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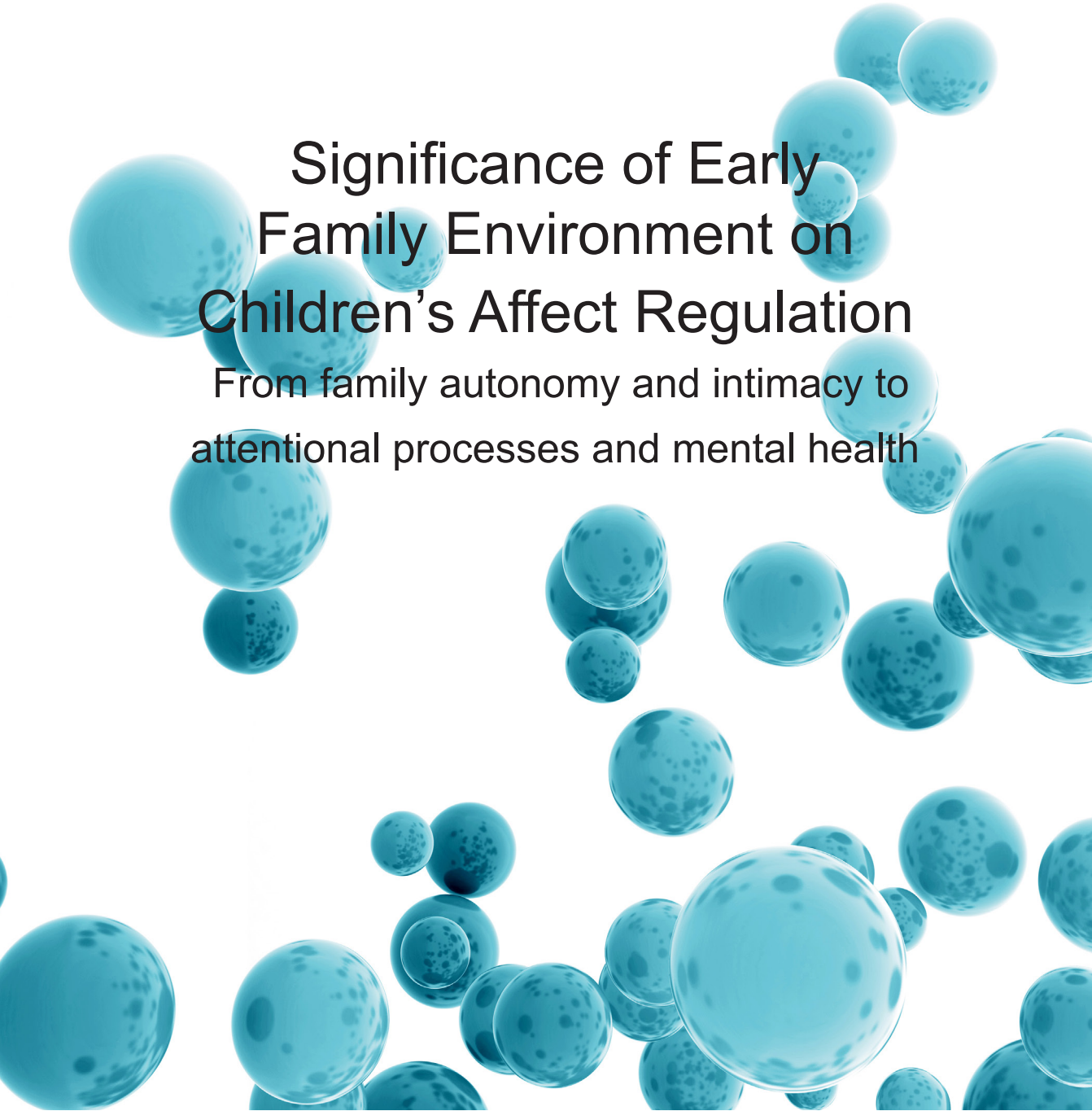
JALLU LINDBLOM

Significance of Early Family Environment on Children's Affect Regulation

From family autonomy and intimacy to attentional processes and mental health



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ACADEMIC DISSERTATION
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Happy families are all alike;

every unhappy family is unhappy in its own way.

Leo Tolstoy (in *Anna Karenina*, 1877), writer

I've discovered that half the people would love to go into space and there's no need to explain it to them. The other half can't understand and I couldn't explain it to them. If someone doesn't know why, I can't explain it.

Sally Ride, astronaut

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ABSTRACT

Developmental theories derived from psychodynamic and evolutionary frameworks suggest that early family relationships shape children's emotional development. However, the long-term effects of early family relationships on children's affect regulation – involving conscious and unconscious regulation and social-emotional information processing – have rarely been studied. Better understanding of such effects is crucial, because family-related alterations in children's affect regulation may have long-term impact on children's mental health.

This dissertation study explored and modeled how family relationships during pregnancy and infancy predict children's emotion regulation, defense mechanisms and emotional attention biases in middle childhood. It also tested whether the timing (early vs late infancy) of family relationship quality has specific effects on children's affect regulation, and whether children's emotion regulation mediate the effects of early family systems on children's internalizing symptoms.

The longitudinal sample comprised 710 families. Both mothers and fathers reported their autonomy and intimacy in marital and parenting relationships, during the second trimester of pregnancy, and at the child's age of 2 months and 12 months. At the child's age of 7-8 years the parents completed questionnaires about their child's emotion regulation, defense mechanisms, and internalizing symptoms. At the age of 10 years, a selected subsample of 79 children participated in an experimental laboratory part of the study, which assessed their emotional attention biases using a facial dot-probe task. The effects of the family relationships on children were analyzed using both variable-oriented and person-oriented methods.

The results of Study I showed that low autonomy and intimacy in both the marital and parenting relationships predicted children's inefficient emotion regulation and reliance on defense mechanisms. There was little evidence about the timing (early vs late infancy) effects on children's affect regulation. In Study II, finite mixture modeling identified seven unique family system types (FSTs): Cohesive (35%), Disengaged (5%), Authoritarian (14%), Discrepant (15%), Escalating Crisis (4%), Enmeshed Declining (6%) and Enmeshed Quadratic (5%) families. The results of Study III showed that both the emotionally distant (i.e.,

Disengaged and Escalating Crisis) and enmeshed (i.e., Enmeshed Declining and Enmeshed Quadratic) FSTs predicted children's inefficient emotion regulation, anxiety and depression. Furthermore, most of the effects of the FSTs on children's depression were mediated through inefficient emotion regulation. Finally, the results of Study IV showed that the FSTs had some unique effects on children's emotional attention biases. Children from Enmeshed Declining families showed heightened attention towards threat cues, whereas children from Disengaged families showed signs of defensive avoidance of threat cues.

This dissertation demonstrates the importance of considering families as holistic systems, involving both the mothers and fathers, and both the marital and parenting subsystems. In line with the developmental models of psychopathology, the findings indicate that very early family dysfunctions forecast children's altered affect regulation, which may heighten their risk for mood disorders. Altered social-emotional information processing suggests that children may tune their affect regulation to adapt with the specific challenges they encounter in their early family environments.

TIIVISTELMÄ

Psykodynaamisista ja evoluutioteoriasta johdettujen kehityspsykologisten teorioiden mukaan varhaiset perhesuhteet muovaavat merkittävästi lapsen tunne-elämän kehitystä. Tästä huolimatta varhaisten perhesuhteiden pitkäkestoisista vaikutuksista lasten affektien säätelylle ei ole juurikaan aiempaa tutkimusta. Tässä väitöskirjassa affektien säätelyllä tarkoitetaan laaja-alaisesti sekä tietoisia että tiedostamattomia tunteiden säätelyn prosesseja, että säätelytehtäviin liittyvää sosiaalis-emotionaalista tiedonkäsittelyä. Varhaisten perhesuhteiden vaikutusten ymmärtäminen on tärkeää, sillä se saattaa tuottaa pitkäkestoisia vaikutuksia lapsen mielenterveydelle.

Tässä väitöskirjassa tarkastellaan ja mallinnetaan sitä, miten perhesuhteet raskausaikana ja ensimmäisen vuoden aikana ennustavat lapsen tunteiden säätelyä, psyykkisiä puolustusmekanismeja ja tunneinformaation käsittelyyn liittyviä tarkkaavuuden vinoumia keskilapsuudessa. Väitöskirjassa tutkitaan myös onko perhesuhteiden laadun ajoittumisella (varhainen vs myöhäinen vauvaikä) merkitystä lapsen affektien säätelyn kehittymiselle, ja välittääkö lapsen tunteiden säätelykyky varhaisten perhesysteemien vaikutuksia lapsen tunne-elämän oireiluun.

Tutkimus perustuu 710 perhettä koskevaan pitkittäisaineistoon. Molemmat vanhemmat raportoivat perhesuhteissa ilmenevää autonomiaa ja läheisyyttä raskauden toisella kolmanneksella, sekä lapsen ollessa 2 ja 12 kuukauden ikäinen. Lapsen ollessa 7-8 vuoden ikäinen, vanhemmat vastasivat lasten tunteiden säätelyä, psyykkisiä puolustusmekanismeja ja tunne-elämän oireilua koskeviin kyselyihin. Lapsen ollessa 10 vuoden ikäinen, 79 perheistä valittua lasta osallistui koetilanteeseen, jossa lasten tunneinformaation käsittelyyn liittyviä vinoumia mitattiin dot probe –tehtävällä. Varhaisia perhesuhteita mallinnettiin väitöskirjan tutkimuksissa sekä muuttujakeskeisin (mm. lineaariset yhteydet rakenneyhtälömallinnuksessa) että yksilökeskeisin (mm. sekoitusmallinnus) menetelmin.

Ensimmäisen tutkimuksen tulokset osoittivat, että autonomian ja läheisyyden puute parisuhteessa ja vanhemmuudessa ennusti lapsen tehotonta tunteiden säätelyä ja taipumusta turvautua psyykkisten puolustusmekanismien käyttöön. Näyttöä ei juuri löytynyt perhesuhteiden ajoittumisen vaikutuksista. *Toisessa*

tutkimuksessa sekoitusmallit tunnistivat seitsemän erilaista perhetyyppiä: Kohesiiviset (35%), Etäiset (5%), Autoritaariset (14%), Eriävät (15%), Kriisiytyvät (4%), Yhteenkietoutuneet laskevat (6%) ja Yhteenkietoutuneet kvadraattiset (5%). *Kolmannen* tutkimuksen tulokset osoittivat, että sekä yhteenkietoutuneet (eli Yhteenkietoutuneet laskevat ja Yhteenkietoutuneet kvadraattiset) että tunne-elämältään viileät (Etäiset ja Kriisiytyvät) perheet ennustivat lapsen tehotonta tunteiden säätelyä, ahdistuneisuutta ja masentuneisuutta keskilapsuudessa. Tulokset osoittivat myös, että suurin osa perhetyyppien vaikutuksista lapsen masennukselle välittyi lapsen tunteiden säätelyn tehottomuuden kautta. *Neljännen* tutkimuksen tulokset puolestaan osoittivat, että perhetyypeillä oli joitakin perhespesifejä vaikutuksia lapsen tunneinformaation prosessointiin liittyviin tarkkaavuuden vinoumiin. Yhteenkietoutuneet etäiset –perheiden lapsilla ilmeni taipumusta kiinnittää enenevästi huomiota uhkaaviin ärsykkeisiin, kun taas Etäisisten perheiden lapsilla ilmeni viitteitä uhkaavien ärsykkeiden defensiiviisestä välttämisestä.

Tämä väitöskirjatutkimus osoittaa, että on tärkeää huomioida perheet kokonaisvaltaisina järjestelminä, joihin kuuluvat sekä äidit että isät, ja sekä vanhemmuus että parisuhde. Psykopatologian kehitystä kuvaavien teorioiden mukaisesti, väitöskirjan löydökset osoittavat, että hyvin varhaiset perheen ongelmat ennakoivat muutoksia lasten affektien säätelyssä, mikä puolestaan voi johtaa lasten mielialahäiriöiden kohonneeseen riskiin. Perhetyyppeihin liittyvät poikkeamat lasten sosiaalis-emotionaalisessa prosessoinnissa puolestaan viittaavat siihen, että lapset sovittavat affektien säätelyään niihin haasteisiin, joita he kohtaavat omassa varhaisessa perheympäristössään.

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LIST OF ORIGINAL PUBLICATIONS

The thesis is based on the following original publications, referred in the text as Studies I-IV.

I. Lindblom, J., Punamäki, R-L., Flykt, M., Vänskä, M., Nummi, T., Sinkkonen, J., Tiitinen, A., & Tulppala, M. (2016). Early family relationships predict children's emotion regulation and defense mechanisms. *Sage Open, 6*, 1–18. doi:10.1177/2158244016681393

II. Lindblom, J., Flykt, M., Tolvanen, A., Vänskä, M., Tiitinen, A., Tulppala, M., & Punamäki, R.-L. (2014). Dynamic family system trajectories from pregnancy to child's first year. *Journal of Marriage and Family, 76*, 796–807. doi:10.1111/jomf.12128

III. Lindblom, J., Vänskä, M., Flykt, M., Tolvanen, A., Tiitinen, A., Tulppala, M., & Punamäki, R-L. (2017). From early family systems to internalizing symptoms: The role of emotion regulation and peer relations. *Journal of Family Psychology, 31,* 316–326. doi:10.1037/fam0000260

IV. Lindblom, J., Peltola, M. J., Vänskä, M., Hietanen, J. K., Laakso, A., Tiitinen, A., Tulppala, M., Punamäki, R-L. (2017). Early family system types predict children's emotional attention biases at school age. *International Journal of Behavioral Development, 41,* 245–256. doi: 10.1177/0165025415620856

1 INTRODUCTION

When a child is born, its parents face the challenge of transitioning from a romantic couple to a group of three persons. New parenthood can bring deep satisfaction and joy, but can also be a source of distress and fatigue. Multiple changes occur in families in transition to parenthood, involving the gradual emergence of a relationship with the baby (Habib & Lancaster, 2006), renegotiating family roles between the parents (Glade, Bean, & Vira, 2005) and coping with the typical decline in marital satisfaction after the child's birth (Doss, Rhoades, Stanley, & Markman, 2009).

Importantly, while the parents undergo a transition in their identities and marital relationship, the infant is completely dependent on the parents' caregiving. Family relationships function to provide sense of safety for the child and essential support in learning the basic regulation of child's own emotions (Sameroff, 2010). However, relational problems in the family may also provoke distress and a sense of insecurity, steering the child to defensively process its own emotions (Cassidy, 1994). In severe cases, exposure to family-related stress can influence a child's psychophysiological stress regulation and neural circuits related to threat processing (Pechtel & Pizzagalli, 2011). Such early developmental alterations in children may have far-reaching influence on children's emotional functioning and well-being (e.g., Moutsiana et al., 2015).

Despite the common understanding about the importance of early family relationships on children, prospective studies spanning from infancy to middle childhood and later developmental periods are scarce. This is surprising, considering that the significance of very early experiences on later development is a classic question in psychology. Thus, we lack knowledge about the long-term effects of early family relationships on children's development and the related developmental mechanisms.

This dissertation contributes to previous developmental research by analyzing how family relationships during pregnancy and the child's first year predict children's emotional development in middle childhood. We conceptualize families as dynamic systems, and model them using both variable-oriented (i.e., dimensions of autonomy and intimacy) and person-oriented (i.e., family system types) methods.

In using the person-oriented approach, we expand previous family research by modeling highly complex family system types, comprised of both the intra-family relationship patterns and their dynamical changes over the transition to parenthood.

The central question of this dissertation is how the early family environment predicts children's affect regulation. Integrating the developmental, psychodynamic and cognitive traditions, we conceptualize children's affect regulation as emotion regulation, defense mechanisms and emotional attention biases. Together, these aspects cover both the conscious and unconscious management of affects, as well as both the behavioral manifestations and the underlying attentional processes of affect regulation. The unique integrative approach makes it possible to depict the specific effects of early family environments on children's affect regulation. Furthermore, the integrative approach allows us to better understand the reasons and processes which lead to children's altered affect regulation.

Finally, we analyze how the early family system types, together with contextual family factors, predict children's mental health in middle childhood. Following the developmental emotion regulation model of psychopathology (e.g., Morris, Silk, Steinberg, & Robinson, 2009), we test the mediating role of emotion regulation linking the early family environment to later anxiety and depression. Here, we expand previous research by using a prospective study-design and by focusing on the highly complex family system types. This part of the dissertation aims to demonstrate the practical significance of emotion regulation development on children's mental health. More importantly, we hope that the comprehensive analysis of early family environments and their consequences on emotional development can contribute to evidence- and theory-based tailoring of family and child interventions.

2 Family systems

According to systemic family theory, families are dynamic systems, composed of multiple interconnected parts (Minuchin, 1985; Watzlawick, Beavin, & Jackson, 1967). These involve individual family members, dyadic relationships (e.g., between mother and child) and family subsystems (e.g., the marital and parenting subsystems). The core premise is that these interconnected parts act together to constitute the holistic nature of the family. The family acts as a homeostatic system, which maintains some equilibrium through feedback loops between the different parts of the system (Minuchin, 1985). Such a process helps the family to adjust to new situations, and also to maintain continuity and stability of the family organization. Intriguingly, families differ in how their basic parts are interconnected, involving differences in, for example, the emotional connectivity of the family members and the strength of boundaries between subsystems. In this dissertation, we focus on family dynamics during the transition to parenthood. We conceptualize family systems to comprise both marital and parenting subsystems, in dimensions of both autonomy and intimacy. Extending family research, we model different family system types based on both the intra-family patterns and their dynamic changes over time.

2.1 Family structures: Subsystems and boundaries

Family subsystems can be formed on the basis of member characteristics (e.g., "boys of the family") and members can belong to multiple subsystems. However, the marital (or couple) and parenting subsystems are considered to be the most central parts of the family (Simon, 2008). The *marital subsystem* is usually present before the birth of a child and forms the basis for the family. It comprises the adult relationship between the parents, involving partnership and romantic aspects. The *parenting subsystem* consists of mother's and father's parenting and caregiving relationship with the child, considering both parents separately and together. Demonstrating the interconnection of the marital and parenting subsystems, research has shown robust support for the *spillover* effects, in that problems in the

marital subsystem are also detrimental to the quality of interaction within the parenting subsystem (Erel & Burman, 1995; Krishnakumar & Buehler, 2000).

The structural family approach emphasizes the importance of boundaries between family members and subsystems for family functioning (Minuchin, 1974, 1985). Boundaries between the marital and parenting subsystems are particularly important, owing to their highly different psychological and biological purposes (i.e., romantic vs caregiving). In *cohesive families* the boundaries tend to be clear but flexible. Such boundaries allow, for example, parents to successfully coordinate their parenting and marital relationship (McHale & Fivaz-Depeursinge, 1999), and prevent a negative spillover of marital problems onto parenting and the child (Krishnakumar & Buehler, 2000; Sturge-Apple, Davies, Cicchetti, & Fittoria, 2014).

In *enmeshed families*, the boundaries are overly diffuse and permeable. Enmeshed family members may lack proper psychological differentiation between the self and others, and may be overly concerned about other family members at the cost of their individuality (Kerig, 2005). Overly diffuse boundaries also increase spillover between the family systems (Sturge-Apple et al., 2014), and heighten the risk of cross-generational alliances, such as a parent turning to the child for comfort after experiencing marital problems (Kerig, 2005). In *disengaged families*, the boundaries are overly tight and impermeable. This limits communication and contact between family members and subsystems, and may lead to emotional distance between the family members (Minuchin, 1974).

2.2 Family dimensions: Autonomy and intimacy

Families can be characterized by two basic dimensions: autonomy and intimacy (Mattejat & Scholz, 1994). *Autonomy* refers to the degree of relational self-assurance, self-definition, agency and independence, and *intimacy* to the degree of emotional relatedness, bonding, acceptance, and sense of belonging (Mattejat & Scholz, 1994; Olson, 2000, 2011). These dimensions characterize individual family members, dyadic relationships and subsystems, as well as the overall emotional climate of the family. Highly similar dimensions have been identified in multiple fields of psychology, involving research into personality and motivation (e.g., self-definition and relatedness; Deci & Ryan, 2002; Luyten & Blatt, 2011), dyadic relationships (e.g., exploration and attachment; Bowlby, 1969; Leary, 1957), and cultural research (e.g., agency and interpersonal distance; Kagitcibasi, 2005; Keller, 2012). Such a permeable presence of autonomy and intimacy in both individuals

and interpersonal relationships suggests that the dimensions are deeply engraved in human nature, perhaps because of they have fostered survival during the evolution of human species (Guisinger & Blatt, 1994; Keller, 2008).

Cultural research has found that families have differing standards of valuing and expressing autonomy and intimacy, both between and within different cultures (Kagitcibasi, 2005; Keller, 2012). For example *interdependent* families, characterized by low autonomy and high intimacy, are traditionally present in collectivistic cultures and rural contexts. These families emphasize relatedness as the leading family value. Thus, the family members have a strong sense of duty, identify themselves as members of the family group rather than individuals, and perceive expressions of autonomy as a threat to the family community (Kagitcibasi, 2005; Olson, 2000). Typically, early parent-child interactions are characterized by close physical proximity and a high engagement in social, face-to-face interactions (Keller, Borke, Lamm, Lohaus, & Dzeaye Yovsi, 2011). However, *independent* families, characterized by high autonomy and low intimacy, are common in individualist cultures and urban contexts. These families emphasize autonomy as the leading family value. Such families are led with a relatively authoritarian style, their members tend to value independence and self-sufficiency, and may disregard expressions of and needs for intimacy (Kagitcibasi, 2005; Olson, 2000). Typically, early parent-child interactions in such families are characterized by an encouragement of exploration and object-oriented interactions (Keller et al., 2011).

Figure 1 shows a conceptual model of prototypical family types, integrating aspects of the structural (Minuchin, 1974, 1985), dimensional (Mattejat & Scholz, 1994; Olson, 2000) and cultural (Kagitcibasi, 2005) frameworks. The model is based on the notion that the sense of autonomy overlaps with that of family boundaries, as both concepts refer to differentiation and hierarchies between parts of the family system (Olson, 2000). Importantly, however, the function and meaning of autonomy depend on the amount of emotional intimacy in the family (Kagitcibasi, 2005). In western societies, both autonomy and intimacy are usually valued. When both of these are succesfully integrated, they lead to *cohesive family* relationships, characterized by functional family boundaries. This allows a sense of togetherness and individuality to co-exist in the family. Without autonomy, high levels of intimacy tend to lead to *enmeshed family* relationships, characterized by overly diffuse family boundaries, negative spillover, and lack of individuality. Without intimacy, high levels of autonomy can lead to *authoritarian family* relationships, characterized by rigid family boundaries, emotional distance and overemphasis on individuality. Finally, the lack of both autonomy and intimacy can

lead to *distant family* relationships, characterized by a lack of the very basic elements that constitute the family group. Boundaries in such families are chaotic, family roles are unclear, and a sense of togetherness is lacking.

