attention problems if the adoption occurred in later years. The second aim of the present study was to test whether currently institutionalized infants' cognitive development, and specifically their performance in attention, novelty preference, and object permanence tasks, is differentially affected by their temperamental characteristics. To the best of our knowledge, there is no study that has tested the differential susceptibility theory in an institutional care group except for that of Ertekin and Berument (2019), which was a part of the broader Turkish Care Type Study. It was found that the self-development of preschool children was differentially affected by the temperament of the children (frustration and perceptual sensitivity). Understanding the individual differences and what makes these children more susceptible to institutional care is essential for

intervention programs. Thus, the present study examined the moderating role of temperament (falling reactivity) for the rates of cognitive development in infants. It was hypothesized that:

- The cognitive development of infants in institutions would be slower compared to their age-mates being raised in family settings.
- Their cognitive development would be moderated by their temperament, where infants with low levels of falling reactivity would be affected more by institutional care and would have lower gains in cognitive development. However, such infants would benefit more from the family environment and would have higher rates of cognitive development.

2.2. Method

2.2.1. Participants

In the current study, 3- to 15-month-old infants staying in institutions or with their biological families were followed across three time points at 4-month intervals. This sample is a subsample of the broader Turkish Care Type Study mentioned above (Berument & Sümer, 2013-2017). The number of participants was slightly different for each task (see Table 1). For the institutional care group, the reasons for care placement ranged from one reason to six reasons per child (for more details, see Table 2). Infants who had stayed at least 1 month in an institution were recruited for the study (M = 7 months, SD = 3.33, min. = 1, max. = 14.5). The mean age for placement was 1.98 months, ranging between 0 and 14 months (SD = 2.85). The education levels of the 65 mothers of the family group were ranked with scores ranging from 1 to 9 (1 = illiterate, 2 = literate but no degree, 3 = elementary school, 4 = middle school, 5 = high school, 6 = 2-year university degree, 7 = undergraduate degree, 8 = graduate degree, 9 = doctoral degree) (M = 6.78, SD = 1.19). The range of the family incomes was scored from 0 (=0 to 1000 Turkish lira) to 10 (=10,000 Turkish lira and above) (M = 5.65, SD = 2.20).

Table 1. Numbers of participants.

	Institutional care group			Biological family group		
Tasks	**Time1**	**Time2**	**Time3**	**Time1**	**Time2**	**Time3**
Novelty preference (3-12 months)	57	40	36	55	39	44
Attention (6-15 months)	62	44	36	51	40	42
Object permanence (6-15 months)	63	44	35	51	42	44
3-15 months in total	76*	54	45	65**	51	55

*35 girls and 36 boys in institutional care group. **41 girls and 24 boys in biological family group.

Table 2. Reasons for institutional placement, N = 75 (1 missing).

Reason	**Frequency**
Child born out of wedlock	34
Psychological problems of mother	22
Family economic problems	21
Father left	13
Neglect/inability to care	13
Mother left	11
Mother underage	11
Abandoned	9
Family violence	9
Physical problems of father	9
Mother was sexually abused	4
Father's imprisonment	3
Inadequate physical conditions	2
Physical problems of mother	2
Emotional abuse	1
Sexual abuse	1
Physical abuse	1
Death of mother	1
Divorce	1
Other reasons	23
Total reasons	(M = 2.61, SD = 1.35)

Note: Children may have more than one reason for placement (min. = 1, max. = 6)

2.3. Measurements

2.3.1. Cognitive Measurements

2.3.1.1. Novelty Preference Task

Infants' novelty preferences were measured with the novelty preference task adapted from Domsch et al. (2009). This task was applied to infants when they were 3 to 12 months old.

Materials and Procedure: One laptop computer (20 × 30 cm screen), a one-way mirror (60 × 120 cm), and stopwatches are used. Since recordings are forbidden in the institutions, live coding was performed to measure infants' looking time by two experimenters using stopwatches who were sitting behind the portable one-way mirror (designed specifically for the project by its authors and produced by the technical staff of the METU Industrial Design Department), while one experimenter held the baby. The three experimenters sat around the table as seen in Figure 1.

A stimulus was prepared using a PowerPoint slide from the Turkish Care Type Study (Berument & Sümer, 2013-2017). Pictures of shapes and female faces are used as a stimulus in this task. The pictures of faces of female volunteers were taken while they were smiling. Before stimuli are presented on the laptop computer, a calibration phase (30 seconds) is held to get the infant's attention to the screen while the experimenter interacts with the infant. A small red dot appears in the center of the screen with an auditory signal between each trial to get the infant's attention. The familiarization stimulus (a black circle) appears on the right and the left side of the screen (30 seconds for 3- to 6-month-old infants and 15 seconds for 7- to 15-month-old infants). The familiarization phase is repeated twice, and the infant's time spent looking at the screen is recorded by the experimenters with stopwatches. One familiar stimulus (the black circle) and one new stimulus (a black plus) then appear simultaneously on the screen for the novelty phase (see Figure 2 for pictures). The novelty phase is repeated twice, where the new stimulus appears on the left side and then the right side of the screen, and the infant's time spent looking at the new stimulus is recorded by the experimenters.

The same task is repeated after a 2-minute break. However, this time, faces are used instead of shapes. The novelty preference score is calculated for both stimuli separately (shape and face) by the formula [N/(F + N) × 100], where N represents the average time looking at the novel stimulus and F represents the average time looking at the two familiarization slides (Marino & Gervain, 2019).

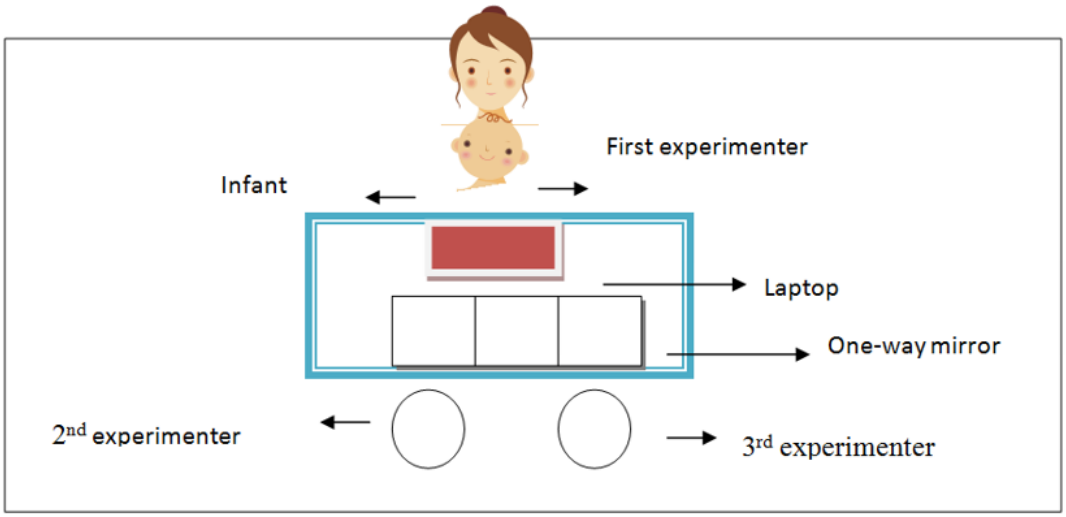

Figure 1. Seating arrangement of the experimenters.

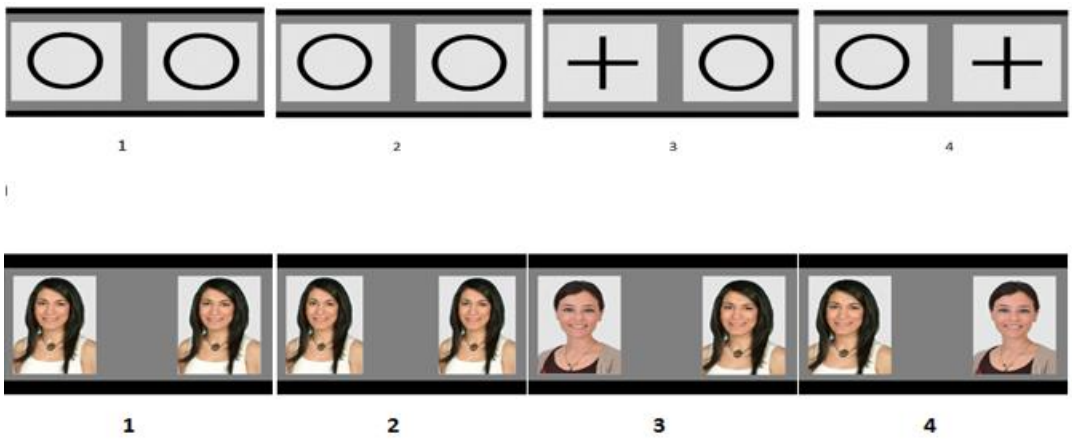

Figure 2. PowerPoint slides used in the novelty preference task.

2.3.1.2. Attention Task

Attention skills of the infants were measured with the attention task adapted from Clearfield and Jedd (2013). It was administered to infants who ranged between 6 and 15 months old.

Materials and Procedure: The seating arrangement is the same as in the novelty preference task (see Figure 1), but a one-way mirror is not placed between the coders and the infant. A total of seven toys, including rattles, small animals, and shape figures, are used. Two stopwatches are used by the experimenters to record infants' time spent looking at the toys.

Attention Task: There are two conditions in this task, which are the one-toy and six-toy conditions. First, one toy (a big rattle) is placed on the table and infants are asked to play with it for 2 minutes. Two experimenters sitting facing the child code the infant's time spent looking at the toy during those 2 minutes by using stopwatches. If the infant drops the toy, it is returned to the table by the first experimenter. In the second condition, six different toys (e.g., rattles, animal figures) are placed on the table and the infant is asked to play with them for 2 minutes. Again, the total time spent looking at the toys during those 2 minutes is recorded separately by the experimenters. If the infant drops one of the toys, it is not returned to the table unless there are no toys left on the table. The mean scores of both experimenters are calculated for each condition separately. Absolute agreement between the experimenters at three time points ranged between 0.98 and 0.99 for the one-toy and the six-toy conditions.

2.3.1.3. Object Permanence

Object permanence skills of the infants were measured with the object permanence task adapted from Moore and Meltzoff (2008). This task was given to infants within the age range of 6 to 15 months.

Materials and Procedure: A white towel of 20 × 20 cm is used to cover objects, and two separate toys (one rattle, one attractive animal figure) are covered. Colored rings are used to warm the infants up in the preassessment period. Infants are placed across a table similarly to Figure 1; there is no one-way mirror.

Preassessment Period: The experimenter plays with the colored rings while the infants are watching from a distance to prevent the child from grasping the rings. After playing for 20 seconds, the experimenter leaves the rings to infant, saying, "It's your turn." After letting the infant play with them for 20 seconds, the experimenter says, "watch," and take the rings back to play again. This phase is repeated twice to teach infants turn-taking.

Assessment: There are two conditions in this task, which are partial and total coverage. The partial coverage condition is used to understand whether infants have the coordination and motor skills to continue to the test trial. In this condition, while the infant is watching, half of the toy is covered with a white towel, leaving the other half of the toy visible. While an infant is watching, the toy is partially covered with a white towel out of the infant's reach. The partially covered toy is brought closer to the infant and he/she is asked to find the toy. The infants are given 20 seconds to find the toy after that. The partial coverage condition has two trials with two different toys. If an infant successfully discovers the toy, the full coverage condition is then applied.

In the full coverage condition, while an infant is watching, the toy is totally covered with a white towel out of the infant's reach. The covered toy is then brought closer to the infant and he/she is asked to find the toy. Again, 20 seconds are given to the infants to find the toy. This condition has two trials carried out with two different toys. If the infant discovers the toy in his/her first attempt, it is scored as 1. The total score calculated from the two trials ranges between 0 and 2.

2.3.2. Temperament

In the present study, as an indicator of negative affect, the "falling reactivity/recovery from distress" subscale (13 items) of the Infant Behavior Questionnaire (IBQ: Gartstein & Rothbart, 2003) was used. Items were ranked using a 5-point Likert scale (1 = never; 5 = always) by caregivers or parents (see Appendix A). Cronbach's alpha was 0.82 with the 3- to 15-month-old infants (N = 140) in Study I.

2.4. Procedure

This study was funded by the Scientific and Technological Research Council of Turkey (TÜBİTAK Project No. 113K222). Ethical approval was obtained from the Human Subjects Ethics Committee of Middle East Technical University (see Appendix B), and official permission was obtained from the Ministry of Family and Social Policy of Turkey for the infants in institutions. Informed consent was also obtained from the parents in the family group (Appendix C). For the institutional care group, the reasons for care placement were obtained from their case files. These details can be seen in Table 2. Data were collected either in institutional settings (institutional care group) or in family homes (family group). Three experimenters visited each institution and house. Before applying the tasks, experimenters spent free time of about 15 minutes playing with the infants to warm them up. When the infants had adapted to the experimenters, the cognitive tasks were administered. The IBQ was completed by the caregivers or mothers of the infants. In institutions, the caregiver who knew the infant best and had spent time with the infant for at least 2 weeks filled out the parent-reported questionnaires. One caregiver in an institution might fill out a questionnaire for more than one infant (not more than three infants). Each participating infant was given an age-appropriate toy as appreciation for their time. A summary report about the development of the infant was provided to the parents and the institutions if requested.

2.5. Results

2.5.1. Analysis Plan

Multilevel linear modeling (MLM) analysis was conducted to test the differences in the rates of the infants' cognitive development. A hierarchical linear modeling (HLM) program was used for the analysis. First, the linearity assumption was checked by adding a squared time variable into the model. The linear slopes of outcome variables showed that the rate of change from the first wave to the third wave was increasing linearly. The quadratic slope showed that there was an increase from wave 1 to wave 2 for the outcome variable, but then there was a decrease from wave 2 to wave 3. The time variable was centered at the first time point and coded as wave 1= 0, wave 2= 1, and wave 3= 2. The group variable was coded as 0 for the institutional care group and 1 for the family group. Temperament was first mean centered and added into the model. Participants were nested in time. Cognitive development of the groups over time was tested with the moderating role of temperament. Since there was no age or gender difference between the groups, they were not taken as control variables.

A fully unconditional model was estimated to determine how much of the variance in child outcomes could be attributed to between-person variables (e.g., group) in comparison to within-person variables (e.g., time). Infants who did not have data from at least two time points were not included in the analysis. However, missing variables for one data point were estimated by maximum likelihood estimation as run by HLM. The Level-1 model shows within-person differences in time, while the Level-2 model represents between-person differences. Four equations were run for each dependent outcome. Model fit was calculated from the difference between deviances from equation 3 and equation 4. The chi-square distribution was tested using the deviance difference between the two models and degrees of freedom by calculating the parameter difference. If the calculated number is significant, it shows that the model with lower deviance values shows a better fit. The summary of the models can be seen in the equations below.

For the notations used in equations, HLM output gives the coefficients with the symbols of π and β. π is used to represent the coefficients in Level one, while β is used to represents the coefficients in Level two. Similar to the cross-sectional design, β gives the person-level coefficient at Level two (Anderson, 2012; Han, Capraro, & Capraro, 2015).

Level-1 Model

$Outcome_{ti} = \pi_{0i} + e_{ti}$

Level-2 Model

$\pi_{0i} = \beta_{00} + r_{0i}$

Mixed Model

$$Outcome_{ti} = \beta_{00} + r_{0i} + e_{ti} \quad (1)$$

The first equation is that of the null model, where $Outcome_{ti}$ represents infant i's cognitive scores at wave t (wave 1, wave 2, or wave 3), while π_{0i} represents the estimated score for infant i across waves (intercept) and β_{00} represents the grand mean of infant scores from wave 1 to wave 3. e_{ti} represents the deviation from the grand mean for infant i in wave t, and r_{0i} is random effect.

Level-1 Model

$Outcome_{ti} = \pi_{0i} + \pi_{1i} \times (TIME_{ti}) + e_{ti}$

Level-2 Model

$\pi_{0i} = \beta_{00} + r_{0i}$
$\pi_{1i} = \beta_{10} + r_{1i}$

Mixed Model

$$Outcome_{ti} = \beta_{00} + \beta_{10} \times TIME_{ti} + r_{0i} + r_{1i} \times TIME_{ti} + e_{ti} \quad (2)$$

In the second equation, π_{0i} represents the estimated score for infant i in wave 1 (intercept), while β_{00} shows the mean of infant scores in wave 1 and π_{1i} shows the estimated rate of (linear) change in scores for infant i from wave 1 to wave 3 (slope). β_{10} represents the average slope across infants and r_{1i} is random effect for the slope, while e_{ti} represents the within-person error of prediction (residual) for infant i.

Level-1 Model

$$\text{Outcome}_{ti} = \pi_{0i} + \pi_{1i}*(TIME_{ti}) + e_{ti}$$

Level-2 Model

$$\pi_{0i} = \beta_{00} + \beta_{01}*(GROUP_i) + r_{0i}$$
$$\pi_{1i} = \beta_{10} + r_{1i}$$

Mixed Model

$$Outcome_{ti} = \beta_{00} + \beta_{01}*GROUP_i + \beta_{10}*TIME_{ti} + r_{0i} + r_{1i}*TIME_{ti} + e_{ti} \quad (3)$$

In the third equation, the group variable is added to the model. The individual intercepts ($\pi 0i$) and slopes ($\pi 1i$) in Level-1 become the outcome variables in the equations in Level-2. $\beta 00$ represents the mean of infant scores in wave 1. $\beta 01$ represents the difference in average intercepts between institution and family groups at wave 1. $r0i$ represents the random effect for the intercept, while $r1i$ represents the random effect for the slope. This equation will only be used to calculate the model fit for the main model (see Equation 4).

Level-1 Model

$$Outcome_{ti} = \pi_{0i} + \pi_{1i} \times (TIME_{ti}) + e_{ti}$$

Level-2 Model

$$\pi_{0i} = \beta_{00} + \beta_{01} \times (GROUP_i) + \beta_{02} \times (Temperament) + \beta_{03} \times (GROUP\_Temperament_i) + r_{0i}$$
$$\pi_{1i} = \beta_{10} + \beta_{11} \times (GROUP_i) + \beta_{12} \times (Temperament) + \beta_{13} \times (GROUP\_Temperament_i) + r_{1i}$$

Mixed Model

$$Outcome_{ti} = \beta_{00} + \beta_{01} \times GROUP_i + \beta_{02} \times Temperament_i + \beta_{03} \times GROUP\_Temperament_i) + \beta_{10} \times TIME_{ti} + \beta_{11} \times GROUP_i \times TIME_{ti} + \beta_{12} \times Temperament \times TIME_{ti} + \beta_{13} \times GROUP\_Temperament_i \times TIME_{ti} + r_{0i} + r_{1i} \times TIME_{ti} + e_{ti} \quad (4)$$

In the fourth equation, group and temperament variables are added to the model. The individual intercepts (π_{0i}) and slopes (π_{1i}) in Level-1 become the outcome variables in the equations in Level-2. β_{00} represents the mean of infant scores in wave 1, β_{01} represents the difference in average intercepts between institution and family groups, and β_{11} represents the difference in average slopes between institutions and family groups. r_{0i} represents the random effect for the intercept, while r_{1i} represents the random effect for the slope. π_{0i} represents infants' outcome levels at baseline (wave 1), while π_{1i} gives the expected linear change in the outcome variable over time. β_{10} is

the average change in outcome variables over time, and each variable in these equations gives the effect of that variable on linear changes in the outcome variables of infants. e_{ti} shows the degree to which infants vary from the slope.

These four equations were run for each developmental outcome separately (attention with one-toy, attention with six-toy, novelty – face, novelty – shape, and object permanence score).

2.5.2. Descriptive Statistics of the Outcome Variables

Descriptive results for the outcome variables can be found in Table 3.

Table 3. Descriptive statistics of the outcome variables for each time point.

	Institutional care group			**Biological family group**		
Tasks	**Time1**	**Time2**	**Time3**	**Time1**	**Time2**	**Time3**
Novelty preference (shape)	25.51 (16.00)*	31.56 (15.54)	29.61 (14.53)	29.47 (11.37)	30.31 (12.17)	34.85 (9.79)
Novelty preference (face)	32.82 (13.38)	35.60 (10.95)	34.20 (11.16)	30.45 (10.44)	33.04 (11.34)	37.90 (10.44)
Attention (one-toy condition)	51.85 (22.20)	46.82 (24.21)	41.32 (25.58)	56.70 (21.76)	55.43 (21.40)	62.88 (24.93)
Attention (six-toy condition)	75.14 (23.99)	73.01 (25.67)	78.14 (29.27)	74.36 (21.27)	81.12 (17.18)	91.80 (21.38)
Object permanence	1.13 (0.92)	1.09 (0.91)	1.26 (0.95)	1.66 (0.66)	2.00 (0.00)	1.90 (0.42)

Note: Mean and standard deviation scores are given only for the participants who were included in the analysis.
*Mean values are given outside of the parentheses, while *SD* is given inside.

2.5.3. Novelty Preference – HLM Results

A total of 114 infants (institutional care group = 61, family group = 53) were presented with the novelty preference task; however, due to dropouts between the three waves, 91 infants (institutional care group = 42, family group = 49) were included in the final analysis. First of all, the linearity of the data was checked by multiplying the time variable (see Equation 1). The squared time variable was not significant in predicting novelty scores of infants including novelty – shape and novelty – face scores (β = -

1.46, $p = 0.40$ and $\beta = -0.39$, $p = 0.79$), respectively. Thus, data were linear and further analysis was run based on this.

For the novelty preference scores of the shape task, variance components were calculated from the fully unconditional model by the following formula: variance component of intercept (*r0*)/(variance component of intercept (*r0*) + variance component of error at Level 1(*e*)). According to this formula, 9% of the variance [16.36/(16.36 + 169.22) = 0.09] can be explained by differences between individual infants for the novelty – shape task. When the time was added into the model, there was a significant variability between infants over time ($\beta 10 = 3.03$, $t(90) = 3.18$, $p < 0.01$; see Equation 2). The average novelty – shape score at Time1 was 26.90, while there was a 3.03 linear increase in novelty scores of infants each time. Since the error of the time slope (r_1) was not significant (χ^2 (88) = 91.96, $p = 0.36$), it was fixed for further analyses.

As seen in Equation 4, all variables were included into both Level-1 and Level-2 (group, temperament, and the interaction term). It was found that 5% of the variance was explained by the group, temperament, and interaction terms [(169.22 – 159.87)/169.22 = 0.05] at Level-2. There was significant variability over time in predicting novelty scores for the shape task between infants ($\beta = 4.32$, $t = 2.50$, $p < 0.05$). However, neither group nor temperament explained this variability over time.[1]

Interaction between group and temperament was not significant in wave 1, but falling reactivity positively predicted the novelty preference scores of infants for the shape task ($\beta = 6.87$, $p < 0.05$). This showed that infants with high levels of falling reactivity looked at the novel shape for longer periods of time. There was also a significant group difference in wave 1 ($\beta = 5.99$, $p < 0.05$), which showed that infants in the family group looked at the novel stimuli longer compared to the infants in institutions (see Table 4).

Moreover, time was centered in wave 3 to examine the group difference in the last wave (Time variable was recoded as wave 1= 2, wave 2 = 1, and wave 3= 0). There

[1] For the novelty scores of the shape task, equation 3 was run to calculate the model fit in equation 4. The deviance difference was 1957.4 - 1951.5 = 5.936, with degrees of freedom 5. The chi squire difference test was not significant, which showed that the final model did not show a better fit.

was no group difference for the novelty scores based on shape task in wave 3 (β = 2.12, p = 0.45; see Figure 3).

Table 4. Final estimation of fixed and random effects for predicting novelty preferences score of infants (shape task).

Fixed effect	Coefficient	*SE*	t-ratio	d.f.	*p*
For intrcpt1, π_0					
intrcpt2, β_{00}	23.33	2.35	9.93	87	<0.001
Group, β_{01}	5.99	2.79	2.14	87	0.035
Recovery, β_{02}	6.87	3.14	2.19	87	0.031
Group × temp., β_{03}	-4.46	3.76	-1.18	87	0.239
For TIME slope, π_1					
intrcpt2, β_{10}	4.32	1.73	2.50	150	0.013
Group, β_{11}	-1.93	2.05	-0.94	150	0.347
Recovery, β_{12}	-4.53	2.65	-1.71	150	0.088
Group × temp., β_{13}	2.98	2.99	0.99	150	0.321
Random effect	*SD*	Variance component	d.f.	χ^2	*p*
INTRCPT1, r_0	4.14	17.12	87	108.67	0.058
Level-1, e	12.64	159.87			

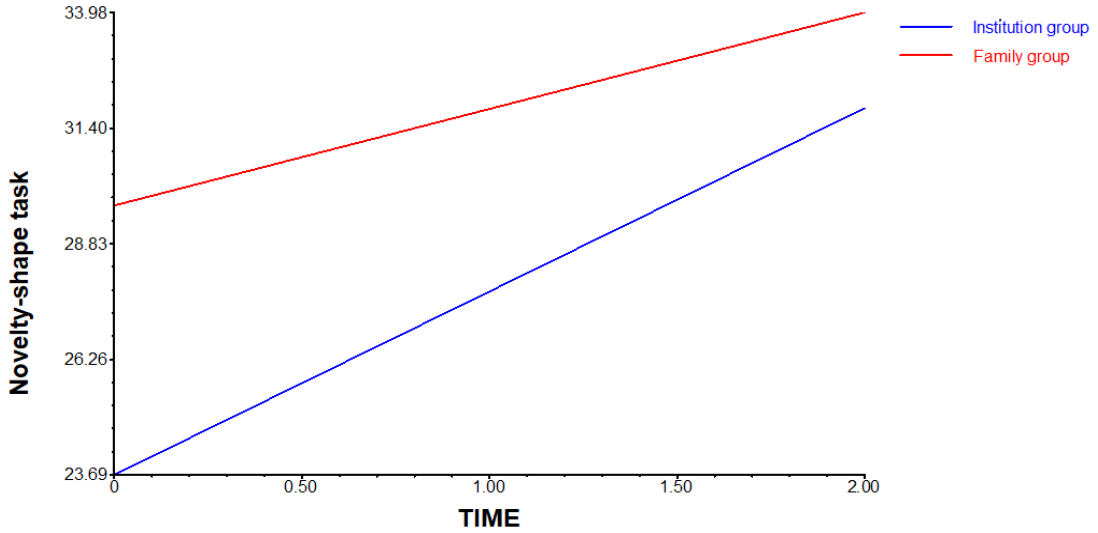

Figure 3. Group difference in novelty scores over time (the slope of the growth rates was not differentiated between groups).

For the novelty preference scores of face tasks, the same analysis was run in the same order. In a fully unconditional model, the unexplained variance component was

insignificant (χ^2 (90) = 84.70, p > 0.500), which means that there was no variability in novelty – face task scores between infants. Thus, further analysis could not be performed.

2.5.4. Focused Attention Skills – HLM Results

There were two conditions in the focused attention tasks, one-toy and six-toy conditions, and a separate analysis was run for each. A total of 112 infants (institutional care group = 62, family group = 50) were given the one-toy and six-toy conditions separately; due to dropouts over time, 91 infants (institutional care group = 44, family group = 47) were included in the analysis. First of all, the data's linearity was checked by multiplying the time variable (see Equation 1). The squared time variable was not significant in predicting infants' attention scores in the one-toy condition (β = 2.90, p = 0.26) or the six-toy condition (β = 3.54, p = 0.21). Thus, the data were linear for both conditions. Further analysis was run based on this information.

For the one-toy condition, variance components were calculated from the fully unconditional model, and 20% variance [115.93/(115.93 + 466.36) = 0.20] was explained by the between-individual difference. When time was added into the model, the error of the time slope (r_1) was significant (χ^2 (89) = 141.16, p < 0.001), and it was left as random for further analyses.

The group, temperament, and interaction (temperament × group) variables were then added to both Level-1 and Level-2 to test whether there was a significant variability between groups with time and whether temperament moderated the growth rates of infants (see Equation 4). It was seen that 24% of the variance in one-toy condition scores of infants [(466.36 – 352.96)/466.36 = 0.24] was explained by group and temperament variables. When all the variables were in the equation, the interaction between temperament × group × time was not significant. There was also no

significant group difference in wave 1. However, the group slopes significantly differed with time (β_{11} = 7.81, $p < 0.05$).[2]

Simple slope analysis of the group × time interaction was performed using the utilities of Preacher (2006). The time slope of the groups was not differentiated in wave 1 (β = 4.24, t = 0.91, p = 0.35), but they were significantly differentiated in wave 2 (β =12.05, t = 3.60, $p < 0.01$) and wave 3 (β = 19.86, t = 3.66, $p < 0.01$). The slope of the family group did not change over time (β = 2.97, t = 1.22, p = 0.22), while the slope of the institutional care group showed a decreasing trend with time (β = -4.84, t = -1.74, p = 0.08; see Figure 4). This showed that the attention skills of the infants in institutions had a tendency to decrease with time.