To further demonstrate the interplay between autonomy and intimacy, Figure 1 shows related differences in adult romantic attachment styles (Marvin & Stewart, 1990), parenting styles (Olson & Gorall, 2006), and cultural (Kagitcibasi, 2005) family models. It is important to note, however, that the model does not imply causal relations or direct correspondence between these phenomena and the prototypical family types.

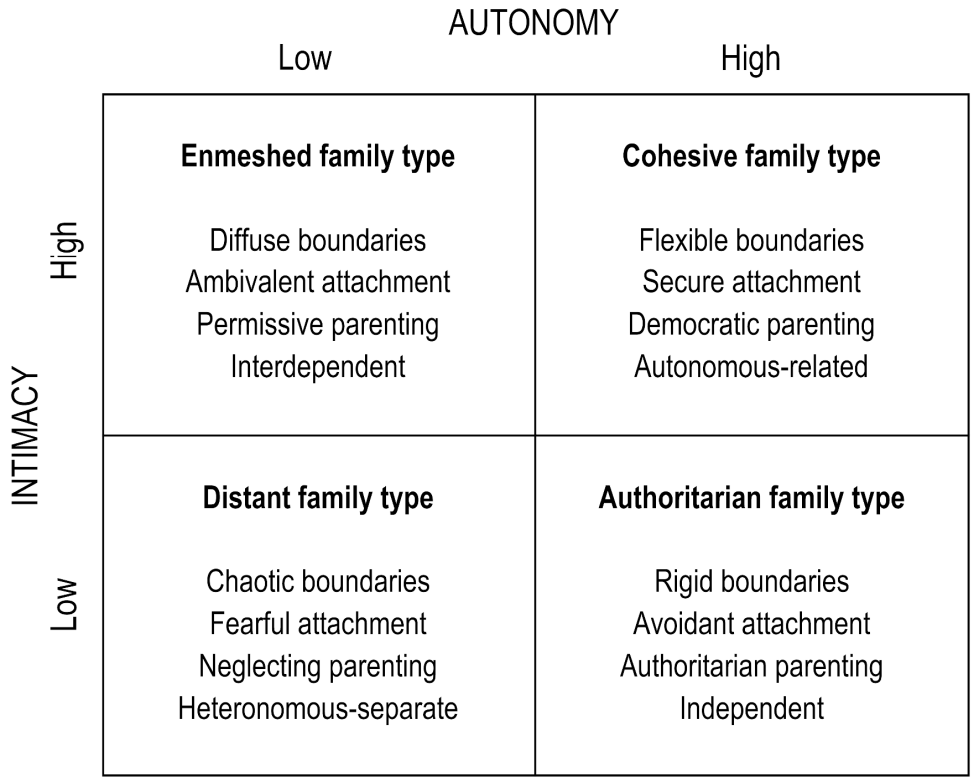

Figure 1. Integrative model of prototypical family types composed of autonomy and intimacy. The model integrates elements from family (Minuchin, 1974, 1985; Olson, 2000), attachment (Marvin & Stewart, 1990), parenting (Olson & Gorall, 2006) and cultural (Kagitcibasi, 2005) research.

2.3 Family changes: Transition to parenthood

A transition to parenthood can already begin when a couple simply contemplates having a child, but at the very least during pregnancy, all parents begin to form mental expectations about the forthcoming child, and about themselves as mothers or fathers (Ammaniti et al., 1992; Slade, Cohen, Sadler, & Miller, 2009). During the transition, the parents experience challenges in multiple domains, involving intrapsychological processes (e.g., changes in their own identity and values), their marital relationship (e.g., renegotiating family roles and sharing of domestic labour) and the actual parent-child relationship with the child (e.g., developing caregiver skills and new responsibilities) (Glade, Bean, & Vira, 2005). In this dissertation the families are followed across the transition to parenthood, from pregnancy to child's age of 2 and 12 months. From the perspective of family research, this period is highly salient, as the families are under pressure to change and reorganize.

2.3.1 Changes in the marital subsystem

During the child's first year of life, the parents can usually find deep satisfaction and joy from interactions with the child, but may also experience fatigue and frustration about the limited time left for themselves as individuals and as a romantic couple (Twenge, Campbell, & Foster, 2003). Research has convincingly shown that, on average, quality of marital relationship declines from the pre- to the postnatal period (Twenge et al., 2003). This involves both a fall in the positive aspects of the relationship such as affection and intimacy, and a rise in the negative, such as conflicts (Doss et al., 2009). The largest decline in marital satisfaction seems to occur during the postpartum period (Doss et al., 2009; Lawrence, Nylen, & Cobb, 2007; Wallace & Gotlib, 1990), and some studies suggest that these changes can last over 4 years (Doss et al., 2009; Kluwer & Johnson, 2007). Based on a meta-analysis ($k = 97$), Twenge et al. (2003) found that marital satisfaction was lower among parents of infants than parents of older children, and particularly low among mothers. It is likely that maternal dissatisfaction stems from the highly increased domestic work-load and intensive demands of infant care during early caregiving. However, a decrease in marital satisfaction is not limited merely to first-time parents, but instead tend to grow larger as the number of children increases (Twenge et al., 2003).

Importantly, couples can show a high variation in the changes within their marital relationships during the transition to parenthood. Empirical research has shown that approximately one third to one half of couples experience stability or even an increase in relationship satisfaction during the transition (Belsky, Hsieh, & Crnic, 1998; Doss et al., 2009; Shapiro, Gottman, & Carrère, 2000). Volling, Oh, Gonzales, Kuo, & Yo (2015) examined longitudinal trajectories of marital satisfaction, based on both parents' experiences from the prenatal period to child's age of 1, 4, 8 and 12 months. The results found six distinctive trajectories, which demonstrated both decreasing and increasing trends in marital satisfaction, as well as some discrepancies between the mothers' and fathers' experiences. For example, in some families, fathers experienced less positive aspects of the marital relationship than mothers.

2.3.2 Emergence of the parenting subsystem

Both mothers and fathers already begin to build emotional bonds with the baby during pregnancy, as they form mental representations and expectations about the forthcoming child and parenthood (Slade et al., 2009; Habib & Lancaster, 2006). Mothers tend to have more elaborate and positive representation of the child-to-be and parenthood than fathers (Abramson, Mankuta, Yagel, Gagne, & Knafo-Noam, 2014; Lawrence et al., 2007; Pancer, Pratt, Hunsberger, & Gallant, 2000). It is possible that mothers advance faster in their psychological transition due to their prenatal physical and hormonal changes as well as the ongoing bodily connection with the fetus (Genesoni & Tallandi, 2009). There is some evidence that fathers' prenatal mental representations about the child and parenthood are colored by their experience of the marital relationship, such that maritally satisfied fathers tend to have more positive expectations (Lawrence et al., 2007). To some extent, parents also seem to share their expectations regarding forthcoming parenthood, as they agree in their expectations about how they will parent the child (Abramson et al., 2014).

Positive prenatal expectations involving, for example, high parenting autonomy and emotional bonding with the child, predict more positive parenthood in the postnatal period (Biehle & Mickelson, 2011; Delmore-Ko, Pancer, Hunsberger, & Pratt, 2000; Flykt et al., 2009). Particularly among mothers, parenting autonomy has a relatively strong continuity from the pre- to postnatal period, whereas fathers' parenting autonomy seems to develop in step with their actual parenting

experiences during the postnatal period (Leerkes & Burney, 2007). In one study, mother's prenatal mental representations during the third trimester of pregnancy predicted actual parenting at the child's age of 12 months (Dayton, Levendosky, Davidson, & Bogat, 2010). Mothers' *balanced* prenatal representations, characterized by acceptance and high intimacy, predicted highly sensitive and engaged parenting; mothers' *disengaged* representations, characterized by low intimacy and emotional deactivation, predicted intrusive and controlling parenting; and finally, mothers' *distorted* representations, characterized by chaotic and bizarre descriptions of the forthcoming child, predicted teasing and hostile parenting. Although there are fewer studies concerning fathers, it has been found that fathers' general sense of *autonomy* (e.g., high sense of agency in work) predicted children's cognitively rich play at the age of 2 years, and greater autonomy support for the child at 5 years (Grossman, Pollack, Golding, & Fedele, 1987). Furthermore, a father's general prenatal sense of *intimacy* (e.g. sense of relatedness in marital relationship) predicted greater intimacy in parenting at the child's ages of 2 and 5 years.

During the postnatal period, mothers tend to experience more positive emotions concerning parenting, and to have a higher sense of parenting autonomy and competence than fathers (Lawrence et al., 2007). However, prenatal expectations do not always correspond with actual postnatal experiences. First-time parents in particular may experience a negative violation of expectations during the first months after birth as they face the tremendous responsibility of parenthood (Flykt et al., 2009; Gross & Marcussen, 2016). After the first months, however, both mothers and fathers often experience an increase in their parenting autonomy compared to their prenatal expectations (Gross & Marcussen, 2016; Porter & Hsu, 2003).

2.3.3 Interplay between the subsystems

In line with family systems theory, marital and parenting subsystems interact during the transition to parenthood. Research has shown that in families with infants the marital problems tend to spillover into parenting (Belsky, Youngblade, Rovine, & Volling, 1991; Christopher, Umemura, Mann, Jacobvitz, & Hazen, 2015; Erel & Burman, 1995; Krishnakumar & Buehler, 2000; McHale et al., 2004). For example, dysfunctional interaction patterns can cross between the parents in the marital subsystem and thereby influence their parenting (Barnett, Deng, Mills-Koonce,

Willoughby, & Cox, 2008). Thus, marital problems during the prenatal period present a risk for the whole family.

Gendered processes during the transition to parenthood are also involved in how marital and parenting subsystems influence each other. There is some evidence that fathers' parenting is influenced more by the quality of the marital relationship than the mothers' parenting (Belsky et al., 1991; Stroud, Durbin, Wilson, & Mendelsohn, 2011), and fathers tend to withdraw from early parenting when experiencing marital difficulties (Christopher et al., 2015; Elliston, McHale, Talbot, Parmley, & Kuersten-Hogan, 2008). For example, Christopher et al. (2015) examined how changes in the quality of marital relationship, from the third trimester of pregnancy to child's age of 8 and 24 months, predicted the parents' ability to coordinate their parenting interactions at the childs' age of 24 months. Only the fathers' experience of declining marital quality, not the mothers', predicted a poor quality of coparenting (e.g., competition and low cooperation between parents when interacting with their child) and fathers' withdrawal from the parenting tasks.

The roles of parents tend to become more traditional during the transition to parenthood, in that women perform more housework and childcare tasks than men, who adopt the breadwinner role in the family (Katz-Wise, Priess, & Hyde, 2010). However, mothers often experience a burdening division of labor, and may feel disappointment about the father's lack of contribution to the household and parenting tasks (Adamsons, 2013). Such violations of expectations about parenthood are a significant source of marital dissatisfaction (Adamsons, 2013; Maas, McDaniel, Feinberg, & Jones, 2015), with negative repercussions on the couple's parenting sensitivity (Krishnakumar & Buehler, 2000).

2.3.4 Predictors of the changes

Family research has identified various family-related factors that predict the quality of and changes in marital and parenting subsystems. Some of the findings in previous studies have been ambiguous, possibly due to the high variety of family systems. In this dissertation, we examine how parental education level, parity, length of relationship and former infertility predict family dynamics during the transition to parenthood. *Parental education level* may associate with both positive and negative family changes. In some studies, high parental education level has been found to protect against the decline of marital satisfaction (Mortensen, Torsheim,

Melkevik, & Thuen, 2012) and to predict sensitive parenting (Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004). Yet, in other studies, high parental education has been found to predict steeper decline in marital satisfaction (Katz-Wise et al., 2010; Twenge et al., 2003) and a low sense of parenting autonomy and intimacy (Arnott & Brown, 2013; Mercer & Ferketich, 1995). High parental education level may decrease family stress due to better economic resources, but may also produce conflicts between parental and professional identities, and in the allocation of time between family and work.

Both *parity* and *length of relationship* are important factors in defining how parents experience the birth of a new child. Typically, marital satisfaction declines most sharply among first-time parents (Dush & Taylor, 2012; Twenge et al., 2003) and among couples with short relationship duration (Belsky & Rovine, 1990; Doss et al., 2009; Volling et al., 2015). These parents may experience heightened conflict between the romantic-marital and caregiving roles, as young couples tend to experience their marital relationship as affectionate love (Murray, Holmes, & Griffin, 1996). Indeed, marital satisfaction declines over time even without children (Doss et al., 2009), and in long marriages the spousal roles tend to become more traditional in terms of division of family work (Grote, Frieze, & Stone, 1996). Regarding parenting, it is known, for example, that first-time parents experience stronger prenatal attachment than multiparous parents (Condon & Corkindale, 1997; Lorensen, Wilson, & White, 2004) but may also experience lower parenting autonomy (Mercer & Ferketich, 1995). Altogether, it is likely that first-time parents and parents with short relationship duration experience larger changes in their family relationships, whereas multiparous parents and those with longer relationship have already gone through many transitional changes, and are better prepared for the challenges of parenthood.

Infertility affects every sixth couple in the western world and four percent of Finnish children are born after assisted reproductive treatments (ART) (Statistics Finland, 2013). Approximately half of the parents in the sample used in this dissertation have experienced involuntary infertility. It is a major life crisis threatening dreams of parenting and one's self-image as a parent. Yet, numerous studies report better marital quality among parents who conceived with assisted reproductive treatment (ART) compared to naturally conceiving (NC) couples, because resolving a shared crisis strengthens the marital relationship (Darwiche, Favez, Simonelli, & Antonietti, 2015; Hammarberg, Fisher, & Wynter, 2008). Due to their high investment in parenthood, ART mothers and fathers are usually highly motivated as parents (Barnes et al., 2004). Whereas most studies suggest

similar postnatal parenting quality between ART and NC parents (Wilson, Fisher, Hammarberg, Amor, & Halliday, 2011), during the prenatal period, ART parents have been observed to be less playful in their simulated triadic interactions with the baby, perhaps indicating difficulties in adopting the parental role (Darwiche et al., 2015). Furthermore, ART mothers tend to be more protective of their children (Barnes et al., 2004), possibly due to an increased fear of losing them. Altogether, although ART parents are well-prepared for parenthood, it is possible that they experience the transition to parenthood more intensely compared to NC parents.

2.4 Person-oriented approach to families

The high complexity of family systems poses a serious challenge for research. A traditional *variable-oriented approach* typically considers only a few relationship elements at a time. It assumes that the variables have the same meanings across all families, and tends to focus only on linear associations. Such an approach may not sufficiently capture the systemic properties of families. Therefore, a *person-oriented approach* is better suited for research into family systems, as it can be used to model the families as organized totalities (Bergman & Magnusson, 1997; Mandara, 2003). Person-oriented methods identify homogenous groups based on patterns across multiple variables, which represent unique profiles and/or changes over time. In this dissertation, we use a person-oriented approach to identify different family system types (FSTs) during pregnancy and across the child's first year.

Somewhat surprisingly, there are relatively few person-oriented studies involving the assessment of both marital and parenting subsystems. Belsky and Fearon (2004) identified FSTs based on parents' (n = 829) self-reporting of marital intimacy (e.g., emotional sharing and support) and their observed parenting sensitivity (e.g., warmth and non-intrusiveness). Although they involved multiple assessments from the child's age of 1 to 54 months, the assessments were averaged over time. Latent class analysis identified five FSTs, labeled as *consistently supportive* (15%), *consistently moderate* (44%), *consistently risky* (15%), *good parenting and poor marriage* (19%), and *poor parenting and good marriage* (7%). As indicated by the labels, three of the FSTs had consistent and comparable levels (high, moderate or low) of marital satisfaction and parenting quality, and two of the FSTs showed an asymmetric pattern between marital satisfaction and parenting quality. The combination of good parenting and poor marriage as well as poor parenting and good marriage are the most interesting family types, because they indicate intra-

family asymmetries between the subsystems. It is possible, for example, that families with the combination of good parenting and poor marriage had functional family boundaries, which helped the parents to compartmentalize their marital problems within the marital subsystem. Differences between mothers and fathers did not emerge in any of the FSTs, perhaps indicating that the averaged nature of the data precluded the identification of more granular family relationship patterns.

Davies, Cummings, and Winter (2004) identified FSTs (n = 221) at the child's age of 6 years based on the marital relationship (e.g., hostility and affection), coparenting (e.g., disagreements about parenting) and parenting practices (e.g., psychological control and acceptance). Both mothers and fathers participated, but their reports were averaged before identifying the FSTs. Cluster analysis identified four FSTs, labeled as *cohesive* (46%), *adequate* (17%), *enmeshed* (8%), and *disengaged* (29%). Cohesive families were characterized by high levels of warmth, low conflict and optimal parenting. Adequate families closely resembled cohesive families, with the exception that the parents used a relatively high amount of psychological control. Enmeshed families were characterized by modest to moderate levels of warmth, but also high levels of coparenting disagreements and reliance on psychological control. Disengaged families were characterized by exceptionally low levels of warmth, a high level of conflicts and poor quality of parenting. Compared to children in cohesive families, children in enmeshed and disengaged families had heightened externalizing (reported by both parents and teachers) and internalizing symptoms (parental reports only) at a one-year follow-up.

Sturge-Apple, Davies, Cicchetti, and Fittoria (2014) identified FSTs (n = 186) at the child's age of 24 months based on numerous observed and maternally reported indicators of interparental conflicts (i.e., expressions of anger, verbal and physical aggression, and escalation of conflicts) and parenting characteristics (i.e., parental empathy, emotional support, physical punishment, insensivity, and harshness). Latent class analyses identified three FSTs, labeled as *adequate functioning* (37%), *spillover* (28%) and *compartmentalization* (35%). Adequate functioning families were characterized by constructive conflicts and moderately sensitive parenting; spillover families were characterized by destructive conflicts and harsh parenting, interpreted to indicate negative spillover from interparental problems to parenting. Compartmentalization families were characterized by destructive conflicts combined with highly sensitive parenting. Interestingly, children from spillover families showed decreased cortisol levels and increased anxiety and depression at the age of 3 years, thereby demonstrating the detrimental effects of overly

permeable family boundaries on children's psychophysiological stress regulation and mental health.

Malinen, Kinnunen, Tolvanen, Rönkä, Wierda-Boer and Gerris (2010) identified FSTs based on parents' (n = 433) self-reporting of the marital satisfaction (e.g., sense of the partner meeting one's needs) and quality of parent-child relationship (e.g., warmth and harmony) among couples with child under the age of 7 years. Latent class analysis identified four FSTs, labeled as *satisfying relationships* (73%), *unsatisfying parent-child relationships* (14%), *dissatisfied men* (6%), and *dissatisfied women* (7%). Families with satisfying relationships were the most common family type, characterized by high relational quality in both the marital and parenting relationships. Parents from unsatisfying parent-child relationships experienced high marital satisfaction but difficulties in parenting. Interestingly, in both dissatisfied men and dissatisfied women families, only one of the parents experienced low marital satisfaction and difficulties in parenting. The latter results suggest that the negative spillover may occur only for one parent in the family, whereas the other parent can maintain positive experience of the family relationships.

In two studies, Johnson (2003, 2010) identified FSTs (n = 68) from children of kindergarten age (5-6 years) to fourth grade (9-10 years) and ninth grade (14-15 years). Multiple assessments provided a unique opportunity to examine changes and consistency in FSTs over time. The identification was based on observed family interactions, involving whole-level family cohesion (i.e., respect for autonomy and expressions of intimacy), and the quality of the marital and parenting subsystems (e.g., expressions of interest and emotional support). Quality of parenting was coded separately for both parents. Cluster analysis identified *cohesive* (49%), *strong father-child alliance* (32%) and *strong mother-child alliance* (19%) families at the kindergarten age; *cohesive* (35%), *strong father-child alliance* (16%) and *separate* (49%) at the fourth grade; and *cohesive* (53%), *separate* (35%) and *detouring* (12%) families at the ninth grade. Cohesive families were the most common family type, characterized by high relational quality in all family subsystems. Separate families were instead characterized by low relational quality in all family subsystems. In families with strong alliances between the father or the mother and the child, the family cohesion and quality of marital relationship was relatively low, suggesting the presence of dysfunctional intergenerational alliances. In detouring families the marital quality was high, but the quality of parenting subsystem was low. Against expectations, however, there was practically no continuity in FSTs across time. It is possible that this was due to the relatively long time span between the assessments (e.g., 4 to 9 years), during which the family systems may have

considerably changed. Furthermore, the relatively small sample size may have precluded the statistical identification of any continuity over time.

To our knowledge, the study by Favez, Frascaloro, & Fivaz-Depeursinge (2006; reported also in Favez et al., 2012) was the first to use a person-oriented approach to family systems during the transition to parenthood (n = 38). The identification was based on the overall quality of observed triadic family interactions (e.g., all family members participate and co-operate) during the second trimester of pregnancy, and child's age of 3, 9 and 18 months. In assessment during pregnancy, the couple was asked to simulate their first meeting with the baby, thereby assessing couples prenatal expectations. Cluster analysis identified three FST's, labeled as *high stable* (50%), *high to low* (26%), and *low stable* (24%). As indicated by the labels, high stable families maintained a high quality of triadic interactions over the transition to parenthood, whereas high to low families showed a decrease in interaction quality from 3 to 9 months, and low stable families had relatively low quality of triadic interactions over the transition to parenthood. At the age of 5 years, children from low stable families showed poor social understanding, and children from high to low families showed increased mental health problems. It is noteworthy that even though the assessments involved both parents and the child, the quality of family relationships was assessed at a global level, precluding the identification of possible intra-family patterns (e.g., mother-child alliances).

In summary, previous person-oriented studies have empirically demonstrated that family systems differ in their overall level of relational quality, as well as in their intra-family relationship patterns, involving triadic relationships and dynamics between the family subsystems. However, while the previous studies help us understand the holistic nature of families, they provide only a limited knowledge about the changes in families that occur over time. Indeed, almost all studies have used cross-sectional (or aggregated) data to identify FSTs. Only one study (Favez et al., 2006) has examined longitudinal family trajectories during the transition to parenthood, but it was based on unidimensional assessment on family relationship quality, making it less clear whether the trajectories were homogenous in terms of the intra-family relationship patterns. Hence, this dissertation extends previous research by identifying FSTs based on both the intra-family relationship patterns and their longitudinal dynamics. We aim to provide a better picture of the naturally occurring FSTs over the transition to parenthood, and subsequently, to better understand their influence on children's affect regulation development and mental health.

3 Significance of early family relationships on child development

During infancy, children form their basic beliefs about the self and others, learn how to express and regulate their own emotions, and attune their biological stress regulation (Easterbrooks, Bartlett, Beeghly, & Thompson, 2012). This development occurs within the context of family relationships (Belsky, 1981), with potentially long-standing effects on children's life trajectories (Bornstein, 2014). There now follows a summary of three theoretical frameworks, which help conceptualize why different aspects of families (i.e., parent-child relationships, marital relationship, and the overall quality of the family climate) can influence children's affect regulation development. The frameworks are attachment theory (Ainsworth, Blehar, Waters, & Wall, 1978; Bowlby, 1969), emotional security theory (Davies & Cummings, 1994; Davies & Martin, 2013) and research on the psychobiological effects of early life stress (Boyce & Ellis, 2005; Giudice, Ellis, & Shirtcliff, 2011).

3.1 Attachment theory and parent-child relationships

According to *attachment theory*, infants form special bonds with their primary caregivers (Bowlby, 1969). Children's attachment behaviors, such as crying and searching for the parent, are considered to be evolutionary adaptive responses, which ensure protection and physical proximity to the caregiver. Ainsworth et al. (1978), using an observation paradigm called *Strange situation*, noted individual differences in 12-month-old infants' behavioural responses to maternal presence and separation. These responses represent secure and insecure strategies, reflecting the infant's mental representations about how available and willing the caregiver is to provide help and protection (Ainsworth et al., 1978; Bowlby, 1969). More specifically, *securely attached* children, who have most likely received sensitive caregiving, are able to trust in the help of the parent and to express their emotions openly. In contrast, *ambivalently attached* children, who have probably received unpredictable caregiving, tend to exaggerate their expressions of distress and

helplessness. Finally, *avoidantly attached* children, who have probably received emotionally unresponsive caregiving, tend to minimize their expressions of distress and neediness. Finally, children with *disorganized attachment*, who have probably received frightening or frightened caregiving, have failed to develop a coherent response pattern with the caregiver. They may exhibit contradictory behaviours such as freezing or overt displays of fear (Main & Solomon, 1990). In general, children's attachment styles relate to their sense of autonomy, i.e., courage to explore their environment, and intimacy, i.e., an ability to approach the parent when distressed (Ainsworth et al., 1978; Sochos, 2013).

The quality of parent-child relationships, involving both mothers and fathers, is decisive in shaping infants' attachment style (van IJzendoorn & De Wolff, 1997). Longitudinal studies suggest that the quality of early caregiving predicts attachment security in later childhood and even in adulthood (Fraley, Roisman, Booth-LaForce, Owen, & Holland, 2013; McConnell & Moss, 2011). Furthermore, research shows attachment security to predict children's social competence ($k = 80$; Groh et al., 2014) and low emotional and behavioral problems ($k = 42$; Groh et al., 2012). These results suggest that the attachment style also generalizes and influences children's lives outside of the caregiver-child relationship.

Various authors have suggested that the whole family system is an important context for the parent-child relationship and for the development of children's attachment (e.g., Belsky, 1981; Crittenden & Dallos, 2009; Rothbaum, Rosen, Ujiie, & Uchida, 2002), although empirical research is scarce. Stevenson-Hinde (1990) hypothesized that interaction styles of cohesive, enmeshed and disengaged families would correspond with children's secure, ambivalent and avoidant attachment styles, respectively. For example, parenting in enmeshed families, with overly permeable family boundaries, would be intrusive and erratic, leading to children's ambivalent attachment; and parenting in disengaged families, lacking emotional intimacy, would be distant and unsupportive, leading to children's avoidant attachment. Empirically, Finger, Hans, Bernstein, & Cox (2009) found that interparental conflicts were associated with the mother's parenting insensitivity and the infant's insecure and disorganized attachment styles. Surprisingly, however, the effects of interparental conflicts on children's attachment were not mediated through the mother's parenting sensitivity, indicating that an infant's exposure to interparental conflicts may also directly influence their attachment.

3.2 Emotional security theory and the interparental relationship

According to *emotional security theory*, children have a prominent goal of maintaining a sense of psychological and physical security in the family context (Cummings & Davies, 1996; Davies, Sturge-Apple, & Martin, 2013). Interparental discord and family conflicts pose a threat to children's sense of security. Such a threat activates processes regarding mental representations (e.g., thoughts about the consequences of the interparental conflict), emotions (e.g., expressions of fear), and regulatory behaviors (e.g., intervening in the interparental conflict). These processes help the child to cope with the insecurity originating from the interparental conflicts, which is a particularly great challenge, because the parents act as the source of distress instead of providing protection for the child (Davies & Martin, 2014).

Prolonged and repeated exposure to interparental conflicts decreases children's emotional sense of security. There is considerable evidence that the children's insecurity mediates the effects of interparental conflicts, as well as the effects of both enmeshed and disengaged families, on children's internalizing and externalizing symptoms and peer problems (Cummings, George, Mccoy, & Davies, 2012; Davies et al., 2004; Du Rocher Schudlich & Cummings, 2007; McCoy, Cummings, & Davies, 2009). Further demonstrating the detrimental effects of insecurity, studies have found children's attention problems (Davies, Woitach, Winter, & Cummings, 2008) and negative interpretations about peer relationships (Bascoe, Davies, Sturge-apple, & Cummings, 2009) to mediate the effects of emotional insecurity on poor school adjustment. Altogether, these results suggest that children's emotional insecurity depletes psychological resources, which heightens the risk of various social-emotional problems.

Most studies of the emotional security theory have focused on kindergarten and school-aged children. However, some infant studies demonstrate the significance of the interparental relationship on children's early development. For example, Du Rocher Schudlich, White, Fleischhauer, & Fitzgerald (2011) observed 6- to 14-month old infants' responses to a live interparental conflict in a laboratory setting. They found that parent's both depressive (e.g., withdrawal) and destructive (e.g., expressions of anger) conflict tactics predicted infants' heightened affect dysregulation (e.g., high distress and contradictory regulatory attempts). Importantly, the infants' history of being exposed to previous interparental conflicts at home further heightened their affect dysregulation. Such results indicate that interparental conflicts already influence children's emotional development during infancy.

The revised version of the emotional security theory emphasizes the role of evolutionary and ethological perspective (Davies & Martin, 2013, 2014). Its novel thesis is that children's strategies for maintaining sense of security are governed by a set of evolved behavioral control systems that have functioned to promote survival and reproduction (Davies & Martin, 2013). *Social defense system* is hypothesized to organize the operation of systems related to exploration (e.g., autonomous functioning and competence), affiliation (e.g., intimacy and cooperation) and caregiving (e.g., empathy and helping behavior). According to the theory, children can be categorized into four groups based on their responses to interparental conflicts and their strategy to cope with emotional insecurity.

(a) Children with *secure strategy* are characterized by circumscribed responses to signs of threat. The child may express mild distress and empathic concern for the parents, but is able to maintain a sense of self-confidence during interparental conflicts.

(b) Children with *mobilizing strategy* show heightened responses to threats and attempt to actively maintain social ties with the parents. The child may express dramatic displays of vulnerability, and/or may attempt to provide comfort to the parent during or after interparental conflict.

(c) Children with *dominant strategy* attempt to defeat the threat through aggressive posturing. The child suppresses its own vulnerable emotions and may be angry and commanding towards the parents.

(d) Children with *demobilizing strategy* attempt to reduce the risk of becoming a target of parental hostility during the conflicts. The child may freeze, mask its own emotions or appear overly submissive towards the parents.

Intriguingly, the revised version of the theory hypothesizes that each of the four strategies have different family precursors (Davies & Martin, 2014). In summary, (a) secure strategy would develop in the context of cohesive and relatively harmonious families; (b) mobilizing strategy would develop in the context of enmeshed families which often involve child-related interparental conflicts; (c) dominant strategy would develop the context of disengaged families which rarely achieve resolutions for the interparental conflicts; and finally, (d) demobilizing strategy would develop in response to harsh family environment, often involving interparental violence and aggression.

3.3 Psychobiological effects of early life stress

Studies of early life stress have focused on the effects of adversities during infancy and early childhood, involving parental emotional and physical abuse and neglect. Research combining both neural and behavioral assessments suggests that early adversity predicts alterations in both cognitive (e.g., executive) and affective (e.g., emotion regulation) functions (Pechtel & Pizzagalli, 2011). Early adversities have been associated with alterations in brain structures responsible for basic emotional learning and responding (i.e., amygdala), inhibition and self-regulation (i.e., cortical areas), and maintaining autobiographical memory (i.e., hippocampus) (Hanson et al., 2015; Pechtel & Pizzagalli, 2011; Teicher & Samson, 2016). Some studies suggest that early life stress disrupts the development of hormonal regulation (i.e., hypothalamic-pituitary adrenal–axis; HPA), which may be partly responsible for altered neural development (Frodl & O'Keane, 2013; Lupien, McEwen, Gunnar, & Heim, 2009). It is worth noting, however, that there are ambiguous results about the effects of early adversity, suggesting the specific type of stressors (e.g., neglect vs abuse), timing (e.g., early vs late), and developmental cascading effects (e.g., later peer relations) may modulate the effects of early life stress on later development (Frodl & O'Keane, 2013; Lupien et al., 2009).

From an evolutionary perspective, it has been suggested that the neural and psychophysiological alterations have had some adaptive value during the development of the human species (Belsky & Pluess, 2009; Boyce & Ellis, 2005; Frankenhuis, Panchanathan, & Nettle, 2016; Giudice et al., 2011). For example, attentional vigilance towards threat cues and reduced behavioral inhibition – both observed among children from harsh and unpredictable families – are likely to foster rapid detection of threats and allow flexible responses during rapidly changing situations (Mittal, Griskevicius, Simpson, Sung, & Young, 2015; Pollak, 2008; Romens & Pollak, 2012). In general, cognitive and emotional alterations among children with early life stress may have developed as a coping mechanism within their chaotic family environment (Frankenhuis et al., 2016).

In an attempt to provide an integrative framework to understand the evolutionary significance of early life experiences, Del Giudice and colleagues proposed an *Adaptive calibration model* (ACM; Giudice, 2014; Giudice, Ellis, & Shirtcliff, 2013). According to ACM, a child's developmental environment tunes the *stress response system* to increase survival and fitness. The stress response system (a) coordinates physiological (e.g., HPA –axis functioning) and behavioral responses to environmental threats and opportunities, (b) encodes and filters

information about social and physical environment and (c) regulates the traits related to long-term adaptation, involving competitive risk-taking, cooperation and attachment.

The quality of a child's developmental environment, involving the quality of parental support, unpredictability and harshness, tunes stress responsivity to match the demands of the larger ecological environment. Intriguingly, ACM hypothesizes the developmental effects to be curvilinear. Growing up in both highly safe and highly threatening environments would lead to high stress responsivity and amplified responses to threat cues. In (a) highly safe environments, children's heightened responsivity would function to foster learning and receiving support from others (i.e., *sensitive profile*), whereas in (b) highly threatening and unpredictable environments the children's heightened responsivity would foster coping with dangers (i.e., *vigilant profile*). Interestingly, growing up in (c) moderately stressful environments would lead to dampened stress responsivity and a high threshold in detecting threat cues, which would function to prevent unnecessary stress responses and conserve energy (i.e., *buffered profile*). Finally, growing up in environments provoking (d) severe and traumatic stress would lead to highly dampened stress responsivity – especially among boys – characterized by antisocial and exploitative tendencies (i.e., *unemotional profile*). Such characteristics would foster coping within extremely dangerous and competitive environments.

In summary, the three theoretical frameworks introduced here focus on different aspects of families: Attachment theory focuses on the parent-child relationships; the emotional security theory focuses on the interparental relationship; and research on early life stress on the more general quality of the family environment. Importantly, all three theories posit that alterations in children's social, psychological and physiological responses are organized to help the child to adapt to the opportunities and threats in their developmental environments. Although such a claim about adaptation is difficult to empirically test, it guides our main hypothesis that the early family environments influence children's affect regulation, involving regulation of emotional experiences and expressions, defensive limiting of painful experiences, and attentional processing of social-emotional information. Furthermore, in line with the reviewed theories, we posit that children's patterns of adaptive responses are best understood when considering their family environment as a whole using a person-oriented approach (see 2.4).

4 Development of affect regulation

Affect regulation is one of the most important developmental tasks during childhood. It involves the regulation of emotions, mood, stress and motivational impulses, which help to maintain, for example, social relationships, goal-directed behaviors, and a sense of security (Gross & Thompson, 2007; Hart, 2014; Koole, 2009; Kopp & Neufeld, 2003). In general, during infancy, children's affect regulation is highly dependent on their parents' help, but later progresses towards more independent forms of regulation (Kopp & Neufeld, 2003; Sameroff, 2010). As depicted by attachment theory (see 3.1), emotional security theory (see 3.2) and psychobiological models (see 3.3), the quality of children's early relationships is crucial in shaping their affect regulation, reflecting their adaptation to their specific family environment.

According to Gross and Thompson, *affect regulation* refers to multiple regulatory processes, involving emotion regulation and defense mechanisms (Gross, 1998; Gross & Thompson, 2007). The most important difference between these two concerns their mode of function: Emotion regulation has been suggested to operate both consciously and unconsciously (Gross & Thompson, 2007; Mauss, Bunge, & Gross, 2007), whereas self-deceptive defense mechanisms are thought to operate unconsciously (Cramer, 2008; Gross & Thompson, 2007; Vaillant, 1995). Furthermore, emotion regulation is often conceptualized to focus on managing discrete emotional states (Gross, 1998; Gross & Thompson, 2007), whereas defense mechanisms can be used to manage a larger range of motivational impulses and needs (Hart, 2014; Vaillant, 1995).

Only a few empirical studies have considered emotion regulation and defense mechanisms together, probably because of their different origins in cognitive versus psychodynamic and clinical research traditions (Sala, Testa, Pons, & Molina, 2015). Furthermore, while substantial empirical research is available on the development of emotion regulation (Eisenberg, Spinrad, & Eggum, 2010; Kopp & Neufeld, 2003; Transactions, 2007), research on children's defense mechanisms and their early predictors is scarce (see Cramer, 2006). In this dissertation, we extend previous reseach by examining the early family predictors of both emotion regulation and defense mechanisms.

4.1 Emotion regulation

Emotion regulation comprises the internal and external processes involved in initiating, maintaining, and modulating the occurrence, intensity, and expression of emotions (Morris et al., 2009; Thompson, 1994). Emotions can be regulated at various stages before, during and after experiencing the event that provokes them (Gross, 1998; Gross & Thompson, 2007). In early development, young children have limited cognitive and motor skills, and thus depend heavily on their caregivers help to regulate their emotional states (Kopp & Neufeld, 2003).

An infant's ability to focus attention appears in early infancy and serves as a primary regulatory system until more complex skills develop (Posner & Rothbart, 2007). At about the age of 3 months, caregivers can soothe an infant's distress by capturing its attention with the help of some interesting object, such as a toy (Rothbart, Sheese, Rueda, & Posner, 2011), and infants show some behaviors indicating self-soothing, such as touching their own hair (Bridges & Grolnick, 1995). By 4 to 5 months, infants can regulate distress by avoiding stress-provoking stimuli (Kopp & Neufeld, 2003; Mesman, Ijzendoorm, & Bakermans-Kranenburg, 2009). During the later part of infancy, children have access to a broader range of emotion regulation strategies, including physical movement (e.g., moving around) and social interactions (e.g., seeking physical comfort) (Kopp, 2009; Kopp & Neufeld, 2003). This is partially established by their more sophisticated cognitive control and coordination of their own behavioral impulses (Bernier, Carlson, Deschenes, & Matte-Gagne, 2012; Diamond, 1988).

In later development, children learn to more actively regulate their emotions when there is a mismatch between their personal goals and their emotional state (Gross, Richards, & John, 2006). It has been suggested that the development of children's emotional self-awareness (e.g., ability to identify own emotions) can foster such goal-directed emotion regulation (Gross & Jazaieri, 2014; Stegge & Terwogt, 2007). In line with this, adult studies have shown that emotional self-awareness promotes efficient emotion regulation because this allows internal states to be better understood and modified (Herwig, Kaffenberger, Jäncke, & Brühl, 2010; Subic-Wrana et al., 2014). Interestingly, however, adult studies also suggest that emotion regulation can occur automatically, without conscious emotion regulation goals (Bargh, Schwader, Hailey, Dyer, & Boothby, 2012; Mauss, Bunge, et al., 2007). For example, Mauss, Cook and Gross (2007) demonstrated that subliminally priming emotion regulation (by presenting words related to emotional control) helped participants to downregulate their emotional responses to anger

provocation. Such automatic emotion regulation probably reflects the activation of previously learned and routinized emotion regulation strategies (Mauss, Bunge, et al., 2007). Thus, while emotional self-awareness and understanding of one's own emotions may foster the development of efficient emotion regulation strategies, it seems that emotion regulation can occur flexibly, both consciously and unconsciously.

4.1.1 Family influences on emotion regulation

Sensitive caregiving facilitates children's emotional competence by providing accurate and accepting feedback on children's emotional states, and being a source of continuous support on which the child can rely (Cassidy, 1994; Thompson & Meyer, 2007). These interactions foster children's cognitive development, such as attention and executive functions (Bernier et al., 2012; Evans & Porter, 2009), which in turn promote efficient emotion regulation (Eisenberg et al., 2010). Furthermore, sensitive caregiving helps children to develop emotional self-awareness and effective emotion regulation with a potentially long-term positive impact on later development (Dykas & Cassidy, 2011; Moutsiana et al., 2014). The long-term effects of secure attachment have been demonstrated, for example, by Moutsiana et al. (2014), who found that secure attachment at the age of 18 months predicted children's efficient neural upregulation of positive emotions at the age of 22 years.

Also, the broader context and emotional climate of the family, including the interparental relationship, is important for children's emotion regulation development (Morris et al., 2009). According to emotional security theory (see 3.2), interparental conflicts decrease children's sense of security, increase reliance on self-protective coping strategies, and deplete psychological resources with detrimental effects on children's emotion regulation development (Davies et al., 2008). Indeed, exposure to interparental conflicts during infancy has been found to predict children's poor cognitive development at the age of 2 years (Pendry & Adam, 2013), indicating developmental deficits in the skills necessary for efficient emotion regulation.

Research also suggests that the more complex family patterns, involving both the parenting and marital subsystems, are important in shaping infants' and toddlers' emotional development (Frankel, Umemura, Jacobvitz, & Hazen, 2015; Volling, Blandon, & Kolak, 2006). For example, Frankel et al. (2015) found that in families

with a highly conflictual marital relationship, the father's insensitive parenting (i.e., harsh responses to the child's negative emotions) at 8 months predicted the child's heightened negative emotionality at 24 months. However, in families with harmonious marital relationships, the father's insensitive parenting did not predict the child's negative emotionality. Such results suggest that both the marital and parenting subsystems interact in shaping the child's emotional development, and may buffer each other's detrimental developmental effects.

Altogether, research suggests that early family relationships shape children's development of emotion regulation during infancy. However, there is a lack of long-term studies about the effects of the early family relationships on children's emotion regulation in middle childhood, which is where this dissertation contributes.

4.2 Defense mechanisms

Defense mechanisms modulate emotional experiences unconsciously, without being consciously accessible (Cramer & Brilliant, 2001; Gross & Thompson, 2007). They aim to maintain a psychological sense of security by producing cognitive distortions and by limiting the conscious experience of painful emotions (Hart, 2014; Steiner, Araujo, & Koopman, 2001). Cramer (1997, 2006, 2008, 2015) has proposed a *developmental model of defense mechanisms*, which suggests that children progress from relying on immature and simple defense mechanisms towards more mature and complex versions. In line with this model, empirical studies suggest that children rely predominantly on *denial* during early childhood (e.g., ignoring painful experiences or aspects of reality), on *projection* during middle-childhood (e.g., attributing their own unacceptable experiences onto someone else), and finally, on a more complex defense of *identification* during adolescence (e.g., imitiating the characteristics of idealized others). While Cramer's developmental model – based on a projective story-telling task – has not been tested among very young children or infants, attachment and clinical literature endorse the view that defensive processes operate already during infancy. Bowlby (1984) suggested that children may rely on *defensive exclusion* in order to prevent the processing of attachment-related information (e.g., cues from the mother) which would otherwise activate psychological pain. In line with this, Fraiberg (1982) described clinical cases in which the mother had abused or neglected her infant. In some of these, the 3-month-old infants systematically avoided looking at their mother, presumably as

their behavioral defense against overwhelming anxiety (see also Salomonsson, 2016). Multiple authors have speculated that very early reflexive behavioral strategies may form the basis for later developing mental defensive operations (Cramer, 2006; Fraiberg, 1982; Plutchik, 1995).

The development of defense mechanisms co-occurs with children's cognitive and psychosocial development (Cramer, 1999, 2007). Considering the self-deceptive nature of defense mechanisms, one important developmental domain is that of emotional self-awareness and understanding (Cramer, 2006). Adult research suggests that defensive self-deception, involving biased attention and memory, is inherently unconscious because awareness of it would impede its effectiveness (von Hippel & Trivers, 2011). For example, conscious and deliberate attempts to suppress unwanted thoughts often result in their recurrence (Abramowitz, Tolin, & Street, 2001), whereas unconscious and automatic repression of unwanted thoughts is more efficient (Geraerts, Dritschel, Kreplin, Miyagawa, & Waddington, 2012; Lambie & Baker, 2003). Thus, it seems essential for defense mechanisms to fulfill their function by operating unconsciously. In line with this, Cramer and Brilliant (2001) found that children's understanding of defense mechanisms increased from 7 to 11 years. Importantly, those children who understood the defensive function of denial and projection in vignettes were less likely to use these defenses themselves. This suggests that children rely on immature and cognitively simple defense mechanisms in their early development, but progress towards using more complex defenses as their self-awareness develops in middle childhood and beyond (Cramer, 2006). While reliance on relatively immature defenses in early years is considered normative, their age-inappropriate use during later years indicates poor psychological functioning (Cramer, 2008; Cramer & Brilliant, 2001; Cramer & Kelly, 2004).