Moreover, time was centered in wave 3 to see group differences in the final wave (Time variable was recoded as wave 1= 2, wave 2 = 1, and wave 3= 0). The groups differed significantly in wave 3, where infants in the institutional care group had lower attention scores based on the one-toy condition (β = 19.86, $p < 0.001$).

For the six-toy condition, variance components were calculated from the fully unconditional model and 16% of variance [93.03/(93.03 + 482.22) = 0.16] was explained by between-individual difference. When time was added into the model, the error of the time slope (r_1) was not significant (χ^2 (90) = 102.75, p = 0.17). Thus, it was fixed for further analysis (the error term was closed).

As seen in the fourth equation, all other variables were added to both Level-1 and Level-2 in order to see whether there was a significant variability between groups over time and whether temperament moderated the growth rates of infants. As a result, 8% of the variance in the six-toy condition scores of infants [(466.36 – 352.96)/466.36 = 0.08] was explained by group, temperament, and interaction variables. When all the

[2] For the focused attention scores of the one-toy condition, equation 3 was run to calculate the model fit in equation 4. The deviance difference was 2282.9 - 2275 = 7.93, with degrees of freedom 5. The chi squire difference test was not significant, which showed that the final model did not show a better fit.

variables were in the equation, the interaction of temperament × group × time was not significant. There was also no significant group difference in wave 1; however, the time × group interaction was significant (β_{11} = 7.64, $p < 0.05$; see Table 5).[3]

Simple slope analysis of group × time interaction was calculated by using the utilities of Preacher (2006). The time slopes of the groups were not differentiated in wave 1 (β = 0.13, t = 0.03, p = 0.97), but they were significantly differentiated in wave 2 (β = 7.77, t = 2.25, $p < 0.05$) and wave 3 (β = 15.41, t = 2.90, $p < 0.01$). The slope of the family group increased with time (β = 8.61, t = 4.08, $p < 0.01$), while the slope of the institutional care group did not change with time (β = 0.97, t = 0.39, p = 0.69) (see Figure 5).

When time was centered around wave 3 (Time variable was recoded as wave 1= 2, wave 2 = 1, and wave 3= 0), there was a significant group difference in wave 3, where the institutional care group had lower attention scores based on the six-toy condition (β = 15.42, $p < 0.01$).

[3] For the focused attention scores of the six-toy condition, equation 3 was run to calculate the model fit in equation 4. The deviance difference was 2302.8 - 2292.3 = 10.50751, with degrees of freedom 5. The chi squire difference test was not significant (p = .06), which showed that the final model did not show a better fit.

Table 5. Final estimation of fixed and random effects (with robust standard errors) in predicting attention skills of infants (one-toy and six-toy conditions).

	One-toy condition					Six-toy condition				
Fixed effect	**Coeff.**	***SE***	**t-ratio**	**d.f.**	***p***	**Coeff.**	***SE***	**t-ratio**	**d.f.**	***p***
For INTRCPT1, π_0										
intrcpt2, β_{00}	51.47	3.17	16.221	87	<0.001	73.91	2.97	24.896	87	<0.001
Group, β_{01}	4.24	4.50	0.943	87	0.348	0.13	4.09	0.031	87	0.975
Recovery, β_{02}	4.38	4.87	0.898	87	0.372	1.01	3.69	0.274	87	0.785
Group × temp., β_{03}	0.73	6.22	0.117	87	0.907	3.18	5.22	0.608	87	0.544
For TIME slope, π_1										
intrcpt2, β_{10}	-4.84	2.78	-1.739	87	0.086	0.97	2.47	0.393	158	0.695
Group, β_{11}	7.81	3.70	2.109	87	0.038	7.64	3.25	2.355	158	0.020
Recovery, β_{12}	-0.86	4.04	-0.213	87	0.832	4.43	3.17	1.396	158	0.165
Group × temp., β_{13}	-0.67	5.15	-0.129	87	0.897	-6.77	4.09	-1.653	158	0.100
Random effect	*SD*	Variance component	d.f.	χ^2	*p*	*SD*	Variance component	d.f.	χ^2	*p*
INTRCPT1, r_0	12.90	166.43	86	131.64	0.001	9.84	96.76	87	139.90	<0.001
TIME slope, r_1	10.46	109.44	86	133.24	0.001					
Level-1, *e*	18.87	356.28				21.03	442.15			

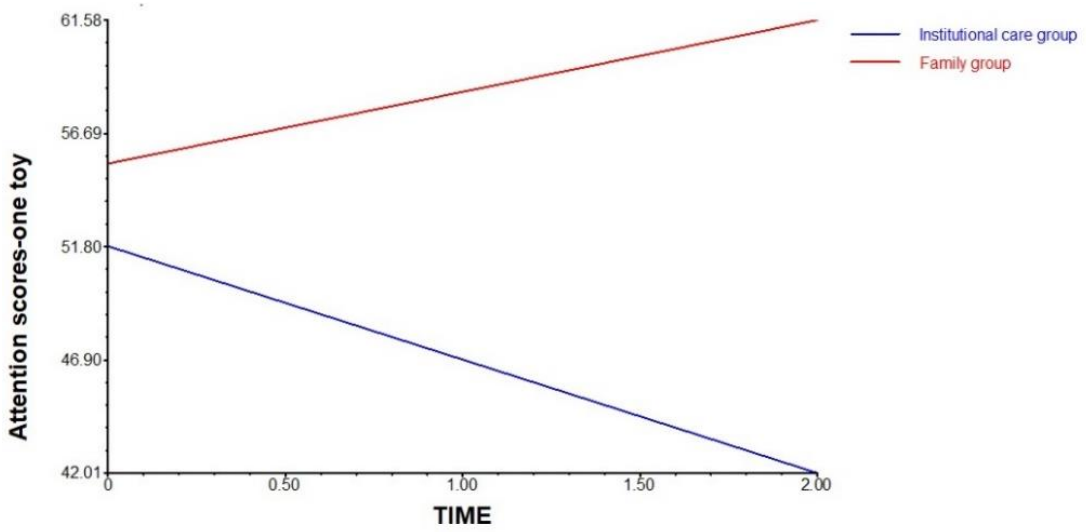

Figure 4. Interaction between time and group variables (the slope of the institutional care group showed a decreasing trend with time).

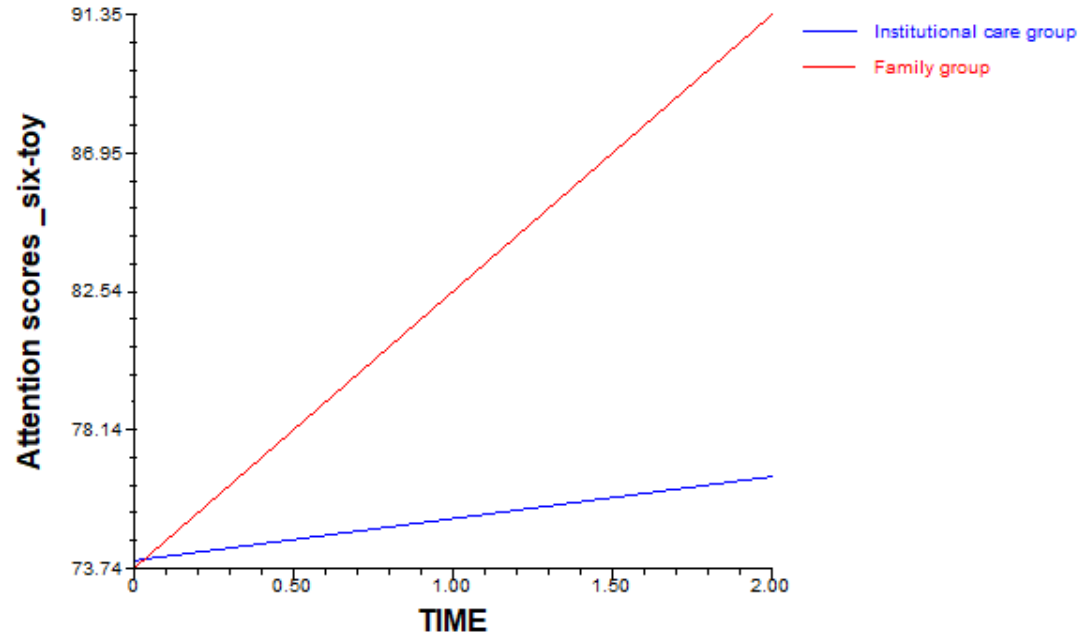

Figure 5. Interaction between time and group variables (the slope of the family group increased with time, while the slope of the institutional care group did not change).

2.5.5. Object Permanence Task – HLM Results

The object permanence task was administered to 114 infants (institutional care group = 63, family group = 51); however, infants who did not have data from at least two time points were not included in the analysis. Thus, the final sample comprised 92 infants (institutional care group = 44, family group = 48). First of all, the linearity of the data was checked by multiplying the time variable (see Equation 1). The squared time variable was not significant in predicting infants' object permanence score (β = -0.02, p = 0.83), which indicated that the data were linear.

Variance components were calculated from the fully unconditional model, and 33% of the variance [0.21/(0.21 + 0.44) = 0.33] can be explained by the between-individual difference. When the time variable was included in the model, the error of the time slope (r_1) was significant (χ^2 (91) = 133.15, $p < 0.01$). Thus, it was left as random for further analyses.

All variables (group, temperament, and the interaction term) were then included in the model, as in the fourth equation. As a result, 21% of variance in the object permanence scores of infants [(0.44 – 0.35)/0.44 = 0.21] was explained by group, temperament, and interaction variables. The interaction between falling reactivity and group was not significant, neither for wave 1 nor by time (see Table 6). Group was significant (β_{01} = 0.65, $p < 0.001$) in wave 1, which showed that infants in institutions had lower scores than infants in the family group. However, the development rates of the groups were not differentiated with time (β_{11} = 0.06, p = 0.57). Overall, there was a significant difference between groups in wave 1, and their rates of development were not differentiated over time (see Figure 6).[4]

When time was centered around wave 3 (Time variable was recoded as wave 1= 2, wave 2 = 1, and wave 3= 0) and the model was run as in equation 4, there was a

[4] For the object permanence score, equation 3 was run to calculate the model fit in equation 4. The deviance difference was 549.59 - 545.03 = 4.567, with degrees of freedom 5. The chi squire difference test was not significant, which showed that the final model did not show a better fit.

significant group difference. Infants in institutions still had lower object permanence scores than infants in the family group ($\beta = 0.77$, $p < 0.001$).

Table 6. Final estimation of fixed and random effects for predicting object permanence scores of infants.

Fixed effect	Coefficient	*SE*	t-ratio	d.f.	*p*
For INTRCPT1, π_0					
intrcpt2, β_{00}	1.09	0.13	8.035	88	<0.001
Group, β_{01}	0.65	0.15	4.173	88	<0.001
Recovery, β_{02}	0.12	0.18	0.647	88	0.519
Group × temp., β_{03}	0.09	0.21	0.439	88	0.662
For TIME slope, π_1					
intrcpt2, β_{10}	0.05	0.10	0.537	88	0.592
Group, β_{11}	0.06	0.11	0.567	88	0.572
Recovery, β_{12}	0.02	0.12	0.135	88	0.893
Group × temp., β_{13}	-0.10	0.14	-0.740	88	0.461
Random effect	*SD*	Variance component	*d.f.*	χ^2	*p*
INTRCPT1, r_0	0.51	0.26	88	162.75	<0.001
TIME slope, r_1	0.29	0.08	88	127.63	0.004
Level-1, *e*	0.59	0.35			

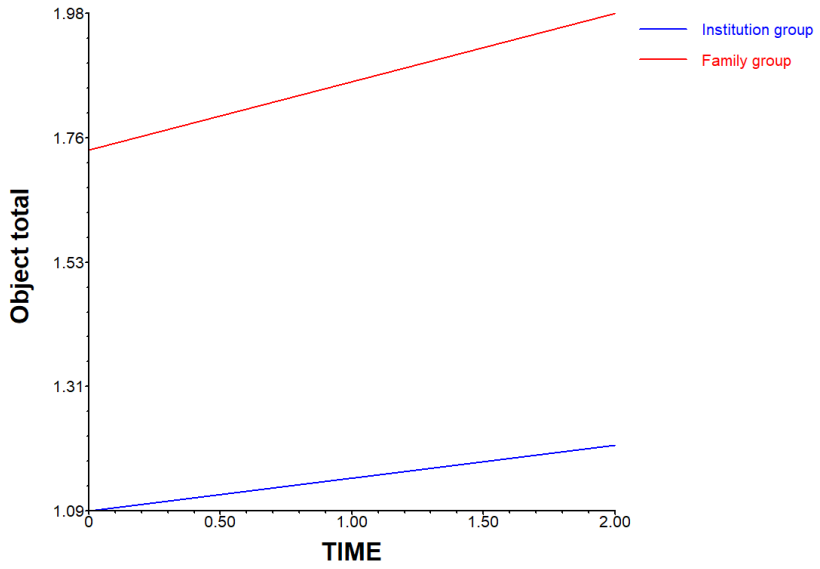

Figure 6. Group difference in object permanence scores in time (the slope of the growth rates were not differentiated between groups).

2.6. Discussion

This study explored the cognitive development of infants residing in institutions. Their growth rates in terms of cognitive development were compared with those of infants reared by their biological families. Novelty preferences, focused attention, and object permanence skills were measured as cognitive outcomes. It was expected that infants in institutional care would have lower scores and slower gains with time than infants in the family group.

A separate analysis was run for each task. First, there was no group difference for **novelty preference scores** measured with the **face task** in wave 1 or wave 3. In their developmental courses, infants are inclined to look at faces rather than non-face patterns and objects (Cashon & Dixon, 2019). They also show preferences for female faces rather than male (Quinn et al., 2008), since they interact more with females during the first year of their lives. We used female pictures in our novelty tasks, which may attract infants' attention more, since almost all caregivers in the institutions are female. In the overall data, all infants looked longer at the faces compared to the shapes. Thus, it can be speculated that infants prefer to look at social stimuli even in an institutional care context. Although there was no group difference in novelty preference scores for the face task, groups were differentiated at the first time point for the novelty preference scores measured with the **shape task**. Infants in institutions looked less at the novel shape than infants in the family group in wave 1. There was no significant interaction between time slope and group, and group differences disappeared in wave 3, indicating that infants in the institutional care group improved with time and approached the results of the infants in the family group. Group difference in wave 1 was in line with our expectations, whereby we expected that infants in institutional care would have lower scores in the novelty preference task compared to the family group. The development rates of the groups were not differentiated by time. The reason for this might be the infants' maturation in the family group. The novelty preference task is mostly used with infants younger than 9 months (Gross & Schwarzer, 2010), but some studies extended the age range up to 15 months (Csibra et al., 2016). Since we expected infants in the institutional care group to be delayed in development and to have slower gains with time,

we used the same task over time. The age range of the infants in wave 3 was between 11 and 21 months old. It is possible that infants in the family group had already reached their developmental milestones in wave 1, as their increases in novelty scores did not change more with time. However, infants in institutional care had lower scores in wave 1, and their novelty scores increased with time and reached the levels of the infants in the family group. Infants' time spent looking at stimuli increases in the first 2 months; then it generally starts to decrease after 6 months, which shows that they have habituated (Hood, Murray, King, & Hooper, 1996; Colombo et al., 2004). Infants in institutional care may not become habituated and may not look at new stimuli. With the increase of age over 1 year, they might reach a certain maturation level where they are habituated faster than in wave 1, and they thus approach the levels of the family group.

There were also some restrictions and limitations in the administration of the novelty preference task because of legal issues. In previous research, all responses of infants were recorded by a camera or an eye tracker in order to differentiate the time spent looking at old and new stimuli (Courage & Howe, 2001; Gross & Schwarzer, 2010). However, we were not allowed to record the infants' responses in the institutions; thus, the number of stimuli were fixed and the experimenters rated the participants' reactions and looking times simultaneously. In the literature, novelty preference tasks start with a habituation phase, in which an infant initially gets habituated to the first stimulus and then a new stimulus is introduced (Dunn & Bremner, 2017). The number of trials that are needed for habituation varies from infant to infant (Bornstein et al., 2006). However, our test trials were fixed, and there were two familiarization trials and two test trials with an old and a new stimulus. Thus, we could not ensure that each infant got habituated to the first stimulus before introducing the new one. Infants in institutional care may need more trials to habituate to the first stimulus. Thus, this might have had an effect on their responses to the new stimulus. In addition, we could not measure the looking times for the old stimulus in the test trials, since we could not record the infants' responses on video. The experimenters could only record the time the infant spent looking at each side of the computer (where each stimulus was presented). They calculated the looking times for the new stimulus with a stopwatch.

Whether and how long the infants looked at the old stimulus or looked away from the computer screen could not be recorded. Therefore, we only compared the groups based on their time spent looking at the new stimuli in the test trials, and total looking time for a new stimulus was considered as an indication of better novelty preference skills.

Despite the fact that we had to modify the administration of the task, to the best of our knowledge this is the first study that examined the novelty preferences of infants in institutional care. Overall, the institutional care group had lower novelty preference scores in wave 1, but their performance approached that of the family group in wave 3. Although there was no significant group difference in wave 3, infants in the institutional care group still generally had lower scores than infants in the family group. It is essential to understand the earlier mechanism of cognitive development in children at risk. Although there is a complex path linking the habituation/novelty paradigm and later cognitive functioning, infants who habituate effectively are the ones who perform better in memory tasks and learn information efficiently (Bornstein et al., 2006; Colombo & Mitchell, 2009). The associated mechanism of lower memory performance and poorer learning abilities of children with a history of institutionalization might be underlined by their poorer performance in novelty preference tasks (Bos et al., 2009; Pollak et al., 2010).

For the **focused attention skills,** there was no group difference in wave 1, but the rates of development differentiated over time, whereby infants in institutional care did not have gains over time but the family group had increased scores from wave 1 to wave 3. This finding was in line with our expectations. The attention duration of infants is expected to increase with age (Ruff & Lawson, 1990). However, the attention duration of the infants in institutional care was not lengthened and they lagged behind their age-mates. In the literature, a cross-sectional study reported similar results, wherein infants in institutional care had lower attention scores than infants in foster care (Ghera et al., 2009). Our results provide further information and show that the gap between infants in institutional care and family care increased over time, which might be a sign of attention problems. In the literature, children with a history of nonparental care have more attention-deficit problems and behavioral problems in middle childhood (Gunnar

& van Dulmen, 2007; Wiik et al., 2011). Although the brain development of neglected children was found to be associated with their ADHD problems (McLaughlin et al., 2013), lower performance in attention scores in early years might also be a reason for later attention-related problems (Lawson & Ruff, 2004). For instance, children who have poorer performance in sustained attention skills around the age of 5 have more attention-related problems in school years (Martin, Razza, & Brooks-Gunn, 2012). Thus, understanding attention skills in earlier stages is essential for prevention and interventions in earlier periods of life.

The early environment is essential for infants' brain and cognitive development, especially in the first 2 years. Infants' brains and nervous systems develop during this critical period. The infant's brain is shaped by interactions and environmental conditions (Bornstein, 2014; Lloyd-Fox et al., 2019). Thus, parental support in directing infants' attention to target objects and scaffolding abilities plays a vital role in their cognitive development (Suarez-Rivera et al., 2019; Yu & Smith, 2016). An intervention study with toddlers in institutions also showed the importance of one-on-one interaction for cognitive and language development (Berument, Sönmez, & Eyüpoğlu, 2012). It was found that 2-hour individual interactions over 10 weeks decreased toddlers' developmental gaps compared to the control group. The current study examined only the context of institutional care. Future studies should also include measures focusing on the process mechanism existing between children and caregivers and their interactions.

For **object permanence skills,** infants in institutions had lower scores than infants in the family group in wave 1, and their rate of development was not differentiated by time. There was no slope × group interaction as was the case for attention scores, but infants in institutions also had lower scores than those in the family group in wave 3. The results showed that infants in institutions failed more often to find covered objects than infants in the family group, which was in line with our expectations. Infants develop object permanence skills around 8-9 months (Piaget, 1954; Prasad et al., 2019). We administered the task to 6- to 15-month-old infants in wave 1, while the age range was between 14 and 24 months in wave 3. However, overall, infants in

institutions still failed more than infants in the family group (only one child failed in this task in the family group in wave 1). The traditional version of the object permanence task was used in the current study, whereby infants needed to take the toys from under a cover. In order to do that, it is necessary to have some motor skills to reach and hold the toys. One of the reasons why infants in institutions failed more often could be their poor motor skills, as shown by previous studies (Levin, Zeanah, Fox, & Nelson, 2014). The Turkish Care Type Study also examined the motor skills of children in institutions. It was found that these children had poorer fine motor skills, but not gross motor skills (Berument & Sümer, 2013-2017). Parental support in fine motor skills is important (Bindman et al., 2014). Since children in institutions have less interaction with their caregivers, delays in their fine motor skills might also affect their ability to discover the covered toy in the object permanence task. Recent studies have measured object permanence skills by looking at the gaze of younger infants where they do not need to reach or discover a toy with their motor skills (Charles & Rivera, 2009; Woods, Wilcox, Armstrong, & Alexander, 2010), which might be a good option for future studies to eliminate the necessity for motor skills.

Overall, these findings were in line with our expectations that infants in institutions would have lower cognitive development than infants in the family group. Previous studies also showed that children in institutions had poorer cognitive development than children in family groups (Fox, Almas, Degnan, Nelson, & Zeanah, 2011; McDermott et al., 2012; Vorria et al., 2006). This study contributes to the literature by showing that the effects of institutional care on cognitive development start in the early months of life. These tasks are precursors of later cognitive development. For instance, object permanence is the first indication of mental representation since infants need to memorize disappeared objects, which is claimed as a striking milestone in cognitive development (Kaufman et al., 2005). The ability to focus on something is also essential for later cognitive processes such as learning, memory, and self-regulation skills (Lawson & Ruff, 2004; Ruff & Rothbart, 2001), while the habituation paradigm might be a predictor for higher-order cognitive functioning like learning and cognition (Bornstein et al., 2006; Colombo & Mitchell, 2009).

Besides the group difference, this study also explored the role of individual differences and more precisely infants' temperament in cognitive development. The moderating role of temperament was tested in light of the differential susceptibility theory and falling reactivity was measured as a temperament dimension and susceptibility marker. In the literature, reactivity to overstimulation and distress has been found as a susceptibility marker (Dilworth-Bart et al., 2012; van IJzendoorn & Bakermans-Kranenburg, 2012), while recovery from peak distress and falling reactivity might also be a susceptibility marker. Infants who have difficulty recovering from distress may need more external help (e.g., parental support) for regulation. When it is not provided, they might be affected more negatively. Since individual care in institutions is not as available as in family environments, it was expected that susceptible infants (infants with low levels of falling reactivity) would be affected more negatively by institutional care type and would have lower cognitive development. However, infants with high levels of falling reactivity (infants who do not have difficulties in recovery from distress) would take advantage of the family environment better and would have higher scores in cognitive tasks than the less susceptible infants. Contrary to our expectations, the moderating role of temperament was not significant.

When we look at the previous studies, results are mixed. For instance, difficult temperament was found as a susceptibility marker in a way that supports differential susceptibility for behavioral problems and social adjustment as well as cognitive outcomes (Hentges, Davies, & Cicchetti, 2015; Van Zeijl et al., 2007; Leve, Kim, & Pears, 2005; Raver et al., 2013). However, some studies looking at the interaction between parenting and child temperament for cognitive outcomes did not support the differential susceptibility theory, similar to the current findings. For instance, Dilworth-Bart et al. (2012) tested difficult temperament-parenting interactions in preterm/very-low-birth-weight infants, and they found that infants with high levels of negative emotionality had lower levels of visual-spatial processing when mothers were more flexible in play-interaction, which is the opposite of the differential susceptibility theory. A recent study also tested the impact of the interaction of parenting quality and negative emotionality on children's executive functioning skills (Suor et al., 2019).

Those results supported the vantage sensitivity theory, whereby children with lower levels of negative emotionality had better executive functioning when parental control was high. Thus, the findings related to differential susceptibility based on parenting and child temperament interaction are mixed in the literature. The present study tested the environment × temperament interaction in institutional settings and the findings did not support the differential susceptibility theory.

One explanation for why the moderating role temperament was not significant here might be the specific temperament dimension that we included in the study. In the literature, the ways in which researchers define and measure difficult temperament is highly varied. Some studies take one subscale of temperament, as in the current study, and some studies calculate a composite score (Kiff, Lengua, & Bush, 2011; Poehlmann et al., 2011), while other studies measure the reaction of children to fear or a stress-inducing task (Gilissen, Bakermans-Kranenburg, van IJzendoorn, & van der Veer, 2008). There are also studies that measured difficult temperament with single-item questions (Vitaro et al., 2006). Thus, it is possible that not every temperament dimension functions as a susceptibility marker for developmental outcomes (Slagt et al., 2016). For instance, Conway and Stifter (2012) found that inhibited toddlers had better executive functioning skills in the preschool years when their mothers supported their attentional focus. However, they had lower executive functioning skills when their mothers did not support their attentional focus. Similarly, observer-measured negative reactivity supported the differential susceptibility theory in predicting the executive functioning of children (Raver et al., 2013). Children with high reactivity had lower executive functioning in impoverished environments, but they had higher executive functioning skills in economically better family environments. Those authors measured temperament differently than in the current study. Thus, further studies are needed to compare different temperament characteristics within a single study to understand which aspect of difficult temperament might serve as a susceptibility marker.

Environmental variables vary for each study, as well. For instance, some studies measured parenting × temperament interaction, while others measured family

environment × temperament interactions. Susceptibility characteristics may function differentially for each environment.

Although a moderating role of temperament was not found, the main effect of temperament was significant for the novelty preference task, showing that infants with high levels of falling reactivity looked longer at the novel shape in wave 1. This finding was not surprising, since attention shifting, including duration of orienting, was positively correlated with the soothability subscale of the IBQ (Gartstein & Rothbart, 2003). In the literature, infants with high adaptability levels, soothability, and positive moods had better attention allocation and attention spans (Kochanska, Murray, & Harlan, 2000; Dixon, Salley, & Clements, 2006; Dixon & Smith, 2000). Looking at a novel shape requires shifting attention from the habituated phase. Thus, infants who are able to soothe themselves may also shift their attention to new stimuli easily. Furthermore, temperamental reactivity includes distress to novelty, which is positively correlated with negative emotionality, including a reversely coded subscale of recovery from distress (Martin et al., 1997). Thus, infants who have difficulty recovering from distress may prefer to look away from new stimuli in order to soothe themselves (Crockenberg & Leerkes, 2004).

Overall, the current findings showed a significant group difference whereby infants in institutions had poorer cognitive development than infants in the family group.

CHAPTER 3

STUDY II: COMPARING COGNITIVE DEVELOPMENT OF INFANTS IN INSTITUTIONAL CARE WITH INFANTS IN LOW-SES FAMILIES: THE MODERATING ROLE OF TEMPERAMENT

3.1. Brief Introduction

In Study I, infants in institutional care were compared with infants reared by their families. However, infants in institutional care are coming from families at risk, as among the reasons for care placement are poverty, parental physical and mental health problems, divorce, parental imprisonment, abuse, and neglect (Muñoz-Hoyos et al., 2001). Thus, family characteristics of children in institutions are more like the family characteristics of children who live in low-SES households, specifically in poverty contexts. Low-SES families usually have economic difficulties, a lack of resources, more household chaos, and lower parental education levels than middle-SES families (Okur, 2015).

In addition, parents in low-SES environments are more likely to be depressed and have higher levels of perceived stress and health problems, including substance abuse. They also show poor parental practices compared to parents in middle-SES environments (Hackman, Gallop, Evans, & Farah, 2015; Hughes & Ensor, 2009; Okur, 2015). Few studies have examined group differences between children in institutional care concerning family SES levels. Preschool children living in institutions had lower outcomes for the Peabody Picture-Vocabulary Test and theory of mind development than children in middle-SES families. However, there was no group difference when the comparison group was low-SES families (Yagmurlu, Berument, & Celimli, 2005). On the other hand, preschool children in institutional care had lower self-scores than children from both low-SES and middle-SES family groups (Ertekin & Berument,

2019). These findings showed that the characteristics of the comparison group are also important. Comparing the development of infants in institutions to infants in high-risk low-SES contexts might enable us to reveal the role of the home environment in children's development. Furthermore, despite the risks involved in low-SES home contexts, if infants perform better there than infants in institutional care this is likely to indicate the importance of one-on-one interaction, which is lacking in institutions. Therefore, the first aim of the current study was to compare infants in institutional care with infants reared in low-SES biological family environments.