In his *hierarchical model of defense mechanisms*, Vaillant (1971, 1995) categorized defenses according to their developmental maturity and mental complexity. Empirical studies have confirmed the existence of two to three defense dimensions among adults (e.g., Andrews, Pollock, & Stewart, 1989; Bond, 1995) and more recently among children and adolescents (Araujo, Medic, Yasnovsky, & Steiner, 2006; Steiner et al., 2001). *Immature defenses* produce severe cognitive distortions about the self and others. For example, in projection, unacceptable emotions are attributed to emancipate from others, and in omnipotence, the self is perceived as superior in comparison to others. *Neurotic defenses* typically alter subjective experiences by dissociating emotional and cognitive mental contents. For example, in repression, a threatening thought is shut out of consciousness, and in reaction

formation, it is transformed into its opposite. In contrast, *mature defenses* typically cause only minor cognitive distortions (Vaillant, 2000) and these have been suggested to be more conscious and deliberate (Conte & Plutchik, 1993; Cramer, 2006; Vaillant, 2000). Indeed, reliance on mature defenses has been found to associate with high emotional self-awareness and efficient emotion regulation (Besharat & Khajavi, 2013; Sala et al., 2015). As mature defenses cannot be clearly differentiated from emotion regulation, this dissertation focuses only on immature and neurotic defenses.

4.2.1 Family influences on defense mechanism

According to Hart's (2014) integrative defense theory, reliance on self-deceptive defense mechanisms is primarily motivated by a sense of insecurity, characterized by experiences of vulnerability and lack of confidence in one's ability to cope with threats. Insecurity can stem from various sources, involving, for example, low self-esteem and insecure attachment relationships. In line with this, adult studies have shown reliance on immature and neurotic defenses to associate with attachment insecurity (Besharat & Khajavi, 2013) and beliefs of abandonment (Walburg & Chiaramello, 2015). Such findings hint at the importance of early experiences within the family on the development of defense mechanisms. However, only a few studies have empirically examined the associations between family factors and children's reliance on defense mechanisms (for a historical review, see Cramer, 1990).

In a rare prospective study, Weinstock (1967) found that the quality of family environment in toddlerhood (child's age of 2–3 years) and in adolescence (child's age of 11–13 years) predicted children's reliance on defense mechanisms at the age of 30 years. Overall, the study found that family problems both in toddlerhood (e.g., withdrawn father and irritable mother) and in adolescence (e.g., family conflicts and harsh parenting) were associated with children's overall higher defensiveness. A father's passivity (e.g., withdrawal from conflicts and indifference) in toddlerhood was especially strongly associated with children's reliance on denial and repression, suggesting that the ways parents handle family conflicts may be important for their children's defense mechanisms. However, the limited sample (n = 39, all males), lack of standardized defense assessment (i.e., non-structured interviews) and the statistical approach (i.e., correlation analyses without covariates) limited the reliability and validity of the study.

Only one previous study has examined the association between the quality of family relationships and children's reliance on mature, immature and neurotic defenses. Thienemann, Shaw & Steiner (1998) found high family conflict and family enmeshment to associate with adolescent's (n = 106, all females) heightened reliance on immature defenses. In general, their results support the view that family problems can be an important source of children's defensiveness. Surprisingly, however, the study found no associations between the family problems and an adolescent's neurotic defenses. This may be because the study used a modified version of the Defense Style Questionnaire (Vaillant, Bond, & Vaillant, 1986) which included only two indicator variables for neurotic defense mechanisms (see Feldman, Araujo, & Steiner, 1996). It is possible that the low reliability of assessment of neurotic defenses explain the lack of significant results regarding neurotic defenses.

Studies have not examined how the quality of family relationships during infancy prospectively predict children's reliance on defense mechanisms. However, studies within infancy have found family relationships to predict an infant's defensive behaviors. For example, Crockeberg, Leerkes, & Lekka (2007) found that exposure to interparental conflicts (assessed at the age of 5 months) predicted an infant's withdrawal responses (e.g., closing eyes and/or movement away from a novel toy) at the age of 6 months. More specifically, interparental conflicts heightened an infant's withdrawal responses, especially if the parents had aggressive conflict resolution styles (e.g., shouting) and if the father was highly involved in the daily caregiving tasks. Such findings suggest that both the infant's direct exposure to interparental conflicts, and the family spillover from the marital subsystem to parenting can heighten an infant's defensive behaviors.

Finally, attachment research has described infants' defensive interpersonal behaviors in response to experiencing insensitive, rejecting or intrusive caregiving (Ainsworth et al., 1978; Cassidy & Kobak, 1988; Mikulincer & Shaver, 2007). These *secondary attachment strategies*, involving deactivation and hyperactivation of the attachment system, help children to maintain physical proximity to the caregiver, and may also be used to defend against overwhelming psychological pain (Dykas & Cassidy, 2011). For example, Kirsch and Cassidy (1997) found that insecurely attached 3-year-old children showed attentional avoidance of attachment cues (e.g., mother-child drawings) and deficits in remembering threatening information (e.g., a story about maternal rejection). Similar defensive information processing biases have been observed in adult research, especially among avoidantly-attached individuals (Dykas & Cassidy, 2011; Mikulincer & Shaver, 2007).

In summary, research is scarce about family relationships predicting children's defense mechanisms. There are no previous studies examining how early family relationships predict children's later reliance on defense mechanisms. This dissertation helps remedy this by examining how early family relationships predict children's neurotic and immature defenses in middle childhood.

4.3 Potential early sensitive periods

Neurodevelopmental and behavioral studies suggest that sensitive periods exist in a child's early development with potential long-term consequences on later functioning (Pechtel & Pizzagalli, 2011; Tottenham & Sheridan, 2009). Sensitive periods are characterized by rapid neural growth, which makes the development highly plastic and malleable to external influences (Knudsen, 2004). As an example of sensitive periods, rodent studies have demonstrated that disruptions in early maternal care can permanently alter attachment-related neural functioning and emotional learning (Rincón-Cortés & Sullivan, 2014). However, research into sensitive periods among human infants is scarce. Studies of institutionalized and then adopted children suggest, that the first two years of life are particularly important for social skills (Almas et al., 2012), and the second year of life is especially important for executive functions (Merz, McCall, Wright, & Luna, 2013). Furthermore, growing up under deprived institutional conditions during the first six months of life seems to predict later quasi-autistic symptoms (e.g. a poor theory of mind), behavioral problems and poor executive functions (for a review, see Julian, 2013). However, due to the restricted variance in the onset of deprivation (e.g., onset often at birth), it is not completely clear whether the results of these studies provide information about early sensitive periods, or whether they merely reflect a child's cumulative exposure to deprivation.

The importance of early experiences on affect regulation has also been demonstrated within more normative family contexts. For example, one study found that a high amount of maternal stroking at the infant's age of 2 months alleviated the detrimental effects of maternal psychopathology on children's psychophysiological and behavioral regulation at the age of 7 months (Sharp et al., 2012). To our knowledge, however, only two studies have explicitly tested for the existence of age-specific timing effects during infancy (based on the same sample as the current study). These studies used a person-oriented approach to model the effects of maternal psychological distress (i.e., depression, anxiety, social

withdrawal) across the pre- and postpartum period on children's hormonal regulation and mental health symptoms. First, Vänskä et al. (2011) found that children of mothers who were symptomatic at the child's age of 2 months (but not during the pregnancy or the child's age of 12 months) showed increased internalizing symptoms at 7-8 years, compared to children of mothers who were symptomatic at other pre- and postnatal periods. A second study, Vänskä et al. (2015), found that the same group of children had flattened awakening cortisol response at the age of 10-12 years, as compared to children of mothers who experienced no distress at the pre- or postnatal periods. Taken together, these two studies suggest that the quality of very early interpersonal experiences may be of special importance in shaping children's psychophysiological and behavioral self-regulation.

Finally, neurodevelopmental research suggests that simple and involuntary functions, such as implicit emotional learning, develop earlier than complex and voluntarily controlled functions, such as executive functions (Pechtel & Pizzagalli, 2011). Considering the functional differences between emotion regulation and defense mechanisms (see 4), it can be theorized that the automatized processes related to defense mechanisms develop earlier than those of the more cognitively complex emotion regulation. Regarding defense mechanisms, it has been suggested that repression (i.e., exclusion of threatening thoughts from consciousness), is related to impaired memory formation and recall, involving altered amygdala and hippocampus function (Axmacher, Do Lam, Kessler, & Fell, 2010). Interestingly, developmental research suggests that the growth of these brain structures is already subject to stress-induced alterations during early infancy (Tottenham & Sheridan, 2010). Regarding emotion regulation, there is some evidence that the underlying brain structures, related to self-aware monitoring and controlling one's own emotions (e.g., orbitofrontal cortex and anterior cingulate gyrus) can be altered by experiences during late infancy and beyond (Moutsiana et al., 2015; Zelazo, Qu, & Kesek, 2010). In this dissertation, we test the novel hypothesis that the early part of infancy is an especially important period for the development of defense mechanisms, whereas the later part of infancy is an especially important period for the development of emotion regulation.

5 Families and developmental psychopathology

Research supports the notion that the family environment can have a crucial influence on children's mental health. Furthermore, there has been a contemporary increasing interest in examining emotion regulation as a transdiagnostic process underlying psychopathology (Aldao, Nolen-Hoeksema, & Schweizer, 2010; Gross & Jazaieri, 2014). Many forms of psychopathology, involving anxiety and depression, are characterized by dysregulated, overly intense and prolonged emotional experiences (Gross & Jazaieri, 2014). Focus on emotion regulation as a developmental process can help explain how negative early family experiences heighten the risk of later psychopathology and teach us how to effectively intervene with these processes (Brumariu & Kerns, 2010; Morris et al., 2009). However, research is scarce about the early prospective family predictors of children's specific symptoms and the mediating role of emotion regulation. Hence, in this dissertation, we examine how early family system types predict children's anxiety and depression, and test the mediating role of emotion regulation between early families and later anxiety and depression.

5.1 Anxiety and depression

Anxiety and *depression*, commonly labeled as *internalizing disorders* or *symptoms* are two of the most common forms of psychopathology among children (Almqvist et al., 1999). Anxiety, including phobias and generalized anxiety, is characterized by feelings of intense fear and worry, which often associate with avoidance of the feared stimuli (Kendall, Hedtke, & Aschenbrand, 2006). Depression, including both dysthymic and major forms, is characterized by sustained feelings of sadness and/or irritability, diminished motivation, and sleep or appetite disturbances (APA, 2000). Based on a large Finnish cohort sample of 8–9-year-old children, point prevalence estimates are 6.2% and 5.2% for clinical depression and anxiety, respectively (Almqvist et al., 1999). Due to the continuous nature of internalizing symptoms, it is noteworthy that subclinical levels of anxiety and depression are

likely to influence an even wider group of children (Zahn–Waxler, Klimes-Dougan, & Slattery, Marcia, 2000).

There is abundant evidence that family problems are associated with and predict the risk of children's internalizing symptoms. Two recent meta-analyses, focusing on children (5 to 11 years; k = 50) and adolescents (12 to 18 years; k = 181), concluded that interparental conflicts, parental hostility, parental overinvolvement and lack of parental warmth were robust predictors of children's heightened internalizing symptoms (Yap & Jorm, 2015; Yap, Pilkington, Ryan, & Jorm, 2014). Such detrimental effects can be easily understood in the light of attachment theory (see 3.1), emotional security theory (see 3.2) and psychobiological models of early life stress (see 3.3).

5.2 Symptom-specific effects of families

A more complicated picture emerges from research, which considers the effects of family relationships separately for anxiety and depression. Older meta-analyses, mostly based on cross-sectional studies, have suggested that families characterized by high threat and low autonomy (e.g., interparental conflicts and parental overprotection) would heighten children's anxiety, whereas families characterized by rejection and low intimacy (i.e., parental hostility and lack of warmth) would heighten children's depression (McLeod, Weisz, & Wood, 2007; McLeod, Wood, & Weisz, 2007). Such symptom-specific effects concur with *evolutionary models of psychopathology*, which suggest that anxiety and depression may be highly adaptive responses in certain environments and situations (Stevens & Price, 2000). For example, anxiety may foster coping with threats and dangers, and depression with interpersonal conflicts and losses (Eley & Stevenson, 1999; Sloman, Farvolden, Gilbert, & Price, 2006). The emotion security theory extends the evolutionary perspective on families, and suggests that anxiety may develop as the consequence of children's coping with family enmeshment, and depression may develop as the consequence of children's coping with emotionally distant families (Davies & Martin, 2013). However, the recent meta-analyses focusing on parenting found only weak evidence of such symptom-specificity (Yap & Jorm, 2015; Yap et al., 2014). Parental hostility and interparental conflicts did predict children's heightened depression (with effects sizes ranging from 3% to 10%). However, there have been only a few longitudinal studies regarding children's anxiety with no

clear pattern of results. Thus, Yap et al. (2015) concluded that evidence about the symptom-specific effects of parenting is not currently available.

What could explain the lack of symptom-specificity? One intriguing possibility is that a variable-oriented approach (see 2.4) cannot successfully capture the developmentally salient aspects of complex family systems. For example, if children develop anxiety or depression symptoms as a part of their adaptation to the family, it is possible that the associations between the quality of family relationships and children's symptoms are highly nonlinear (Del Giudice et al., 2013). Furthermore, studies suggest that family relationships and subsystems interact together in complex ways in shaping children's emotional development (Crockenberg et al., 2007; Frankel et al., 2015; Volling et al., 2006). To our knowledge, previous person-oriented studies have not examined whether different family system types have unique associations with children's anxiety and depression. Hence, we test the hypothesis that early family system types have specific effects on children's anxiety and depression.

5.3 The mediating role of emotion regulation

According to the *emotion regulation model of psychopathology*, emotion regulation has a central role in maintaining both anxiety and depression. Regarding anxiety, research suggests that reliance on maladaptive emotion regulation strategies (e.g., suppression and avoidance) helps to decrease the immediate experiences of fear and worry, but prevents habituation to the feared stimuli (Cisler, Olatunji, Feldner, & Forsyth, 2010). This reinforces the emotional responses, increases threat monitoring, and can lead to functional impairments (Cisler & Koster, 2010; Cisler et al., 2010). Regarding depression, research suggests that individuals prone to depression have difficulties in utilizing adaptive emotion regulation strategies (e.g., positive reappraisal), and instead, tend to rely on maladaptive emotion regulation strategies (Joorman & Stanton, 2016). Because of this, they have difficulties in recovering from hardships, and even from seemingly minor everyday hassles. Prolonged experience of sadness and other negative emotions increases memory and interpretation biases, leading to consolidation of pessimistic and hopeless beliefs (Joorman & Stanton, 2016).

There is robust empirical support for the emotion regulation model of psychopathology. Meta-analyses of both adult ($k = 114$) and adolescent ($k = 35$) studies show that anxiety and depression associate strongly with the frequent use

of maladaptive emotion regulation strategies (such as rumination on negative thoughts), and moderately with the infrequent usage of adaptive emotion regulation strategies (Aldao et al., 2010; Schäfer, Naumann, Holmes, Brunna Tuschen-Caffier, & Samson, 2016). Furthermore, evidence about the causal role of emotion regulation for psychopathology is emerging from intervention studies (Gratz, Weiss, & Tull, 2015; Velden, Kuyken, Wattar, & Crane, 2015). Depressed individuals rely slightly more than anxious individuals on avoidant emotion regulation strategies (e.g., avoidance of painful emotions), but research has not found other differences between anxious and depressed individuals (Aldao et al., 2010; Schäfer et al., 2016). Thus, general difficulties in emotion regulation may similarly contribute to both anxiety and depression.

As suggested by previous variable-oriented research, highly different problems in families seem to have similar effects on children's anxiety and depression (Yap & Jorm, 2015; Yap et al., 2014). It is possible that very different family dysfunctions similarly disrupt children's early emotion regulation development, heightening later risks of both anxiety and depression (Brumariu & Kerns, 2010; Morris et al., 2009; Suveg, Morelen, Brewer, & Thomassin, 2010; see also 4.1.1 and 5). In line with such *developmental emotion regulation model of psychopathology,* some studies have found inefficient emotion regulation to mediate the effects of child maltreatment on internalizing symptoms in middle childhood (e.g., Kim & Cicchetti, 2010), as well as on depression in adulthood (Abravanel & Sinha, 2015). However, studies are lacking in the context of more normative family relationships. One retrospective study has found inefficient emotion regulation to mediate the effects of emotionally distant and conflictual families on anxiety among young adults (Suveg et al., 2010). To our knowledge, prospective family studies spanning infancy to later developmental periods are lacking. We hence contribute to this by testing whether children's emotion regulation mediates the effects of early family system types on children's anxiety and depression in middle childhood.

Finally, it is important to note that emotion regulation is not the only plausible mediating mechanism between early families and children's anxiety and depression, For example, *peer relationships* have an increasingly important meaning for children in middle childhood, and provide alternatives to parents as sources of emotional support (Mayseless, 2005). Thus, it is not surprising that peer exclusion and victimization predict heightened internalizing symptoms among 7- to 12-year-olds (Reijntjes, Kamphuis, Prinzie, & Telch, 2010). Harmonious families likely foster children's internal security and social skills, both needed to form and maintain mutually beneficial peer relationships (Davies & Martin, 2013). Indeed, there is

evidence from attachment research that early parent-child attachment security predicts children's competence with their peers (Groh et al., 2014). Thereby, the quality of peer relationships (e.g., acceptance and exclusion) is a potential mediator between family relationships and later internalizing symptoms. Because the quality of peer relationships and emotion regulation are developmentally interrelated (e.g., Kim & Cicchetti, 2010), in this dissertation, we consider them together to test their unique mediating roles on children's anxiety and depression.

5.4 Family related protective and vulnerability factors

Contextual and situational factors, such as parental education levels and parity, influence child development together with the family relationships (Bronfenbrenner, 1989; Sameroff, 2010). These factors can either prevent or exaggerate problems in families, and can either protect the child from or expose the child to the negative effects of existing family problems (Lucas-Thompson & Goldberg, 2011). Knowledge about the interplay between the contextual factors and family systems provide useful information to identify the protective and risky family environments, and can also foster a theoretical understanding about the family system types. Hence, in this dissertation, we test whether the family-related factors, involving parental education levels, parity, former infertility and the child's gender, moderate the effects of early family system types on children's emotion regulation and internalizing symptoms.

Interestingly, high *parental education level* has been found to function both as a protective and a vulnerability factor. Buehler et al. (1997) found in their meta-analysis (k = 68) that in families with severe interparental conflicts, high parental education levels protected adolescent mental health. In contrast, McLeod, Weisz et al. (2007) found in their meta-analysis (k = 12) that in families with poor parenting, high parental education levels actually heightened adolescents' depression. Thus, it seems possible that the effects of parental education depend on more specific relational characteristics of the family system.

The number of children in a family, i.e., *parity*, has a crucial impact on the children's experience of it. Sibling relationships in childhood can provide safety and protection against interparental conflicts, but they can also be a source of rivalry and stress (Lucas-Thompson & Goldberg, 2011). For instance, among adolescents, supportive sibling relationships have been shown to predict efficient emotion regulation and social competence, whereas negative relationships predict

internalizing symptoms (Padilla-Walker, Harper, & Jensen, 2010). It is likely that the effects of parity on children's social-emotional development depend on various other relational characteristics of the family.

Due to their high investment in parenthood, *formerly infertile* couples are often highly motivated as parents (Barnes et al., 2004). There is some indication that ART mothers tend to be more protective of their children compared to NC mothers (Barnes et al., 2004). Furthermore, there is a slightly heightened risk for internalizing symptoms among ART children, perhaps due to family dynamics (e.g., parental overprotection) or biological infertility- or treatment-related factors (Barnes et al., 2004; Wilson et al., 2011). However, previous studies have not examined the combined effects of early family relationships and former infertility on children's emotional development.

Finally, the *child's gender* can moderate the effects of families on the child's mental health. For example, Jacobvitz, Hazen, Curran and Hitchens (2004) found that early enmeshed family interactions, such as intrusiveness and role-reversals, predicted depression among girls, but inefficient self-regulation among boys at 7 years. A heightened vulnerability of girls to depression has also been found in the studies of interparental conflicts (Yap & Jorm, 2015). Such results suggest that gender-specific biological sensitivity and socialization can moderate the effects families have on children.

6 Attentional processes

Models of social-emotional information processing describe the ways children attend, perceive, store, and think in social and emotional situations (Crick & Dodge, 1994; Lemerise & Arsenio, 2000). In this dissertation, we focus on the initial phase of social-emotional information processing, which is children's attentional processes. We consider children's attention as an especially salient aspect of social-emotional information processing, because it is one central neurocognitive process underlying affect regulation (Gross, 1998; Todd, Cunningham, & Anderson, 2012). Using a computerized experiment, we gather unique information about children's regulatory attentional processes. These basic processes occur typically outside of one's awareness and would thus be practically impossible to assess using more traditional methods. We examine how early family system types predict children's emotional attention biases in middle childhood.

6.1 Attention and affect regulation

Attention has a central role in social and emotional information processing, as it influences the extent to which environmental information undergoes deeper processing, or is ignored (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van IJzendoorn, 2007). According to the widely known *process-model of emotion regulation* (Gross, 1998; Gross & Thompson, 2007), attention can be consciously deployed to regulate emotional experiences and responses, for example, by focusing attention away from the emotion-provoking stimulus. Such attentional affect regulation is considered to be highly efficient because it occurs relatively early in the process of generating emotional responses (Gross & Thompson, 2007). There is considerable empirical support for the central role that attention has in affect regulation. A meta-analysis of experimental adult studies ($k = 306$) showed that instructing the participants to focus their attention on positive or neutral content efficiently decreased the experience of negative emotions, as well as the related physiological arousal (Webb, Miles, & Sheeran, 2012).

In the *extended model of emotion regulation*, Todd et al. (2012) further clarified the role of attention in affect regulation. According to their model, attentional processes can regulate emotions reflexively before the emotion-provoking event (i.e. "affect biased attention") and more deliberately after experiencing the event (i.e., "attention deployment"). The reflexive regulation plays a part in constructing the mental representation of the emotion-provoking event, and thus can influence emotions before the event has been consciously experienced. Such reflexive affect regulation does not require cognitive skills or conscious emotion regulation goals, but instead, is shaped by developmental experiences and associative learning. Supporting the notion that attentional regulation can occur without emotion regulation goals, there is evidence that learning to habitually focus attention away from threat-related information (by using Attention Bias Modification Treatment) decreases anxiety symptoms (Hakamata, Lissek, Bar-Haim, Britton, & Fox, 2010; Lowther, Newman, & H., 2014). Thus, intriguingly, attention is a theoretically plausible process underlying affect regulation, involving both deliberate emotion regulation and unconscious defense mechanisms.

Attachment research has described the ways in which individual differences in attachment styles influence one's social-emotional information processing (Dykas & Cassidy, 2011). According to the adult attachment model of Mikulincer and Shaver (2016; 2002), mental representations and beliefs about the attachment figure determine which secondary attachment strategies are used. In general, one's representation of the attachment figure as rejecting and not available increases reliance on deactivation strategies, which involve attentional avoidance of emotional information. In contrast, one's representation of the attachment figure as an unreliable source of support increases reliance on hyperactivation strategies, involving heightened attention towards the emotional information. Altogether, the results of attachment studies indicate that early interpersonal experiences are important for attentional affect regulation, which involves both attentional avoidance and vigilance towards emotion-provoking information.

Interestingly, based on the review of the extant child studies, Zimmermann and Iwansky (2015) concluded that insecure children, especially those with an avoidant attachment style, often show both vigilant and avoidant attention biases. They suggested that this may indicate a *vigilant-avoidance* attention pattern, that is, the children initially monitor for cues of threats, but subsequently, defensively limit their processing of threat provoking information (see also Derakshan, Eysenck, & Myers, 2007). Such findings extend the attachment model of Mikulincer and Shaver (2016; 2002) by suggesting that attachment-related attentional affect

regulation is not temporally constant, but instead, a dynamic process which unfolds over time.

6.2 Early and late stage of processing

Because attentional affect regulation is a continuous process occurring over time, in this dissertation we consider both the early and late stages of information processing. The dot-probe task is commonly used to assess emotional attention biases (MacLeod, Mathews, & Tata, 1986). The task simultaneously presents one neutral and one emotional stimulus (e.g., facial expressions), which compete for the participant's attention. The participant is instructed to indicate the location of a probe that is appearing randomly at the location of either the neutral (neutral cue trials) or the emotional stimulus (emotional cue trials). Attention-bias scores are computed as differences in response times between the neutral and emotional cue trials, indicating either a tendency to focus upon (positive score) or away from (negative score) the emotional stimulus. Importantly, attentional biases can be investigated separately at different time points by varying *stimulus onset asynchrony (SOA)* – the time between the appearance of the emotional stimulus and the probe.

Attentional biases at the *early stage of processing* (e.g., SOA of 500 ms) have been suggested to reflect relatively automatic responses that serve adaptive threat detection (Cisler & Koster, 2010; LoBue & Rakison, 2013). Children growing up in highly threatening environments, e.g., in abusive families, often show a strong attentional bias toward threat (i.e., angry faces) at this stage of processing (Shackman, Shackman, & Pollak, 2007). Yet, some studies have found physically abused children to attend away from threat (Pine et al., 2005), and children from normative families to attend toward threat at the early stage of processing (Lindstrom et al., 2009). Such mixed findings suggest that there is a high heterogeneity in how children attend toward threat at the early stage of processing, perhaps reflecting differences in the monitoring of and reflexive responding towards threats (Del Giudice et al., 2013; Todd et al., 2012).

Attentional biases at the *late stage of processing* (e.g., SOA of 1000 ms), in turn, have been suggested to reflect higher-level processing of emotional information involving the activation of regulatory strategies (Bar-Haim et al., 2007; Cisler & Koster, 2010). Avoiding threats at a later stage of processing is considered to indicate defensive exclusion of threatening information, often thought to be characteristic of avoidantly attached adults and children (Dewitte, Koster, De

Houwer, & Buysse, 2007; Dykas & Cassidy, 2011; Zimmermann & Iwanski, 2015). In contrast, maintaining attention towards threat may indicate inefficient emotion regulation (Derryberry & Reed, 2002) or strategic heightening of one's own emotions (Dykas & Cassidy, 2011). Such attentional biases are thought to be characteristic of highly depressed, anxious, and ambivalently attached adults and children (Bar-Haim et al., 2007; Dykas & Cassidy, 2011; Joormann & Stanton, 2016; Zimmermann & Iwanski, 2015). Finally, disengaging attention from threat (i.e., no attention bias) after initially attending toward it is considered to reflect adaptive emotion regulation and evaluation of the stimulus as signaling only minor threat, typical for securely attached adults and children (Bar-Haim et al., 2007; Dykas & Cassidy, 2011).

6.3 Previous family studies on emotional attention biases

Research about the influence of family relationships on children's emotional attention biases is scarce. Only two studies have examined how the quality of the mother-child relationship associates with children's emotional attention biases, both focusing on the late stage of processing (at the SOA of 1000 ms). Gibb, Johnson, Benas, Uhrlass, Knopik, & McGeary (2011) studied the associations between the mother's critical parenting attitude (assessed using a maternal speech task) and children's (8-12 years; n = 74) emotional attention biases. The study found no main effect of the mother's parenting attitude on children's emotional attention biases. However, among genetically vulnerable children (i.e., carriers of the 5-HTTLPR short allele), the mother's critical parenting attitude predicted children's attention bias away from angry facial expressions. There were no effects regarding happy and sad facial expressions. Half of the mothers in the sample had experienced clinical depression but this was statistically controlled in the analyses.

In another study, Gulley, Oppenheimer, & Hankin (2014) examined the effects of the mother's parenting (assessed in a conflict discussion task) on children's emotional attention biases. The study used two separate samples: a psychiatrically enriched high-risk sample (11-17 years; n = 60), and a general community sample (9-15 years; n = 75). In both samples, the mother's authoritarian parenting, criticism and negative affect predicted the children's attention bias towards angry facial expressions. Only among the high-risk adolescents, however, did authoritarian parenting predict an attention bias towards sad facial expressions. No effects regarding happy facial expressions were found. Interestingly, children's

attention bias towards angry facial expressions mediated the influence of the mother's authoritarian parenting and negative affect on children's social anxiety, supporting both the role of attention in affect regulation (see 6.1) and developmental emotion regulation model of psychopathology (see 5.3).

The results of Gibb et al. (2011) and Gulley et al. (2014) provide somewhat conflicting results about the effects of poor parenting – the former reporting an attention bias away and the latter towards the threat. The results are not directly comparable, however, due to the moderating role of genetic vulnerability (analyzed in Gibb et al., 2011), and the methodological differences, for example, involving sampling (i.e., maternal depression) and assessment of parenting (i.e., a mother alone vs dyadic interaction). Altogether, however, the studies suggest that harsh parenting can alter children's attentional affect regulation, potentially reflecting alterations in children's ability to regulate their emotions and reliance on defense mechanisms.

It is important to note that both of these studies had several limitations. Firstly, they were cross-sectional, making it difficult to interpret the causal relation between the quality of parenting and the children's attentional biases. Secondly, only the mother-child relationship was assessed, leaving open the question of how more comprehensive family systems, involving also the father-child and marital relationships, influence children's attentional biases. Thirdly, the studies focused only on the late stage of processing, which may only provide a limited view of the attentional biases. Fourthly, the studies did not consider the potentially important role of emotional priming or presence of threat during the attention task. In this dissertation, we attempt to overcome each of these limitations.

6.4 Person-situation interactions and priming

According to the *cognitive-affective model of personality* (Mischel & Shoda, 2008) behavior is always a product of both the individual and the situational properties. For example, Shoda, Mischel, and Wright (1994) noted that while two children may have the same average amount of aggression, other one of them may show aggression mainly in situations that involve limit-setting adults, whereas the other may show aggression in interaction with peers. Such intraindividual patterns can help understand the adaptive functions and psychological motivations related to behaviors. From this perspective, personality is best conceptualized as "if-then"-relations, which link situational perceptions to certain behaviors. Such a view is in

concordance with the attachment theory (see 3.1), in that one's internal representations and the actual situation together determine how threat-related information is processed (Dykas & Cassidy, 2010; Mikulincer & Shaver, 2016).

Situational priming can influence children's attentional affect regulation. For example, Romens & Pollak (2012) found that physically maltreated children showed attentional bias towards sad faces (at the SOA of 1500 ms) after being primed with sadness (using a 3 min writing task). The same children did not show any attentional biases before the priming, indicating that the attentional biases were specific to their emotional state. Importantly, children without a maltreatment history did not show any biases prior to or after the priming. Such results indicate that the activation of mental representations and emotional states may be necessary for the individual differences in affect regulation to emerge (Stupica & Cassidy, 2014).

In this dissertation we are interested in how early family system types predict children's emotional attention biases. To ensure that the children's attentional biases were related to their affect regulation, we used a situational priming procedure using audiotaped stories. The themes of these stories were related to autonomy and intimacy, because these are the two most basic developmental needs expressed in families (Keller, 2012; Luyten & Blatt, 2011) and are relevant to the way we assessed early family relationships. More specifically, we created stories to prime threat to autonomy (e.g., failure in achievement) and threat to intimacy (e.g., interpersonal rejection), as well as secure stories to prime positive fulfillment of both autonomy and intimacy (e.g., winning in a team game with one's peers). We expected the threat priming conditions to activate children's affect regulation processes.

7 AIMS OF THE DISSERTATION

This dissertation aims to explore and model the mechanisms and processes that link early family environments to children's affect regulation and mental health. The main concepts are summarized in Figure 2. Specifically, we test how early family relationships during pregnancy and at the child's ages of 2 and 12 months (the largest circle in Figure 2) predict children's affect regulation (the middle sized circle in Figure 2) and mental health (the smallest circle in Figure 2) in middle childhood.

We conceptualize early family systems to comprise both the marital and parenting subsystems, in dimensions of autonomy and intimacy (upper part of the largest circle in Figure 2). These dimensions constitute the emotional climate of the family, and define the family boundaries that regulate how the subsystems influence each other (the vertical dashed line in the upper part of Figure 2). In modeling the family systems, we use both variable- and person-oriented approaches. In the person-oriented approach, we model families as complex family system types (FST), comprising multidimensional relationships (i.e., mother-to-father, father-to-mother, mother-to-child, father-to-child) and their trajectories over the transition to parenthood.

We consider emotion regulation and defense mechanisms as distinct forms of affect regulation, differing in their mode of function (upper part of the middle sized circle in Figure 2). Furthermore, we consider emotional attention biases to reflect the basic processes underlying children's affect regulation (lower part of the middle sized circle in Figure 2). Although not directly tested in this dissertation, Figure 2 mentions the three major frameworks (attachment theory, emotional security theory, and psychobiological models) that explain how and why families may influence children's affect regulation (lower left quadrant of the largest circle).

Finally, we test the role of children's emotion regulation in mediating the effects of early family systems on children's mental health in middle childhood. Here we consider the interplay between the FSTs and the family-related contextual factors (bottom left in Figure 2), hypothesizing that these factors may function either as protective or vulnerability factors depending on the specific FST.

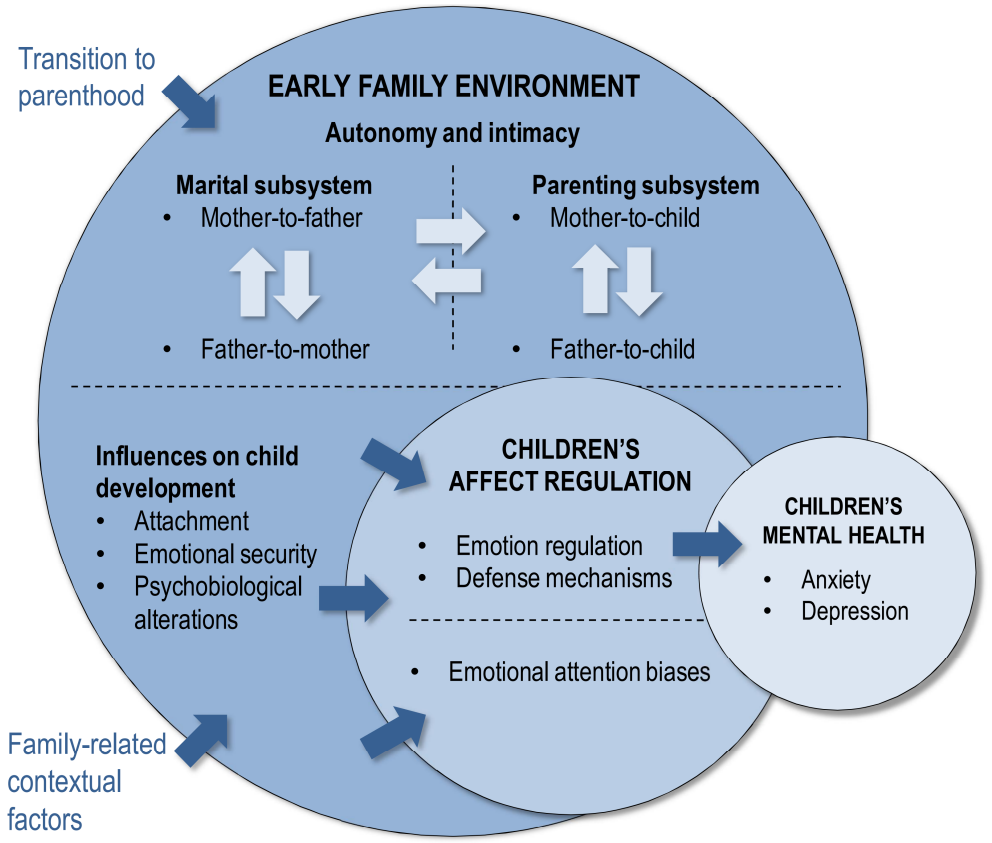

Figure 2. Overall summary of the theoretical study concepts and their relationships.

7.1 How early family relationships predict children's affect regulation?

In *Study I*, following a variable-oriented approach (see 2.4), we examine how early family relationships at 2 and 12 months predict children's emotion regulation and defense mechanisms at the age of 7-8 years. We focus separately on both the marital and parenting subsystems (see 2.1), and conceptualize relationship quality using the relational dimensions of autonomy and intimacy (see 2.2).

Different family preconditions hypothesis. Based on research into the family predictors of emotion regulation (see 4.1.1) and defense mechanisms (see 4.2.1), we hypothesize high quality of parenting and marital relationships to predict children's efficient emotion regulation, reflecting the emotional guidance and sense of safety

children have acquired in the family. Furthermore, we hypothesize low quality of parenting and marital relationship to predict children's reliance on neurotic and immature defenses, reflecting children's defensive coping with the sense of emotional insecurity.

Age specific hypothesis. Based on extant research about sensitive periods (see 4.3), we hypothesize that the early quality of family relationships at the age of 2 months is especially important in predicting children's defense mechanisms, whereas the later quality at the age of 12 months is especially important in predicting children's emotion regulation.

7.2 What kind of early family system types (FSTs) exist?

In *Study II*, following a person-oriented approach (see 2.4), we model the unique ways families change and organize during the transition to parenthood. We conceptualize family systems as comprising both marital (i.e., mother-to-father, father-to-mother) and parenting (i.e., mother-to-child, father-to-child) relationships, and conceptualize the quality of these relationships using the dimensions of autonomy and intimacy. We further consider the dynamic changes from pregnancy to child's age of 2 and 12 months.

Identification of the FSTs. We use factor mixture modeling to identify the FSTs as latent classes. Based on previous FST studies (see 2.4), we expect to identify at least Cohesive, Enmeshed and Disengaged families. However, due to the exploratory nature of the analysis, we do not posit more specific hypotheses about the FSTs.

Predictors of the FSTs. We examine how family-related factors (i.e., parental education levels, parity, length of relationship, and previous infertility) predict belonging to FSTs. Based on previous research (see 2.3.4), we hypothesize a short length of the interparental relationship to predict belonging to FSTs with steeper decline in the quality of family relationships, due to the more abrupt termination of the passionate interparental relationship. Furthermore, we hypothesize a high number of children and long relationship duration to predict belonging to FSTs characterized by low intimacy, due to normative decline of marital satisfaction over time.

7.3 How do FSTs predict emotion regulation and internalizing symptoms?

In *Study III* we examine how the early FSTs (identified in *Study II*) predict children's emotion regulation, anxiety and depression, as well as peer exclusion at the age of 7-8 –years. Furthermore, we test whether emotion regulation mediates between the FSTs on children's internalizing symptoms.

Direct effects. In line with previous research (see 4 and 5), we expect the problematic FSTs (i.e., other than Cohesive families) to predict children's inefficient emotion regulation, heightened peer exclusion, and heightened anxiety and depression. Drawing upon evolutionary approaches to psychopathology (see 5.2), we test the *symptom specificity hypothesis* that enmeshed FSTs would predict children's heightened anxiety, whereas distant FSTs would predict heightened depression. Theoretically, such symptom specificity would reflect children's coping with the particular challenges and threats present in their family environments.

Contextual factors hypothesis. We examine whether family-related variables (i.e., parental education levels, parity, previous infertility, and the child's gender) moderate the effects of FSTs on children's emotion regulation, peer exclusion, anxiety and depression. Due to the mixed results of previous research (see 5.4), we hypothesize that the moderators can function as both protective and vulnerability factors, depending on the specific FST.

Mediating role of emotion regulation hypothesis. In line with developmental emotion regulation models of psychopathology (see 5.3), we test the mediating role of emotion regulation linking FSTs to children's anxiety and depression. We hypothesize emotion regulation to be a common mediating mechanism between the problematic FSTs and internalizing symptoms. As a competitive hypothesis, we expect peer exclusion to mediate between the problematic FSTs and internalizing symptoms.

7.4 How do FSTs predict emotional attention biases?

In *Study IV*, we examine how a selected subset of the early FSTs (identified in *Study II*) predict children's emotional attention biases at the age of 10 years. In line with previous research, we conceptualize the attention biases to be central part of children's affect regulation (see 6). To capture attentional biases at the early and late stage of processing, we use stimulus onset asynchronies (SOA) of 500 ms and

1250 ms. We also use both threatening (angry) and affiliative (happy) facial expressions as attentional cues. To ensure that the assessed emotional attention biases are relevant for affect regulation, we use situational priming to activate children's sense of threat and safety.

Unique attentional biases hypotheses. We expect the FSTs to predict different profiles of emotional attention biases, reflecting children's family related affect regulation strategies (see 6.1). More specifically, we hypothesize children from Cohesive families to show (a) no threat related attentional biases or (b) a late-stage attention disengagement from threat, indicating efficient emotion regulation. Furthermore, we hypothesize the problematic FSTs to predict either (c) an early stage attentional bias toward threat, indicating high emotional responsivity; (d) a late-stage attentional bias toward threat, indicating inefficient emotion regulation or strategic heightening of emotions; or (e) a late-stage attentional bias away from threat, indicating defensive exclusion of threatening information.

Activation of threat hypothesis. Based on research into person-situation interactions (see 6.4), we hypothesize situational priming to moderate the effects of FSTs on children's attentional biases. We expect children to show heightened attentional biases under the threat conditions, reflecting the activation of affect regulation processes. To test this, we use audiotaped stories to prime the following: (1) *threat to intimacy*, (2) *threat to autonomy*, and (3) *secure situation* (i.e., positive fulfillment of both autonomy and intimacy).

8 METHODS

8.1 Study procedure and design

This dissertation is based on a longitudinal sample of 710 Finnish married or cohabiting couples. The collection of the data began in 1999 and consists of naturally conceiving (NC) couples with no history of infertility (n = 371), and couples who had experienced infertility and received assisted reproductive treatments (ART) with their own gametes (n = 334). The NC couples were recruited at Helsinki University Central Hospital during routine ultrasonographic examination, and the ART couples in five Finnish infertility clinics. Only couples with singleton pregnancies were included in this study. Other exclusion criteria for the NC group were previous infertility and a maternal age under 25 years. All eligible clients in ultranosographic examination or in infertility treatment were systematically asked to participate until about thousand had consented.

As shown in Table 1, the data was collected in five different waves (T1-T5). Both mothers and fathers completed questionnaires focusing on their family relationships at three time points during the transition to parenthood: at the second trimester of pregnancy (T1; 18–20 weeks of gestation), and when the child was 2 months (T2) and 12 months old (T3). At the child's age of 7-8 years (T4), both mothers and fathers completed questionnaires focusing on child outcomes. At the child's age of about 10 years (T5), a selected subsample of the families was contacted, and their children participated in the laboratory part of this dissertation, involving assessments of the children's emotional attentional biases. The ethics committees of the responsible clinics or universities approved the study at each stage of the data collection.

Table 1. Timeline of assessments, main variables and their role as independent, dependent or control variables

	EARLY FAMILY RELATIONSHIPS			CHILD OUTCOMES	LABORATORY
	T1: Pregnancy	T2: Child's age of 2 months	T3: Child's age of 12 months	T4: Child's age of 7-8 years	T5: Child's age of 10 years
Study I (*n* = 420)	Mothers' and fathers' reports of autonomy and intimacy in the marital and parenting subsystems (*independent variables*); Index of early developmental achievements (*covariate*)			Emotion regulation and defense mechanisms (*dependent variables*)	
Study II (*n* = 710)	Mothers' and fathers' reports of autonomy and intimacy in father-to-mother, mother-to-father, mother-to-child and father-to-child relationships (*independent/dependent variables*)				
Study III (*n* = 491)	The FSTs identified in *Study II* (*independent variables*); Family related moderating factors (*independent variables*)			Emotion regulation, peer relations, internalizing symptoms (*dependent variables*)	
Study IV (*n* = 79)	Selected subset of the FSTs identified in *Study II* (*independent variables*)				Attentional biases (*dependent variables*); State-anxiety (*covariate*)

8.2 Participants

In the beginning of the study, at T1, the mean age of the mothers was 33.19 years (*SD* = 3.73) and fathers 34.60 (*SD* = 4.95). The mothers were older than the Finnish national average of mothers giving birth (*M* = 29.9 years; Statistics Finland, 2013). The education level of the sample was relatively high: 29% of the mothers and 31% of the fathers had a university-level education; 40% of the mothers and 27% of the fathers had a college-level education; 14% of the mothers and 23% of the fathers had vocational training; and 17% of the mothers and 19% of the fathers had basic education.

There were no differences in age, child's gender, or father's education level between ART and NC couples. However, the ART couples were more often primiparous (65.70%) than the NC couples (34.30%), $p < .001$, and the ART couples (*M* = 9.63 years, *SD* = 4.47) also had longer partnerships than NC couples (*M* = 7.69 years, *SD* = 4.45), $p < .001$. NC mothers were better educated than ART mothers, $p = .024$, as they more often had university level education (35%) than ART mothers (28%).

8.2.1 Early family relationships (Study I-IV)

As shown in Table 1, all studies of this dissertation utilized mothers' and fathers' reports of the family relationships at pregnancy (T1), and when the child was 2 months (T2) and 12 months old (T3). Response rates at T1 were 95% (*n* = 671) for mothers and 89% (*n* = 634) for fathers; at T2 92% (*n* = 654) for mothers and 86% (*n* = 615) for fathers; and at T3 77% (*n* = 546) for mothers and 71% (*n* = 506) fathers. Seventy three percent (*n* = 515) of the mothers and 66% (n = 467) of the fathers participated in all assessments T1-T3.