Although environment has an important role in shaping a child's development, individual differences like temperament seem to determine the extent of these effects (Pluess & Belsky, 2010). Therefore, from a differential susceptibility perspective, the moderating role of temperament was examined in the current study. Difficult temperament and reactivity to overstimulation are commonly studied as susceptibility markers in testing the effects of care or environment (Slagt et al., 2016). As an aspect of negative affect, falling reactivity/recovery from peak distress, which shows how long it takes an infant to return to a regulated state, might also be a susceptibility marker, especially in the context of nonparental care. Children who have difficulty in recovery from distress may need more parental support to soothe themselves, and when it is provided, they show better developmental outcomes (Calkins et al., 2008). When parental support is not provided, they might be more susceptible to environmental effects, and their development might be negatively affected. Thus, the second aim of the current study was to examine the moderating role of temperament (falling reactivity) in infants' cognitive development in institutions. It was hypothesized that:

- Infants in the institutional care group would have lower scores for cognitive development (including attention skills and object permanence skills) compared to the low-SES family group.
- The group difference would be moderated by the infants' temperaments, where infants with low levels of falling reactivity would be negatively affected by the institutional care setting and would have lower scores compared to infants in low-SES family homes, and they would be positively affected by their environments.

3.2. Method

3.2.1. Participants

Sixty-three infants from institutions and 60 infants from low-SES family backgrounds were recruited for this study. The low-SES families were reached in disadvantaged neighborhoods of two large cities of Turkey, Ankara and Konya. The mothers' education level in the low-SES group was mainly elementary school or middle school and the majority of them were not working. The mean income of this sample was around the minimum wage of Turkey. Descriptive information can be found in Table 7.

3.2.2. Measurements

The cognitive development of the infants was measured with a focused attention task (Clearfield & Jedd, 2013) and object permanence task (Moore & Meltzoff, 2008) as described in the method section for Study I. The absolute agreement between experimenters for the attention task was 0.98 to 0.99. The infants' temperamental characteristics were measured by the IBQ (Gartstein & Rothbart, 2003) with the falling reactivity/recovery from distress subscale (13 items), as stated in Study I (see Appendix A). Cronbach's alpha for the scale was found as 0.84 in this sample. The SES of the families was measured by asking the education levels of mothers and household incomes with a demographic information questionnaire (see Appendix D). The quality of the home environment was also measured with the Home Environment Questionnaire (HEQ; Miser & Hupp, 2012). Descriptive information can be seen in Table 7.

The HEQ (Miser & Hupp, 2012) was adapted in the scope of the Turkish Care Type Project. Nineteen questions address the availability of toys and facilities like singing to the baby or going to a park, the frequency of stimulation at home (e.g., "How frequently do you read a book to your child?"), and parenting practices (e.g., "Have you ever shouted at your child when he/she made you angry?"). The scaling of each question varies. For the frequency of the behavior, a 5-point Likert scale was used (1 = once a month, 2 = once a week, 3 = a couple of times a week, 4 = every day, 5 = a couple of times a day). Some questions were dummy-coded (e.g., 0 = yes, 1 = no).

Therefore, they were all converted to z-scores and combined, then divided by the number of items. The total score ranged between -1 and +1 (see Appendix E).

3.2.3. Procedure

Data from institutions were already gathered as a part of the Turkish Care Type Study. Ethical approval was obtained from the Human Subjects Ethics Committee of Middle East Technical University (see Appendix F). The experimenters visited each house for the low-SES group. After obtaining informed consent (see Appendix G) from the mothers, tasks were applied with the same procedure as in Chapter Two. The data collection procedure was explained for the infants in institutional care in Chapter Two, which was a part of the larger Turkish Care Type Study. For the low-SES family group, before applying the tasks, a warm-up session of 10 to 15 minutes was carried by using free play with the infants. Mothers filled out the parent-reported questionnaires, but experimenters read the questions when needed (when the mother could not read well). Incentives were given to both infants and mothers after assessment. A summary report about the infant's development was also provided to the parents. The manuscript from Study II was accepted for publication in the journal of *Infancy* (see Appendix H).

Table 7. Characteristics of the participants.

	Institutional care group (N = 63)			Low-SES family group (N = 60)		
	Mean	*SD*	Min.-max.	Mean	*SD*	Min.-max.
Age of infants (months)	9.80	2.67	6-15	10.52	2.75	6-15
Gender	34 male (54%)			30 male (50%)		
Number of siblings				2.23	1.03	1-5
Age of mothers (years)				29.00	5.25	19-40
Education level of mothers* [a]				3.93	1.12	1-7
Home quality scale				0.002	0.33	-0.94-0.64
Home income**				2.62	1.12	0.50-7
Mother working				3 (5%)		

*Education level ranged between 1 (illiterate) and 9 (doctoral degree) (1 = illiterate, 2 = literate but no degree, 3 = elementary school, 4 = middle school, 5 = high school, 6 = 2-year university degree, 7 = undergraduate degree, 8 = graduate degree, 9 = doctoral degree). **Family income ranged between 0 (0 to 2000 Turkish lira) and 10 (10,000 Turkish lira and above).

3.3. Results

3.3.1. ANOVA

One-way ANOVA was run to test the group differences in the infants' cognitive development. Cognitive development was measured with two different tasks, a focused attention task (one-toy condition and six-toy condition) and an object permanence task.

The main effect of group was significant for the focused attention skills for both the one-toy condition (F (1, 119) = 32.36, $p < 0.001$) and six-toy condition (F (1, 119) = 20.97, $p < 0.001$). Infants in the institutional care group had lower attention scores than the infants in the low-SES group for both one-toy and six-toy conditions. The group's main effect was also significant for the object permanence score (F (1, 120) = 14.28, $p < 0.001$), where infants in institutions had lower scores than infants in the low-SES family group (for the means of the tasks, see Table 8).[5]

Table 8. Descriptive statistics for moderating and outcome variables.

	Institutional care group	Low-SES family group
	M (*SE*)	*M* (*SE*)
Attention task (one-toy condition)	51.12 (2.92)	73.95 (2.74)
Attention task (six-toy condition)	75.08 (3.08)	92.79 (2.28)
Object permanence	1.11 (0.12)	1.66 (0.08)
Recovery from distress	3.77	3.67

[5] Group differences in cognitive tasks between the family group in Study I and the low-SES family group in Study II were also conducted by one-way ANOVA.
Main effect of group was significant for the focused attention one-toy condition $F(1, 107) = 17.63$, $p < .001$ and six-toy condition $F(1, 107) = 26.94$, $p < .001$. Infants in family group in Study I had lower scores in both conditions ($M = 56.83$; 73.63) than infants in low-SES family group in Study II ($M = 73.96$; 92.79). There was no group difference for the object permanence scores of the infants F (1, 108) = 0.04, $p = 0.84$.
Group difference for the focused attention task was surprising, but it can be speculated that toys used in the task were more attractive and new for infants in low-SES homes. Thus, they were interested in toys more than the family group in Study I, where the family group's socio-economic status was around the middle to high SES.

3.3.2. Moderation Analysis

The moderating role of temperament (falling reactivity/recovery from distress) was also examined between groups for the cognitive development of the infants. Moderation analysis was performed using the PROCESS macro of Hayes (2013).

For the focused attention task with one-toy condition, the model was significant (F (3, 117) = 10.40, $p < 0.001$, $R^2 = 0.27$). There was a significant interaction between group and temperament (recovery from distress) (B = -15.57, SE = 5.20, t(117) = -2.99, $p < 0.05$, 95% CI [-25.87, -5.26]). Slope analysis for recovery from distress was performed based on one SD above and below the mean as three levels (low, moderate, and high). For the low levels of the moderator (M = -0.77), attention skills of the institutional care group were significantly lower than those of the low-SES family group (b = 34.70, SE = 5.57, $p < 0.001$). For moderate levels of temperament (M = 0.000), the institutional care group had significantly lower scores than the low-SES family group (b = 22.89, SE = 3.91, $p < 0.001$); however, there was no group difference for high levels of the moderator (M = 0.77) (see Figure 7).

For the six-toy condition, although the model was significant (F (3, 117) = 7.39, $p < 0.01$, $R^2 = 0.16$), there was no interaction between groups and temperament.

For the object permanence score, the same model was run and was found to be significant (F (3, 118) = 6.44, $p < 0.01$, $R^2 = 0.14$). The interaction between group and temperament (recovery from distress) indicated a trend (B = -0.34, SE = 0.19, t(118) = -1.77, $p = 0.08$, 95% CI [-0.72, 0.04]). When the slope was calculated based on one SD above and below the mean as three levels (low, moderate, and high), the results showed the same trend as the focused attention score with one-toy condition. For low levels of the moderator (M = -0.76), the object permanence scores of the institutional care group were significantly lower than those of the family group (b = 0.79, SE = 0.21, $p < 0.01$). For moderate levels of temperament (M = 0.000), the institutional care group had significantly lower scores than the low-SES family group (b = 0.53, SE =

0.44, $p < 0.01$); however, there was no group difference for high levels of the moderator ($M = 0.76$) (see Figure 8).

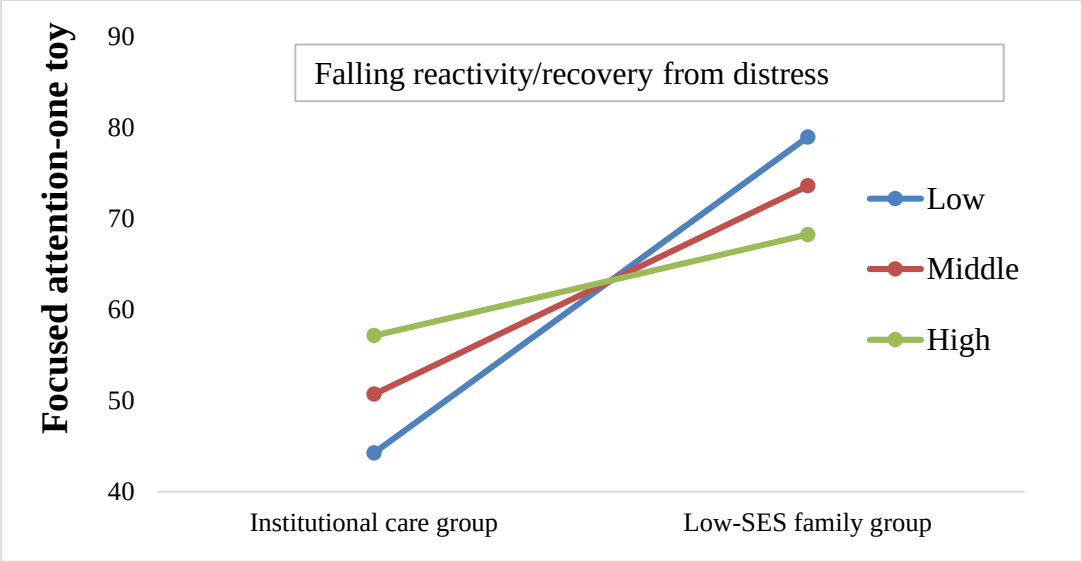

Figure 7. The interaction between groups and temperament in predicting focused attention scores (one-toy condition).

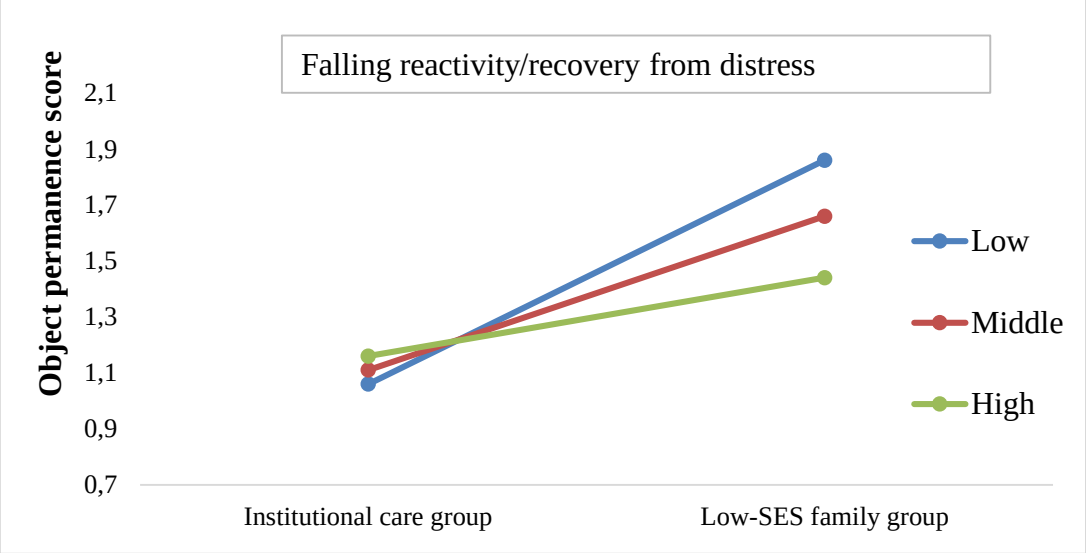

Figure 8. The interaction between groups and temperament in predicting object permanence score.

3.4. Discussion

The current study aimed to compare institutionalized infants' cognitive development with that of infants reared by their families in low-SES environments. The low-SES family group was chosen as a comparison group since the biological family backgrounds of infants in institutions are close to low-SES environments in terms of socioeconomic status (McCall, 2011). The income level of the family group was equal to the minimum wage of Turkey in the year that the data were collected. The majority of mothers had an elementary or middle school education. Thus, this was a relatively low-SES sample, as was aimed.

As expected, it was found that infants in institutions obtained lower scores in the focused attention task and object permanence task than infants in low-SES families. Studies run with previously institutionalized children or adopted children showed similar findings, where children with a history of institutions had lower cognitive skills than children in family groups (Merz et al., 2013; van IJzendoorn et al., 2011). According to the Bucharest Early Intervention Project, infants staying in institutions (the "care as usual" group) had lower attention scores than infants in the foster care group (Ghera et al., 2009). Similarly, infants in institutions had lower attention scores than infants who were never institutionalized (Smyke et al., 2007).

The SES level of the comparison groups in these studies might be important. However, most of the studies did not report the SES levels of the family groups or chose a sample from middle-SES environments. One of the earlier studies concerning SES levels of family groups found that children in institutions had lower theory of mind scores than the middle-SES family group, but not the low-SES family group (close to reaching significance level) (Yagmurlu, Berument, & Celimli, 2005). Thus, the current study has contributed to the literature in choosing a relatively comparable group for infants in institutional care.

Secondly, the moderating role of infants' temperament (falling reactivity) between group and cognitive outcomes was examined. It was hypothesized that infants'

temperament would function as a susceptibility marker in showing the effects of the environment on cognitive development based on the differential susceptibility theory. As expected, we saw that infants with low levels of falling reactivity had lower scores in focused attention tasks for the one-toy condition if they were residing in institutions, while they had higher scores if they were residing in low-SES family environments. Although the slope analysis did not reach the significance level, a similar pattern was found in the infants' object permanence skills and the focused attention task with the six-toy condition. These findings were in line with the differential susceptibility theory and showed a pattern in a "for better and for worse" manner (Pluess & Belsky, 2009). That is, susceptible infants (infants with low levels of falling reactivity) had better and worse outcomes in the family environment and institutions, respectively.

Negative emotionality has been a widely studied temperament dimension under the umbrella term of "difficult temperament" (Slagt et al., 2016). In the current study, falling reactivity was measured as negative emotionality (Putnam et al., 2006). Difficult temperament was found to be a susceptibility marker for maternal sensitivity in line with differential susceptibility theory for behavioral problems (van Aken et al., 2007; Bradley & Corwyn, 2008). Similarly, Roisman et al. (2012) found difficult temperament as a marker of susceptibility to maternal sensitivity for teacher-reported social competence and academic skills. Looking at cognitive outcomes, Pluess and Belsky (2010) followed family-reared children from infancy to childhood and found that difficult temperament in infancy served as a susceptibility marker for later outcomes, including cognitive-academic domains. This study has contributed to the literature in showing temperamental susceptibility in institutionalized children.

In the current study, it was seen that infants with low levels of falling reactivity (infants who are harder to soothe) are more susceptible to their environments in terms of focused attention skills. It can be speculated that these infants need more individual care while soothing. However, that is not possible in institutions, unlike family environments. External factors, and especially parenting, help children to regulate themselves, and sensitive parents could support reactive infants more (Choe, Olson, & Sameroff, 2013; Jennings et al., 2008). Parenting support is especially important in the

early years since infants cannot regulate their behaviors and emotions (Kochanska et al., 2000). Since highly distressed infants have lower attention skills (Lawson & Ruff, 2004), they need more parental support, but it is not very possible in institutional care settings. Thus, these infants had better cognitive development in a family environment, but they had lower attention skills in institutions.

Overall, we found that infants in institutions still had lower cognitive development than infants in the low-SES group. It was also seen that the level of environmental effects was different for every child. Some infants (infants with lower levels of falling reactivity) are more susceptible to their environments in a “for better and worse” manner.

CHAPTER 4

STUDY III: THE ROLE OF SES, TEMPERAMENT, AND CORTISOL LEVELS IN INFANTS' COGNITIVE DEVELOPMENT

4.1. Brief Introduction

As discussed in Chapter One, children in low-SES family environments show poorer development than children in high-SES families (Bradley & Corwyn, 2002; Raver et al., 2013), which might be because of either the direct effects of poverty on children (lack of facilities and food) or poorer parenting skills (Mistry, Vandewater, Huston, & McLoyd, 2002) or low-quality caregiving (Conger et al., 2002). High-risk low-SES environments are stressful for children and affect not only their social and cognitive development but also their stress regulation systems (Blair et al., 2008). Although there are some contradictory findings, most studies reported that children living in low-SES environments had higher basal cortisol levels (Vaghri et al., 2013; Vliegenthart et al., 2016).

Several studies also reported an association between cortisol levels and cognitive outcomes of infants and children. For instance, basal cortisol levels of 15-month-olds were negatively associated with their cognitive development as measured by the mental developmental index of Bayley (Finegood et al., 2017). One of the reasons why children in low-SES families have poorer cognitive skills might be the overactivation of their stress regulation systems, specifically cortisol levels. One recent study showed that the salivary cortisol level of preschool children mediated the association between mothers' depressed moods and child executive functioning (Neuenschwander et al., 2018). A study conducted with infants also showed the mediating role of salivary cortisol between household risk, parenting, and infants' cognitive skills (Blair et al., 2011). However, these studies took salivary cortisol samples; the first study took a salivary sample after a stress-induced task, while the second study measured basal

cortisol levels. Salivary cortisol gives the current cortisol level, which is more sensitive to sampling time and daily routines, while hair samples give more cumulative results, including basal secretion and reaction to stressors (LeBeau et al., 2011; Liu et al., 2017). Thus, in the current study, the mediating role of hair cortisol was examined in the association between SES and cognitive outcomes in infants.

Moreover, there are also individual differences in children's hormone activities and temperaments that moderate the environmental influences. For instance, negative emotionality was positively associated with salivary cortisol levels in children (Dettling et al., 2000; Dougherty et al., 2013; Gunnar et al., 1997). For the association between hair cortisol and temperament, the findings are limited, except for a recent study that showed the moderating role of emotional reactivity between SES and HCC (Kao et al., 2019). Thus, in the current study, the moderating role of temperament was also investigated. It was hypothesized that:

- Hair cortisol levels would mediate the association between infants' SES and cognitive development.
- Temperament would moderate the association of HCC and family SES. That is, children with negative emotionality would have higher HCC levels in a lower-SES environment.
- Negative emotionality would moderate the mediating effects of HCC on the relation between SES and cognitive development (see Figure 9).

Moreover, data about infants' daily routines associated with hair cortisol levels, such as the frequency of hair washing and sleeping or breastfeeding routines (Flom et al., 2017; Hamel et al., 2011), were also included in the study as possible covariates. Similarly, the mothers' perceived stress and depression levels were included as possible covariates since they were strongly associated with SES levels, which might influence the cortisol levels of the infants (Lupien, King, Meaney, & McEwen, 2000; Palmer et al., 2013).

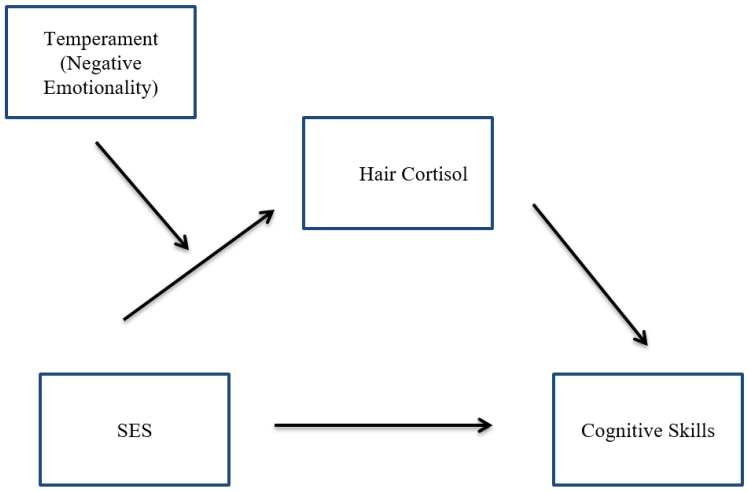

Figure 9. Moderated mediation model, where stress level is the mediator and temperament is the moderator.

4.2. Method

4.2.1. Participants

A total of 60 infants between 6 and 15 months of age were recruited for the study from low-SES families in economically disadvantaged neighborhoods of Ankara and Konya. Thirty of them were male, while 30 were female. The majority of the mothers were not working; only three mothers were working. The descriptive statistics of the sample can be seen in Table 9.

Table 9: Descriptive statistics of the measures (N = 60).

	Min.	Max.	Mean	*SD*
Age (months)	6	15	10.63	2.85
Education level of fathers*	3.00	8.00	4.43	1.25
Education level of mothers	1.00	7.00	3.93	1.12
Home income**	0.50	7.00	2.74	1.13
Hunger index	0.00	5.00	0.80	1.35
Home quality (z-scored)	-0.94	0.64	0.00	0.33
Total SES	-0.72	1.90	0.00	0.59

*Education level ranged between 1 (illiterate) and 7 (university degree). **Family income ranged between 0 (0 to 2000 Turkish lira) and 10 (10,000 Turkish lira and above).

4.2.2. Measures

4.2.2.1. Socioeconomic Status (SES)

Socioeconomic situations of the families were measured with the Home Environment Questionnaire (HEQ), a food insecurity scale, mothers' education level, and home income (see Table 9). Since there was no variability in the food security scale, the total SES score was the combination of home environment quality, mothers' education level, and home income.

4.2.2.1.1. Home Environment Questionnaire

The HEQ (Miser & Hupp, 2012) was used to measure stimulation in the home environment. Details related to this scale were given in the method section for the second study in Chapter Three (see Appendix E).

4.2.2.1.2. Food Insecurity

The Community Childhood Hunger Identification Project Hunger Index (Wehler et al., 1995) is used to test the extent of impoverishment (see Appendix I). The Turkish adaptation was done by Okur (2015). There are eight questions with a yes/no format. The scale's scores range between 0 and 8, and scores of 5 points or more represent food insecurity. Scores of 1-4 indicate the risk of food insecurity. The original scale's reliability was between 0.80 and 0.89 (Wehler, 1994), while it was 0.78 for the Turkish adaptation (Okur, 2015). There was no variability between families in terms of food insecurity (see Table 9); thus, this scale was not included in the analysis.

4.2.2.1.3. Education and Income

The education level of the mothers was ranked on a 7-point Likert scale (1 = Illiterate, 2 = Literate but no degree, 3 = Elementary school, 4 = Middle school, 5 = High school, 6 = Two-year university degree, 7 = University degree), while family income was

measured with a 11-point Likert scale from 0 (0 to 1000 Turkish lira) to 10 (10,000 Turkish lira and above). Descriptive statistics of these variables can be seen in Table 9. Other demographic information was also collected, such as the number of people living in the house, the number of siblings, ages of the parents, and the parents' job information, using the demographic information questionnaire (see Appendix D).

4.2.2.2. Temperament

The infants' temperament was measured with three subscales of the IBQ (Gartstein & Rothbart, 2003): falling reactivity/rate of recovery from distress (13 items, reverse-scored), distress to limitations (13 items), and fear (16 items). Mothers or caregivers scored the items on a 5-point Likert scale (1 = never; 5 = always). The negative emotionality (NE) score was obtained by calculating the values of these three subscales (Cronbach's alpha was 0.87) (see Appendix A).

4.2.2.3. Stress Measures – Cortisol

Hair samples of 3 cm were collected from infants near the scalp (15-30 mg) based on the method of Flom et al. (2017). Hair samples were kept in aluminum foil and stored in a room with temperature of about 18-20 °C before being sent to a laboratory. It is assumed that human hair grows 1 cm per month (LeBeau, Montgomery, & Brewer, 2011); thus, 3 cm of hair would correspond to the preceding 3 months' cortisol levels. The samples were sent to Dresden Lab Service, Germany, to assay hair cortisol concentration (HCC). The assay procedure in the lab followed the protocol of Davenport et al. (2006).

4.2.2.4. Information about Daily Routines

Information about the daily routines of infants was collected for possible control variables that may influence cortisol levels. Sleeping hours, breastfeeding routines (total breastfeeding time and whether the child breastfed in the last 3 months), medication history of the infant, medication information of the mothers who were still

breastfeeding, frequency of bathing, any hair treatment, and birth weight were asked of parents. Descriptive statistics are provided in Table 10.

Mother-related factors like depression and perceived stress were also measured as possible control variables (see descriptive statistics in Table 10).

4.2.2.5. Brief Symptom Inventory

The Brief Symptom Inventory (Derogatis, 1992; Turkish adaptation: Şahin & Durak, 1994) was used to measure depression levels (see Appendix J). The original scale consists of 52 items with nine dimensions, including depression. The Turkish adaptation (Şahin & Durak, 1994) revealed five dimensions (hostility, somatization, interpersonal sensitivity, depression, and anxiety). Only the depression subscale was included in this study. Twelve items were scored on a 5-point Likert scale (0 = not at all; 4 = extremely). The internal consistency was found to be 0.88 for the Turkish translation (Şahin & Durak, 1994).

4.2.2.6. Global Measure of Perceived Stress Scale

The mothers' perceived stress was measured with the Global Measure of Perceived Stress Scale (Cohen, Kamarck, & Mermelstein, 1983; Turkish adaptation: Eskin, Harlak, Demirkıran, & Dereboy, 2013) to evaluate the perceived stress of the mothers about daily life (see Appendix K). There were 14 questions with a 5-point Likert scale (0 = never; 4 = very often). The internal consistency was found to be 0.84 for the Turkish translation (Eskin et al., 2013).

4.2.3. Procedure

Ethical approval was obtained from the Human Subjects Ethics Committee of Middle East Technical University (see Appendix F). The Scientific Research Projects Unit (BAP: Project code: GAP-104-2018-2788) and the Society for Research in Child Development Patrice L. Engle Dissertation Grant in 2018 supported this study. Three

experimenters visited each home. After obtaining parental consent (see Appendix G), questionnaires were filled out by the mothers. Experimenters read the questions out loud when the mothers could not read well. Free play was carried out with the infants for 10-15 minutes to warm them up to the experimental design. After applying the tasks for the infants, hair samples were collected. All hair samples were stored in a dark room at room temperature before being sent to the laboratory. They were sent for assaying to Dresden Lab Service, Germany. Incentives were given to both mothers and infants. A summary report was also provided about the infant's development to the parents. The manuscript from Study III was published online in *Developmental Psychobiology* (see Appendix H).

4.3. Results

4.3.1. Analysis Plan

The distribution of HCC was skewed; therefore, HCC was log10-transformed. Due to insufficient hair length and mass, 11 infants were excluded from the analyses. Thus, the final analysis was run with 49 hair samples. There was no difference between the infants who were included in the study and those excluded in terms of age, gender, household income, or education levels of the mothers. To test the association between adversity, temperament, stress levels (HCC), and cognitive outcomes, moderated mediation analysis was proposed (see Figure 9), but because of the small sample size, the mediating role of cortisol and the moderating role of temperament were run separately.

First, bivariate correlation and stepwise regression were run for the selection of the covariates. The mediating role of HCC between SES and infants' cognitive outcomes (attention skills and object permanence score) was then tested with the PROCESS macro of Hayes (2013). The moderating role of negative emotionality between SES and HCC was also run with Hayes's PROCESS macro (2013). Results will be given below separately.

4.3.2. Descriptive Statistics and Correlations

Descriptive statistics of all measures can be seen in Table 10. For the mother-related factors, the mean depression level score was 1.18 and minimum and maximum scores were 0 and 4. The mean scores of depression values were 0.66 and 0.77 in different studies with adults in Turkey (Kurt & Akbaba, 2018). The mean score for perceived stress level was 1.85, while the mean score for perceived stress was 1.92 in a study with adults (Tekin, Çilesiz, & Gede, 2019). Thus, it can be said that mothers reported high levels of depression and perceived stress as expected in low-SES environments. According to bivariate correlation, family SES level was negatively correlated with the perceived stress of mothers (r = -0.37, $p < 0.01$) and their depression levels (r = -0.33, $p < 0.01$). HCC was negatively correlated with infant age (r = -0.33, $p < 0.05$) and positively correlated with breastfeeding in the last 3 months (r = 0.32, $p < 0.05$) (see Table 11). According to stepwise regression analysis, all covariates were entered into the model; however, only three variables remained in the model for HCC (F (1, 44) = 6.43, $p < 0.05$). Breastfeeding in the last 3 months (β = 0.34, $p < 0.05$), frequency of bathing (β = -0.46, $p < 0.01$), and birth weight (β = 0.30, $p < 0.05$) accounted for 31% of the variance in infants' HCC. Thus, four variables retained as covariates in further analyses (age, breastfeeding in the last 3 months, frequency of bathing, and birth weight).

Table 10. Descriptive statistics of the measures (N = 49).

	Min.	Max.	Mean	*SD*
Measures				
SES	-0.72	1.58	-0.04	0.54
Perceived stress of mothers	0.57	3.36	1.85	0.62
Depression of mothers	0.00	3.25	1.18	0.76
Hair cortisol (raw scores: pg/mg)	2.40	46.33	15.11	11.53
Log hair cortisol	0.38	1.67	1.06	0.33
Negative emotionality	1.38	3.58	2.47	0.56
Age (months)	6	15	10.63	2.80
Duration of sleep (hours)	5.00	16.00	12.33	2.37
Frequency of bathing	1.00	4.00	2.92	0.53
Duration of breastfeeding	0.00	15.00	8.60	3.65
Breastfed in last 3 months	0.00	1.00	0.75	0.43
Infants on medication	0.00	1.00	0.25	0.44
Birth weight (g)	1680.00	4380.00	3226.32	513.88

Table 11. Pearson correlations between child-specific factors and hair cortisol concentration (HCC) (N = 49).

	1	2	3	4	5	6	7	8	9	10	11	12	13
1. HCC (log-transformed)	1	.	.	.	.	.	.	.	.	.	.	.	.
2. SES	-0.04	1	.	.	.	.	.	.	.	.	.	.	.
3. NE[a]	0.04	-0.27	1	.	.	.	.	.	.	.	.	.	.
4. Perceived stress	0.26	-0.37**	0.29*	1	.	.	.	.	.	.	.	.	.
5. Depression	0.15	-0.33*	0.13	0.63**	1	.	.	.	.	.	.	.	.
6. Age	-0.33*	-0.21	0.18	-0.13	-0.08	1	.	.	.	.	.	.	.
7. Gender	-0.07	-0.02	-0.07	-0.17	-0.02	0.17	1	.	.	.	.	.	.
8. Duration of sleep in a day	-0.06	0.09	-0.23	-0.11	-0.04	0.23	0.04	1	.	.	.	.	.
9. Frequency of bathing	-0.26	0.36*	-0.23	-0.45**	-0.27	-0.00	-0.10	0.03	1	.	.	.	.
10. Duration of breastfeeding	0.15	-0.11	0.38**	0.06	-0.17	0.38**	-0.05	0.03	0.04	1	.	.	.
11. Breastfed in last 3 months	0.32*	0.12	0.23	-0.06	-0.28	-0.40**	-0.13	-0.16	0.23	0.56**	1	.	.
12. Infants on medication	0.11	0.22	0.13	0.19	0.15	-0.21	-0.24	-0.12	-0.14	-0.05	-0.03	1	.
13. Birth weight	0.24	-0.09	-0.13	-0.29*	-0.15	0.03	-0.01	0.24	0.39**	0.17	0.29*	-0.43*	1

*$p < 0.05$, **$p < 0.01$. [a]Negative emotionality.

4.3.3. Mediation Analysis

Mediation analysis was run with the PROCESS macro of Hayes (2013) with 5000 bootstrapping iterations to test whether the hair cortisol levels of infants mediated the association between SES and infants' cognitive development.

For the one-toy condition for attention scores, there was no direct effect of SES on attention scores (*B* = -6.65, SE = 6.61, 95% CI [-20.01, 6.69]). The indirect effect of SES on the attention scores through the mediation of HCC was not significant (*B* = 0.03, boosted SE = 1.88, 95% CI [-2.71, 5.40]) after controlling for age, frequency of bathing, breastfeeding in the last 3 months, and birth weight. Looking at the control variables, infant birth weight positively predicted and frequency of bathing negatively predicted hair cortisol (see Table 12 for more details).

Table 12. Mediation analysis for cortisol between SES attention scores of the infants (one-toy condition).

Model summary when the outcome is cortisol						
R	R-sq	MSE	*F*	df1	df2	*p*
0.57	0.33	0.07	4.2415	5.00	42.00	0.0033
	Coeff.	*SE*	*t*	*p*	LLCI	ULCI
Constant	1.29	0.32	4.04	0.0002	0.65	1.94
SES	0.05	0.08	0.63	0.5269	-0.11	0.22
B. weight	0.00	0.00	2.57	0.0135	0.00	0.00
Age	-0.02	0.01	-1.67	0.1007	-0.05	0.00
Breastfed	0.16	0.09	1.72	0.0922	-0.02	0.35
Bathing	-0.28	0.09	-3.12	0.0032	-0.46	-0.09
Model summary when the outcome is attention score (one-toy condition)						
R	R-sq	MSE	*F*	df1	df2	*p*
0.27	0.07	462.73	0.55	6.00	41.00	0.76
	Coeff.	SE	*t*	*p*	LLCI	ULCI
Constant	90.35	29.63	3.04	0.0040	30.51	150.19
SES	-6.65	6.61	-1.00	0.3200	-20.01	6.69
HCC	0.48	12.09	0.04	0.9683	-23.93	24.90
B. weight	-0.01	0.00	-1.10	0.2739	-0.023	0.00
Age	-0.53	1.22	-0.4319	0.6681	-3.01	1.95
Breastfed	8.26	7.69	1.07	0.2889	-7.26	23.80
Bathing	2.57	7.85	0.32	0.7447	-13.29	18.44

For the six-toy condition, there was no direct effect of SES on attention scores (*B* = 2.81, SE = 5.77, 95% CI [-8.83, 14.46]). The indirect effect of SES on the attention scores through the mediation of HCC was significant (*B* = -0.02, boosted SE = 0.08, 95% CI [-0.22, 0.12]) after controlling for age, frequency of bathing, breastfeeding in the last 3 months, and birth weight (see Table 13). Results were still the same upon running the mediation analysis without the control variables.

Table 13. Mediating role of hair cortisol between SES attention scores of the infants (six-toy condition).

Model summary when the outcome is cortisol						
R	R-sq	MSE	*F*	df1	df2	*p*
0.5792	0.33	0.07	4.24	5.00	42.00	0.0033
	Coeff.	SE	*t*	*p*	LLCI	ULCI
Constant	1.29	0.32	4.045	0.0002	0.65	1.94
SES	0.05	0.08	0.63	0.5269	-0.11	0.22
Breastfed	0.16	0.09	1.72	0.0922	-0.02	0.35
Age	-0.02	0.01	-1.67	0.1007	-0.05	0.00
B. weight	0.00	0.00	2.57	0.0135	0.00	0.00
Bathing	-0.28	0.09	-3.12	0.0032	-0.46	-0.09
Model summary when the outcome is attention score (six-toy condition)						
R	R-sq	MSE	*F*	df1	df2	*p*
0.2928	0.08	351.82	0.64	6.00	41.00	0.6968
	Coeff.	SE	*t*	*p*	LLCI	ULCI
Constant	101.22	25.83	3.91	0.0003	49.04	153.40
SES	2.82	5.76	0.48	0.6274	-8.82	14.46
HCC	-6.71	10.54	-0.63	0.5278	-28.00	14.57
Breastfed	11.49	6.70	1.71	0.0941	-2.04	25.04
Age	0.89	1.07	0.83	0.4100	-1.27	3.05
B. weight	-0.00	0.0066	-0.50	0.6194	-0.01	0.01
Bathing	-3.19	6.85	-0.46	0.6437	-17.02	10.64

For object permanence scores, there were also no direct or indirect effects of SES (*B* = 0.07, SE = 0.17, 95% CI [-0.27, 0.42] and *B* = 0.01, boosted SE = 0.05, 95% CI [-0.07, 0.14], respectively) after controlling for age, frequency of bathing,

breastfeeding in the last 3 months, and birth weight (see Table 14). Mediation analysis was rerun without the control variables and the results did not change.

Table 14. Mediating role of hair cortisol between SES and object permanence scores.

Model summary when the outcome is cortisol

R	R-sq	MSE	*F*	df1	df2	*p*
0.59	0.35	0.08	4.58	5	42	0.002
	Coeff.	*SE*	*t*	*p*	LLCI	ULCI
Constant	1.31	0.33	3.94	0.0003	0.641	1.98
SES	0.06	0.08	0.75	0.4536	-0.10	0.23
Breastfed	0.17	0.11	1.53	0.1316	-0.05	0.40
B. weight	0.00	0.00	2.55	0.0143	0.00	0.00
Age	-0.02	0.01	-1.57	0.1238	-0.05	0.00
Bath	-0.30	0.09	-3.20	0.0026	-0.50	-0.11

Model summary when the outcome is object permanence score

R	R-sq	MSE	*F*	df1	df2	*p*
0.55	0.30	0.3103	3.0036	6	41	0.0159
	Coeff.	*SE*	*t*	*p*	LLCI	ULCI
Constant	-0.90	0.76	-1.18	0.2444	-2.45	0.64
SES	0.07	0.16	0.44	0.6595	-0.26	0.41
HCC	0.14	0.30	0.46	0.644	-0.47	0.75
Breastfed	0.19	0.22	0.87	0.3884	-0.26	0.65
B. weight	0.00	0.00	0.93	0.3537	-0.00	0.00
Age	0.11	0.03	3.46	0.0013	0.04	0.18
Bath	0.15	0.21	0.74	0.4594	-0.26	0.58

4.3.4. Moderation Analysis

The moderating role of temperament (negative emotionality) was run with Hayes's PROCESS macro (2013). The model was significant (F (7, 41) = 5.14, R^2 = 0.47, p < 0.001). The interaction between negative emotionality (NE) and SES was significant after controlling for age, breastfeeding in the last 3 months, bathing, and birth weight (B = 0.41, SE = 0.14, p < 0.01, 95% CI [0.12, 0.69]). A simple slope test was run by using the ±1 SD above and below the mean temperament. The results were not

significant at low and moderate levels of the moderator (NE). However, the slope was significant (*b* = 0.37, SE = 0.13, *p* < 0.01, 95% CI [0.10, 0.64]) at high levels of NE (M = 0.56), Thus, the results showed that infants high in negative temperament had lower cortisol outputs if they were growing up in poorer households, but they had high cortisol levels in higher-income households (see Figure 10).

When we look at the control variables, age negatively predicted hair cortisol levels of the infants (marginal; B = -0.03, SE = 0.02, *p* = 0.06, 95% CI [-0.06, 0.001]). However, breastfeeding in the last 3 months did not predict HCC. Moreover, frequency of bathing negatively, while birth weight positively predicted HCC; (B = -0.29, SE = 0.09, p < 0.01, 95% CI [-0.47, -0.11]), (B = 0.00, SE = 0.00, p < 0.05, 95% CI [0.00, 0.001]), respectively. These results showed that an increase in age was associated with lower levels of HCC. Higher frequency of hair washing was associated with lower levels of HCC, but an increase in birth weight was associated with higher levels of HCC in infants.

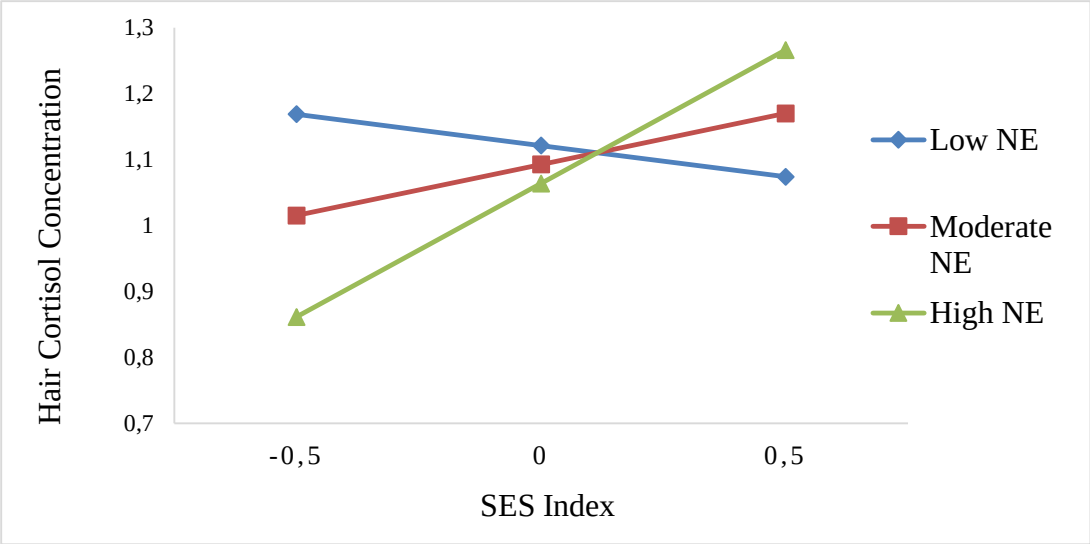

Figure 10. Interaction between negative emotionality and SES in predicting hair cortisol concentrations of the infants.

4.4. Discussion

The present study aimed to examine the mediating role of cortisol between SES and cognitive development of infants with the moderating role of temperament. A

moderated mediation model was hypothesized first, but due to the small sample size, mediation and moderation analysis were run separately. Thus, the findings will be discussed separately.

4.4.1. Mediating Role of Cortisol

Measuring cortisol from the hair is a new technique that is becoming more prevalent. Compared to salivary cortisol, hair cortisol is less sensitive to sampling time and gives cumulative cortisol levels including basal secretion (LeBeau et al., 2011; Russell et al., 2012). In the current study, infants' stress levels were measured by hair cortisol levels. Stress hormone levels are associated with children's cognitive functions, such as executive functions (Blair, Granger, & Razza, 2005) and memory performance (Diamond et al., 2007; Fernandez-Baizan et al., 2019). Since the infants and children in low-SES environments had lower cognitive skills (Bradley & Corwyn, 2002; Ursache & Noble, 2016) and low-SES environments are associated with increased cortisol reactivity (Chen et al., 2010; Lupien et al., 2001), cortisol might play a role in the association between SES and cognitive development. Early adversity conditions influence the functioning of the HPA axis, which results in over- or under secretion of cortisol. The effects of early adversity on the neurocognitive development of children and specifically the possible connection between the HPA axis and cognition are still being investigated, but mostly in older children. Thus, in the current study, the association between cortisol and cognitive development was examined in infants in the context of SES. It was hypothesized that the infants' HCC would mediate the association between SES and cognitive development, including the outcomes of the focused attention task and object permanence task. However, there was no significant association between SES, HCC, and cognitive development of the infants and a mediating role of cortisol was not found in the current study.

Studies showing the role of cortisol in the association between environment and cognitive development are limited. Contrary to the current study, partial mediation effects of salivary cortisol measured in infancy were found between household risk, parenting, and executive functioning of 3-year-old children (Blair et al., 2011). A

recent study also showed that cortisol reactivity to a challenging task mediated the association between maternal mood and child executive functioning in preschoolers, but only for boys (Neuenschwander et al., 2018). Although the participants' ages were controlled in the current study, compared to previous studies, our participants were younger. Cortisol levels are sensitive to age, especially at younger ages (Gunnar et al., 1996). A recent study showed the interaction of age and family SES; whereas low SES was associated with higher cortisol in younger children, it was associated with lower cortisol levels in older children (Ursache et al., 2015). Furthermore, executive functioning skills of young children were examined in previous studies, which are among higher-order cognitive functions (Garon et al., 2008). The associations between cortisol and focused attention skills and object permanence were examined in the current study, as cortisol may serve different functions for different aspects of cognition.

The measurement methods in the two aforementioned studies are different from the approach applied in the current study. Contrary to salivary cortisol, hair cortisol gives a cumulative amount of HPA activation covering both diurnal cortisol (salivary cortisol levels) and stress reactivity to stressful events (Meyer & Novak, 2012). However, to the best of our knowledge, no study has examined hair cortisol levels as a mediator between environment and developmental outcomes. Thus, more research is needed on the HCC levels of infants.

The reason why there was no association between HCC and SES might be the hair cortisol levels of these infants. The levels of HCC in the current sample were low relative to other studies. The mean level of HCC was 15.11 in this case, while it was 86.26 in other infants (Flom, St. John, Meyer, & Tarullo, 2017) and 35.27 in 3-year-old children in recent studies conducted in the United States (Kao et al., 2019). However, the mean level was 9.55 for 4-year-old children from Pakistan (Armstrong-Carter et al., 2020), which is also in the low range, like in the current study. Thus, it can be speculated that there might be a cultural difference in cortisol levels since the HCC levels in the current study are lower than the HCC level of children from a disadvantaged environment in the USA, which was 32.02 (Ling, Robbins, & Xu,

2019). Moreover, the optimal cortisol level for cognitive development is still being sought, and there have been contradictory findings. The role of cortisol might be different for different environmental contexts. For instance, higher cortisol levels were associated with better executive functioning skills in preschool children in high-income environments but negatively associated with the children's executive functioning skills in lower-income environments (Obradović et al., 2016). Thus, the optimal cortisol level necessary for healthy cognitive development may change across different nationalities, environmental contexts, and living conditions and this requires further investigation.

Another reason might be the range of SES backgrounds. We aimed to reach families of relatively low SES. Although there is still variability in the participants' SES levels, the majority of these mothers had an elementary or middle school education. Including a wider range of SES might provide better variability; thus, future studies should also include middle- and high-SES samples.

4.4.2. SES, HCC, and Temperament

It was hypothesized that infants in low-SES environments would have higher HCC levels and that this association would be more prominent for infants with high negative emotionality. We expected infants with high levels of negative emotionality to have higher cortisol levels in a lower-SES environment.

The findings showed that there was no direct association between SES and HCC, while the results in the literature are mixed. Similar to the current study, there was no direct association between the SES and HCC of 12-month-old infants, but the combination of diurnal slope and HCC was negatively associated with SES (Flom et al., 2017). A negative association was found between the SES and HCC of 12- to 60-month-old children in a recent review (Bates, Salsberry, & Ford, 2017). Similarly, the neighborhood-level SES was negatively associated with HCC levels of 4- to 18-year-old children, but there was no association with family income (Vliegenthart et al., 2016).

Looking at the salivary cortisol outputs, both lower and higher SES were found to be associated with lower morning cortisol levels in preschoolers (Zalewski, Lengua, Thompson, & Kiff, 2016). There was no association between family SES and basal cortisol in adolescents, but lower neighborhood SES was associated with lower basal cortisol (Chen & Paterson, 2006). How SES is measured might influence the findings. In the current study, we created a composite score, including maternal education level, family income, and home environment quality, as in previous studies (Kao et al., 2019; Lee, Zhou, Eisenberg, & Wang, 2013). However, some studies take indicators of SES separately, such as income, education, perception of family SES, having a house, or having family debt (Clearfield et al., 2014; Ouellette et al., 2015). Thus, differences in results might be due to the variety in measuring SES. More research is needed to understand which SES indicators are more influential upon cortisol hormone.

Moreover, negative emotionality moderated the relation between SES and HCC. Contrary to our expectations, we found that infants with high negative emotionality had lower HCC in lower SES environments and higher HCC in relatively better environments. Contrary to our findings, a recent study found that higher emotional reactivity was associated with higher HCC in preschoolers in relatively lower-SES family environments (Kao et al., 2019). This difference might be due to the participants' ages in the study of Kao et al. (2019), but more importantly, the SES level of the sample was relatively high in that study, where the majority of parents had a university degree. Similar to our findings, temperamental distress to limitation was related to decreased cortisol reactivity in African American groups. It could be speculated that African American participants are more likely to live in poverty than white ethnic groups (Blair et al., 2008).

We expected hyperactivation of the HPA axis in lower-SES settings, but our results showed hypocortisolism (i.e., lower cortisol findings). Although activation of the HPA axis is expected in the face of challenging events (de Kloet & Sarabdjitsingh, 2008), prolonged exposure to stress may result in the downregulation of the HPA axis (Fries, Hesse, Hellhammer, & Hellhammer, 2005; Koss & Gunnar, 2018). Children with higher negative emotionality may react more to stressors at first, but they may give up

with prolonged exposure. Since HCC gives cumulative cortisol levels, this might be the reason why lower HCC was found in a more impoverished environment.

Moreover, poorer parenting skills are more common in lower-SES environments (Bornstein & Bradley, 2003; Ispa et al., 2004), which may also influence children's stress regulation systems. However, infants with higher negative emotionality may need more external support to regulate their stress (Crockenberg & Leerkes, 2004). Hypocortisolism was mostly found in the case of neglect and non-sensitive care (Fisher, 2017; Bruce, Fisher, Pears, & Levine, 2009; Gunnar & Fisher, 2006). Thus, not economic difficulties but rather parenting quality and sensitivity may define cortisol levels. We did not measure the parenting dimension in the current study, and more research is needed covering both parenting and economic indicators.

4.4.3. Cortisol and Other Infant Measures

Variables related to infants' daily routines that might affect HCC were taken as possible control variables, including sleeping hours, breastfeeding routines (total breastfeeding time and whether the child was breastfed in the last 3 months), medication history of the infant, medication information of the mothers who were still breastfeeding, frequency of bathing, and any hair treatment. The age of the infants and birth weight were also controlled in the analysis. First, we ran a bivariate correlation and stepwise regression analysis to determine which variables should be included as covariates. Only four variables remained in the final model: age, birth weight, frequency of bathing, and breastfeeding in the last 3 months.

First, age was negatively associated with HCC in the current sample, which might be due to developmental change. The stress response is not stabilized before 6 months, and cortisol decreases as an infant gets older (Gunnar et al., 1996). A similar association was found between children's cortisol levels and ages in a recent review (Jansen et al., 2010). Breastfeeding in the last 3 months did not predict infants' HCC in the current study, but in the literature, it was found that breastfeeding infants had lower HCC (Flom et al., 2017). Forns et al. (2014) found a positive association

between boys' salivary cortisol outputs and breastfeeding duration. Similar to the present findings, breastfeeding did not predict cortisol reactivity in 5-month-old infants (Tollenaar et al., 2012). Although cortisol might be transmitted through breastfeeding to the infant (Hamosh, 2001), one-on-one interaction and touching the mother's skin might buffer the stress outcomes. More research is needed to understand breastfeeding and cortisol outcomes.

Furthermore, according to the current findings, the frequency of bathing negatively predicted the infants' HCC, which showed that washing the hair decreased the hair cortisol concentration. Similarly, more washing leached more cortisol from animals' hair shafts (Hamel et al., 2011). Dettenborn, Tietze, Kirschbaum, and Stalder (2012) also found decreased hair cortisol in distal segments from the scalp for adults who washed their hair more frequently. However, there were also studies showing no association between hair washing and HCC in infants (Flom et al., 2017), in children (Groeneveld et al., 2013), in women (Kirschbaum, Tietze, Skoluda, & Dettenborn, 2009), and in adults (Manenschijn, Koper, Lamberts, and van Rossum, 2011).

There was also a positive association between infants' birth weights and their HCC in the current study. Higher birth weight predicted higher HCC. However, no association was found in a recent study (Finegood et al., 2017), while low HCC was found in very-low-birth-weight infants (Watterberg et al., 2007). Thus, new studies are needed to show the association between HCC and infant-related factors, including daily routines.

4.4.4. Cortisol and Maternal Measures

Besides the infants' daily routines, maternal factors such as mothers' perceived stress levels and depression might affect HCC and were also measured as possible control variables. Although there was a negative correlation between SES, perceived stress, and depression, they were not directly associated with the infants' HCC. Thus, they were not retained as control variables in the analysis. In the literature, the results were mixed. Similar to the current findings, there was no association between parental stress, depression, and infants' cortisol outputs (Flom et al., 2017). However, a positive

association was found between maternal HCC and the salivary cortisol of infants (Tarullo, St. John, & Meyer, 2017). Higher maternal stress and lower depression levels were associated with increased HCC in 1-year-old infants (Palmer et al., 2013), but mothers who had comorbidity (depression with stress) had infants with increased salivary cortisol (Azak et al., 2013).

Other variables might influence the association between parental factors and infants' stress hormones, like parenting quality. For example, Ouellette et al. (2015) examined mother-daughter dyads' HCC levels and found that the association was moderated by parenting styles, where it was stronger with lower-quality parenting. Similarly, mothers with higher HCC showed more intrusive behavior and less positive interaction with their infants in a free-play interaction task (Tarullo et al., 2017). Thus, the relation between parental factors and infants' HCC needs further investigation.

CHAPTER 5

GENERAL DISCUSSION

The current thesis has aimed to examine the effects of early adversity and cumulative stress on infants' cognitive development with the moderating role of temperament. This undertaking comprised three related studies. In the first and second studies, the cognitive development of infants in institutional care was compared with that of infants in biological family environments, including low-SES family homes. Temperamental differences were also examined. In the third study, the associations between early adversity, temperament, stress levels, and infants' cognitive developmental outcomes in low-SES families were examined.

The first study showed that infants in institutions had lower cognitive development than infants in family environments. Specifically, infants in institutional care had lower novelty preference scores and object permanence skills in wave 1, while they later caught up with their age-mates in terms of novelty preferences but not object permanence performance. Although there was no group difference in wave 1 for focused attention skills, the gap between institutionalized infants and family-reared infants increased over time. This is a very crucial finding in showing developmental delays over time and it indicates that the infants did not make the expected gains with time. Furthermore, it can be speculated that this might represent the cascading consequences of institutionalization, which may further shape later developmental outcomes or delays (Masten & Cicchetti, 2010). Poor cognitive performance of older children with a history of institutionalization (Fox et al., 2011) might be set in infancy, when they are already behind their age-mates. Although poorer cognitive skills in institutionalized children have been shown in previous studies, to the best of our knowledge, this is the first study in which infants currently residing in institutional care were followed over the course of a full year.

It is also crucial to note that similar results were found in Study II, where the comparison group comprised infants in low-SES families. The low-SES family group was specifically chosen for comparison since these families seem to share similar backgrounds with institutionalized children in terms of economic difficulties and poor parenting practices. Thus, the results of Study II enabled us to examine the effects of family context beyond the facilities of higher income levels. Although infants' cognitive development in low-SES families is worse than that of infants in middle-SES environments (Markant et al., 2016), it appears that, compared to the institutions, children in low-SES backgrounds have parents present and this increases infants' chances to receive more individualized care, which supports their cognitive development beyond the economic facilities.

Moreover, not all infants had lower cognitive performance in institutions, and their temperamental characteristics changed the level of environmental influence. In the second study, it was found that infants with high levels of falling reactivity in institutional care showed performances similar to those of infants in low-SES families. However, we found that infants with low levels of falling reactivity, who had difficult recovery from peak distress, were more susceptible to institutional care and showed poorer performance in cognitive tasks. The same infants benefitted from the family environment and showed better results in cognitive tasks (in this case, the focused attention task and, relatively, the object permanence task). This finding was in line with the differential susceptibility theory: children with low levels of falling reactivity are affected by their environment in a "for better and worse" manner (Pluess & Belsky, 2009). It can be argued that infants who have difficulty recovering from distress may need more external help to soothe themselves. Since one-on-one interaction is not always possible in institutional care, these infants are more negatively affected by their environments. Where one-on-one interaction is relatively more likely, like in a low-SES family context, these infants have better developmental outcomes. In the literature, temperamental reactivity to overstimulation has commonly been studied as a susceptibility marker (van IJzendoorn & Bakermans-Kranenburg, 2012). However,

our results strongly suggest that infants' ability to recover from distress is also a susceptibility marker in the institutional care context.

The current study also aimed to examine the mechanisms of early environmental care effects on infants' cognitive development beyond group comparisons. Early life stress not only influences observable developmental outcomes but also influences one's stress regulation system. Prolonged exposure to stress may damage the HPA axis's functioning, which may influence children's developmental outcomes. Therefore, the third study focused on the mediating role of cortisol between SES and cognitive development.