Attrition at T2 and T3 was independent of the T1 autonomy and intimacy dimensions of family relations among both parents. Attrition was also independent of parents' ages, parity, parental education level, and length of the marital relationship. However, at T2 attrition was greater among NC (17%) than ART (9%) fathers, $p = .001$, and among NC (9%) than ART (5%) mothers at, $p = .046$. At T3 the attrition was greater among NC (33%) than ART (25%) fathers, $p = .011$.

8.2.2 Child outcomes at T4 (Study IV)

At the child's age of 7-8 years (T4) both mothers and fathers completed questionnaires about children's affect regulation, peer relationships, and internalizing sympotms. Response rates were 68% (n = 485) for mothers and 42% (n = 299) for fathers. In 69% (n = 491) of the families at least one parent responded. Attrition at T4 was independent of parents' ages, parity, parental education level, former infertility, child's gender and the FSTs at T1-T3. Families whose FST could not be reliably identified in *Study II* were excluded (8%; n = 39). Thus, the final sample consisted of n = 452 families, involving n = 447 maternal and n = 281 paternal reports.

8.2.3 Laboratory subsample (Study IV)

A subsample of children participated (n = 79) in *Study IV* at the age of about 10 years (T5; M = 10.63 years, SD = 0.60). Children's attentional biases were measured using a dot-probe task either at their homes or at the university facility. We aimed to collect a purposive subsample of 20 children from Cohesive, Disengaged, Enmeshed Quadratic and Authoritarian families, based on family system types (FST) identified in *Study II*. Quota sampling was used to ensure that in each FST, half of the families had a history of infertility and both genders were equally represented. One family cancelled their participation at the end of the data collection period. The final sample thus consists of children from Cohesive (n = 20), Disengaged (n = 19), Enmeshed Quadratic (n = 20), and Authoritarian (n = 20) families.

In overall, the subsample was similar to the larger sample regarding infertility history, children's gender, parity, mother's age, and parents' educational levels (all *ns*). Furthermore, there were no differences between the FST's regarding children's or mother's ages, or parent's educational levels (all *ns*). However, 40% (n = 8) of Cohesive, 50% (n = 10) of Authoritarian, and 21% (n = 4) of Disengaged families were primiparous, whereas 75% (n = 15) of Enmeshed families were primiparous, p = .008, at T1. Thus, parity was controlled in the analyses of this study.

8.3 Questionnaire measures

8.3.1 Family relationships (Study I- IV)

Family relationships were measured by the Subjective Family Picture Test (SFTP; Mattejat & Scholz, 1994) at T1, T2, T3 and T4. Both parents rated the quality of four family relationships: wife-to-husband, husband-to-wife, mother-to-child, and father-to-child. These relationships were rated in terms of autonomy (four pairs of items, e.g., determined–indecisive, shy–self-assured) and emotional intimacy (four pairs of items, e.g., rejecting–loving, warm–cool) using a 7-point scale. Higher scores on autonomy indicate relational self-assurance, agency, and independence; whereas high scores on intimacy indicate emotional attachment, interest, and acceptance. The item pairs were identical for all relationship, but the questions varied according to each relationship (e.g., "In relation to me my husband is . . ." or "In relation to our child I am . . ."). At T1 parents were asked to report their expectations of the future relationship with the unborn child. The validity of such prenatal assessment is supported by the finding that they predict the level of parenting stress during the postpartum period (Flykt et al., 2009) and the actual the actual postnatal parent-child interactions (Harwood, Neil, & Kevin, 2007). The SFTP has been shown to be a valid and reliable measure of family relationships with an average between-scale correlation of .60 with other family diagnostic questionnaires and a test–retest correlation of .77 (Mattejat & Scholz, 1994).

Study I used continuous SFTP ratings to depict the quality of parenting and marital subsystems at T2, T3 and T4. Indicator variables (four for each latent construct) were computed for both parents' perceptions of autonomy and intimacy in the parenting (i.e., mother-to-child and father-to-child) and marital (i.e., husband-to-wife, wife-to-husband) relationships by averaging over self and spouse related items. This was justified as these ratings correlated moderately (average $r = .44$, ranging from .27 to .79, all $p < .001$). However, the correlation was small for the item *determined–indecisive* between mothers' reports of wife-to-husband and husband-to-wife relationships at T3, $r = .15$, $p < .001$. Cronbach's alpha reliability coefficients ranged from $\alpha = .61$ to $\alpha = .94$ (average $\alpha = .80$).

Study II used continuous SFTP ratings to identify latent FSTs based on family relations at T1, T2 and T3. Indicator variables (four for each latent construct) were computed for both parents' perceptions of autonomy and intimacy in all family relationships (self-to-spouse, spouse-to-self, self-to-child, spouse-to-child).

Cronbach's alpha reliability coefficients were acceptable for mothers' (α = .68–.81) and fathers' (.73–.79) reports of marital autonomy and for mothers' (α = .80–.91) and fathers' (.73–.88) reports of marital intimacy. Nevertheless, the reliability coefficients were lower for both mothers' and fathers' reports of parenting autonomy and intimacy (α =.52–.82). These variables were highly skewed (ranging from −0.77 to −4.34) and had high kurtosis (ranging from 0.19 to 24.17), indicating that parents reported high levels of own and spousal parenting autonomy and intimacy. Such deviations from the normal distribution tend to cause unrealistically low reliability coefficients (Sheng & Sheng, 2012), and indeed, when logarithmic transformations were used, the reliabilities increased to a satisfactory level (α= .65–.80, except mothers' self-reports of intimacy at T1, α = .59). Because our analyses were robust against nonnormality, we used the non-transformed original variables.

Studies III and *IV* used the categorical FSTs identified in *Study II*. *Study III* used all the FSTs, but combined four of the FSTs to two family system groups to achieve sufficient sample size for the analyses. *Study IV* focused on a subsample of children from four of the FSTs.

8.3.2 Children's emotion regulation (Study I and III)

Children's emotional self-regulation at the age of 7–8 years (T4) was measured by the self-regulation subscale of the Emotion Questionnaire (Rydell, Berlin, & Bohlin, 2003). This questionnaire consists of vignettes describing anger, sadness fear and joy evoking situations. For each vignette, parents estimated on a 5-point Likert scale how easily the child was able to calm down by him- or herself (1 = doesn't apply at all, 5 = applies very well to my child).

Study I used nine vignettes for negative emotions of anger (e.g., "My child gets into a conflict with a peer"), sadness (e.g., "A toy is lost or broken"), and fear (e.g., "My child gets frightened and worried"). To include more complex emotions as well, we added six vignettes for shame/guilt (e.g., "My child gets caught doing something forbidden"). Indicator variables were formed, first, by averaging items separately for each emotion of anger (three items), sadness (three items), fear (three items), and shame/guilt (six items). Second, these four variables were averaged to represent efficiency of emotion regulation separately for mothers (α = .84) and fathers (α = .93). These two variables were used as indicator variables in structural equation models.

Study II used the nine original vignettes for negative emotions of anger, sadness and fear. All nine items were averaged separately for mothers (α = .88) and fathers (α = .87). These two variables were used as indicator variables in structural equation models.

8.3.3 Children's defense mechanisms (Study I)

Children's defense mechanisms were measured at the age of 7–8 years (T4) with the Response Evaluation Measure for Parents (REM-P: Steiner et al., 2001; Yasnovsky et al., 2003). REM-P is similar to the widely studied Defense Style Questionnaire (Andrews et al., 1989), but is modified to use less pathological wording and be suitable for adolescents and children. REM-P comprises 71 items that describe 21 defenses ranging from immature to neurotic and mature defense mechanisms, such as repression (three items; e.g., "My child doesn't show his/her true feelings"), projection (three items; e.g., "My child feels that s/he is always treated unfairly"), and intellectualization (four items; e.g., "My Child uses reason and logic, not feelings, to understand people"). Both parents independently estimated the child's typical defensive behaviors on a 5-point Likert scale (1 = totally disagree, 9 = totally agree).

Because only a few studies have used REM-P among young children, the dimensionality of the measure was examined. First, 21 sum variables were computed by averaging the items representing each defense mechanism (three to four items per defense mechanism). Second, to examine the factor structure of defense mechanisms in this population and age group of children, we performed exploratory factor analyses (using averaged values between the parents' reports and the principal extraction method with oblimin rotation). The analysis yielded a 3-factor solution: (1) immature defenses (22.19% variance explained; e.g., acting out, projection, displacement, omnipotence, passive aggression), (2) mature defenses (16.12%; e.g., humor, intellectualization, sublimation, reaction-formation, altruism), and (3) neurotic defenses (8.17%; e.g., repression, denial, dissociation, withdrawal, suppression). Two sum variables of individual defense mechanisms had to be excluded from the analyses because of low variability (conversion) or low initial eigen values in factor analysis (<0.20 for somatization).

Based on the 3-factor solution, defense-style scores were computed by averaging the corresponding sum variables to represent the child's reliance on immature defenses (five variables; mother, α = .74; father, α = .72) and neurotic

defenses (six variables; mother, α = .64; father, α = .67) separately for both parents' reports. The resulting four variables were used as indicator variables in structural equation models. Mature defenses were excluded from these analyses because our hypotheses did not concern them.

8.3.4 Children's anxiety and depression (Study III)

Children's depression (12 items) and anxiety (11 items) were measured using those subscales of the Behavior Assessment System for Children (Reynolds & Kamphaus, 1992). Both parents reported their child's symptoms using a 4-point Likert scale, ranging from 1 (never) to 4 (almost always). Items for each subscale were averaged separately for both parents and showed satisfactory internal reliability for mothers (depression α = .82; anxiety α = .76) and fathers (depression α = .80; anxiety α = .82).

8.3.5 Children's peer exclusion (Study III)

Children's peer exclusion was measured using the subscale of the Child Behavioral Scale (Ladd & Profilet, 1996). For the purposes of this study, four of eight items were reverse worded to indicate positive peer acceptance (e.g., "Child is often accepted to join peer play"). Both parents estimated how well the descriptions fit their child on a 4-point Likert scale, ranging from 1 (never) to 4 (almost always). All eight items were averaged separately for both parents and showed satisfactory internal reliability for mothers (α = .78) and fathers (α = .80).

8.3.6 Covariates (Study I-IV) and moderators (Study III)

In all studies, various background variables were used to ensure that the main results were not spuriously caused by them. In *Study I* and *Study III* the effects of child's gender, previous infertility, parent's education levels (academic level, college level, vocational training, basic education/student), and parity (primi vs multi) were controlled for. Futhermore, in *Study I* the mother's age was used as a covariate.

To be used as a covariate in *Study I*, an *index of early developmental achievements* (or delays) was built. At the child's age of 2 months (T2), parents reported the emergence of the child's contact smile (0 = no, 1 = yes), eye contact (0 = no, 1 =

yes), and regularity of eating and sleeping rhythms (0 = no, 1 = yes). At the age of 12 months (T3), parents reported the child's regularity of sleeping rhythms (0 = no, 1 = yes), ability to stand (0 = no, 1 = yes), and ability to walk without support (0 = no, 1 = yes). These six items were standardized and averaged to form a developmental achievement index. As could be expected, the reliability of this index was poor (α = .53), indicating these developmental domains were largely independent of each other. However, to obtain a balanced assessment of developmental achievements during the first year, we decided to use this variable as a rough cumulative index (for a similar approach, see Appleyard, Egeland, van Dulmen, & Sroufe, 2005). Providing some validity for the index, a previous study has found a highly similar index to associate with birth complications and neonatal health (e.g., agpar scores) (Punamäki et al., 2006).

In *Study II* the background variables were used to predict membership in the family system types. These included previous infertility, parent's education levels, parity and length of the marital relationship.

In *Study IV* only parity was used as a covariate, because the Enmeshed Quadratic families were more often primiparous than the other FSTs in the laboratory subsample. Furthermore, the children's state anxiety was controlled to ensure, that the children's attention biases did not spuriously result from their emotional states (e.g., some children may have been more anxious about participating in the experiment than others). Children's state anxiety was assessed in the beginning of the experiment using the state-anxiety subscale (a = .76) of the State-Trait Anxiety Inventory for Children (Spielberger, 1973).

Finally, in *Study III* it was examined whether child's gender, former infertility, parent's education level and parity moderated the effects of the family system types on child outcomes.

8.4 Experimental design (Study IV)

8.4.1 Dot-probe task

The dot-probe task was used to assess children's emotional attention biases, controlled by E-Prime 2.0 software (Psychology Software Tools, Pittsburgh, PA). Typically, the task simultaneously presents one neutral and one emotional stimulus, which competed for the participant's attention. In each trial, the participant is

instructed to indicate the location of a probe that appear randomly at the location of either the neutral (neutral cue trials) or the emotional stimulus (emotional cue trials). After all the trials, the attention-bias scores are computed as mean differences in response times between the neutral and emotional cue trials, indicating either a tendency to attend toward (positive score) or away (negative score) from the emotional stimulus.

In this study, children performed the dot-probe task three times after different situational priming conditions (see 8.4.2 below). Each time the task included 90 dot-probe trials (270 trials altogether). An example trial is shown in Figure 3. In the beginning of the task, the children were instructed to focus their eyes on the fixation cross appearing for 500 ms in the beginning of each trial (see Fixation in Figure 3). This was followed by the presentation of a face pair for 500 ms in 40 of the trials and for 1250 ms in 40 of the trials, that is, stimulus onset asynchronies (SOAs) of 500 ms and 1250 ms (see Stimuli in Figure 3). Two different SOAs were used to allow separate assessments of early and late occurring attentional biases. In 40 trials, the face pair consisted of an angry and a neutral face (20 trials in both SOA conditions), while in another 40 trials it consisted of a happy and a neutral face. Using both angry and happy faces allowed separate assessment of attentional biases for these faces. In 10 filler trials the face pair consisted of two neutral faces (responses to these were not analyzed in this study).

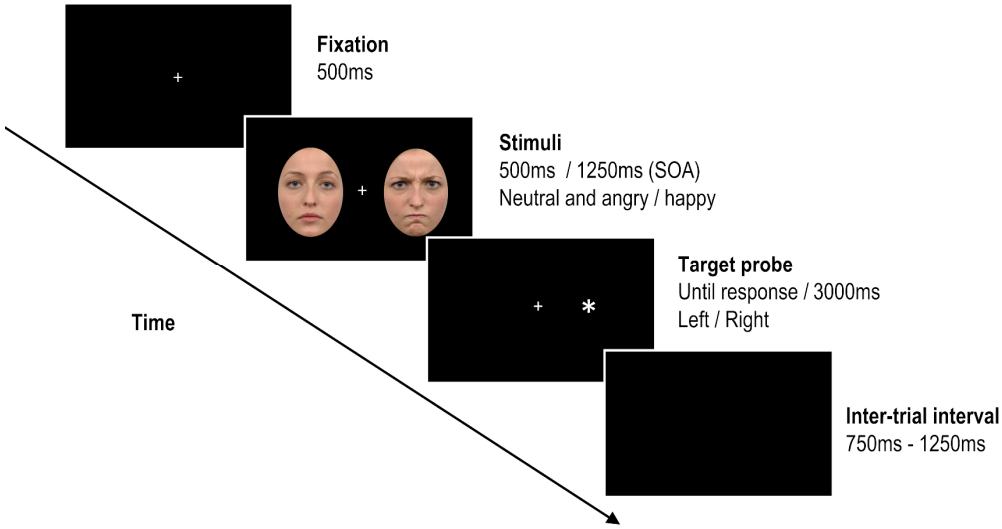

Figure 3. A schematic of the dot probe task. Visualization shows an example of one emotional cue trial in which the target probe appears at the place of the angry face (right side of the screen).

After the disappearance of the face pair, an asterisk probe was displayed on the left or right side of the screen, replacing one of the faces (see Target probe in Figure 3). In the beginning of the task, the children were instructed to indicate the location of the probe (left or right) as quickly and accurately as possible by using computer mouse buttons. The probe appeared either at the location of the neutral or emotional face (40 trials in each) and was presented for a maximum of 3000 ms or until the child responded. The interval between the child's response and the next trial varied randomly between 750 ms and 1250 ms (see Inter-trial interval in Figure 3).

All conditions were presented in a randomized, balanced order. A one-minute break was allowed after every 30 trials. Photographs of five male (m6, m8, m10, m11 and m14) and five female (f1, f7, f11, f14 and f29) models from the Karolinska Directed Emotional Faces stimulus set were used as stimuli (KDEF; Lundqvist, Flykt, & Öhman, 1998). Following Calvo & Nummenmaa (2008), the KDEF photographs were cropped so that only facial features relevant for emotional expressions (i.e., forehead, eyes, nose, cheeks, mouth, and chin) were visible. On a 17-inch monitor each face fit within an oval window subtending 20 x 15 cm.

Before computing attention bias scores, incorrect responses and outlier responses (response times < 150 ms or > 1500 ms) were removed from the data, followed by the removal of responses with response times deviating by 2.5 SD from the individual mean. Due to equipment failure, four children completed only two of the three blocks of the experiment. Little's MCAR test showed this missingness to occur completely at random $\chi^2(8) = 9.70$, $p = .286$. The final data consisted, on average, of 223.77(SD = 21.23) out of 240 trials for each child.

Attention bias scores were computed separately for different stimulus onset asynchronies (500 ms and 1250 ms) and for different emotional faces (angry and happy). This was achieved by subtracting the mean response time for emotional-cue trials from the mean response time for neutral-cue trials.

8.4.2 Situational priming procedure

We created nine stories (three stories per theme) to activate children's mental representations related to (1) *threat to intimacy* (i.e., parental belittling after being physically hurt; parental insensitivity after being bullied by peers; peer exclusion at school); (2) *threat to autonomy* (i.e., getting lost in unfamiliar place while exploring;

getting a cut when using adult's bread knife; failing a school exam); and (3) *secure situation*, involving fulfillment of both autonomy and intimacy (i.e., a pleasant solo bus trip to visit grandparents; having a special day and getting to decide what to do; winning in a team game with one's peers at school). The stories were adapted from previous research (Reijntjes, Stegge, Terwogt, & Kamphuis, 2006; Rijo, 2000; Zimmer-Gembeck, Lees, Bradley, & Skinner, 2009). A female actress narrated the stories expressing the emotional experiences of the story's protagonist (e.g., sad after parental belittling, anxious and fearful when getting lost, happy when winning in a team game). Recorded stories (mean length 1:17 min, ranging from 0:54 to 1:43 min) were edited to contain different protagonist names to match each participant's gender.

In the situational priming procedure, the children heard the three thematically related stories before completing the dot-probe task. The three story themes and the three individual stories within each theme were presented in a balanced, randomized order. However, due to the distressing content of the threat stories, the secure situation stories were always presented between the autonomy-threat and intimacy-threat stories. Immediately after hearing each individual story, children reported their perceptions about the story events regarding the degree of threat ("That would be a bad thing to happen"), personal importance ("I would care if that happened to me"), and whether they had experienced similar events in their own life ("Something similar has happened to me in reality") using five-point Likert scales (see Hood, Power, & Hill, 2009). The primary purpose of these questions was to ensure that the children engaged with the story events and empathized with the story protagonist.

8.5 Statistical analyses (Study I-IV)

8.5.1 Structural equation framework (Study I and III)

In *Study I and Study III* the statistical analyses were carried out using structural equation modeling with the Mplus 7 program (Muthén & Muthén, 1998) using maximum likelihood estimation with robust standard errors. This estimation method handles missing data using Full Information Maximum Likelihood. The overall fit of the models was evaluated with the comparative fit index (CFI), the Tucker-Lewis index (TLI), the root mean square errors of approximation

(RMSEA), and the chi-square (χ^2). As a criterion of acceptable fit, we used values of > 0.95 for CFI and TLI (Hu & Bentler, 1999), and < 0.08 for RMSEA (Browne & Cudeck, 1993). Chi-square ($\chi 2$) was also reported, even though it tends to be inflated with large sample sizes.

The overall fit of measurement models was tested in *Study I* and *Study III* to ensure that the structural equation models were based on appropriate assumptions. The assumption of structural invariance between different subgroups (e.g., among boys and girls) was tested using multiple group analyses. Further tests verified whether the factor loadings of mothers and fathers indicator variables of the same latent construct could be fixed to 1. This was done to ensure that both parents' reports equally contributed to the analysis. The assumption of longitudinal factorial invariance was tested in *Study I* to ensure that the latent constructs captured identical content across T1, T2, and T3.

In *Study I* and *Study III* the fit of nested models was compared with the Satorra-Bentler Scaled chi-square test ($\Delta\chi 2$). *Study II* also used Wald's test to assess the joint significance and FST specific effects on dependent variables. *Study I* and *Study III* involved a large number of statistical tests (i.e., tests of age-specific effects and moderated effects). Therefore, the Benjamini-Hochberg procedure was used to protect significance levels against false positive discoveries (Benjamini & Hochberg, 1995). Effect sizes were indicated using standardized regression coefficients when possible, and R-squared values to indicate absolute (R^2) and incremental (ΔR^2) variance accounted by the independent variables over and above the covariates.

8.5.2 Tests of age-specific models (Study I)

Study I tested whether the quality of autonomy and intimacy at child's age of 2 months and 12 months differently predicted children's affect regulation at the age of 7-8 years. The age-specific models were built separately for each family-relationship dimension predicting children's emotion regulation, neurotic defenses, and immature defenses. For a conceptual depiction of these models, see Figure 4.

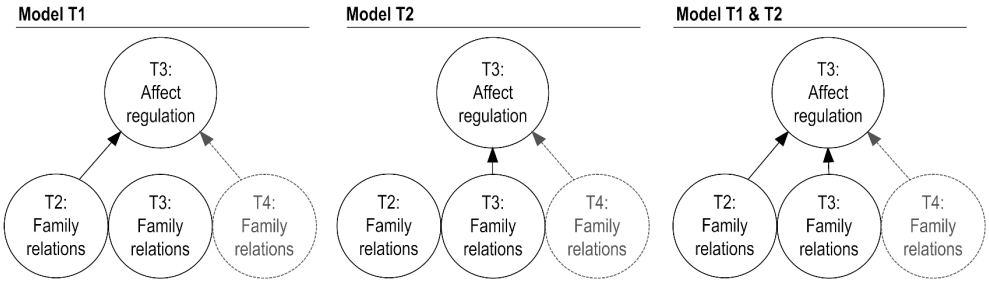

Figure 4. Conceptualization of models used to test age-specific effects of family relationships on affect regulation. T2, T3, and T4 refer respectively to child's ages of 2 months, 12 months, and 7–8 years. Family relationships at T4 (marked with dashed lines) are included in all age-specific models as a control predictor. [From Lindblom et al. (2016). Early family relationships predict children's emotion regulation and defense mechanisms. *Sage Open, 6*, 1-18. Copyright © 2017 by Sage Publishing. Adapted by permission of Sage Publications.]