In laboratory experiments, increased glucocorticoids were associated with decreased selective attention and decreased inhibition of nonrelevant information (Skosnik, Chatterton, Swisher, & Park, 2000; Wolkowitz, 1994). It was expected that low-SES environments would result in heightened cortisol levels, which in turn influence the cognitive development of infants. However, a mediating role of cortisol between SES and cognitive development was not found in the current study. Studies showing the mediating role of cortisol between environment and cognitive skills were conducted with older children (Blair et al., 2011; Neuenschwander et al., 2018), and they focused on executive functioning skill as a cognitive outcome, which is a higher-order cognitive skill. Thus, it can be argued that cortisol levels may function differently for specific aspects of cognitive functions as measured by unique tasks. The way in which the environment is measured changes in each study, but findings generally show that the same cortisol level might function differentially for different SES levels (Obradović et al., 2016).

There was also no association between cortisol and SES, in contrast to our expectations. Findings in the literature are mixed, but the majority of the studies showed evidence for a negative association between SES and cortisol level (Bates et al., 2017; Flom et al., 2017). However, how SES is measured has changed in each study, which might be the reason why we did not find an association between SES and cortisol in the current study. It is possible that the indicators of SES may function

differently. For instance, it was found that neighborhood SES was negatively associated with children's hair cortisol levels but not associated with family income (Vliegenthart et al., 2016). In the current study, the SES index was created by combining mothers' education levels, household income, and home environment quality. Future studies may add other SES indicators to see the whole picture of the association between SES and HCC, such as neighborhood SES or parents' perception of their SES levels.

Besides, there may be additional mechanisms that influence their association. For instance, we found an individual difference whereby children's cortisol levels were differentiated based on their temperament in the association with family SES. That is, infants with high levels of negative emotionality had lower HCC in lower-SES family environments. However, if they were growing up in a relatively better environment, they had higher HCC.

We expected hyperactivation of the HPA axis, which would result in higher HCC in infants in a lower-SES environment. However, our results support the hypofunctioning of the HPA axis (lower levels of HCC). This is a very prominent finding that shows that HPA axis functions may differ in each child in different care contexts. It can be suggested that there is an optimal level of cortisol for healthy functioning, but it might be different for different age groups, different ethnicities, and different types of adversity.

There is now increasing evidence of hypocortisolism in exposure to early adversity, especially in the case of neglect (Desantis, Kuzawa, & Adam, 2015; Fisher, 2017; White et al., 2017). In our sample, children with higher negative emotionality may need more individual support, and when it is not provided, they might feel the results of neglect more. New findings also revealed that exposure to stressors first results in elevated cortisol levels, but in prolonged exposure, the cortisol level is more blunted (Koss & Gunnar, 2018). Since hair samples give cumulative cortisol levels, it is not surprising to find blunted cortisol levels in reactive children in lower-SES environments.

Overall, these results have shown the importance of individual differences. The environment's influence cannot be denied, but how infants are affected by the environment depends on who they are, and temperament has a decisive role in child development.

5.1. Limitations, Strengths, Future Directions, and Implications

5.1.1. Limitations

The work presented here has some limitations. First, the temperament characteristics of the infants were rated by the mothers or caregivers. Although the caregiver who knew an institutionalized child best filled out our questionnaire, they do not spend as much time with the infants as mothers do at home. Thus, multiple measurements, such as experimenter-rated temperament, should be included in future studies.

Second, the sample size was relatively small and it changed the analysis plan. We could not run the moderated mediation model in Study III as initially proposed. It was not easy to convince parents in low-SES backgrounds to give biological (hair) samples because of religious and cultural beliefs. Furthermore, it was originally hoped to obtain biological samples from the infants in institutions, but we could not obtain official permission from the Ministry of Family, Labor, and Social Services of Turkey. That would have helped in better understanding the stress regulation systems of infants who are neglected for an overall clearer picture.

Third, the socioeconomic background of the biological family comparison group in Study I was relatively high. Study I was a part of a larger project called the Turkish Care Type Study. We aimed to reach families from all SES backgrounds equally, but there was limited time to complete the study.

Fourth, the data were collected through home visits, which allowed us to observe participants in their natural environments. However, each house and institution had

different conditions, which we could not control. This should be kept in mind while interpreting the results.

5.1.2. Strengths

The current study has several strengths. First, the study participants are unique, including infants in institutions, which are more difficult to reach. Most of the evidence about the effects of institutional care are based on data from children who had a history of institutional care. However, in this study, infants currently living in institutions were recruited. Second, the infants' cognitive development was measured as early as 3 months old and followed across three time points, which is essential for understanding the early developmental processes and environmental effects from the very early years.

Third, infants' cognitive development was measured with multiple tasks to highlight various cognitive milestones, which were novelty preferences, attention skills, and object permanence. Fourth, this was the first study to collect hair cortisol samples from infants in Turkey, which provides unique data for the literature. Fifth, the data were collected in institutions and home visits, which allowed us to observe infants in their natural environments. Finally, this study has contributed to the literature by showing individual differences (temperament) beyond group differences.

5.1.3. Implications

This study shows that institutions are not optimal places for infants, and individual care is necessary for a healthy development. Although the number of institutions has decreased in Turkey, there are still some in big cities. Alternative care types such as foster care should be replaced with institutions. Individual differences should also be considered since every child is unique and some are more susceptible to their environments. These findings provide valuable information for social policies. Policymakers often overlook such situations while taking action or designing rules. Our results show that susceptible children need more attention than others. Thus, it is important that caregivers and parents be trained about developmental processes and

the importance of small actions. For instance, spending individual time with infants can make a major difference in their lives. Additionally, awareness should be increased about each child's uniqueness, as each child's needs might be different.

5.2. Conclusion

The current thesis has aimed to examine the role of early adversity in the context of institutional care and low-SES family environments in infants' cognitive development. The association between early care environment and infants' HCC levels was also examined. Infant temperament was included as a moderating varaible between the early care environment and outcomes, including cognitive development and hair cortisol level. Three related studies were carried out to explore these research questions.

In sum, these three studies showed that, as expected, institutional care negatively influences the cognitive development of infants, and its influence persists and increases with time. However, the full impact of the early care environment depends on the temperament characteristics of the infant. Temperament moderated the impact of early care environment for both cognitive skills and HCC levels of the infants. Infants with low levels of falling reactivity (infants who had difficulty recovery from distress) are more susceptible to their environment in terms of cognitive development. They are more negatively influenced by the conditions in institutional care. Similarly, infants with high levels of negative emotionality are differentially affected by their environment, and they had lower HCC in lower SES environments. Thus, the level of environmental influence differs for ech child and the importance of individual differences stands out as a result of these studies.

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APPENDICES

A. INFANT BEHAVIOR QUESTIONNARE

Bebek Davranış Anketi

Katılımcı No. _____

Tarih _____

Bebeğin Doğum Tarihi:

_____ _____ _____

Gün Ay Yıl

Cinsiyeti _____

Bebeğin Yaşı _____

_____

Yıl ay

Açıklamalar: Lütfen başlamadan önce dikkatlice okuyunuz;

Aşağıda bebeklerin gösterdiği davranışların bir listesi verilmiştir. Lütfen bu ifadeler için bebeğinizin**"SON 2 HAFTASINI"**düşünerek o davranışı ne sıklıkta gerçekleştirdiğini işaretleyiniz.

Her ifade için verilen numaralardan birini işaretleyin,

l Hiçbir zaman

2 Nadiren

3 Bazen

4 Çoğu zaman

5 Her zaman

Lütfen her madde için bu seçeneklerden birini işaretlediğinizden emin olun.

1	2	3	4	5
Hiçbir zaman	**Nadiren**	**Bazen**	**Çoğu zaman**	**Her zaman**

	Gece yatağa yatırıldıktan sonra, bebeğiniz ne sıklıkla;					
19	10 dakika içinde uykuya dalar?	1	2	3	4	5
20R	Uykuya geçmede zorluk yaşar?	1	2	3	4	5
21	Uyku için kolaylıkla hazır hale gelir?	1	2	3	4	5
	Gece uyandığında bebeğiniz ne sıklıkla;					
22R	Yeniden uykuya dalmada sıkıntı yaşar?	1	2	3	4	5
23	Kolaylıkla yeniden uykuya dalar?	1	2	3	4	5
	Gündüz uykusu için yatırıldığında bebeğiniz ne sıklıkla;					
24R	Uzun süre uyanık kalır?	1	2	3	4	5
25	Hemen uykuya dalar?	1	2	3	4	5
26	Çabucak durulur/ uykuya hazır hale gelir?	1	2	3	4	5
27R	Durulmakta/ uykuya hazır hale gelmekte zorluk çeker?	1	2	3	4	5
	Bir şey için hırçınlaştığında/huysuzlaştığında/gerildiğinde bebeğiniz ne sıklıkla;					
28	5 dakika içinde sakinleşir?	1	2	3	4	5
	Bir şey için sinirlendiğinde/hayal kırıklığına uğradığında, bebeğiniz ne sıklıkla;					
29R	10 dakikaya kadar veya daha uzun süre üzgün kalır?	1	2	3	4	5
30R	20 dakikaya kadar veya daha uzun sure üzgün kalır?	1	2	3	4	5
31	Kendini başka şeylerle yatıştırır (pelüş hayvan veya battaniye gibi)	1	2	3	4	5

	Besleme esnasında bebeğiniz ne sıklıkla;					
32	Yiyecekteki pütürlü dokuyu farkeder? (Örneğin: tam ezilmemiş / süzgeçten geçirilmemiş sebze çorbasını/ çorbanın içindeki kıymayı)	1	2	3	4	5
	Bebeğiniz oyundan başını ne sıklıkla kaldırır;					
33	Telefon çaldığında?	1	2	3	4	5
34	Yan odadan gelen sesleri duyduğunda?	1	2	3	4	5
	Geçen hafta boyunca bebeğiniz ne sıklıkla;					
35	Çok düşük seviyedeki sesleri bile dinler göründü?	1	2	3	4	5
36	Dışarıdaki görüntülere veya seslere dikkat etti? (Örneğin: kuşun kanat çırparak havalanmasını, çiçekleri, hayvanları, su fıskiyesini)	1	2	3	4	5
	Bebeğiniz bunları ne sıklıkla farketti?					
37	Düşük frekanslı gürültüleri (örneğin; klima, ısıtıcı, buzdolabının çalışma veya başlama sesi)?	1	2	3	4	5
38	Uzaktaki itfaiye veya ambulans aracının sirenini?	1	2	3	4	5
39	Oda sıcaklığındaki değişimi?	1	2	3	4	5
40	Güneşin üzerinden bir bulut geçtiğinde oluşan ışık değişimini?	1	2	3	4	5
41	Yukarıdan geçen bir uçağın sesini?	1	2	3	4	5
42	Ağaçtaki bir kuşu veya sincabı?	1	2	3	4	5
43	Kaşındıran/ batan dokudaki kumaşları (örneğin; yün)?	1	2	3	4	5
	Geçen hafta boyunca bebeğiniz ne sıklıkla;					
44	Ebeveynlerin görünümündeki bir değişime karşılık ağladı veya huzursuzlandı (gözlüklerin çıkarılması, duş bonesi takılması, vb.)?	1	2	3	4	5
45	Vücut pozisyonu aniden değiştirildiğinde (örn: sırtüstü yatarken alınıp yüzüstü konulduğunda) irkildi?	1	2	3	4	5
46	Ani veya yüksek bir ses karşısında irkildi?	1	2	3	4	5
	Tanıdık olmayan bir yetişkinle tanıştırıldığında bebek ne sıklıkla:					
47	ebeveyne sarıldı/yapıştı?	1	2	3	4	5

48	tanıdık olmayan kişiye gitmeyi reddetti?	1	2	3	4	5
49	tanıdık olmayan yetişkinden kaçındı/uzaklaştı?	1	2	3	4	5
50	tanıdık olmayan yetişkine hiç ısınmadı?	1	2	3	4	5
	Tanıdık olmayan birkaç yetişkinin bulunduğu durumlarda bebeğiniz ne sıklıkla:					
51	ebeveyne sarıldı/yapıştı?	1	2	3	4	5
52	ağladı?	1	2	3	4	5
53	10 dakika veya daha uzun bir süre üzgün olmaya devam etti?	1	2	3	4	5
	Yeni bir yeri ziyaret ederken bebek ne sıklıkla:					
54	ilk birkaç dakika huzursuzlandı?	1	2	3	4	5
55	10 dakika veya daha uzun bir süre üzgünolmaya devam etti?	1	2	3	4	5
	Bebeğiniz ve siz dışarıdayken (örneğin alışveriş yapıyorken) yabancı bir kişi ona yaklaştığında bebeğiniz ne sıklıkla:					
56	huzursuzlandı?	1	2	3	4	5
57	ağladı?	1	2	3	4	5
	Evinize yabancı bir misafir geldiğinde bebeğiniz ne sıklıkla:					
58R	misafirin kendisini kucaklamasına tepki göstermeden izin verdi?	1	2	3	4	5
59	misafir kendisini kucaklamaya çalıştığında ağladı?	1	2	3	4	5
	Geçen hafta boyunca bebeğiniz ne sıklıkla;					
60R	gece uykuya dalmadan önce bebeğiniz huzursuzlanmadı veya ağlamadı?	1	2	3	4	5
61	Uyandıktan sonra bebeğiniz hemen huzursuzlandı veya ağladı?	1	2	3	4	5
62R	beşiğinde/yatağında sessizce oynadı?	1	2	3	4	5
63	bir kaç dakika içinde yanına birisi gelmezse ağladı?	1	2	3	4	5
	Bebeğiniz ne sıklıkla:					

64	beşiğinde/yatağında yalnız bırakıldığında sinirlenmiş (ağlamak veya huzursuzlanmak) gibiydi?	1	2	3	4	5
65R	beşiğinde/yatağında bırakıldığında mutlu/memnun gibiydi?	1	2	3	4	5
66	ara uyku (sabah ve ögleden sonra) için yatağa gitmeden önce ağladı veya huzursuzlandı?	1	2	3	4	5
	Banyo yapma ve giydirme (giyinme): Bebeğiniz ne sıklıkla:					
67	Yüzü yıkandığında bebeğiniz huzursuzlandı veya ağladı?	1	2	3	4	5
68	Saçı yıkandığında bebeğiniz huzursuzlandı veya ağladı?	1	2	3	4	5
	Bebeğin oynadığı oyuncağın ortadan kaldırılması gerektiğinde bebeğiniz ne sıklıkla:					
69	ağladı veya bir süre hırçınlaştı/gerildi?	1	2	3	4	5
70	umursamamış göründü?	1	2	3	4	5
	Geçen hafta boyunca bebeğiniz ne sıklıkla;					
71	Kısıtlayıcı bir yere konulduğunda karşı çıktı (ana kucağı, oyun bahçesi, araba koltuğu, vb.)?	1	2	3	4	5
	Sırtüstü konulduğunda bebeğiniz ne sıklıkla:					
72	Huzursuzlandı veya karşı çıktı?	1	2	3	4	5
	Bir şey isteyip alamadığında bebeğiniz ne sıklıkla:					
73	üzüldü?	1	2	3	4	5
74	öfke nöbeti geçirdi (ağlama, çığlık atma, kızarmış yüz, vb.)	1	2	3	4	5
	Bebek koltuğuna veya araba koltuğuna yerleştirildiğinde bebeğiniz ne sıklıkla:					
75	ilk önce huzursuzlandı; sonra sakinleşti.	1	2	3	4	5

B. APPROVAL OF THE METU HUMAN SUBJECTS ETHICS COMMITTEE

1956

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8 Eylül 2011

Gönderilen: Doç. Dr. Sibel Kazak Berument
Psikoloji Bölümü

Gönderen : Prof. Dr. Canan Özgen
Uygulamalı Etik Araştırma Merkezi Başkanı

İlgi : Etik Onayı hk.

Etik Kurul izni için sunmuş olduğunuz "Koruma altındaki bebek ve çocukların bireysel özellikleri ile bakım tiplerinin gelişimsel sonuçlar üzerindeki etkilerinin boylamsal olarak incelenmesi" isimli Tübitak projesi başvurunuz ODTÜ "İnsan Araştırmaları Etik Komitesi" tarafından uygun görülerek etik onayı verilmiştir.

Bilgilerinize sunarım.

Prof. Dr. Canan Özgen
UEAM Başkanı

Prof.Dr. Canan Sümer
Etik Komitesi Üyesi

Prof.Dr. Mehmet Utku
Etik Komitesi Üyesi

Prof. Dr. Ayhan Sol
Etik Komitesi Üyesi

Doç.Dr. Emel Aközer
Etik Komitesi Üyesi

C. INFORMED CONSENT

ORTA DOĞU TEKNİK ÜNİVERSİTESİ

1956

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Sevgili Anne-Babalar,

Orta Doğu Teknik Üniversitesi Psikoloji Bölümü olarak 3 ay -24 ay arasındaki çocukların zihinsel, dil ve sosyal- duygusal gelişimleri üzerinde, bireysel özelliklerin ve yaşadıkları çevrenin etkilerini inceleyen bir araştırma projesi yürütmekteyiz. Bu proje çerçevesinde devlet tarafından korunma altına alınmış yuva, sevgi evleri ve çocuk evlerinde büyüyen çocuklarla ailelerin yanında büyüyen çocukların gelişimlerini karşılaştırmayı planlıyoruz.

Bu çalışma kapsamında çocuğunuzla bazı oyunlar oynayarak (yeni olana bakma, saklanan oyuncağı bulma, problem çözme ve bilgisayarda şekilleri takip etmek veya resimli kartlara bakarak onun dil, bilişsel ve duygusal gelişimini değerlendirmek istemekteyiz. Bu oyunların onların gelişimini üzerinde hiçbir olumsuz etkisi bulunmamakta ve çocuklar bu oyunlardan keyif almaktadır.

Sizin de bazı anketleri doldurarak çocuğunuzun mizacı, gelişimi ve davranışları hakkında bilgi vermenize ihtiyaç duymaktayız. Katılımınız bizim için son derece değerli ve önemlidir. Bu çalışmaya destek vermeye karar verdiğiniz takdirde, size uygun olan bir zamanda ev ziyareti gerçekleştirecektir. Bu ziyaretler çocuklarla çalışma konusunda eğitimli ve deneyimli, ODTÜ Gelişim Psikolojisi lisans üstü veya Psikoloji Bölümü son sınıf lisans öğrencileri tarafından yapılacaktır. Ayrıca sizlere çocuğunuzun gelişimi hakkında da kısa rapor şeklinde geri bildirim verilecektir.

Çocuğunuzun değerlendirmeleri ile sizin dolduracağınız anketlerdeki cevaplarınız kesinlikle gizli tutulacak ve bu cevaplar sadece bilimsel araştırma amacıyla kullanılacaktır. Bu formu imzaladıktan sonra hem siz hem de çocuğunuz katılımcılıktan ayrılma hakkına sahipsiniz.

Bu çalışmaya katılarak sağlayacağınız bilgiler, ülkemizdeki korunma altında bulunan çocukların gelişimlerini anlamamıza çok önemli katkılarda bulunacaktır.

Proje Yürütücüsü: Prof. Dr. Sibel Kazak Berument

Tel: (312) 210 3184; E-posta: sibel@metu.edu.tr

Proje Asistanı: Zeynep Ertekin

Proje Ofisi Tel: (312) 210 7379; Cep Tel: 555 682 66 59

Proje web sitesi: www.cdlab.psy.metu.edu.tr

Orta Doğu Teknik Üniversitesi Psikoloji Bölümü öğretim Üyelerinden Prof. Dr. Sibel Kazak Berument'in yürütücülüğünü yaptığı 3 ay -5 yaş arasındaki çocukların zihinsel, dil ve sosyal-duygusal gelişimleri üzerinde, bireysel özelliklerin ve yaşadıkları çevrenin etkilerini inceleyen araştırma projesine tamamen gönüllü olarak katılıyorum ve çocuğum ..... katılımcı olmasına izin veriyorum. Çalışmayı istediğim zaman yarıda kesip bırakabileceğimi biliyorum ve verdiğim bilgilerim bilimsel amaçlı kullanılmasını kabul ediyorum.

Adı Soyadı .....

İmza .....

D. DEMOGRAPHIC INFORMATION QUESTIONNAIRE

DEMOGRAFİK BİLGİ FORMU

	ANNE için	BABA için
Yaş		
Eğitim durumu:	□ Okuma-yazma bilmiyor □ Okuma yazma biliyor □ İlkokul □ Ortaokul □ Lise □ Üniversite □ Lisanüstü (belirt):	□ Okuma-yazma bilmiyor □ Okuma yazma biliyor □ İlkokul □ Ortaokul □ Lise □ Üniversite □ Lisansüstü(belirt):
Şu an için ne iş yapıyor?		
Aylık kazancı:	□ 0-1000 TL □ 1000-1500 TL □ 1500-2500 TL □ 2500-3500 TL □ 3500-5000 TL □ 5000 üzeri	□ 0-1000 TL □ 1000-1500 TL □ 1500-2500 TL □ 2500-3500 TL □ 3500-5000 TL □ 5000 üzeri
Medeni hali:	□ Evli ve birlikte yaşıyor □ Evli ama eşinden ayrı yaşıyor □ Eşinden ayrılmış □ Eşini kaybetmiş	□ Evli ve birlikte yaşıyor □ Evli ama eşinden ayrı yaşıyor □ Eşinden ayrılmış □ Eşini kaybetmiş

Toplam kaç çocuğunuz var? ……

Yaşları nelerdir? (*büyükten küçüğe yazınız*):

Evde toplamda kaç kişi yaşıyor?

Kimlerin aylık kazancı var?

E. THE HOME ENVIRONMENT QUESTIONNAIR

Ev Ortamı Anketi

1. Çocuğunuzun aynı evde yaşadığı kaç tane kardeşi (üvey kardeşleri de dahil) var? (Toplam kardeş sayısını yazın)	Kardeş sayısı	
2. Siz ya da bir başkası çocuğunuza hikaye okur mu? Ne sıklıkla okur?	□ Evet □ Hayır	□ Yılda birkaç kez □ Ayda birkaç kez □ Haftada bir kez □ Haftada en az 3 kez □ Her gün □ Günde birçok kez
3. Çocuğunuzun kendisine ait çocuk kitabı var mı? Yaklaşık kaç tane var?	□ Evet □ Hayır	□ 10 ya da daha fazla □ 3 – 9 arası □ 1 ya da 2
4. Çocuğunuzun beşiğinin üzerine asılı ışıklı, hareket eden ve sesler çıkaran dönencesi var mı?	□ Evet □ Hayır	
5. Çocuğunuzun çıngırağı, dokununca ses ve ışık çıkaran oyuncakları var mı? Yaklaşık kaç tane var?	□ Evet □ Hayır	□ Bir □ İki □ Üç □ Dört ya da daha fazla
6. Çocuk dışında aile üyelerinin okuyabileceği kitaplarınız var mı? Yaklaşık kaç tane var?	□ Evet □ Hayır ……tane Kitap türü:……	
7. Ailenizin düzenli olarak aldığı dergi var mı?	□ Evet □ Hayır	□ Bir □ İki □ Üç

Yaklaşık kaç tane var?		□ Dört ya da daha fazla
8. Evde çocuğunuza çocuk şarkıları, hikayeler, masallar, ninniler dinletmek için kullandığınız bir CD çalar, kasetçalar, ses kayıt cihazı, ya da MP3 var mı? (Kardeşleriyle paylaştıkları da dahil)	□ Evet □ Hayır	
9. Çocuğunuzun, çocuk şarkıları çalan, hikayeler, masallar anlatan, kendisine ait CD'si ya da kaseti var mı? Yaklaşık kaç tane var?	□ Evet □ Hayır	□ 10 ya da daha fazla □ 3 – 9 arası □ 1 ya da 2
10. Çocuğunuz, DVD ya da bilgisayardan çocuklara yönelik çizgi filmler, videolar izler mi?	□ Evet □ Hayır	
11. Çocuğunuza şarkı, şiir, tekerleme veya ninni söyler misiniz?	□ Evet, her fırsatta □ Evet, arada sırada □ Hayır, pek değil	
12. Bebeğinizle, onu giydirirken, emzirirken ya da onun altını açarken konuşur musunuz?	□ Evet, her fırsatta □ Evet, arada sırada □ Hayır, pek değil	
13. Bebeğiniz sesler çıkardığında siz de ona sesler çıkararak ya da konuşarak karşılık verir misiniz?	□ Evet □ Hayır	
14. Çocuğunuza etrafta gördüğünüz şeyleri gösterip/ işaret edip isimlerini söyleyerek, yeni şeyler öğretmeye çalışır mısınız? Örneğin, "aaa bak bu kuş, balon, tren, ayıcık, top" gibi.	□ Evet □ Hayır	
15. Siz ya da başka bir aile üyesi çocuğunuzu dışarıya çıkarma fırsatı bulur mu? Örneğin, alış-verişe, parka, pikniğe, araba gezintisine vb. Yaklaşık ne sıklıkla çocuğunuzu dışarıya çıkarırsınız?	□ Evet □ Hayır	□ Yılda birkaç kez ya da daha az □ Ayda yaklaşık bir kez □ Ayda yaklaşık iki ya da üç kez □ Haftada birkaç kez □ Yaklaşık günde bir kez

16. Sıradan bir günde, çocuğunuzu, evde ya da evinizin dışında bir yerde (örneğin bakıcısında) televizyonun karşısına oturtup oyalar mısınız? Çocuğunuz, televizyonu izler mi?	□ Evet □ Hayır □ Evet □ Hayır
17. Geçtiğimiz hafta içerisinde, çocuğunuz sizi kızdırdığında, ona hiç bağırdığınız oldu mu? Geçtiğimiz hafta içerisinde, çocuğunuz sizi kızdırdığında, ona hiç vurduğunuz oldu mu?	□ Evet □ Hayır □ Evet □ Hayır

F. APPROVAL OF THE METU HUMAN SUBJECTS ETHICS COMMITTEE

UYGULAMALI ETİK ARAŞTIRMA MERKEZİ
APPLIED ETHICS RESEARCH CENTER

ORTA DOĞU TEKNİK ÜNİVERSİTESİ
MIDDLE EAST TECHNICAL UNIVERSITY

DUMLUPINAR BULVARI 06800
ÇANKAYA ANKARA/TURKEY
T: +90 312 210 22 91
F: +90 312 210 79 59
ueam@metu.edu.tr

Sayı: 28620816 / 265

11 MAYIS 2018

Konu: Değerlendirme Sonucu

Gönderen: ODTÜ İnsan Araştırmaları Etik Kurulu (İAEK)

İlgi: İnsan Araştırmaları Etik Kurulu Başvurusu

Sayın Prof. Dr. Sibel Kazak BERUMENT

Danışmanlığını yaptığınız doktora öğrencisi Zeynep ERTEKİN' in **"Erken Dönem Yaşam Stresinin Çocukların Kortizol Düzeyleri ve Bilişsel Becerileri Üzerindeki Etkisi: Mizacın Düzenleyici Rolü"** başlıklı araştırması İnsan Araştırmaları Etik Kurulu tarafından uygun görülerek gerekli onay **2018-SOS-090** protokol numarası ile **31.05.2018 - 30.03.2019** tarihleri arasında geçerli olmak üzere verilmiştir.

Bilgilerinize saygılarımla sunarım.

Prof. Dr. Ş. Halil TURAN
Başkan V

Prof. Dr. Ayhan SOL
Üye

Prof. Dr. Ayhan Gürbüz DEMİR
Üye

Doç. Dr. Yaşar KONDAKÇI
Üye

Doç. Dr. Zana ÇITAK
Üye

Doç. Dr. Emre SELÇUK
Üye

Dr. Öğr. Üyesi Pınar KAYGAN
Üye

G. INFORMED CONSENT

ORTA DOĞU TEKNİK ÜNİVERSİTESİ

1956

MIDDLE EAST TECHNICAL UNIVERSITY
06531 ANKARA-TURKEY

Psikoloji Bölümü **Tel: 90 (312) 210 31 82**
Department of Psychology **Faks:90 (312) 210 79 75**

Sevgili Anne-Babalar,

Orta Doğu Teknik Üniversitesi Psikoloji Bölümü olarak erken dönem yaşam stresinin çocukların bilişsel gelişimleri üzerindeki etkisini araştırmak için bir proje yürütmekteyiz. Bu çalışma kapsamında bebeğinizle bazı oyunlar oynayarak (oyuncaklarla dikkat oyunu, oyuncak saklama oyunu, gecikmeli taklit oyunu) onun bilişsel gelişimini değerlendirmek istemekteyiz. Bu oyunların onların gelişimi üzerinde hiçbir olumsuz etkisi bulunmamakta, ve bebekler bu oyunlardan keyif almaktadır.

Çalışma kapsamında sizin de bazı anketleri doldurarak çocuğunuzun gelişimi ve mizacı hakkında bilgi vermenize ihtiyaç duymaktayız. Ayrıca bebeğinizin gelişimi için çok önemli olan stres seviyesini ölçmek için minik bir tutam saç örneklemi almak istemekteyiz. Bunun nedeni yaşadığımız stresin vücudumuzda kortizol hormonu olarak ortaya çıkmaktadır. Bu hormonun en kolay ölçüm yöntemlerinden bir tanesi de saçtan sağlanmaktadır.