Two criteria, adapted from Budescu (1993), were used to compare the relative importance of family relationships at 2 months and at 12 months. The age-specific predictor is more important than another predictor if it both (a) explains a larger proportion of the dependent variable when examined without another predictor, and (b) explains a unique proportion of the dependent variable when shared variance with another predictor is taken into account.

To test which of the age-specific models (Model T2 or Model T3 in Figure 4) *explained a larger proportion* of emotion regulation and neurotic and immature defenses, Akaike's information criterion (AIC; Akaike, 1973) was used. A difference of $\geq |2.00|$ in AIC was used as a rule of thumb to indicate meaningful significance in the explanatory power between the non-nested age-specific models (Burnham & Anderson, 2002).

Secondly, to test whether each of the age-specific models had *unique predictive power* over and above the other age-specific models, the Satorra-Bentler Scaled chi-square test ($\Delta\chi^2$) (Satorra & Bentler, 2001) was used. To test the unique contribution of 2 months over 12 months, the fit of Model T3 was tested against that of Model T2 & T3. Conversely, to test the unique contribution of family relationships quality at 12 months over 2 months, the fit of Model T2 was tested against that of Model T2 & T3.

Both non-nested (i.e., AIC) and nested (i.e., $\Delta\chi^2$) comparisons of age-specific models were based on the total fit of the models, because this is not influenced by the possible problem of multicollinearity biasing individual path coefficients (e.g., Marsh, Dowson, Pietsch, & Walker, 2004). In other words, the comparisons reflect the combined total effects of both parents' reports of family relationships.

8.5.3 Factor mixture modeling (Study II)

To identify FSTs as multidimensional family relationship trajectories, a mixture modeling with Mplus 5 was used (Muthen & Muthen, 2007). Mixture modeling identifies naturally occurring subpopulations from the data, called latent classes, and provides criteria to evaluate the number of these classes (B. Muthén, 2001). As shown in conceptual form in Figure 5, identification of latent classes was based on means of 48 variables depicting autonomy and intimacy in mother-to-father, father-to-mother, father-to-child and mother-to-child relations, measured at T1, T2 and T3, and reported by both mothers and fathers. To avoid identifying an artificially high number of latent classes due to highly correlating variables (Lubke & Neale, 2006), two common latent factors with constant loadings of 1 for all maternal (i.e. Mother Level in Figure 5) and paternal (i.e. Father Level in Figure 5) reports were added in the model. Inclusion of these latent factors reduces redundant variation, such as parental response biases.

The FSTs were identified in two phases. The first phase of the analysis identified the overall number of latent classes. The second phase of the analysis identified those latent classes in which mother's and father's reports of family relations were either equal or discrepant. This was achieved by constraining the means of all corresponding variables to be the same between maternal and paternal reports. This constraint was done in successive steps, ranging from zero to all latent classes being constrained.

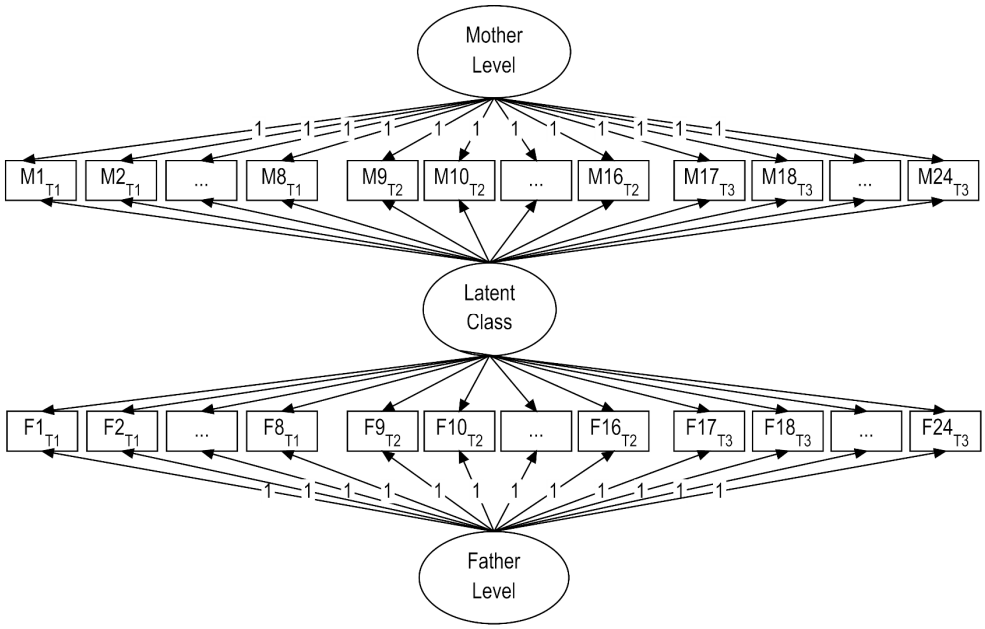

Figure 5. The factor mixture model used to identify the early FSTs. Variables M1 to M24 are based on mothers' and F1 to F24 on fathers' reports of family relationships during pregnancy ($_{T1}$) and at the child's ages of 2 months ($_{T2}$) and 12 months ($_{T3}$). Parent's reports were fixed to be the same (i.e., $M1_{T1} = F1_{T1}$, $M2_{T1} = F2_{T1}$ etc.) when indicated by fit indices. [From Lindblom, Peltola et al. (2017). Early family system types predict children's emotional attention biases at school age. *International Journal of Behavioral Development, 41*, 245-256. Copyright © 2017 by Sage Publishing. Adapted by permission of Sage Publications.]

In both phases of analysis the number of identified latent classes was based on the Bayesian Information Criterion (BIC), as simulation studies show it to be highly reliable for factor mixture models (Nylund, Asparouhov, & Muthén, 2007; Tolvanen, 2007). Smaller BIC values indicate better goodness-of-fit between theoretical model and empirical data. We further evaluated the quality of the resulting FST classification with entropy and average posterior probabilities for most likely latent class membership. These ranged from 0 to 1, the higher values indicating better discrimination of the classes. Model parameters were estimated using the maximum likelihood method with robust standard errors against non-normality, and missing data was handled by the Full Information Maximum Likelihood estimation implemented in Mplus (Muthen & Muthen, 2007). It is noteworthy that the bootstrapped likelihood ratio test (BLRT) could not be used to identify the number of latent classes due to high computational demands.

However, we ensured that the analysis found the best solution of all local maximums by using a large number (5000) of randomized initial starting values.

After the identification of the latent classes, the FSTs were described using repeated measures ANOVAs. To provide simplified description, the marginal means were aggregated over relationships (marital and parenting) and target parents (mother and father). Longitudinal changes were described with linear and quadratic trends. To foster the interpretation of effect sizes, the relationship variables were standardized (using pooled variance over mother and father) and Partial Eta Squared (η^2) values were reported. Greenhouse-Geisser correction was used to correct the violation of sphericity when needed.

8.5.4 Tests of mediation and moderation (Study III)

Study III tested whether family related factors (i.e., parental education levels, parity, former infertility, and the child's gender) moderated the effects of early FSTs on children's social-emotional outcomes (i.e., emotion regulation, peer exclusion, anxiety, and depression). These moderation effects ($b_1 * b_5$ in Figure 6) were computed using the product terms between the FSTs and the moderators. Following Hayes and Preacher (2014), the FSTs were represented as dummy coded variables, which indicated contrasts between the Cohesive type and the other family system types (0 vs 1).

The study also tested whether emotion regulation and peer exclusion mediated the effects of FSTs on children's anxiety and depression, and whether the family related factors moderated these effects (i.e., moderated mediation). Mediation ($b_2 * b_3$ in Figure 6) and moderated mediation ($b_2 * b_3 * b_4$ in Figure 6) were tested using the delta method based on the product terms between the path coefficients (MacKinnon, 2008). Because the product terms do not necessarily follow normal distributions (Hayes & Preacher, 2014), the bias corrected bootstrapped confidence intervals were estimated in Mplus (Muthen & Muthen, 2007). Exclusion of the value of 0 from the 95% confidence interval indicates statistical significance ($p < .05$).

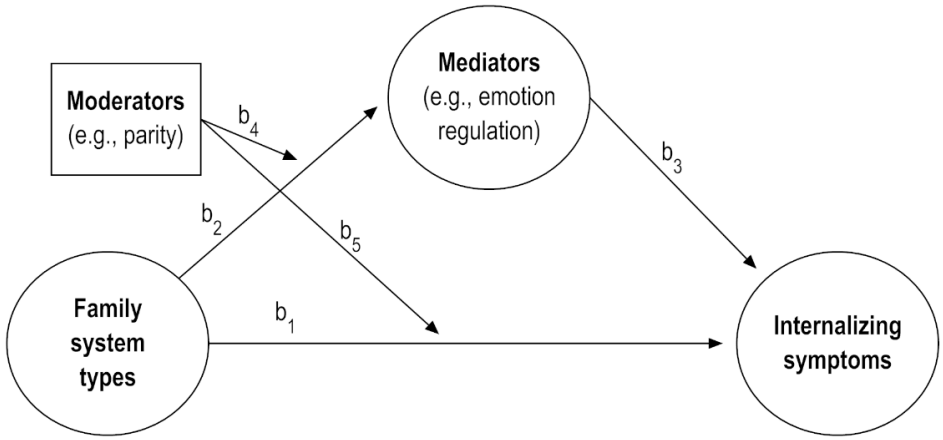

Figure 6. Conceptual model of the mediation and moderation in Study III.

8.5.5 Linear mixed-effects models (Study IV)

To examine how FSTs (identified in *Study II*) and situational priming predict children's attentional biases, linear mixed-effect models were built using IBM SPSS Statistics 20. Mixed-effect models are effective in handling missing values because they use maximum-likelihood estimation, which utilizes all the information available in the data.

Attention-bias scores from the dot-probe tasks were the dependent variables in the models. Emotion (angry or happy face), SOA, i.e., stimulus onset asynchrony (500 ms or 1250 ms), and situational priming (intimacy-threat, autonomy-threat, or secure situation) were used as fixed within-subject factors. FST (Cohesive, Disengaged, Enmeshed, Authoritative) was used as a fixed between-subjects factor. Parity and children's state anxiety were used as covariates to control for family differences and to ensure that pre-experiment anxiety did not confound the results.

Unstructured covariance structure was used, making no *a priori* assumptions about correlations between the study variables. To achieve parsimonious models, nonsignificant interactions involving FSTs or covariates were removed from the model (except when their higher-order interactions were significant). Post hoc analyses were run using separate mixed-effects modeling for the relevant factors.

95% confidence intervals (CIs) were used to test the absolute presence of attentional biases (i.e., whether the difference in response times between emotional-cue and neutral-cue trials deviated from zero). Cohen's *d* was reported to indicate effect sizes.

9 RESULTS

9.1 Study I

9.1.1 Measurement models and preliminary analyses

Preliminary analyses showed that factorial invariance, i.e., similar factor loadings, could be assumed from T2 to T3 and T4 for intimacy and autonomy in parenting and marital subsystems. However, one indicator variable (item *independent–dependent* averaged over self- and spouse) had to be excluded due to low factor-loading from models of family subsystem autonomy. Tests of factorial invariance between mothers' and fathers' reports showed similarity in reports of parental autonomy, marital autonomy, and marital intimacy, but not in reports of parental intimacy. The lack of interparental factorial invariance for parental intimacy indicates that mothers and fathers perceived the concept of parental intimacy differently, although parents' own perceptions of the construct were consistent over time. Furthermore, tests of structural equality, i.e., similarity of the correlations between latent constructs, showed that parental reports of parenting intimacy differently associated with children's emotion regulation, neurotic defenses and immature defenses. Thus, the main analyses were done separately for mothers' and fathers' reports of parental intimacy, but were combined regarding reports of parental autonomy, marital intimacy and marital autonomy.

9.1.2 Effects of family relationships on affect regulation

The results were largely in line with the different preconditions hypothesis. As shown in Table 2, high levels of marital autonomy and parental autonomy at the child's ages of 2 and 12 months predicted children's efficient emotion regulation. Furthermore, as hypothesized, low levels of marital autonomy and parental autonomy at the child's ages of 2 and 12 months predicted children's high reliance on neurotic defenses and immature defenses. Finally, low marital intimacy at the

child's age of 12 months predicted children's reliance on immature defenses and on neurotic defenses. Regarding parental intimacy, father's reports at the child's age of 12 months predicted reliance on immature defenses. However, against our hypothesis, mother's or father's reports of parental intimacy at the child's age of 2 months did not predict emotion regulation, neurotic defenses, or immature defenses.

Marital autonomy accounted for 2% to 4% of affect regulation; parental autonomy accounted for 3% to 9% of affect regulation; marital intimacy accounted for 1% to 4% of affect regulation; and father's reports of parental intimacy accounted for 1% to 4% of affect regulation over and above the covariates (i.e., children's developmental achievements, parity, child's gender, parents' level of education and infertility history).

9.1.3 Age-specific effects of early family relationships on affect regulation

The results showed some support for our *age-specific hypotheses*. Parental autonomy at the age of 2 months (T2) explained a larger proportion of neurotic defenses, $\Delta AIC = -6.42$, $\Delta R^2 = 0.03$, than parental autonomy at 12 months (T3). Parental autonomy at 2 months (T2) also explained a unique proportion of neurotic defenses, $\Delta\chi^2 = 15.52$, $p < .001$, $\Delta R^2 = 0.09$, over parental autonomy at 12 months (T3) and 7–8 years (T4). Thus, we concluded that parental autonomy at the age of 2 months was a more important predictor of children's reliance on neurotic defenses than parental autonomy at the age of 12 months. Against our hypotheses, however, age-specific effects were not found regarding other family subsystems, or for emotion regulation or immature defenses.

Table 2. Family relationships at 2 months (T2) and 12 months (T3) predicting children's affect regulation at the age of 7–8 years (T4)

	Emotion regulation			Neurotic defenses			Immature defenses		
	B	*SE*	Δr^2	*B*	*SE*	Δr^2	*B*	*SE*	Δr^2
T2: 2 months									
Marital autonomy	0.09**	0.03	0.03	−0.10**	0.04	0.03	−0.11**	0.04	0.02
Parental autonomy	0.10***	0.03	0.05	−0.14***	0.03	0.09	−0.15***	0.04	0.05
Marital intimacy	0.05(*)	0.03	0.01	−0.06(*)	0.03	0.02	−0.09*	0.04	0.01
Parental intimacy, mothers' reports	0.09	0.05	0.01	−0.01	0.07	0.00	−0.04	0.07	0.00
Parental intimacy, fathers' reports	0.03	0.06	0.00	−0.05	0.06	0.00	−0.05	0.06	0.00
T3: 12 months									
Marital autonomy	0.11***	0.03	0.05	−0.14***	0.04	0.07	−0.10*	0.05	0.01
Parental autonomy	0.13***	0.03	0.07	−0.13**	0.04	0.06	−0.17***	0.05	0.05
Marital intimacy	0.05(*)	0.03	0.02	−0.08**	0.03	0.04	−0.09**	0.04	0.02
Parental intimacy, mothers' reports	0.11(*)	0.06	0.02	−0.01	0.07	0.00	−0.13(*)	0.06	0.02
Parental intimacy, fathers' reports	0.04	0.05	0.01	−0.23*	0.10	0.04	−0.06	0.06	0.00

Note. Δr^2 = Incremental change in r^2 over and above the background variables and early developmental achievements. Coefficients are constrained to be the same between mothers' and fathers' reports, except for parental intimacy. Asterisks in parentheses refer to nonsignificance after the Benjamini-Hochberg correction ($p > .0266$). The models showed acceptable fit, CFI = 0.942–0.967; TLI = 0.932–0.959; RMSEA = 0.03–0.03, 90% CI = 0.02–0.04; $\chi^2(341–530) = 482.92–849.92$, all p's < 0.001. *p < .05. **p < .01. ***p < .001. [From Lindblom et al. (2016). Early family relationships predict children's emotion regulation and defense mechanisms. *Sage Open, 6*, 1-18. Copyright © 2017 by Sage Publishing. Adapted by permission of Sage Publications.]

9.2 Study II

9.2.1 Identification of the latent FSTs

During the first phase of analysis, the factor mixture modeling identified 11 distinct latent FST classes. The goodness of fit (BIC) decreased as the number of the classes increased until 11 classes were added into the model, suggesting that this was the best model in terms of parsimony and adequate representation of the data. Class sizes for this model were 304, 88, 85, 71, 54, 31, 24, 19, 16, 10, and 8. High entropy (.931) and high average latent class probabilities (.882 – .999) indicated that these classes were clearly distinguishable.

During the second phase of the analysis, we estimated 11 classes in the factor mixture modeling and constrained maternal and paternal reports to be the same in successive steps from 0 up to 11 classes. The goodness of fit was smallest when nine out of 11 classes had constraints. Thus, in two out of 11 FSTs the parents had discrepant views of family relations. Constrained class sizes were 274, 107, 46, 41, 38, 30, 14, 11, and 10, and unconstrained class sizes were 115 and 24. High entropy (.898) and high average latent class probabilities (.855 – .998) indicated that the classes were clearly distinguishable.

Power analyses showed that for the smallest classes, with $n < 25$ (ns ranging from 10 to 24), powers of .34 to .65 were achieved, whereas for classes with $n > 25$ (ns ranging from 30 to 115) powers of .74 to .99 were achieved when they were compared to the largest class ($n = 274$). Thus, to ensure that acceptable power of about 0.80 could be assumed for pairwise tests, we decided to exclude the four smallest classes ($n = 14$, 2%; $n = 11$, 2%; $n = 10$, 2%; and $n = 24$, 4%) using a cutoff criterion of $n < 25$. These excluded classes accounted for 9% of the whole sample ($n = 59$), whereas the remaining seven classes accounted for 91% ($n = 646$) of the whole sample.

9.2.2 Description of the FSTs

The identified FSTs and their longitudinal trajectories are shown in Figure 7. They differed in their overall level of autonomy, $\eta 2 = .63$, and intimacy, $\eta 2 = .61$, indicating qualitative differences in these relationship dimensions. Furthermore, the FSTs differed in how overall autonomy, $\eta 2 = .13$, and intimacy, $\eta 2 = .29$, changed over time, indicating that different FSTs had unique longitudinal dynamics during the transition. To further describe the FSTs, autonomy and intimacy were compared between the FSTs at T1, T2 and T3, and both linear and quadratic trends were examined separately within each FST.

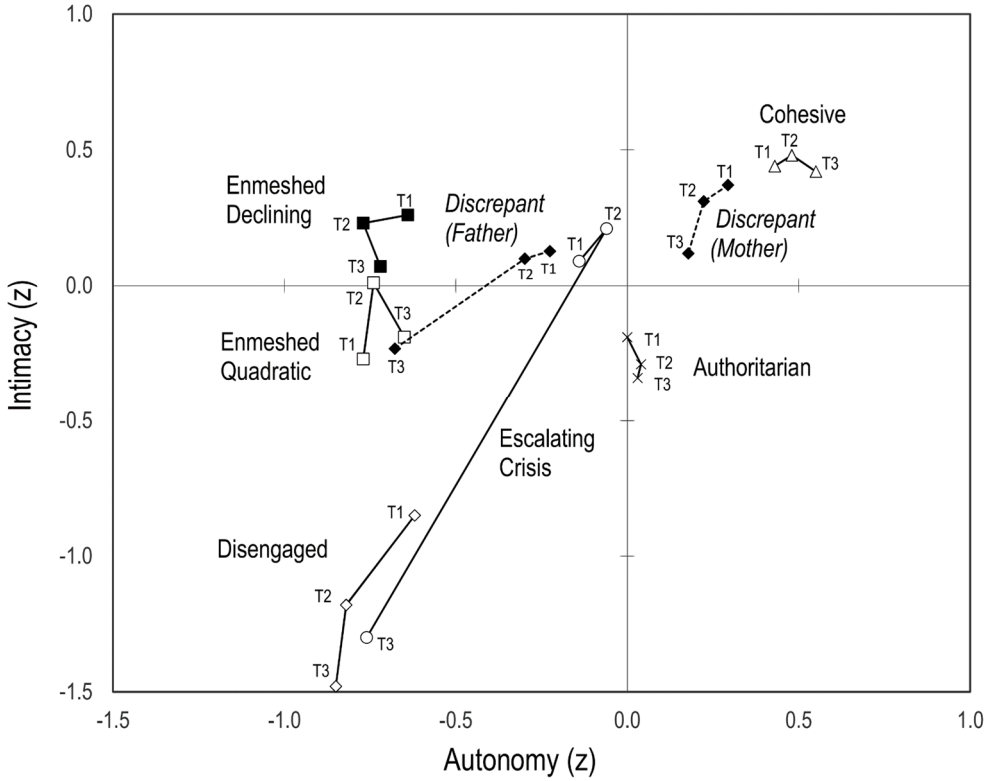

Figure 7. Identified family system trajectories in dimensions of autonomy and intimacy. T1, T2 and T3 denote pregnancy, child's age of 2 months and 12 months, respectively. Values are means, aggregated over parent's gender (father or mother), relationship (parental or marital) and reporter (father or mother). Separate values are presented for father's and mother's reports in Discrepant families (dashed line). [From Lindblom et al. (2014). Dynamic family system trajectories from pregnancy to child's first year. *Journal of Marriage and Family, 76*, 796-807. Copyright © 2014 by John Wiley Sons, Inc. Reproduced by permission of John Wiley & Sons, Inc.]

The first FST was called *Cohesive* (*n* = 274; 34.6%), because it had the highest levels of autonomy and intimacy when compared to other trajectories at all timepoints. Autonomy in this FST increased from pregnancy to 12 months, $\eta 2 = .07$.

The second FST was called *Disengaged* (*n* = 41; 5.2%) because it had the lowest levels of both autonomy and intimacy when compared to other FSTs at all timepoints. Intimacy in this FST declined from pregnancy to 12 months, $\eta 2 = .36$.

The third and fourth FSTs were both interpreted to be *Enmeshed* because they had the lowest levels of autonomy, but somewhat higher levels of intimacy, i.e., higher intimacy than in Disengaged family systems. The third FST was called *Enmeshed Declining (n* = 46, 6%), as intimacy declined from pregnancy to 12 months, $\eta 2 = .22$. The fourth FST was called *Enmeshed Quadratic* (*n* = 38, 5%), as intimacy first increased from pregnancy to 2 months, but had declined by 12 months, $\eta 2 = .34$. Enmeshed Declining families had a higher level of intimacy than Enmeshed Quadratic families at all timepoints.