Katılımınız bizim için son derece değerli ve önemlidir. Bu çalışmaya destek vermeye karar verdiğiniz takdirde, size uygun olan bir zamanda evziyareti yapılacaktır. Bu ziyaretler çocuklarla çalışma konusunda eğitimli ve deneyimli, ODTÜ Gelişim Psikolojisi doktora öğrencisi ve lisans öğrencileri tarafından gerçekleştirilecektir.

Çocuğunuzun değerlendirmeleri ile sizin dolduracağınız anketlerdeki cevaplarınız kesinlikle gizli tutulacak ve bu cevaplar sadece bilimsel araştırma amacıyla kullanılacaktır. Bu formu imzaladıktan sonra hem siz hem de çocuğunuz katılımcılıktan ayrılma hakkına sahipsiniz.

Bu çalışmaya katılarak sağlayacağınız bilgiler, erken dönem yaşam stresinin bebeklerin gelişimleri üzerindeki etkisini anlamamıza çok önemli katkılarda bulunacaktır.

Uzman Psikolog: Zeynep Ertekin **Tel:** 0555 682 66 59 **E-mail:** zeynepertekinn@gmail.com

Tez Danışmanı: Prof. Dr. Sibel Kazak Berument **Tel:** (312) 210 3184 **E-mail:** sibel@metu.edu.tr

Orta Doğu Teknik Üniversitesi Psikoloji Bölümü öğretim Üyelerinden Prof. Dr. Sibel Kazak Berument'in tez danışmanlığını yaptığı, doktora öğrencisi Zeynep Ertekin tarafından yürütülen çalışmaya tamamen gönüllü olarak katılıyorum ve çocuğum ..... katılımcı olmasına izin veriyorum. Çalışmayı istediğim zaman yarıda kesip bırakabileceğimi biliyorum, ve verdiğim bilgilerim bilimsel amaçlı kullanılmasını kabul ediyorum.

Adı Soyadı .....

İmza .....

H. LIST OF PUBLICATIONS FROM THE CURRENT DISSERTATION

From Study II

Ertekin, Z., Gunnar, M. R., & Berument, S.K. (accepted for publication). Temperament Moderates the Effects of Early Deprivation on Infant Attention. *Infancy* (Manuscript ID: HIFC-2019-0093.R1).

From Study III

Ertekin, Z., Berument, S. K., & Gunnar, M. R. (2020). Examining the Role of Socioeconomic Status and Temperament in the Hair Cortisol Levels of Infants. *Developmental Psychobiology*. doi:10.1002/dev.22014

I. HUNGER INDEX

Gıda Güvencesi İndexi

Aşağıdaki soruları son 1 yılı düşünerek cevaplayın.

1. Yemek yapacak malzeme (mesela sebze, et gibi) almak için hiç ailenizin parasının bittiği oldu mu?	□ Evet □ Hayır
2. Yeterli yiyecek alacak paranız olmadığı için, siz ya da evinizdeki bir başka yetişkinin, hiç doyacak kadar yemek yiyemediği oldu mu?	□ Evet □ Hayır
3. Yeterli yiyecek alacak paranız olmadığı için, çocuğunuz ya da çocuklarınızın, hiç doyacak kadar yemek yiyemediği oldu mu?	□ Evet □ Hayır
4. Evde yiyecek bir şey olmadığı için, çocuğunuz ya da çocuklarınız hiç aç olduklarını söyledi mi?	□ Evet □ Hayır
5. Yiyecek alacak yeterli paranız olmadığı için, çocuğunuz ya da çocuklarınız hiç aç olarak yatağa gitti mi?	□ Evet □ Hayır
6. Yeterli yiyecek alacak paranız olmadığı için, hiç çocuğunuzun ya da çocuklarınızın yemeklerinin boyutunu küçülttünüz mü ya da çocuklarınız öğün atladı mı?	□ Evet □ Hayır
7. Yeterli yiyecek alacak paranız olmadığı için, siz ya da evinizdeki bir başka yetişkin, hiç yemeğinin boyutunu küçülttü mü ya da öğün atladı mı?	□ Evet □ Hayır
8. Yemek yapacak malzeme almak için çok az paranız kaldığından, ailenizi doyurmak için, hiç sınırlı sayıda malzemeyi uzun süre kullandınız mı (mesela patates, makarna gibi)?	□ Evet □ Hayır

J. THE BRIEF SYMPTOM INVENTORY

KISA SEMPTOM ENVANTERİ

Size şimdi insanların bazen yaşadıkları belirtilerin ve yakınmaların bir listesini okuyacağım. Her belirti sizde hiç olmayabilir, biraz olabilir, orta derecede olabilir, epey olabilir veya çok fazla olabilir. Daha sonra o belirtilerin sizde bugün dahil, SON BİR HAFTADIR ne kadar var olduğunu yandaki bölmede uygun olan yere işaretleyin.

	Hiç	Biraz	Orta	Epey	Çok fazla
1. Yaşamınıza son verme düşünceleri					
2. Başka insanlarla beraberken bile yalnızlık hissetmek					
3. Yalnız hissetmek					
4. Hüzünlü, kederli hissetmek					
5. Hiçbir şeye ilgi duymamak					
6. Ağlamaklı hissetmek					
7. Kolayca incinebilme, kırılmak					
8. Uykuya dalmada güçlükler					
9. Karar vermede güçlükler					
10. Gelecekle ilgili umutsuzluk duyguları					
11. Bedenin bazı bölgelerinde zayıflık, güçsüzlük hissi					
12. Ölme ve ölüm üzerine düşünceler					

K. GLOBAL MEASURE OF PERCEIVED STRESS SCALE

Algılanan Stress Ölçeği

Yönerge: Aşağıda geçtiğimiz ay içerisindeki kişisel deneyimleriniz hakkında bir dizi soru yöneltilmektedir. Okuyacağım maddeleri ne sıklıkta hissettiğinizi belirtiniz. Soruların doğru veya yanlış cevabı yoktur. Önemli olan sizin duygu ve düşüncelerinizi yansıtan yanıtları vermenizdir.

	Hiçbir zaman	**Neredeyse Hiçbir zaman**	**Bazen**	**Oldukça sık**	**Çok sık**
1.Beklenmedik bir şeylerin olması nedeniyle rahatsızlık duydunuz mu?					
2.Yaşamınızdaki önemli şeyleri kontrol edemediğinizi hissettiniz mi?					
3.Kendinizi sinirli ve stresli hissettiniz mi?					
4. R Gündelik zorlukların üstesinden başarıyla geldiniz mi?					
5. R Yaşamınızda ortaya çıkan önemli değişikliklerle etkili bir şekilde başa çıktığınızı hissettiniz mi?					
6. R Kişisel sorunlarınızı ele alma yeteneğinize güven duydunuz mu?					
7. R Geçen ay, her şeyin yolunda gittiğini hissettiniz mi?					
8.Yapmanız gereken şeylerle başa çıkamadığınızı fark ettiniz mi?					
9. R Yaşamınızdaki zorlukları kontrol edebildiniz mi?					
10. R Her şeyin üstesinden geldiğinizi hissettiniz mi?					
11. Kontrolünüz dışında gelişen olaylar yüzünden öfkelendiniz mi?					
12. Kendinizi başarmak zorunda olduğunuz şeyleri düşünürken buldunuz mu?					
13. R Zamanınızı nasıl kullanacağınızı kontrol edebildiniz mi?					
14. Problemlerin üstesinden gelemeyeceğiniz kadarbiriktiğini hissettiniz mi?					

L. CURRICULUM VITAE

Zeynep ERTEKİN

Contact
E-mail: zeynepertekinn@gmail.com

Education

Ph.D. **:** Middle East Technical University (METU)
Developmental Psychology, starts 2014-2020

Master Degree **:** Middle East Technical University (METU)
Developmental Psychology 09/2012 – 09/2014

Major **:** Middle East Technical University
Psychology, 09/2007 – 06/2012

Minor Degree **:** Middle East Technical University
Sociology, 09/2008 – 06/2012

Employment

* Teaching Assistant - Middle East Technical University - Since 2018.
* Teaching Assistant - Adana Science and Technology University – 2017 (9 months).

Research Experience

* Fulbright Scholar as a Visiting Student Researcher in University of Minnesota-Institute of Child Development 2018 - 2019.

* Volunteer Research Assistant in The Scientific and Technological Research Council of Turkey (TÜBİTAK: 1001 Project: Project Code 120K385): The effects of Covid-19 on the psycho-social development and academic life of children and youth. Supervised by Prof. Dr. Sibel Kazak Berument. 2020 - Current.

*Research Assistant in The Scientific and Technological Research Council of Turkey (TÜBİTAK) 1003 Project (Project Code: 113K035): The Effects of Parenting Attitudes and Parent Child Interaction On Child and Adolescent Developmental Outcomes - Supervised by Prof. Dr. Sibel Kazak Berument. 2018 - Current.

*Researcher in METU – BAP Project (Scientific Research Projects: GAP-104-2018-2788) Supervised by the Sibel Kazak Berument. 2018 - 2019.

*Participation of Summer Research in Center for Family Research - Cambridge University - 2015 (Erasmus Internship).

* Research Assistant in TÜBİTAK 1001 Project (Project code: 113K222): Turkish Care Types Study (Longitudinal investigation of the effects of temperament, and care type on the developmental outcomes of infant and children who are under the care of social services). Supervised by the Prof. Dr. Sibel Kazak Berument. 2013 - 2017.

Awards

* European Association for Developmental Psychology (EADP) Travel Fellowship for the 19th European Conference on Developmental Psychology, in 30 Agust-2 September, 2019, Athens, Greece.

* 2018-2019 Fulbright Ph.D. Dissertation Research Grant

* Society for Research in Child Development (SRCD) Patrice L. Engle Dissertation Grant For Global Early Child Development 2018.

*Jacobs Foundation International Travel Award for the Biennial Meeting of Society for Research in Child Development (SRCD), in April 6 - 8, 2017, Austin, Texas, USA

* EADP Travel Fellowship for the 18thEuropean Conference on Developmental Psychology, in 31 Agust-1September, 2017, Utrecht, Netherlands.

* TÜBİTAK 2224-A –Travel award for the participation in scientific activities-2017

* Scholarship from The Scientific and Technological Research Council of Turkey (TÜBİTAK) – 2014 - 2020 (2211-E for Ph.D.)

* Scholarship from the TÜBİTAK – 2012-2014 (2210-E –for M.S.)

***** Scholarship from the TÜBİTAK – 2007-2012 (2205 for B.Sc.)

Dissertations

Ertekin, Z. (Ph.D Thesis). Examining The Role of Early Adversity and Temperament in Cognitive Development and Hair Cortisol Levels of Infants

Ertekin, Z. (2014). *The Effects of Care Types and Temperament on Self Concept and Self Regulation Skills of Children Under the Care of Social Services*. (Unpublished Master Thesis). Middle East Technical University, Graduate School of Social Sciences, Ankara.

Publications

Ertekin, Z., Gunnar, M. R., & Berument, S.K. (in press). Temperament Moderates the Effects of Early Deprivation on Infant Attention. *Infancy,* (Manuscript ID: HIFC-2019-0093.R1).

Ertekin, Z., Berument, S.K., & Gunnar, M. R. (2020). Examining the Role of Socioeconomic Status and Temperament in the Hair Cortisol Levels of Infants. *Developmental Psychobiology*. doi:10.1002/dev.22014

Ertekin, Z. & Berument, S.K. (2019). Self-concept development of children in institutional care, alternative care types and biological family homes: Testing differential susceptibility *Applied Developmental Science,* http://dx.doi.org/10.1080/10888691.2019.1617146

Memişoğlu, A., **Ertekin, Z**., Taşfiliz, D. (2015). Şiddete tanıklık etmiş çocukların sosyal ve dil gelişimleri ile ebeveynlerine yönelik müdahale programı: koza projesi [Intervention program for children and mothers who are women protective centers]. *Hacettepe University Faculty of Health Sciences Journal, 1*, 717–729.

Presentations in Peer-Reviewed International Conferences

Ertekin Z., & Berument, S.K. (2020). A longitudinal investigation of self-development of toddlers in institutions. Individual Presentation was accepted to the International Congress of Psychology (ICP) in July 19-24, Prague (postponed 2021).

Ertekin Z., & Berument, S.K., Akkaya, S. (2020). Problem Solving Skills of Infants in Institutional Care: Turkish Care Types Study. Individual Poster Presentation was accepted in 26th Biennial Meeting of the International Society for the Study of Behavioural Development (ISSBD) in 21-25 June, Island of Rhodes, Greece (postponed 2022).

Ertekin Z., Berument, S.K., & Gunnar, M. R. (2019). Cognitive development of infants in institutional care settings, comparison with the low and high-SES family groups. Individual paper was presented in the Meeting of 19th European Conference on Developmental Psychology in August 29-September 1, Athens, Greece.

Ertekin Z., Berument, S.K., & Gunnar, M. R. (2019). The effects of early adversity on infant's hair cortisol levels: The moderating role of negative emotional temperament. Individual paper was presented in the Meeting of 19th European Conference on Developmental Psychology in August 29-September 1, Athens, Greece.

Koç, G., Berument, S.K., Gölcük, M., & Ertekin Z., (2019). The receptive language of institutionalized infants: The moderator role of temperament. Individual paper

was presented in the Meeting of 19th European Conference on Developmental Psychology in August 29-September 1, Athens, Greece.

Ertekin, Z. & Berument, S.K. (2019). Novelty Preferences of Infants in Institutional Care: Turkish Care Types Study. Individual poster was presented in the Biennial Meeting of Society for Research in Child Development (SRCD) in March 21- 23, 2019, Baltimore, Maryland, USA.

Bayram-Gülaçtı, H. Berument, S.K., Ertekin, Z., & Akkaya, S. (2019). Growth Rates in Elicited Imitation of Toddlers in Turkish Care Types Study: The Role of Temperament. Individual poster was presented in the Biennial Meeting of Society for Research in Child Development (SRCD) in March 21 - 23, 2019, Baltimore, Maryland, USA.

Gölcük, M., Berument, S.K., & Ertekin, Z. (2019). The longitudinal investigation of social cognition of infants in institutional care: Turkish Care Types Study. Individual poster was presented in the Biennial Meeting of Society for Research in Child Development (SRCD) in March 21 - 23, 2019, Baltimore, Maryland, USA.

Ertekin, Z. &Berument, S.K. (2017). Attention Skills of Institutional Infants: Turkish Care Type Study. Poster paper was presented in the the18th European Conference on Developmental Psychology in August 29 – September 1, at Utrecht, the Netherlands.

Ertekin, Z. &Berument, S.K. (2017). Testing the Role of Temperament and Care Types on Self-development of Children in Care: Turkish Care Types Study. Poster paper was presented in the Biennial Meeting of Society for Research in Child Development (SRCD) in April 6 - 8, 2017, Austin, Texas, USA

Ertekin, Z., Memişoglu Sanlı, A., & Berument, S.K. (2017). Examining the Effects of Institutional Care and Temperament on Executive Functioning of Children Longitudinally: Turkish care types study. Poster paper was presented in the Biennial Meeting of Society for Research in Child Development (SRCD) in April 6 - 8, 2017, Austin, Texas, USA

Bayram-Gulacti, H. G., Berument, S.K., Ertekin, Z., &Karakaya, S. (2017). Growth Rates in Elicited Imitation and Memory Development of Children in Turkish Care Types Study: The Moderating Role of Temperament. Poster paper was presented in the Biennial Meeting of Society for Research in Child Development (SRCD), in April 6 - 8, 2017, Austin, Texas, USA

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Ertekin, Z. & Berument, S.K. (2015). The Effects of Care Types and Temperament on Children's Self Concept and Self-Regulation Skills. Poster was presented in the Biennial Meeting of Society for Research in Child Development (SRCD) in March 19-21, Philadelphia, Pennsylvania, USA

Ceylan, S., Çeviker, G., Ertekin, Z., Taşfiliz, D., & Berument, S, K. (2015). Comparing Cognitive Development of Children Residing in Institutions, Group Homes, Care Villages and Foster Care in Turkey. Poster was presented in the Biennial Meeting of Society for Research in Child Development (SRCD) in March 19 21, Philadelphia, Pennsylvania, USA

Memişoğlu, A., Berument, S.K., Ertekin Z. (2015). The Effects of Care Types and Temperament on Children Under the Care of Social Services in Turkey in Terms of Social Competency. Individual paper was presented in the Meeting of 17th European Congress of Developmental Psychology (ECDP) in September 8-12, at the University of Minho, Braga, Portual.

Presentations in Peer-Reviewed National Conferences

Koç, G., Berument, S.K., Gölcük, M. & Ertekin, Z. (2018). Koruma Altındaki Bebeklerin Alıcı Dil Gelişimi: Mizacın Düzenleyici Rolü [Receptive Language Skills of Children Under the Government Care: Moderator Role of Temperament]. Individual Presentation. 20th National Psychology Congress, 15-17 November, Ankara. Turkey.

Akkaya, S., Berument, S.K., **Ertekin, Z.,** Bayram-Gülaçtı, H. (2018). Farklı Bakım Tiplerinde Kalan Bebeklerin Gelişimlerinin Boylamsal Olarak İncelenmesi. [Examining the Development of Infants Longitudinally in Different Care Types]. Individual Presentation. 20th National Psychology Congress, 15-17 November, Ankara. Turkey.

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Bayram-Gulacti, H. G., Berument, S.K., Ertekin, Z., & Çeviker-Beki, G. (2016). ÇocuklardaSöyletimli Öykünme Farklılıkları: Bakım Çeşitlerinin Karşılaştırılması ve Mizacın Düzenleyici Rolü. [Elicited Imitation Differences in Children: Comparison of Care Types and Regulatory Role of Temperament]. Individual Presentation. 19th National Psychology Congress, 5-7 September, İzmir. Turkey.

Ceylan, S., Berument, S.K., & Ertekin, Z. (2016). Bakım Çeşitlerine gore Çocuklarda Bellek ve Dikkat Gelişiminin Karşılaştırılması ve Mizacın Düzenleyici Rolü. [The Comparison of Memory and Attention Development of Children in Different Care Types: Moderator Role of Temperament]. Individual Presentation in Panel. 19th National Psychology Congress, 5-7 September, İzmir. Turkey.

Memberships

* Fulbright Alumni association of Turkey: Since September 2019

* Member of European Association of Developmental Psychology (EADP): Since 2017

* Member of Society for Research in Child Development (SRCD): Since 2016

* Member of METU Psychology Student Club: 2009-2012 (The president of Board Management 2011-2012)

Expertise and Certificates

* MEFS Certificate: The Minnesota Executive Functioning Scale

* Tifaldi Certificate: Turkish Expressive and Receptive Language Test

* Statistical programs: SPSS, HLM, EQS

Teaching Assistantship

PSY 622, Developmental Interventions with Children and Parents 2019-2020 Spring Semester

PSY 481 Topics in Experimental Psychology 2019-2020 Spring Semester

PSY 113 Research Methods in Psychology 2018-2019 fall Semester

PSY 428, Developmental Psychopathology 2017-2018 Spring Semester

PSY 452, Psychology of Gender 2017-2018 Spring Semester

M. TURKISH SUMMARY / TÜRKÇE ÖZET

BİRİNCİ BÖLÜM

Giriş

Erken dönem yaşam stresi, yoksulluk, ihmal ve doğum öncesi olumsuz deneyimleri içermekte ve çocukların gelişimsel süreçlerini olumsuz etkilemektedir (Pechtel & Pizzagalli, 2011). Bu etkilenme derecesi, olumsuz koşullara maruz kalma seviyesine, stresin türüne ve maruz kalınan süreye göre değişebilmektedir (Teicher, Samson, Polcari ve McGreenery, 2006). Devlet koruması altındaki çocuklara verilen bakım, aile ortamındaki bakım ile kıyaslandığında optimal seviyede değildir. Devlet koruması altında yetişen çocukların, aile ortamındaki çocuklara göre bilişsel beceriler de dahil olmak üzere gelişimsel olarak geride kalmaları daha olasıdır (Loman ve ark. 2009). Bu nedenle, bu çalışmanın ilk amacı, bebeklerin bilişsel gelişimlerini incelemek ve kurum bakımında (çocuk yuvalarında) büyüyen bebekleri aile ortamında büyüyen bebeklerle karşılaştırmaktır. Bu amaçla, Çalışma I'de, çocuk yuvalarında büyüyen bebeklerin bilişsel gelişimleri kapsamlı ve boylamsal olarak ailede ortamında büyüyen bebeklerin bilişsel gelişimleri ile karşılaştırılmıştır. Bilişsel gelişimin alt boyutları olarak, yeniyi tercih etme (novelty preference), dikkat (focused attention), ve nesne devamlılığı (object permanance) becerileri alınmıştır. İkinci çalışmada ise, yuvalarda büyüyen bebeklerin bilişsel gelişimleri düşük sosyo-ekonomik düzey (SED) aile ortmaında büyüyen bebeklerle tek zamanlı olarak karşılaştırılmıştır.

Farklı bakım türlerini karşılaştırmanın yanı sıra, bu tezin amaçlarından biri de bebeklerin mizacının çevre ile etkileşimini ve mizacın düzenleyicirolünü incelemektir. Bu yüzden hem Çalışma I'de hem de Çalışma II'de mizaç özelliği olarak sıkıntılı durumlardan toparlanabilme becerisi (falling reactivity/ recovery from distress), farklılaşan hassasiyet teorisi (differential susceptibility theory) çerçevesinde incelenmiştir (Pluess ve Belsky, 2009).

Yukarıdaki verilen bilgilere ek olarak, erken dönem yaşam stresi sadece çocukları gelişimsel olarak olumsuz etkilemiyor. Bir dizi çalışma, erken dönemdeki sıkıntıların

bebeklerin ve çocukların stres düzenleme sistemlerini de etkileyebileceğini öne sürüyor. Örneğin, yoksulluk ve sosyo-ekonomik sorunlara maruz kalan çocuklarda kortizol düzeylerinin (stres hormonu) yüksek olduğu bulunmuştur (Chen ve ark., 2010; Clearfield ve ark., 2014; Urizar ve ark., 2010). Kortizolün çocukların bilişsel gelişimiyle ilişkili olabileceğini öne süren çalışmalar da vardır. Forns ve arkadaşları (2014), orta SED aile yanında büyüyen bebeklerde yüksek bazal kortizol düzeylerinin daha iyi bilişsel becerilerle pozitif yönde ilişkili olduğunu bildirmiştir. Bununla birlikte, düşük bazal kortizol seviyesi, düşük SED aile ortamında büyüyen bebeklerde daha iyi yürütme işlevi (executive functioning) becerileriyle ilişkilendirilmiştir (Blair ve ark., 2017). Bu nedenle, bu tezin üçüncü amacı, kortizol düzeyinin ailelerin sosyo-ekonomik düzeyi ile bebeklerin bilişsel gelişimleri arasındaki aracı rolünü incelemektir. Bu amaçla Çalışma III'te, düşük SED aile yanında büyüyen bebeklerin kortizol düzeyleri saç örneklerinden alınmıştır. SED, kortizol seviyesi ve bilişsel gelişim arasındaki ilişki incelenmiştir. Bu ilişkide mizacın rolü de ayrıca incelenmiş ve mizaç özelliği olarak olumsuz duygulanım (negative emotionality) ölçülmüştür.

Özet olarak, mevcut tezde üç çalışma vardır ve her biri ayrı bir bölümde arka arkaya verilecektir. Her çalışma ile ilgili kısa bir giriş, yöntem, sonuçlar ve tartışma verilecektir.

İKİNCİ BÖLÜM

Birinci Çalışma: Kurum Bakımında ve Aile Yanında Büyüyen Bebeklerin Bilişsel Gelişmlerinin Boylamsal Olarak Karşılaştırması: Mizacın Düzenleyici Rolü

2.1 Kısa Giriş

Devlet koruması altınaki çocuklara verilen bakım türlerinden biri olan çocuk yuvalarının (institutions), fiziki koşulları yıllar içinde iyileşmiş olsa da, hala kurumlarda çocukların gelişimi için çok önemli olan bire bir etkileşim ve bireysel bakım imkanı yoktur. Bu nedenle, çeşitli araştırmacıların gösterdiği gibi, çocukların gelişimlerinde bilişsel gelişimleri de dahil olmak üzere gecikmeler görülmektedir (Smyke ve ark., 2007). Korunma altında bakım geçmişi olan çocuklar hakkında

yapılan araştırmalar, bu bakım türünün etkilerinin sonraki yıllarda da devam ettiğini göstermiştir (Bos ve ark., 2009; McDermott ve ark., 2013). Kesitsel olarak yapılan bir karşılaştırmada araştırmacılar, kurum bakımında yeni yürümeye başlayan çocukların, koruyucu aile grubundaki küçük çocuklardan daha düşük dikkat puanlarına sahip olduklarını bulmuşlardır (Ghera ve ark., 2009). Fakat, kurumlarda bulunmanın gerçek etkilerini incelemek için kesitselden ziyade boylamsal araştırma tasarımı gereklidir. Bebekler ve çocuklarınkurum öncesi deneyimleri, doğum öncesi koşullar da dahil olmak üzere değişiklik gösterir, bu da onların gelişimlerini, özellikle bilişsel gelişimini etkileyebilir. Bu nedenle bu çalışma, halen kurum bakımında (çocuk yuvalarında) olan bebeklerin gelişimlerini boylamsal olarak takip etmeyi amaçlamaktadır. Yeniyi tercih etme, dikkat ve nesne devamlılığı becerileri dahil olmak üzere bilişsel gelişimleri kapsamlı bir şekilde incelenmiştir. Nesne devamlılığı bebeklerin zihinsel temsillere sahip olma yeteneğini gösteren önemli kilometre taşlarından bir tanesidir (Kaufman, Csibra ve Johnson, 2005). Benzer şekilde, onların yeniyi farketmeleri ve dikkat becerileri, çocukların sonraki bilişsel becerilerinin önemli yordayıcılarıdır (Bornstein ve ark., 2006; Colombo ve Mitchell, 2009). Ev ortamlarına kıyasla kurum bakımında erken bilişsel gelişimi anlamak, önleme ve müdahale çalışmaları geliştirmek açısından kritiktir.

Ancak kurumlardaki tüm çocukların olumsuz etkilenmediği görülmektedir. Bazı özelliklere sahip çocuklar, bu özelliklere sahip olmayan çocuklara göre çevreye daha duyarlıdır. Bireysel farklılıklar ve çevresel etkiler arasındaki etkileşimi açıklayan teorilerden biri, farklılaşan hassasiyet teorisidir. Bu teoriye göre bazı çocuklar (örneğin, bazı genotipe sahip çocuklar) çevrelerine daha duyarlıdır ve çevresel faktörlerden daha çok etkilenirler (Pluess & Belsky, 2010). Bu çalışmanın ikinci amacı, kurum bakımında büyüyen bebeklerin bilişsel gelişimlerinin, özellikle dikkat, yeniyi tercih etme ve nesne devamlılığı görevlerindeki performanslarının mizaç özelliklerine göre farklı şekilde etkilenip etkilenmediğini test etmektir. Bireysel farklılıkları ve bu çocukları kurum bakımına neyin daha duyarlı kıldığını anlamak, müdahale programları için çok önemlidir. Bu nedenle, bu çalışma bebeklerde bilişsel gelişimin büyüme oranlarında mizacın (sıkıntılı durumlardan toparlanma becerisi) düzenleyici rolünü incelemiştir. Çalışmanın hipotezleri:

• Kurum bakımında büyüyen bebeklerin bilişsel gelişimlerinin büyüme hızı, aile grubundaki yaşıtlarına göre daha yavaş olması beklenmektedir.

• Mizaç olarak sıkıntılı durumlardan toparlanmakta güçlük çeken bebeklerin bilişsel gelşimlerinin kurum bakımından daha olumsuz etkileneceği öngörülmektedir. Bununla birlikte, bu bebekler aile ortamından daha fazla yararlanarak daha yüksek bir büyüme oranına sahip olacakları öngörülmektedir.

2.2. Yöntem

2.2.1. Örneklem

Bu çalışmada kurumlarda veya biyolojik ailesiyle birlikte kalan 3-15 aylık bebekler dört aylık aralıklarla üç farklı zamanda takip edilmiştir. Örneklemimiz "Korunma Altında Büyümek" Projesinin bir parçasıdır (Berument ve Sümer, 2013-2017). Katılımcı sayısı her ölçüm aracı için farklılaşmaktadır (bkz. Tablo 1). Aile grubundaki 65 annenin eğitim düzeyleri 1 ile 9 arasında değişmektedir (1 = okuma yazma bilmeyen, 2 = okuma yazma bilen, fakat diploması olmayan, 3 = ilkokul, 4 = ortaokul 5 = lise, 6 = önlisans, 7 = üniversite derecesi, 8 = yüksek lisans derecesi 9 = Doktora derecesi) (Ortalama eğitim seviyesi= 6.78, SD = 1.19). Ailelerin gelir aralığı 0 (0 - 1000 Türk Lirası) ile 10 (10.000 Türk Lirası ve üzeri) arasında değişmektedir (Ortalama gelir düzeyi = 5.65, SD = 2.20).

2.2.2. Veri Toplama Araçları

Yeniyi Tercih Etme Görevi: Bebeklerin yeniyi tercih etme becerileri, Domsch, Lohaus ve Thomas (2009) 'dan uyarlanan bir task ile ölçülmüştür. Bu görev 3 ila 12 aylık bebeklere uygulanmıştır. Bu görevde kısaca, power-pointte ilk iki slaytta ekranın sağ ve sol köşesinde belli bir şekil veya kadın yüzleri gösterilmiştir. Daha sonra üçüncü ve dördüncü slaytta ise ekranın bir köşesinde eski şekil veya yüz, diğer köşesinde ise yeni şekil ve yeni yüz gösterilmiştir. Bebeklerin yeni olan şekle ve yüze bakma süreleri ölçülmüştür. Yeniye bakma süresi su şekilde hesaplanmıştır: [N/(F+N) × 100]; N burada yeni olan şekle/yüze ortalama bakma süresini göstermektedir, F ise ilk iki slayta ortalama bakma süresini göstermektedir (Marino & Gervain, 2019).

Dikkat Görevi: Bebeklerde dikkat gelişimini ölçmek için Clearfield ve Jedd (2013) 'den uyarlanan dikkat görevi kullanılmıştır ve 6-15 aylık bebeklere uygulanmıştır. Bu görevde kısaca bebeğin önüne bir veya altı oyuncak konularak, oyuncaklara bakma süresi iki dakika boyunca ölçülmüştür. Her iki oyuncak sayısı için dikkat puanı ayrıca hesaplanmıştır ve puanlama 0 ile 120 saniye arasında değişmektedir.

Nesne Devamlılığı: Bebeklerin nesne devamlılığı becerileri, Moore ve Meltzoff (2008) 'den uyarlanan nesne devamlılığı görevi ile ölçülmüştür. Bu görev, yaş aralığı 6 ila 15 ay olan bebeklere uygulanmıştır. Bu görevde kısaca, iki farklı oyuncak önce yarım sonra da tam bir şekilde bebek izlerken örtünün altına saklanmıştır. Daha sonra bebeği oyuncağı bulma becerisi kodlanmıştır. Puanlamada sadece örtünün altına tam saklanan iki test aşaması baz alınmıştır, ve 0 ile 2 arasında değişmektedir.

Mizaç: Bu çalışmada, mizaç özelliği olarak bebeğin "sıkıntılı durumlardan toparlanabilme" alt ölçeği kullanılmıştır (IBQ: Gartstein & Rothbart, 2003). Alt ölçekte toplam 13 madde bulunmaktadır. Maddeler, bakıcılar veya ebeveynler tarafından 5'li Likert tipi pıanlamasında (1 = asla ve 5 = her zaman) doldurulmuştur (bakınız Ek A). Çalışma I'de 3-15 aylık bebeklerle (N = 140) yapılan güvenilirlik puanı ise Cronbach alfa .82 idi.

2.4. Prosedür

Bu çalışma TÜBİTAK tarafından desteklenmiştir (Proje kodu: 113K222). Orta Doğu Teknik Üniversitesi İnsan Araştırmaları Etik Kurulu'dan etik onay alınmıştır (bkz. Ek B), kurum bakımında büyüyen bebekler için T.C.Aile ve Sosyal Politika Bakanlığı'ndan resmi izin alınmıştır. Ayrıca aile grubundaki ebeveynlerden bilgilendirilmiş onam alındı (Ek C). Bilişsel görevler üç araştırmacı tarafından bebeklere uygulanırken, mizaç ölçeği bebeklerin bakıcıları veya anneleri tarafından cevaplanmıştır.

2.5. Sonuçlar

Bebeklerin bilişsel gelişimindeki büyüme hızı farklılıklarını test etmek için Çok Seviyeli Doğrusal Modelleme (MLM) analizi yapıldı. Analiz için HLM programı

kullanılmıştır. Zaman 1. Seviye değişkeni iken, kişiler arası farklar 2. Seviye değişkeni olarak alınmıştır. Zaman değişkeni 0= 1. Zaman, 1= 1. Zaman, ve 2= 3. Zaman olarak kodlanmıştır. Bunun yanında grup 0= kurum bakımında büyüyen bebekler, 1= aile yanında büyüyen bebekler olarak kodlanmıştır. Denklem üçteki gibi tüm değişkenler hem 1. Seviyeye, hem de 2. Seviyeye dahil edilmiştir (grup, mizaç, ve grup × mizaç değişkenleri).

Yeniyi tercih etme – şekil görevi sonuçlarına göre, bebekler arasında zaman içerisinde yeniyi tercih etme süreleri açısından bir farklılık bulunmuştur (β = 4.32, t = 2.50, p <.05). Ancak, ne grup farklı, ne de mizaç özelliği, zaman içindeki bu değişimdeki varyansı açıklamamıştır. 1. Zaman sonuçlarına baktığımızda, mizaç özelliği pozitif yönde bebeklerin yeniyi tercih etme puanlarını yordadığı görülmüştür (β = 6.87, p < .05). Ayrıca 1. Zamanda kurum bakımındaki bebeklerin yeni şekle bakma puanı, aile yanında büyüyen bebeklerden daha düşüktür (β = 5.99, p <.05), (bkz. Tablo 4). Fakat grup farkı 3. Zamanda ortadan kalkmıştır (β = 2.12, p = .45), (bkz. Şekil 3).

Aynı analizler yeniyi tercih etme-yüz görevi içinde tekrarlanmıştır. Bebekler ve gruplar arasında yeni yüze bakma süresi açısında farklılık çıkmamıştır, ve bu durum zaman içerisinde de değişmemiştir.

Dikkat Görevi

Denklem 4'teki gibi dikkat puanları üzerinde tek oyuncak ve altı oyuncaklı görevler için ayrı ayrı analiz yapılmıştır. Tek oyuncağa bakma süresi baz alındığında, 1. Zamanda gruplar arası fark görülmemiştir, fakat grupların zaman içindeki gelişimi farklılaşmaktadır ($\beta 11$ = 7.81, p <.05). Grup × zaman etkileşiminin basit eğim analizi, Preacher'ın (2006) yardımcı programları kullanılarak hesaplanmıştır. Aile grubunun gelişim hızı zamanla değişmezken β = 2.97, t = 1.22, p = 0.22, kurum bakımında büyüyen bebeklerin eğimin de zamanla azalma gözlenmiştir β = -4.84, t = -1.74, p = 0.08 (bkz. Şekil 4), ve üçüncü zamanda kurumda kalan bebeklerin dikkat puanı aile yanındaki bebeklere göre daha düşük bulunmuştur (β = 19.86, p <.001).

Altı oyuncak görevi için sonuçlara baktığımızda, birinci zamanda grup farkı yoktu; ancak zaman ve grup etkileşimi anlamlıydı, $\beta 11$ = 7.64, p <.05. (bkz. Tablo 5).

Grup × zaman etkileşiminin basit eğim analizi sonuçlarına göre, aile grubunun gelişim hızı zamanla artarken β = 8.61, t = 4.08, p <0.01, kurumlarda büyüyen bebeklerin gelişim hızı değişmemektedir β = 0.97, t = 0.39, p = 0.69 (bkz. Şekil 5), ve üçüncü zamanda kurumda kalan bebeklerin dikkat puanı aile yanındaki bebeklere göre daha düşük bulunmuştur.

Nesne devamlılığı için aynı analizler tekrarlanmıştır. Özer olarak sonuçlara baktığımızda, 1. Zamanda gruplar arası fark bulunmuştur. Kurum bakımında büyüyen bebeklerin puanı, aile yanında büyüyen bebeklerin puanından anlamlı derecede daha düşüktür, $\beta 01$ = 0.65, p <.001. Bu grup farkı zaman içinde de değişmemiştir, ve üçüncü zamanda da gruplar arası fark aynı kalmıştır (β = 0.77, p <.001), (bkz. Şekil 6).

Mizacın aracı rolü hiç bir görev için anlamlı bulunmamıştır.

2.6. Tartışma

Bu çalışmada, halen kurumlarda ikamet eden bebeklerin bilişsel gelişimleri araştırıldı. Bilişsel gelişimdeki büyüme hızları, biyolojik aileleri tarafından yetiştirilen bebeklerle karşılaştırıldı. Yeniyi tercih etme, dikkat ve nesne devamlılığı becerileri bilişsel gelişim alt boyutları olarak ölçüldü. Kurum bakımında büyüyen bebeklerin, aile grubundaki bebeklere göre daha düşük puanlara ve zamanla daha yavaş gelişim hızına sahip olması öngörülmüştür.

İlk olarak yeniyi tercih etme-yüz görevi sonuçlarına baktığımızda, ne birinci zamanda, ne de üçüncü zamanda gruplar arası fark görülmemiştir. Gelişimsel süreçte bebekler yüz dışı desenler ve nesneler yerine yüzlere bakma eğilimindedir (Cashon & Dixon, 2019). Genel veriye baktığımızda, bu çalışmadaki bebekler şekillere kıyasla yüzlere daha uzun süreli bakmışlardır. Bu nedenle, bebeklerin kurum bakımı bağlamında bile sosyal uyaranlara bakmayı tercih ettikleri söylenebilir.

Yeniye bakma-şekil görevi sonuçlarına göre ise, kurumlardaki bebekler, birinci zamanda aile grubundaki bebeklerden daha az süreyle yeni şekle bakmışlardır. Üçüncü zamanda grup farkı kayboldu ve kurum bakımı grubundaki bebeklerin zamanla aile grubundaki bebeklere yaklaştığı görülmüştür. Bu sonuç, Aile grubundaki bebeklerin, birinci zamanda gelişimsel kilometre taşlarına çoktan ulaşmış olmaları ile açıklanabilir. Bununla birlikte, kurum bakımındaki bebeklerin birinci zamanda daha düşük puanları vardı ve yeni şekle bakma puanları zamanla artarak aile grubundaki bebeklere yaklaşmıştır. Gelişimsel süreçte, bebeklerin bakma süreleri ilk iki ay boyunca artarken, 6 aydan sonra azalmaya başlar bu da daha erken alışkanlık (habituation) kazandıklarını gösterir (Hood ve ark., 1996; Colombo ve ark., 2004). Kurum bakımdaki bebekler eski şekle daha geç alışmış olabilir, ve yeni şekle bakmamış olabilirler. Yaklaşık bir yıl aradan sonra, yaşın verdiği gelişimle, onlarda yeni şekle daha çok bakmış olabilirler.

Dikkat becerileri için, birinci zamanda grup farkı yoktu, ancak kurum bakımındaki bebeklerin zamanla kazanımları olmadığı görülmüştür. Aile grubu birinci zamandan üçüncü zamana gelişim hızlarında artış görülürken, diğer grup için bu gelişim görülmemiştir. Bu bulgu beklentilerimizle uyumluydu. Bebeklerin dikkat süresinin yaşla birlikte artması beklenmektedir (Ruff & Lawson, 1990). Ancak kurum bakımındaki bebeklerin dikkat süreleri artmamış ve zaman içerisinde yaşıtlarının gerisinde kalmışlardır. Literatürde, kesitsel bir çalışmada, kurumlarda bübüyen bebeklerin koruyucu aile yanındaki bebeklerden daha düşük dikkat puanlarına sahip olduğu benzer sonuçlarla bildirilmiştir (Ghera ve ark., 2009). Bu çalışmanın sonuçları, bu bulguları ileriye taşıyarak, dikkat gelişimlerinin zamanla gerilediğini göstermiştir. Bu da, Kurum bakımı geçmişi olan bebeklerin neden ileri yaşlarda dikkate dayalı sorunlar (örn. dikkat eksikliği hiperaktivite bozukluğu) yaşadığının bir açıklaması olabilir.

Nesne devamlılığı sonuçlarına baktığımızda, birinci zamanda kurumlardaki bebeklerin aile grubundaki bebeklerden daha düşük puanları olduğu ve büyüme hızlarının zaman içinde farklı olmadığı görülmüştür. Dikkat puanlarında olduğu gibi üçüncü zamanda

da kurumlardaki bebeklerin aile grubundan daha düşük puanları olduğu bulunmuştur. Sonuçlar, beklentiler doğrultusunda bulunmuştur.

Genel olarak bu bulgular, kurumlardaki bebeklerin aile grubundaki bebeklerden daha düşük bilişsel gelişime sahip olacağına dair beklentilerimiz ile uyumludur. Önceki çalışmalar da kurumlardaki çocukların aile gruplarındaki çocuklara göre daha zayıf bilişsel gelişim gösterdiklerini göstermiştir (Fox ve ark., 2011; McDermott ve ark., 2012; Vorria ve ark., 2006). Bu çalışma, kurum bakımının bebeklerin bilişsel gelişimleri üzerindeki etkisini yaşamın ilk aylarından itibaren göstererek literatüre katkı sağlamaktadır.

Grup farkının yanı sıra, bu çalışma aynı zamanda bireysel farklılıkların (mizaç ile) bilişsel gelişimlerindeki rolünü araştırdı. Mizacın farklılaşan hassasiyet teorisine göre düzenleyici etkisi test edilmiştir, ve mizaç olarak da sıkıntılı durumlardan toparlayabilme becerisi ölçülmüştür. Çalışma hipotezine göre, her bebeğin kurum bakımından olumsuz etkilenmeyeceği, ve mizaç olarak sıkıntılı durumlardan toparlanmakta zorluk çeken bebeklerin kurum bakımından daha olumsuz etkileneceği, ve bilişsel gelişimlerinin aile yanındaki bebeklerden daha geri olacağı öngörülmüştür. Bununla birlikte, bu bebeklerin aile ortamından daha fazla yararlanarak ve daha az duyarlı bebeklere göre bilişsel görevlerde daha yüksek puanlar alacakları öngörülmüştür. Fakat beklentinin aksine, mizacın düzenleyici rolü anlamlı bulunmamıştır.

Mizacın etkisini bulamama sebeplerinden birisi, çalışmaya dahil ettiğimiz belirli mizaç boyutundan kaynaklanıyor olabilir. Literatürde, araştırmacıların zor mizacı nasıl adlandırdıkları ve ölçtüğü oldukça çeşitlidir. Bazı çalışmalar mevcut çalışmada olduğu gibi mizacın bir alt ölçeğini alırken, bazı çalışmalar bileşik bir puan hesaplarken (Kiff ve ark., 2011; Poehlmann ve ark., 2011), diğer çalışmalar ise çocukların çeşitli görevlere verdiği tepkilerini ölçmektedir (Gilissen ve ark., 2008). Dolayısıyla, her mizaç boyutunun gelişimsel sonuçlar için bir duyarlılık belirteci olarak işlev görmemesi mümkündür (Slagt ve ark., 2016). Bu nedenle, mizacın hangi yönünün bir duyarlılık belirteci olarak işlev gördüğünü anlamak için farklı mizaç özelliklerinin karşılaştırıldığı daha fazla çalışmaya ihtiyaç vardır.

Ayrıca çevresel değişkenler de her çalışma için farklılık göstermektedir. Örneğin, bazı araştırmalar ebeveynlik × mizaç etkileşimini ölçerken, diğerleri aile ortamı × mizaç etkileşimlerini ölçmüştür. Duyarlılık özellikleri, her ortam için farklı şekilde işlev görebilir.

Genel olarak, mevcut bulgular, kurum bakımındaki bebeklerin aile grubundaki bebeklerden daha zayıf bilişsel gelişime sahip olduğu ve zamanla bu farkın aynı kaldığı ya da açıldığı görülmüştür.

ÜÇÜNCÜ BÖLÜM

Çalışma II: Kurum Bakımında Büyüyen Bebeklerin Bilişsel Gelişimlerinin Düşük Sed Aile Yanında Büyüyen Bebeklerle Karşılaştırılması: Mizacın Düzenleyici Rolü

3.1. Kısa Giriş

Çalışma I'de kurum bakımındaki bebekler, aileleri tarafından yetiştirilen bebeklerle karşılaştırılmıştır. Ancak kurum bakımındaki bebekler riskli aile ortamlarından gelmektedirler. Korunma altına yerleştirilme nedenleri arasında yoksulluk, ebeveynin fiziksel ve ruhsal sağlık sorunları, boşanma, ebeveyn hapsi, istismar ve ihmal sıralanabilir (Ertekin ve Berument, 2019; Muñoz-Hoyos ve ark., 2001). Bu nedenle, kurumlardaki çocukların aile özellikleri, özellikle yoksulluk bağlamlarında düşük sosyo-ekonomik düzeyde (SED)'de yaşayan çocukların aile özellikleriyle daha benzerdir. Düşük SED'li ailelerde orta SED aile ortamına göre daha çok ekonomik zorluklar, kaynak ve uyaran eksikliği, daha fazla ev içi kaos ve düşük ebeveyn eğitim seviyesi vardır (Okur, 2015).

Ek olarak, düşük SED ortamlarındaki ebeveynlerin depresif olma olasılığı daha yüksektir, daha yüksek düzeyde algılanan stres ve madde bağımlılığı da dahil olmak üzere sağlık sorunları vardır. Ayrıca orta SED ortamındaki ebeveynlere kıyasla daha zayıf ebeveny becerileri gösterirler (Hackman ve ark., 2015; Hughes & Ensor, 2009; Okur, 2015). Kurumlardaki bebeklerin gelişimini, düşük SED ortamındaki bebeklerle karşılaştırmak, ekonomik avantajın ötesinde, sadece ev ortamının çocukların

gelişimindeki rolünü ortaya çıkarmamızı sağlayabilir. Dahası, düşük SED ev ortamında ortaya çıkan risklere rağmen, eğer kurum bakımında büyüyen bebeklerden daha iyi performans gösterirlerse, bu muhtemelen kurumlarda eksik olan bire bir etkileşimin önemini gösterir. Bu nedenle, mevcut çalışmanın ilk amacı, kurum bakımındaki bebekleri düşük SED biyolojik aile ortamında yetiştirilen bebeklerle karşılaştırmaktır.

Ayrıca bu çalışmada mizacın düzenleyici rolü farklılaşan hassasiyet teorisi çerçevesinde incelenmiştir. Sıkıntılı durumlardan toparlanma becerisi mizaç özelliği olarak alınmıştır. Sıkıntılı durumlardan toparlanmakta zorluk çeken bebeklerin, yatışmak için daha fazla ebeveyn desteğine ihtiyaç duyabilir ve bu sağlandığında daha iyi gelişimsel sonuçlar gösterebilirler (Calkins ve ark.,, 2008). Ebeveyn desteği olmadığı durumlarda, çevresel etkilere karşı daha duyarlı olabilirler ve gelişimleri olumsuz etkilenebilir. Bu nedenle, bu çalışmanın ikinci amacı, kurumlarda bebeklerin bilişsel gelişiminde mizacın düzenleyici rolünü incelemektir. Çalışmanın hipotezleri:

- Kurum bakımı grubundaki bebekler, düşük SED aile grubuna kıyasla bilişsel gelişimde (dikkat becerileri ve nesne devamlılığı) daha düşük puanlara sahip olmaları beklenmektedir.
- Grup farkının mizaca göre değişmesi beklenmektedir. Sıkıntılı durumlarda toparlanmakta güçlük çeken bebeklerin kurum bakımında daha olumsuz etkileneceği ve düşük SED'li aile evlerindeki bebeklere kıyasla daha düşük puanlara sahip olacağı öngörülmektedir. Aynı bebeklerin aile ortamından daha çok faydalanacağı, ve daha yüksek puanlar almaları beklenmektedir.

3.2. Yöntem

3.2.1. Katılımcılar

Çalışmaya kurumlardan 63 bebek ve düşük SED aileden 60 bebek katılmıştır. Düşük SED teki ailelere, Türkiye'nin iki büyük kenti olan Ankara ve Konya'nın dezavantajlı mahallelerinden ulaşılmıştır. Düşük SED grubundaki annelerin eğitim düzeyi

çoğunlukla ilkokul veya ortaokul düzeyinde olup, çoğunluğu çalışmamaktadır. Bu örneklemin ortalama geliri Türkiye'nin asgari ücreti civarındadır. Daha ayrıntılı bilgiler Tablo 7'de bulunabilir.

3.2.2. Ölçüm Araçları

Bebeklerin bilişsel gelişimi, dikkat görevi (Clearfield & Jedd, 2013) ve nesne devamlılığı görevi (Moore & Meltzoff (2008) ile, Çalışma I'in yöntem bölümünde açıklandığı gibi ölçülmüştür. Bebeklerin mizaç özellikleri, Çalışma I'de belirtildiği gibi, Bebek Davranışı Anketi (IBQ: Gartstein & Rothbart, 2003) ile sıkıntılı durumlardan toparlanma alt ölçeği alınarak ölçülmüştür (13 madde) (Bkz. Ek A). Ailelerin sosyo ekonomik durumları, demografik bilgi anketi ile ailelerin eğitim düzeyleri ve hane halkı geliri sorarak ölçülmüştür (bkz Ek D). Ev ortamı kalitesi de, Ev Ortamı Anketi (HEQ: Miser & Hupp, 2012) ile ölçülmüştür. Betimsel bilgiler Tablo 7'de görülebilir.

3.2.3. İşlem

Kurum bakımında büyüyen bebeklerin gelişimleri halihazırda anlatılmış olan "Korunma Altında Büyüme" projesinin bir parçası olarak toplanmıştır. Orta Doğu Teknik Üniversitesi İnsan Araştırmaları Etik Kurulu'ndan etik onay alınmıştır (bkz. Ek F). Araştırmacılar, aile grubunda ev ziyaretleri yaparak veri toplamışlardır. Annelerden bilgilendirilmiş onam alındıktan sonra, görevler Çalışma I'de ki prosedürle uygulanmıştır. Çalışma II'den bir makale *Infancy'*de yayınlanmak üzere kabul almıştır (bkz., Ek H).

3.3. Sonuçlar

ANOVA

Bebeklerin bilişsel gelişimindeki grup farklılıklarını test etmek için tek yönlü ANOVA analizi yapıldı. Bilişsel gelişim iki farklı görevle ölçülmüştür, dikkat görevi (bir oyuncak durumu ve altı oyuncak durumu) ve nesne devamlılığı görevi.

Dikkat becerileri için grubun ana etkisi hem bir oyuncak durumu $F(1, 119) = 32.36$, $p < .001$ hem de altı oyuncak durumu $F(1, 119) = 20.97$, $p < .001$ için anlamlıydı. Kurumsal bakım grubundaki bebekler, hem tek hem de altı oyuncak koşullarında düşük SED grubundaki bebeklere göre daha düşük dikkat puanlarına sahipti. Grubun ana etkisi, nesne devamlılığı puanı için de anlamlıdır, $F(1, 120) = 14.28$, $p < .001$, burada da kurumlardaki bebeklerin düşük SED aile grubundaki bebeklerden daha düşük puanları vardır (Değerler için bkz. Tablo 8).

Mizacın Düzenleyici Rolü

Mizacının düzenleyici rolü (sıkıntılı durumlardan toparlanma becerisi), çevrenin ve bebeklerin bilişsel gelişimi arasındaki ilişki de incelenmiştir. Analiz Hayes'in PROCESS MACRO'su (2013) kullanılarak yapılmıştır.

Dikkat görevi-tek oyuncak durumu için, grup ve mizaç arasında anlamlı bir etkileşim vardır, $B = -15.57$, $SE = 5.20$, $t(117) = -2.99$, $p < .05$% 95 GA [-25.87 , -5.26]. Basit eğri analizine göre, mizacın düşük seviyesi için ($M = -.77$), kurum bakımı grubunun dikkat becerileri, düşük SED li aile grubuna göre anlamlı derecede düşüktü ($b = 34.70$, $SE = 5.57$, $p < .001$). Ancak, mizacın yüksek seviyesi için grup farkı ortadan kaybolmuştur ($M = .77$) (bkz. Şekil 7).

Altı oyuncak durumu için model anlamlı $F(3, 117) = 7.39$, $p < .01$, $R^2 = .16$ olmasına rağmen gruplar ve mizaç arasında etkileşim yoktu.

Nesne devamlılığı puanı için de aynı model çalıştırılmıştır. Model anlamlıydı, $F(3, 118) = 6.44$, $p < .01$, $R^2 = .14$. Grup ve mizaç arasındaki etkileşim, istatistiksel olarak anlamlı olmasada yaklaşmıştır ($B = -.34$, $SE = .19$, $t(118) = -1.77$, $p = .08$,% 95 CI [-.72, .04]. Basit eğri analiz sonucu, dikkat görevi ile benzerlik göstermektedir. Düşük mizaç seviyesi için, kurum bakımı grubunun nesne devamlılık puanı aile grubuna göre anlamlı derecede düşüktür ($b = .79$, $SE = .21$, $p < .01$). ancak, mizacın yüksek seviyesi için grup farkı ortadan kaybolmuştur (bkz. 8).

3.4. Tartışma

Bu çalışma, kurum bakımında büyüyen bebeklerin bilişsel gelişimini, düşük sosyoekonomik düzey (SED) aile ortamında büyüyen bebeklerin gelişimini karşılaştırmıştır. Kurumlardaki bebeklerin geçmiş öykülerine ve biyolojik aile özelliklerine baktığımızda, sosyo ekonomik durum açısından düşük SED aile ortamına yakın olduğu söylenebilir (McCall, 2011). Bu nedenle düşük SED aile grubu karşılaştırma grubu olarak alınmıştır. Aile grubunun gelir düzeyi, verilerin toplandığı yıldaki Türkiye asgari ücretine eşittir. Annelerin çoğu ilk veya ortaokul mezunudur. Dolayısıyla hedeflendiği gibi görece düşük SED örneğidir.

Beklendiği gibi, kurumlardaki bebeklerin dikkat görevi ve nesne devamlılığı görevinde düşük SED ailelerde büyüyen bebeklere göre daha düşük puanları olduğu görülmüştür. Daha önce kurum geçmişi olan veya evlat edinilmiş çocuklarla yapılan araştırmalar da benzer sonuçlar göstermiştir (Merz ve ark., 2013; van IJzendoorn ve ark., 2011). İkinci olarak, bebeklerin mizacının (sıkıntılı durumlardan toparlanma becerisi) grup ve bilişsel gelişim arasındaki düzenleyici rolü incelenmiştir. Beklediğimiz gibi, mizaç olarak sıkıntılı durumlardan toplamakta zorlanan bebekler, kurumlarda ikamet ediyorlarsa dikkat görevlerinde (tek oyuncak koşulu için) daha düşük puanlara sahip olduklarını ve düşük SED aile ortamlarında ikamet ediyorlarsa daha yüksek puanlara sahip olduklarını görülmüştür. Basit eğri analizlerine göre, anlamlılık düzeyine ulaşmasa da bebeklerin nesne devamlılığı becerilerinde ve dikkat (altı oyuncaklı) görevinde de benzer bir örüntü bulunmuştur. Bu bulgular, farklılaşan hassasiyet teorisini desteklemektedir (Pluess ve Belsky, 2009). Yani, duyarlı bebekler (sıkıntılı durumlardan toparlanmakta güçlük çeken bebekler) aile ortamında ve kurumlarda daha iyi ve daha kötü gelişimsel sonuçlara sahiptir.

Kendi kendini yatıştırmakta güçlük çeken bebeklerin daha fazla bireysel bakıma ihtiyaçları olduğu söylenebilir. Ancak aile ortamından farklı olarak kurumlarda bu çok mümkün değildir. Dış faktörler, özellikle ebeveynlik, çocukların duygu düzenlemelerine yardımcı olmaktadır ve duyarlı ebeveynler, hassasiyeti yüksek olan bebekleri daha fazla destekleyebilirler (Choe ve ark., 2013; Jennings ve ark., 2008).

Ebeveyn desteği, bebekler davranışlarını ve duygularını düzenleyemedikleri için özellikle erken yaşlarda önemlidir (Kochanska ve ark., 2000). Çok sıkıntılı bebekler daha düşük dikkat becerilerine sahip olduklarından (Lawson & Ruff, 2004), daha fazla ebeveyn desteğine ihtiyaç duyarlar ancak kurum ortamında bu pek mümkün değildir. Bu nedenle, bu bebeklerin aile ortamında daha iyi bilişsel gelişimleri olduğu görülmüştür.

DÖRDÜNCÜ BÖLÜM

Çalışma III: SED, mizaç ve kortizol düzeylerinin bebeklerin bilişsel gelişimindeki rolü

4.1. Kısa Giriş

Birinci bölümde tartışıldığı gibi, düşük SED aile ortamındaki çocuklar, yüksek SED ailelerdeki çocuklardan daha zayıf gelişim gösterdiği bulunmuştur (Bradley & Corwyn, 2002; Raver ve ark., 2013). Bu durum gıda ya da uyaran eksikliği gibi yoksulluğun doğrudan etkilerinden kaynaklanıyor olabilir (Mistry ve ark., 2002). Ya da dolaylı olarak ebeveynlerin bakım verme becerilerinin düşük olmasından kaynaklanabilir (Conger ve ark., 2002). Yüksek riskli düşük SED ortamları çocuklar için streslidir ve sadece çocukların sosyal ve bilişsel gelişimini değil aynı zamanda stres düzenleme sistemlerini de etkiler (Blair ve ark., 2008). Alanyazında bazı çelişkili bulgular olsa da, çalışmaların çoğu düşük SED ortamlarında büyüyen çocukların daha yüksek bazal kortizol seviyelerine sahip olduğunu bildirmektedir (Vaghri ve ark., 2013; Vliegenthart ve ark., 2016).

Ayrıca, pekçok çalışmada kortizol seviyeleri ile bebeklerin ve çocukların bilişsel sonuçları arasındaki ilişki bildirilmiştir. Örneğin, 15 aylık bebeklerin bazal kortizol seviyeleri, Bayley'in zihinsel gelişim indeksi ile ölçülen bilişsel gelişim ile olumsuz yönde ilişkili olduğu bulunmuştur (Finegood ve ark., 2017). Düşük SED ailelerdeki çocukların daha zayıf bilişsel becerilere sahip olmasının nedenlerinden biri, stres düzenleme sistemlerinin aşırı aktivasyonu, bunun sonucu olarak ta yüksek kortizol düzeyi olabilir. Son çalışmalardan biri de, okul öncesi çocukların tükürükten alınan

kortizol seviyesinin, annelerin depresif ruh hali ile çocuğun yürütme becerileri arasındaki ilişkide aracı rolü olduğunu bulunmuştur (Neuenschwander ve ark., 2018). Bebeklerle yapılan bir diğer çalışma, tükürükten alınan kortizol seviyesinin hanehalkı riski, ebeveynlik ve bebeklerin bilişsel becerileri arasındaki aracı rolünü de göstermiştir (Blair ve ark., 2011). Bununla birlikte, bu çalışmalarda kortizol düzeyi tükürük örneklerinden alınmıştır. Tükürük örneklemi, örneklemin alınma zamanına ve günlük rutinlere daha duyarlıdır ve o anda mevcut olan kortizol düzeyini verir, ancak saç örnekleri, bazal salgılama ve strese karşı tepki olarak salgılanan kortizol da dahil olmak üzere daha kümülatif sonuçlar verir (LeBeau ve ark., 2011; Liu ve ark., 2017). Bu nedenle, bu çalışmada kortizol saç örnekleminden alınmıştır ve bebeklerde SED ile bilişsel gelişimleri arasındaki ilişkide kortizolünün aracı rolü incelenmiştir.

Dahası, çocukların hormon aktivitesinde çevresel etkilerin yanında, mizacın da etkili olabileceği görülmüştür. Örneğin, olumsuz duygulanımı yüksek olan çocukların tükürük örneğinden alından kortizol düzeyleri ile pozitif yönde ilişkili bulunmuştur (Dettling ve ark., 2000; Dougherty ve ark., 2013; Gunnar ve ark., 1997). Saç örnekleminden alınan kortizol, ve mizaç arasındaki ilişkiye bakıldığında, yakın zamanda yapılan bir çalışma dışında sınırlıdır (Kao ve ark., 2019). Bu yüzden bu çalışmada mizacın düzenleyici rolü de araştırılmıştır. Çalışmanın hipotezleri:

- Saç örnekleminden alınan kortizol düzeyleri, ailenin SED düzeyi ile bebeklerin bilişsel gelişimleri arasında aracı rol oynayacağı öngörülmektedir.
- Ayrıca bebeklerin mizacının, ailenin SED düzeyi ile kortizol düzeyleri arasındaki ilişkide düzenleyici rol oynayacağı öngörülmüştür. Mizaç olarak negatif duygulanım özelliği yüksek olan bebeklerin, daha düşük SED ortamında daha yüksek kortizol seviyesine sahip olacağı hipotez edilmektedir.

Ayrıca saç yıkama sıklığı, uyku süresi veya emzirme sıklığı gibi günlük rutinlerin bebeklerin kortizol düzeyleri ile ilişkili olduğunu bulan çalışmalar da vardır (Flom ve ark., 2017; Hamel ve ark., 2011). Bu yüzden bu bilgilerde olası kontrol değişkeni olarak çalışmada ölçülmüştür. Benzer şekilde, annelerin algıladıkları stres ve depresyon düzeyleri de ailenin sosyo ekonomik düzeyleri ile güçlü bir şekilde ilişkili

olduğu daha önceki çalışmalarda gösterilmiştir (Lupien ve ark., 2000; Palmer ve ark., 2013), ve bunun da bebeklerin kortizol düzeylerini etkileyebileceği düşünülmektedir. Bu yüzden bu bilgiler de olası kontrol değişkeni olarak çalışmaya dahil edilmiştir.

4.2. Yöntem

4.2.1. Katılımcılar

Bu çalışmanın verisi Ankara ve Konya'nın dezavantajlı mahallelerinden toplanmıştır. 6 ila 15 ay arasında toplam 60 bebek çalışmaya alınmıştır. Bunların 30'u oğlan, 30'u kız bebektir. Annelerin eğitim seviyesi çoğunlukla ilkokul ve orta okul düzeyindedir, ve çoğu çalışmamaktadır; sadece üç anne çalışıyordu. Örneklemin betimsel istatistikleri Tablo 9'da görülebilir.

4.2.2. Ölçüm Araçları

Sosyo-ekonomik durum (SED): Ailelerin sosyo-ekonomik durumu, ev ortamı kalitesi ölçeği (HEQ), gıda güvensizliği ölçeği, annelerin eğitim düzeyi ve hane geliri ile ölçülmüştür (bkz. Tablo 9). Gıda güvenliği ölçeğinde yeterli varyans olmadığından, toplam SED puanı, ev ortamı kalitesi (HEQ), annelerin eğitim düzeyi ve hane gelirinin toplam puanı alınarak oluşturulmuştur.

Ev Ortamı Anketi: Ev ortamı kalitesini ölçmek için Ev Ortamı Anketi (HEQ: Miser & Hupp, 2012) kullanıldı. Bu ölçekle ilgili ayrıntılar, Çalışma II'nin yöntem bölümünde verilmiştir (bkz. Ek E).

Gıda Güvensizliği: Açlık Endeksi (Wehler ve ark., 1995) yoksulluğun boyutunu test etmek için kullanılmıştır (bkz. Ek G).

Eğitim ve Hane Gelir: Annelerin eğitim düzeyi 7'li Likert ölçeğinde (1 = okuma yazma bilmiyor, 2 = Okuryazar ama derece yok, 3 = İlkokul, 4 = Ortaokul, 5 = Lise, 6 = İki yıllık üniversite derecesi, 7 = Üniversite derecesi), ailenin geliri 11 puanlık Likert ölçeği 0 (0 - 1000 Türk Lirası) ile 10 (10.000 Türk Lirası ve üzeri) ile ölçülmüştür. Bu değişkenlerin betimsel istatistikleri Tablo 9'da görülebilir.

Mizaç: Bebeklerin mizaçları, Bebek Davranışı Anketinin (IBQ: Gartstein ve Rothbart, 2003) üç alt ölçeği ile ölçülmüştür: sıkıntılı durumlardan yeniden toparlanma sıklığı (13 madde, ters puanlı), kısıtlamalar karşısında sıkıntıya girme (13 madde), ve korku (16 madde). Anneler ve bakıcılar, maddeleri 5'li Likert tipi ölçek üzerinde doldurmuştur (1 = asla ve 5 = her zaman). Negatif Duygulanım (ND) puanı, bu üç alt ölçek (Cronbach alfa .87) hesaplanarak oluşturulmuştur (bkz. Ek A).

Stres Ölçümü-Kortizol: Flom ve arkadaşlarının (2017) yöntemine göre bebeklerden, kafa derisine yakın kısımdan 3 cm saç örnekleri alınmıştır (15-30 mg). Saç örnekleri alüminyum folyo içerisinde ve laboratuvara gönderilmeden önce 18-20 C civarı sıcaklıkta saklanmıştır. İnsan saçının ayda bir cm uzadığı varsayılmaktadır (LeBeau, Montgomery ve Brewer, 2011); bu nedenle 3 cm saç, önceki üç ayın kortizol seviyelerine karşılık gelmektedir. Örnekler, saç kortizol konsantrasyonunu (HCC) ölçmek için Almanya Dresden Laboratuvar Servisine gönderilmiştir. Laboratuvardaki tahlil prosedürü için Davenport ve ark. (2006)' dan bakılabilir.

Günlük Rutinler: Günlük rutinler hakkında bilgiler: Uyku saatleri, emzirme rutinleri (toplam emzirme süresi ve son üç ayda çocuğun emzirilip emzirilmediği), bebeğin ilaç öyküsü, halen emziren annelerin ilaç bilgileri, banyo sıklığı, herhangi bir saç tedavisi ve doğum kilosu ebeveynlere sorulmuştur. Betimsel istatistikler Tablo 10'da görülebilir.

Ayrıca, Kısa Semptom Envanteri (Derogatis, 1992; Türkçe uyarlaması: Şahin ve Durak, 1994) ile depresyon gibi anneye ilişkin faktörler ve Algılanan Stresin Küresel Ölçümü Ölçeği (Cohen, Kamarck ve Mermelstein, 1983; Türkçe uyarlaması: Eskin ve ark., 2013) olası kontrol değişkenleri olarak da ölçülmüştür (Tablo 10'daki betimsel istatistiklere bakınız).

4.2.3. İşlem

Orta Doğu Teknik Üniversitesi İnsan Araştırmaları Etik Kurulu'ndan etik onay alınmıştır (bkz. Ek F). Bilimsel Araştırma Projeleri (BAP: Proje kodu: GAP-104-2018-2788) ve Society for Research in Child Development Patrice L. Engle

Dissertation Grant -2018 bu çalışmayı desteklemiştir. Üç araştırmacı ev ziyaretleri yaparak veri toplamıştır. Ebeveyn izni alındıktan sonra (bkz. Ek G) Anneler tarafından anketler doldurulmuştur. Görevler bebeklere uygulandıktan sonra saç örnekleri toplanmıştır. Çalışma III'ten bir makale *Developmental Psychobiology* (2020)' de yayınlanmıştır (bkz., Ek H).

4.3. Analiz planı

Kortizol verisinin dağılımı çarpıktı; bu nedenle, log10 dönüşüm yöntemi uygulandı. Yetersiz saç uzunluğu ve kütlesi nedeniyle 11 veri analizlerden çıkarıldı. Böylece son analiz 49 bebek ile gerçekleştirildi. Sosyo ekonomik düzey, mizaç, stres seviyeleri (kortizol düzeyi) ve bilişsel gelişim arasındaki ilişkiyi test etmek için düzenleyici aracılık modeli (moderated mediation model) önerilmişti (bkz. Figur 9). Fakat düşük katılımcı sayısı nedeniyle kortizolün aracı etkisi ve mizacın düzenleyici etkisi ayrı ayrı modeller çalıştırılarak hesaplanmıştır.

İlk olarak, kontrol değişkenine karar vermek için ikili korelasyon ve aşamalı regresyon analizleri yapılmıştır. Diğer analizler Hayes'in PROCESS macro'su (2013) kullanılarak yapılmıştır.

4.3.1. Betimsel İstatistikler ve Korelasyonlar

Tüm ölçümlerin betimsel istatistikleri Tablo 10'da görülebilir.

İki değişkenli korelasyon sonuçlarına göre, kortizol düzeyi, bebeklerin yaşı ile negatif (r = -.33, p <.05) ve son üç ayda emzirme durumu ile pozitif korelasyon göstermiştir (r = .32, p <.05) (bkz. Tablo 11).

Aşamalı regresyon analizine göre, kortizol bagımlı değişken alınarak, tüm ortak değişkenler modele girildiğinde son basamakta sadece üç değişken kalmıştır, bunlar: Son üç ayda emzirme durumu (β = 0,34, p <0,05), banyo sıklığı (β = -0,46, p <0,01) ve doğum kilosudur (β = 0,30, p < 0,05). Bu nedenle, sadece yaş, emzirme, banyo yapma sıklığı ve doğum kilosu sonraki analizlerde kontrol değişkenleri olarak alınmıştır.

4.3.2. Aracı Değişken Analizleri

Dikkat görevinin her iki versiyonundan gelen puanlama (tek oyuncak ve altı oyuncak versiyonu) ve nesne devamlılığı puanı baz alınarak, korizolün, ailenin ekonomik düzeyi ve bilişsel gelişim arasındaki aracı rolü incelenmiştir. SED in bilişsel puanlar üzerinde direk bir etkisi bulunmamıştır. Direkt olmayan etkide (kortizol üzerinden) her üç puan için de anlamlı bulunmamıştır. Detaylı bilgiler için Tablo 12, 13, ve 14'e bakılabilir.

4.3.3. Düzenleyici Değişken Analizi

Mizacın (olumsuz duygulanım) SED ve kortizol düzeyi arasındaki düzenleyici rolü Hayes'in PROCESS makrosu (2013) ile yapılmıştır. Model anlamlı bulunmuştur ($F(7, 41) = 5.14$, $R2 = 0.47$, $p < 0.001$). Kontrol değişkenleri olan, yaş, son 3 ayda emzirme durumu, banyo yapma sıklığı ve doğum kilosu kontrol edildikten sonra negatif duygulanım (ND) ve SED arasındaki etkileşim anlamlıydı ($B = 0.41$, $SE = 0.14$, $p < 0.01$, % 95 CI [0.12, 0.69]). Düzenleyici değişkenin ortalamasının ± 1 SD üstünde ve altındaki değerler baz alınarak basit eğri analizi hesaplanmıştır. Düşük seviyelerde ($M = -0.56$) ve orta seviyelerde ($M = 0.00$), eğimler anlamlı bulunmamıştır. Bununla birlikte, negatif duygulanımı yüksek oldugunda ($M = 0.56$), eğim anlamlı bulunmuştur ($b = 0.37$, $SE = 0.13$, $p < 0.01$, % 95 CI [0.10, 0.64]). Bu sonuçlar, negatif duygulanım puanları yüksek olan bebeklerin, daha düşük SED ortamlarında, daha düşük kortizol derecesine sahip oldukları bulunmuştur. Aynı bebeklerin ekonomik olarak daha iyi aile ortamında daha yüksek kortizol düzeyine sahip oldukları bulunmuştur (bkz. Şekil 10).

Kontrol değişkenlerine baktığımızda, bebeklerin yaşı, kortizol düzeyini negatif yönde yordarken (marjinal; $B = -0.03$, SE = 0.02, $p = 0.06$, % 95 CI [-0.06, 0.001]), son 3 ayda emzirme durumu kortizol seviyesini yordamamaktadır. Banyo yapma sıklığı kortizol düzeyini negatif yönde yordarken ($B = -0.29$, SE = 0.09, $p < 0.01$, % 95 CI [-0.47, -0.11]), doğum kilosu pozitif yönde yordamaktadır ($B = 0.00$, $SE = 0.00$, $p < 0.05$, % 95 CI [0.00, 0.001]). Bu sonuçlar, bebeklerin yaşı ve saç yıkama sıklığı arttıkça kortizol düzeyinin azaldığı, doğum kilosunun artması ile kortizol düzeyinin arttığını göstermektedir.

4.4. Tartışma

Ailelerin SED, ve bebeklerin bilişsel gelişimi arasındaki kortizolun aracı rolü, ve mizacın çevre ve kortizol düzeyi arasındaki düzenleyici rolü ayrı ayrı analiz edilmiştir bu nedenle ayrı ayrı tartışılacaktır.

4.4.1. Kortizolün Aracı Rolü

Dikkat görevi ve nesne devamlılığı görevinin sonuçları dahil olmak üzere, bebeklerin kortizol düzeyinin, SED ve bilişsel gelişim arasındaki aracı rolü anlamlı bulunmamıştır. Ayrıca, ailelerin SED ne bebeklerin bilişsel gelişimini, ne de kortizol düzeyini anlamlı olarak yordamamaktadır.

Çevre ile bilişsel gelişim arasındaki ilişkide kortizolün rolünü gösteren çalışmalar sınırlıdır. Mevcut çalışmanın aksine, bebeklik döneminde ölçülen kortizolün, hanehalkı riski, ebeveynlik ve 3 yaşındaki çocukların yürütücü işlevleri arasında kısmi olarak aracı etkisi bulunmuştur (Blair ve ark., 2011; Neuenschwander ve ark., 2018). Bu çalışmalarda, yönetici işlevsel becerileri alınmıştır, bu da aslında ikincil derecede (daha üst düzey) bilişsel becerileri temsil etmektedir (Garon ve ark., 2008). Fakat bu tezde, bilişsel gelişimin birincil düzey etkenleri alınmıştır, bu da kortizolün daha üst düzey bilişsel beceriler üzerinde etkisi oldugu ama birincil derecede etkisi olmadığını göstermektedir.

Kortizol düzeyi ile SED arasında bir ilişki olmamasının bir diğer nedeni, mevcut örneklemin kortizol düzeyinin diğer çalışmalara göre düşük olması olabilir. Bu örneklemde ortalama kortizol düzeyi 15.11 iken, bebeklerle yapılan diğer çalışmada 86.26 (Flom ve ark., 2017) ve 3 yaşındaki çocuklarda yapılan çalışmada ortalama 35.27 olarak bulunmuştur (Kao ve ark., 2019). Her iki çalışma da Amerika Birleşik Devletleri'nde yapılmıştır. Bununla birlikte, Pakistan'dan toplanan veriye göre 4 yaşındaki çocuklar için ortalama seviye 9,55 bulunmuştur (Armstrong-Carter ve ark., 2020) ve bu da mevcut çalışmada olduğu gibi düşük aralıktadır. Bu nedenle, mevcut çalışmadaki kortizol düzeyi, ABD'deki dezavantajlı çevreden gelen çocukların kortizol düzeyinden bile düşüktür (ortalama 32.02) (Ling, Robbins ve Xu, 2019). Bu

bulgularda kortizol düzeyinde kültürler arası fark olabileceğini göstermektedirler. Dolayısı ile kortizolün çevre ile etkileşimi de her kültür ve etnik grupta farklı olabilir.

4.4.2. SED, Kortizol ve Mizaç

Düşük SED ortamlarındaki bebeklerin daha yüksek kortizol düzeylerine sahip olacağı ve bu ilişkinin yüksek olumsuz duygulanıma sahip bebekler için daha belirgin olduğu varsayılmıştır. Olumsuz duygulanımı yüksek bebeklerin daha düşük SED ortamında daha yüksek kortizol seviyelerine sahip olması beklenmektedir.

Bulgular, SED ile kortizol düzeyi arasında doğrudan bir ilişki olmadığını göstermiştir. Literatürdeki sonuçların ise karışık olduğunu görülmektedir. Mevcut çalışmaya benzer şekilde, 12 aylık bebeklerin SED ve saç örnekleminden alınan kortizol arasında doğrudan bir ilişki olmadığını gösterirken, saçtan ve tükürükten alınan kortizol düzeyi birleştirildiğinde SED ile negatif olarak ilişkili olduğu bulunmuştur (Flom ve ark., 2017). Yakın zamanda yapılan bir incelemede, 12 ila 60 aylık çocukların SED ve saçtan alınan kortizol düzeyleri arasında negatif bir ilişki bulmuştur (Bates ve ark., 2017).

Çevre değişkeninin nasıl ölçüldüğü, bulguları etkileyebilir. Bu çalışmada, önceki çalışmalarda olduğu gibi anne eğitim düzeyi, hane gelir ve ev ortamı kalitesini içeren bir değişken oluşturularak SED ölçülmüştür (Kao ve ark., 2019; Lee ve ark., 2013). Ancak bazı araştırmalar gelir, eğitim, ailenin SED algısı, ev sahibi olma veya ailenin borcu olup olmadığı gibi değişkenleri, SED göstergesi olarak almaktadır (Clearfield ve ark., 2014; Ouellette ve ark., 2015). Bu nedenle, sonuçlardaki farklılıklar, SED ölçümündeki çeşitlilikten kaynaklanıyor olabilir. Hangi SED göstergelerinin kortizol hormonu üzerinde daha etkili olduğunu anlamak için daha fazla araştırmaya ihtiyaç vardır.

Dahası, beklentilerimizin aksine, olumsuz duygulanımı yüksek olan bebeklerin daha düşük SED ortamlarında daha düşük kortizol düzeyine sahipken ve nispeten daha iyi ortamlarda daha yüksek kortizol seviyesine sahip olduğu görülmektedir. Bulgularımızın aksine, son zamanlarda yapılan bir araştırma, mizaç olarak

tepkiselliğin, göreceli olarak düşük SED aile ortamlarında okul öncesi çocuklarda daha yüksek kortizol ile ilişkili olduğunu bulmuştur (Kao ve ark., 2019). Bu fark, katılımcıların Kao ve arkadaşlarının çalışmasındaki yaşlarından kaynaklanıyor olabilir. (2019), ancak daha da önemlisi, ebeveynlerin çoğunun üniversite diplomasına sahip olduğu bu çalışmada, örneklemin SED düzeyinin nispeten yüksek olması olabilir.

Ayrıca, alanyazındaki diğer çalışmalara baktığımızda, düşük kortizol düzeyinin daha çok ihmal ve bakım eksikliği olduğu durumlarda bulunduğu görülmüştür (Fisher, 2017; Bruce ve ark., 2009; Gunnar & Fisher, 2006). Bu nedenle, belkide kortizol düzeyi ile ailenin ekonomik düzeyi değil, ama ebeveynlik becerisi ve bebeğe verilen bakımın kalitesi ilişkili olabilir. Mevcut çalışmada ebeveynlik boyutunu ölçmemiştik. Çevre – kortizol ilişkisinin netlik kazanması için ve hem ebeveynlik hem de ekonomik göstergeleri kapsayan daha fazla araştırmaya ihtiyaç var.

BEŞİNCİ BÖLÜM

5. Genel Tartışma

Bu tez, erken dönem yaşam stresinin ve bebeklerin mizacının, bebeklerin bilişsel gelişimleri ve kortizol düzeyleri arasındaki ilişkiyi incelemiştir. Bunun için üç farklı çalışma yürütülmüştür. Çalışma I ve Çalışma II'de kurum bakımda büyüyen bebeklerin bilişsel gelişimi, aile ortamında büyüyen bebekler ve düşük SED aile ortamında büyüyen bebeklerle karşılaştırılmıştır. Ayrıca mizacın düzenleyici rolü incelenmiştir. Çalışma III'te ise ailelerin sosyo-ekonomik düzeyi, bebeklerin mizacı, stres düzeyleri ve bebeklerin bilişsel gelişimleri arasındaki ilişki incelenmiştir.

İlk çalışma, kurumlardaki bebeklerin aile ortamlarında bebeklere göre hem 1. Zaman veri toplama sürecinde hem de zaman içinde daha düşük bilişsel gelişime sahip olduğunu göstermiştir. Bilişsel gelişimde gruplar arasında zaman içindeki farklılıklar oldukça önemli bir bulgudur.

Karşılaştırma grubu düşük SED ailelerde büyüyen bebeklerden oluştuğunda da (Çalışma II) kurum bakımında büyüyen bebeklerin bilişsel gelişim puanları daha

düşük olduğu bulunmuştur. Böylece, Çalışma II'nin sonuçları, aile bağlamının etkilerini daha yüksek gelir seviyelerinin olanaklarının ötesinde önemini göstermiştir. Düşük SED aile ortamlarında büyüyen bebeklerin bilişsel gelişimi, orta SED aile ortamlarındaki bebeklere göre daha kötü olsa da (Markant ve ark., 2016), kurumlara göre düşük SED ailelerde ebeveynin etkisiyle, ekonomik olanakların ötesinde bilişsel gelişimlerinin daha iyi olduğu bulunmuştur.

Ayrıca, her bebeğin çevreden aynı derece etkilenmediği bulunmuştur. İkinci çalışmada, sıkıntılı durumlardan toparlanabilme becerisi düşük olan bebekler, kurum bakımında daha düşük dikkat puanlarına sahipken, aynı bebekler, düşük SED aile ortamında daha yüksek dikkat puanları olduğu bulunmuştur. sıkıntılı durumlardan toparlanmakta zorluk yaşamayan bebeklerde ise gruplar arası fark bulunmamıştır. Bu bulgu da farklılaşan hassasiyet teorisini destekler yöndedir (Pluess & Belsky, 2009).

Erken yaşam stresinin sadece gözlemlenebilir gelişimsel sonuçlar üzerinde etkisi bulunmamıştır. Aynı zamanda kişinin stres düzenleme sistemini de etkidiği alanyazındaki çalışmalar tarafından gösterilmiştir. Strese uzun süre maruz kalmak, HPA ekseninin işleyişine zarar verebilir ve bu da çocukların gelişimsel sonuçlarını etkileyebilir. Bu nedenle Çalışma III, kortizolün SED ve bilişsel gelişim arasındaki aracı rolüne odaklanmıştır. Fakat, ailelerin sosyo-ekonomik düzeyi, bebeklerin saç örnekleminden alınan kortizol düzeyleri ve bilişsel gelişimleri arasında herhangi bir ilişki bulunamamıştır. Fakat, bebeklerin mizacının SED ve bilişsel gelişimleri arasında düzenleyici etkisi anlamlı bulunmuştur. Basit eğri analizi sonuçlarına göre, negatif duygulanımı yüksek olan bebeklerin daha düşük SED ortamında daha düşük kortizol düzeyine sahip olduğu bulunurken, daha iyi SED ortamında daha yüksek kortizol düzeyine sahip olduğu görülmüştür.

Genel olarak, bu sonuçlar bireysel farklılıkların önemini göstermektedir. Çevrenin bebeklerin gelişimi üzerindeki etkisi inkar edilemez, ancak bebeklerin çevreden nasıl etkileneceği, kim olduklarına bağlıdır ve mizaç, çocuk gelişiminde belirleyici bir role sahiptir.

5.1. Çalışmanın Sınırlılıkları ve Güçlü Yönleri

Bu tezde yapılan çalışmaların bazı sınırlılıkları bulunmaktadır. İlk olarak, bebeklerin mizaç özellikleri anneler ve bakıcılar tarafından değerlendirildi. Kurum bakımında büyüyen çocukları en iyi tanıyan bakıcılar değerlendirse de, yine de bakıcılar bebeklerle ev ortamında anne-bebek kadar çok vakit geçirmemektedirler. İkincisi, örneklem büyüklüğü nispeten küçüktü ve bu yüzden Çalışma III'te analiz planı değiştirilmiştir. Üçüncüsü, Çalışma I'deki karşılaştırma grubu olan biyolojik aile grubunun sosyo-ekonomik düzeyi görece orta ve ortanın üzerindedir. Çalışma I, daha büyük bir projenin parçası olduğu için vakit kısıtlılığından her düzeyden katılımcı aile sağlanamamıştır ve ortalama SED görece yüksek kalmıştır. Dördüncüsü, veriler, katılımcıları doğal ortamlarında gözlemlememizi sağlayan ev ziyaretleri yoluyla toplandı. Ancak her evin ve kurumun kontrol edemeyeceğimiz farklı koşulları vardı. Bulgular değerlendirilirken bu da dikkate alınmalıdır.

Sınırlılıkların yanı sıra, mevcut tezin pek çok güçlü yönü vardır. İlk olarak, ulaşılması daha zor olan kurumlardaki bebekler de dahil olmak üzere çalışmaların katılımcıları özel gruplardan oluşmaktadır. İkincisi, bebeklerin bilişsel gelişimi üç aylıkken başlayarak boylamsal olarak takip edilmiştir. Üçüncüsü, bebeklerin bilişsel gelişimi, çeşitli bilişsel kilometre taşlarını vurgulamak için birden çok görevle ölçülmüştür. Dördüncüsü, Türkiye'deki bebeklerden saç örneklemi alarak kortizol seviyesine bakan ilk çalışmadır. Son olarak, bu çalışma grup farklılıklarının ötesinde bireysel farklılıkların (mizaç) önemini göstererek literatüre katkı sağlamıştır.

Tüm bu bulgular hem alanda uygulamalar hem de sosyal politikalarda kararlar alırken değerlendirilmek üzere çok değerli bilgiler sağlamıştır. Araştırmacılar ve yasaları belirleyenler, genellikle harekete geçerken veya yasaları tasarlarken bireysel farklılıkları göz ardı edebilmektedir. Bu tezin sonuçları, duyarlı çocukların diğerlerinden daha fazla bireysel ilgiye ihtiyaç duyduğunu göstermektedir.

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