The fifth FST was called *Authoritarian* (*n* = 107; 13.5%) because it had a low level of intimacy combined with an average level of autonomy when compared to the other FSTs at all timepoints. Intimacy in this FST declined from pregnancy to 12 months of child's age, $\eta 2 = .09$.

The sixth FST was called *Escalating Crisis* (*n* = 30, 3.8%) because it had average levels of autonomy and intimacy during pregnancy and at 2 months, but the lowest level of autonomy and intimacy at 12 months, not differing from those of Disengaged families. Both intimacy, $\eta 2 = .79$, and autonomy, $\eta 2 = .43$, were stable from pregnancy to 2 months, but then had declined by 12 months. As a result, both intimacy, $\eta 2 = .82$, and autonomy, $\eta 2 = .69$, declined from pregnancy to 12 months.

The seventh FST was called *Discrepant* (*n* = 115, 14.5%), because the parents had discrepant views of family relations. On average, the Discrepant family type had moderate levels of both autonomy and intimacy during pregnancy and at 2 months. However, autonomy was relatively low at 12 months, i.e. lower than in Authoritarian families but higher than in Disengaged families. As shown in Figure 7, fathers viewed family relations as less intimate than mothers, $\eta 2 = .16$. Further, fathers viewed family relations as less autonomous than did mothers, $\eta 2 = .27$, and perceived steeper decline in family autonomy than mothers, $\eta 2 = .09$. Nevertheless parents agreed that intimacy declined over time, $\eta 2 = .35$, particularly from 2 months to 12 months, $\eta 2 = .15$.

9.2.3 Predictors of the FSTs

Contrary to our hypotheses about the *predictors of the FSTs*, the analysis revealed no simple main effects of duration of partnership or parity on trajectory membership. There were either no main effects of parents' educational levels, or previous infertility on the trajectory membership. However, significant interactions were found between parents' educational levels and duration of partnership, $\chi^2(6) = 24.68$, $p < .001$; between education and parity, $\chi2(6) = 13.87$, $p = .037$; between education and previous infertility, $\chi2(6) = 21.17$, $p = .002$; and between duration of partnership and previous infertility, $\chi^2(6) = 14.46$, $p = .025$, on predicting family trajectory membership. We examined the interaction effects further in post hoc analyses. We used the Cohesive family trajectory type as a reference group because it was the largest family trajectory and had the highest levels of autonomy and intimacy.

Post hoc analyses showed that among couples with low education levels, multiparity predicted membership in both the Disengaged and Authoritarian trajectories, and that a short duration of partnership predicted membership in the Escalating Crisis trajectory. Furthermore, among couples with high education levels, previous infertility predicted membership in both the Enmeshed Quadratic and Enmeshed Declining trajectories, and primiparity predicted membership in the Authoritarian family trajectory. Finally, among couples with no previous infertility, a long duration of partnership predicted membership in both the Authoritarian and Disengaged trajectories, and a low educational level predicted membership in the Enmeshed Quadratic trajectory. These interaction effects explained about 17% of trajectory membership, $\chi^2(48) = 103.82$, $p < .001$, Cox and Snell $R^2 = .17$.

9.3 Study III

9.3.1 Combining FSTs based on preliminary analyses

The analysis in *Study II* identified seven family system types. However, to achieve sufficient statistical power in the *Study III*, we combined the two small enmeshed families (Enmeshed Quadratic, $n = 26$; Enmeshed Declining, $n = 32$) to one group of Enmeshed families, and the two family system types characterized by low intimacy (Disengaged, $n = 29$, Escalating Crisis, $n = 22$) to one group of Distant

families. Thus, the families in the present study represent either Cohesive (n = 200), Discrepant (n = 70), Enmeshed (n = 58), Distant (n = 51), or Authoritarian (n = 72) family system types.

We tested the plausibility of this grouping by examining whether the grouped family system types had similar effects on child outcomes. The results showed that the path coefficients could be constrained to be the same between the two original enmeshed, Wald(4) = 4.49, p = .344, and between the two original distant, Wald(4) = 7.38, p = .120, family system types. Thus, the grouping was maintained in the subsequent analyses

9.3.2 Direct effects of the FSTs

Regarding children's internalizing symptoms, the results supported our *direct effects hypothesis* by showing that Discrepant, Enmeshed and Distant families predicted children's anxiety and depression. Against our specific effects hypothesis, the effects of Discrepant, Enmeshed and Distant families on anxiety and depression were highly similar, Wald(4) = 1.07, p = .899. Furthermore, Authoritarian families did not predict children's anxiety or depression. These direct effects of FSTs accounted for 9.7% of anxiety and 6.5% of depression over and above the covariates (former infertility, parity, parental education level and child's gender).

Regarding children's emotion regulation and peer exclusion, the results supported our hypotheses by showing that Enmeshed and Distant families predicted children's inefficient emotion regulation. These effects of Enmeshed and Distant families on emotion regulation were highly similar, Wald(1) = 0.34, p = .563. Contrary to our hypotheses, however, Authoritarian and Discrepant families did not predict children's emotion regulation. None of the FSTs predicted children's peer exclusion. These direct effects of early FSTs accounted for 8.7% of emotion regulation and 1.0% of peer exclusion over and above the covariates.

9.3.3 Moderated effects of the FSTs

The results supported the *contextual factors hypothesis* by showing that former infertility, Wald(16) = 27.21, p = .039, parity, Wald(16) = 32.41, p = .009, and parental education, Wald(16) = 30.65, p = .015, moderated the effects of family system types on child outcomes. The child's gender did not have a protective or vulnerability role, Wald(16) = 13.51, p = .636.

Parents' former infertility moderated the effects of Distant families on children's depression. As shown in Figure 8, Distant families did not predict children's depression in families with infertility history, but predicted children's heightened depression in naturally conceiving families.

Parity moderated the effects of Enmeshed families on children's peer exclusion. As shown in Figure 9, Enmeshed families did not predict children's peer exclusion when the child had older siblings, but predicted heightened peer exclusion when the child was the first born.

Finally, parental education level moderated the effects of Authoritarian families on children's emotion regulation and depression. As shown in Figure 10, Authoritarian families predicted children's inefficient emotion regulation only when the parents had high education level. Similarly, Authoritarian families predicted children's depression only when the parents had high education level.

The moderated effects accounted for 7.7% of anxiety, 7.9% of depression, 6.8% of emotion regulation, and 6.4% of peer exclusion over and above the direct effects and covariates.

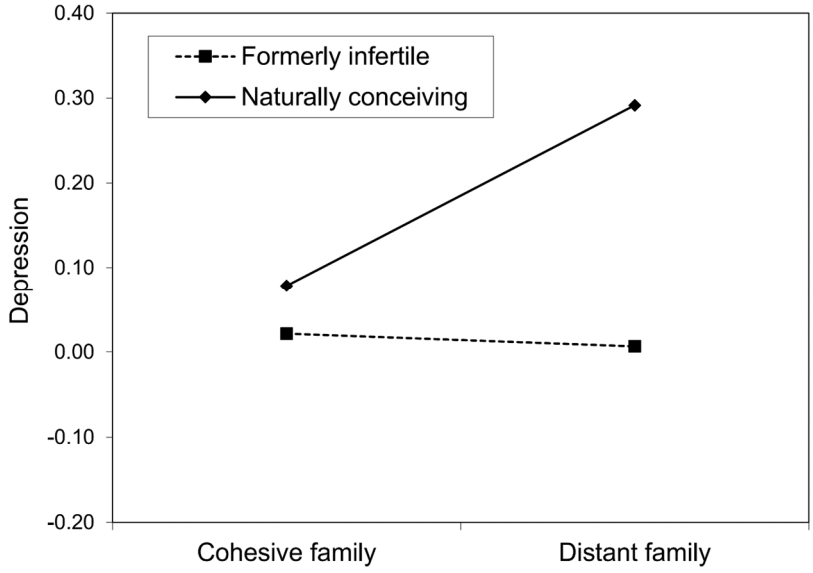

Figure 8. Former infertility moderates the effects of Distant (vs Cohesive) families on children's depression. Among naturally conceiving (NC) parents Distant family predicted children's heightened depression, β = 0.38, SE = 0.11, p < .001, whereas among previously infertile (ART) parents Distant family did not predict depression, β = 0.11, SE = 0.13, p = .400.

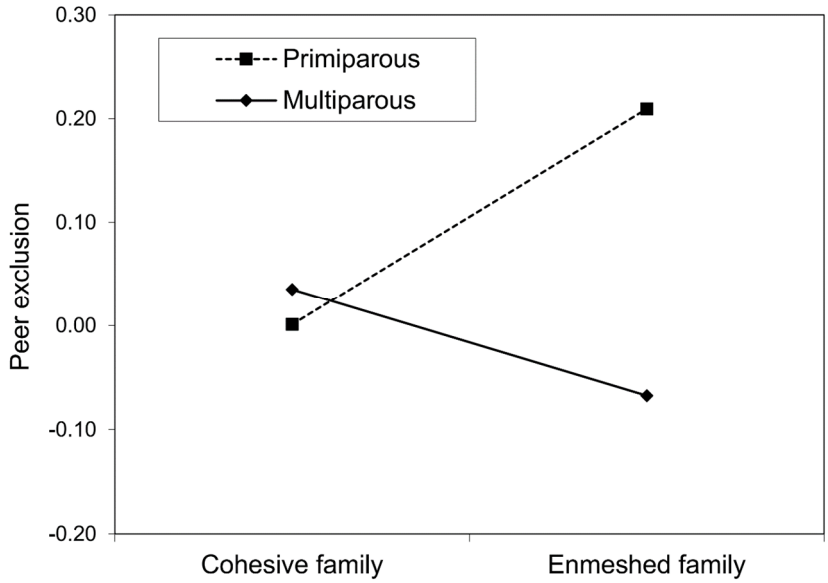

Figure 9. Parity moderates the effects of Enmeshed (vs Cohesive) families on children's peer exclusion. Among primiparous parents Enmeshed family predicted children's heightened peer exclusion, β = 0.31, *SE* = 0.09, p = .001, whereas among multiparous parents Enmeshed family did not predict children's peer exclusion, β = -0.14, SE = 0.13, p = .264.

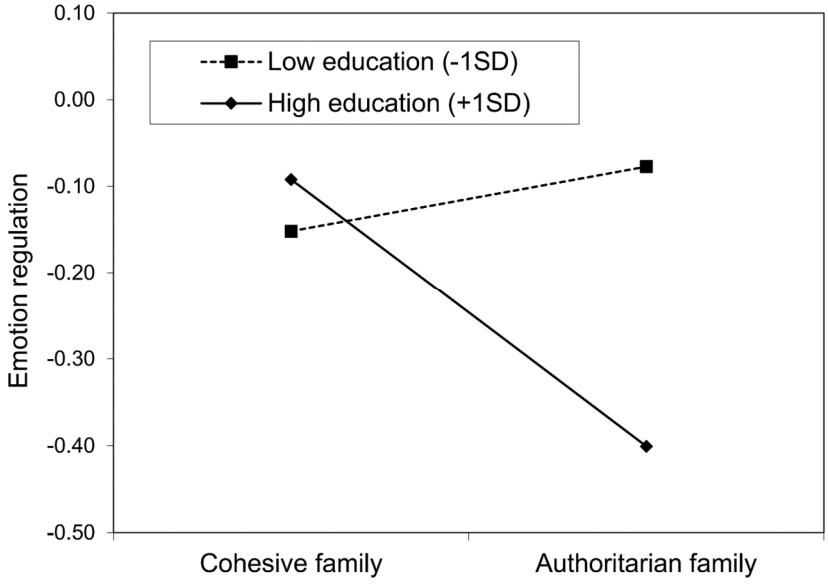

Figure 10. Parental education level moderates the effects of Authoritarian (vs Cohesive) families on children's emotion regulation. In Authoritarian families high parental education predicted inefficient emotion regulation, β = -0.51, *SE* = 0.23, p = .029, whereas in Cohesive families parental education did not predict emotion regulation, β = 0.05, *SE* = 0.10, p = .599.

9.3.4 Mediated effects of the FSTs

The results of the mediation model are shown in Figure 11. The results supported our hypotheses about the *mediating role of emotion regulation* by showing that the detrimental effects of Enmeshed, $\tilde{z}$ = 0.08, 95% CI [0.02, 0.20], and Distant families, $\tilde{z}$ = 0.07, 95% CI [0.02, 0.19], on children's depression were mediated via inefficient emotion regulation.

Furthermore, the interaction effect between Authoritarian families and parental education on children's depression was mediated via inefficient emotion regulation, $\tilde{z}$ = 0.06, 95% CI [0.01, 0.15]. In other words, only when the parents had high education levels did the Authoritarian families predict children's inefficient emotion regulation, leading in turn to heightened depression.

Contrary to the hypothesized mediation model, the bootstrapped path coefficients were nonsignificant from emotion regulation to anxiety, and from peer exclusion to anxiety and depression. This indicated that mediated pathways were possible only through emotion regulation to depression. It is noteworthy that the direct effect of Discrepant families on children's anxiety, but not on depression, remained significant in the mediation model.

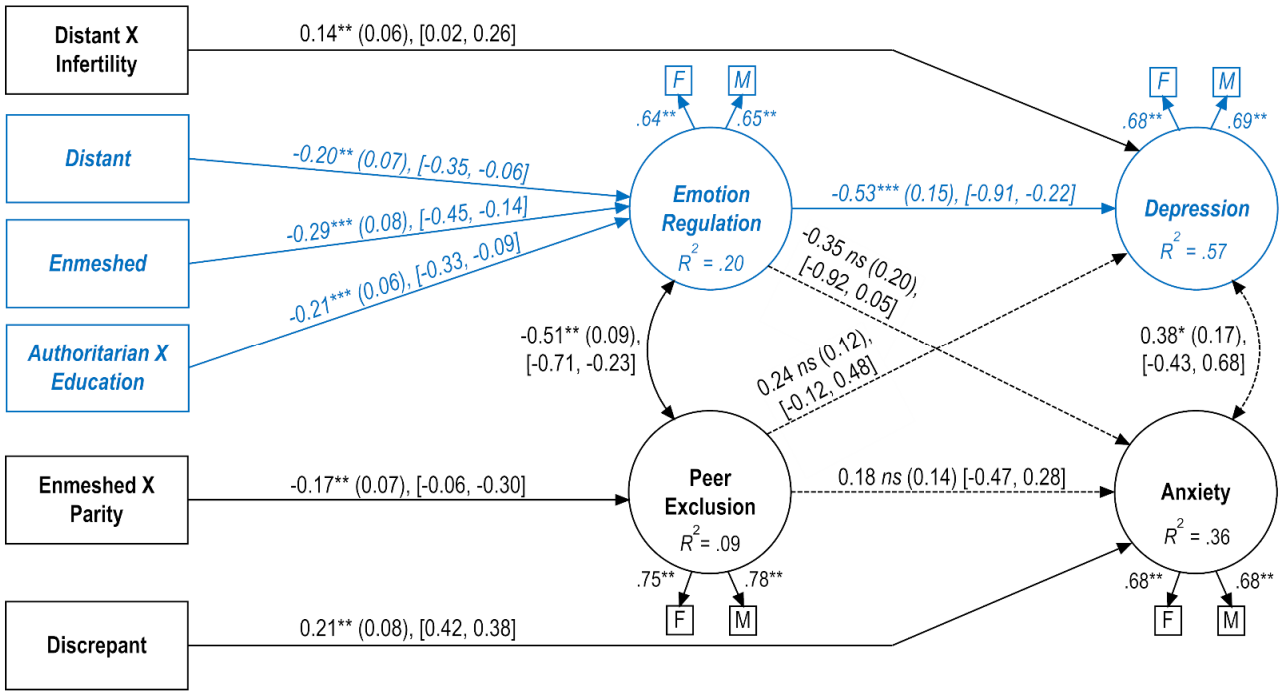

Figure 11. Model testing the mediating pathways from early FSTs on children's anxiety and depression symptoms at the age of 7-8 years. Values refer to standardized beta coefficients, standard errors and 95% confidence intervals, respectively. Blue color (text in italics) denote significant mediating pathway. Dashed lines denote nonsignificant paths. Letters F and M refer to fathers' and mothers' reports, respectively. The model showed acceptable fit, $\chi^2(50) = 44.59$, $p = .689$, CFI = 1.000, TLI = 1.000, RMSEA < 0.01; 90% CI [0.00, 0.03]. * $p < .05$, ** $p < .01$, *** $p < .001$. [Copyright © 2017, American Psychological Association. Reproduced with permission. Lindblom, Vänskä et al. (2017). From early family systems to internalizing symptoms: The role of emotion regulation and peer relations. Journal of Family Psychology, 31, 316-326.

9.4 Study IV

9.4.1 Effects of FSTs on emotional attention biases

In response to our research question regarding how early FSTs predict attentional biases, the linear mixed-effects model showed a three-way Family x SOA x Emotion interaction effect on attentional biases, p = .014. Figure 12 depicts the attention bias scores among children from different family types. To further examine the three-way interaction, we first analyzed the two-way Family x SOA interaction separately for angry and happy faces, and then analyzed the two-way Emotion x SOA interaction separately for each family type.

Firstly, the results showed a significant two-way Family x SOA interaction in the angry face condition, but not in the happy face condition. Pairwise comparisons between family types showed that at the stimulus onset asynchrony (SOA) of 500 ms, children from Cohesive families, d = -0.86, p = .008; and Disengaged families, d = -0.68, p = .037, had greater attentional bias toward angry faces than children from Authoritarian families. Examination of the 95% CIs showed that children from Cohesive and Disengaged families had a significant attentional bias toward angry faces at the SOA of 500 ms, whereas children from Enmeshed Declining families had a significant attentional bias toward angry faces at the SOA of 1250 ms.

Secondly, the results showed a significant two-way Emotion x SOA interaction effect among children from Cohesive families. Pairwise comparisons showed that these children had a marginally greater attentional bias toward angry faces at the stimulus onset asynchrony (SOA) of 500 ms than at the SOA of 1250 ms, d = 0.32, p = .060. There was no such effect of SOA for happy faces, d = 0.06, p = .731.

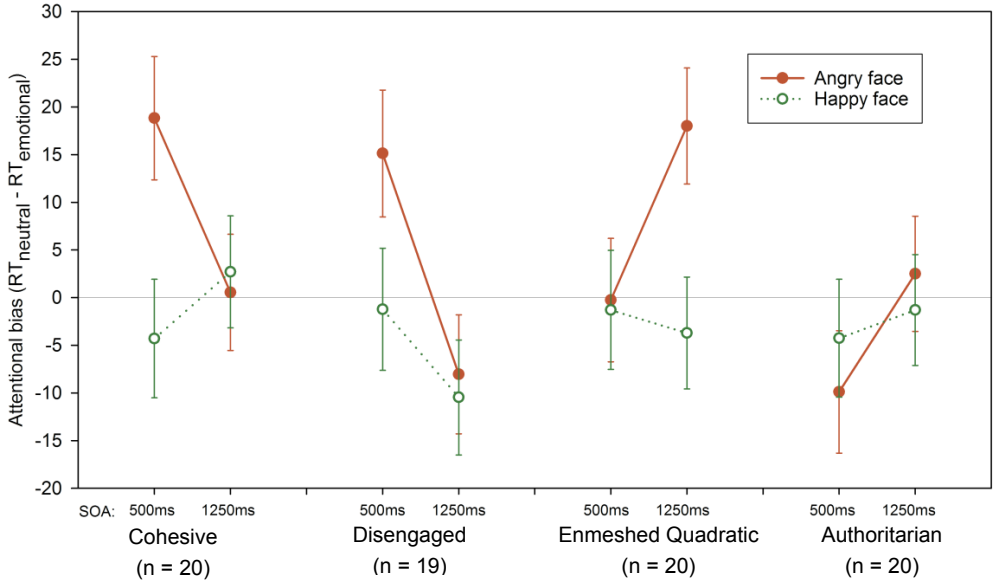

Figure 12. Children's attentional biases to angry and happy faces at the SOA of 500ms and 1250ms according to the FSTs. *Note.* SOA = stimulus onset asynchrony. Positive and negative values indicate attentional biases toward and away from emotional faces, respectively. Error bars represent ±1 standard errors. [From Lindblom, Peltola et al. (2017). Early family system types predict children's emotional attention biases at school age. *International Journal of Behavioral Development, 41*, 245-256. Copyright © 2000 by John Wiley Sons, Inc. Adapted by permission of John Wiley & Sons, Inc.]

There were no significant Emotion x SOA interaction effects among children from Disengaged, Enmeshed Declining or Authoritarian families. However, there was a significant main effect of stimulus onset asynchrony (SOA) among children from Disengaged families and Authoritarian families, indicating that attentional biases occurred similarly for both emotional faces among these children (i.e., angry and happy). Pairwise comparisons showed that children from Disengaged families had a greater attentional bias toward emotional faces at the SOA of 500 ms than at the SOA of 1250 ms, d = -0.71, p = .006. In contrast, children from Authoritarian families had a greater attentional bias toward emotional faces at the SOA of 1250 ms than at the SOA of 500 ms, d = 0.69, p = .013. Examination of the 95% CIs showed that children from Disengaged families had a significant attentional bias toward emotional faces at the SOA of 500 ms, and away from emotional faces at the SOA of 1250 ms. Children from Authoritarian families had a significant attentional bias toward emotional faces at the SOA of 1250 ms.

9.4.2 Moderating effects of situational priming

Regarding our second research question, we included the interactions between the FSTs and situational priming in the mixed-effects model. The results were nonsignificant for the four-way interaction, Priming x Emotion x SOA x Family; for the three-way interactions, Priming x Emotion x Family, and Priming x SOA x Family; and for the two-way interaction, Priming x Family. The results remained nonsignificant after the model was simplified by removing the four-way interaction. Thus, contrary to our hypothesis, we concluded that situational priming did not moderate the effects of family type on children's attentional biases. Parity did not have significant main or interaction effects on attentional biases.

10 DISCUSSION

During the transition to parenthood, families experience dramatic relational changes involving both their marital relationship and new parenthood. At the same time, the infant undergoes one of the most intense developmental periods in human life. Within the early family system, the infant learns ways of regulating emotions, maintaining connection to his or her parents, and adapting to the family as a group.

This dissertation explored and modeled the mechanisms and processes that link early family environments to children's affect regulation and mental health in middle childhood. The central results are summarized in Figure 13. In variable-oriented *Study I* we hypothesized and found that high autonomy and intimacy in both the marital and parenting subsystems predicted children's efficient emotion regulation, and conversely, predicted low reliance on immature and neurotic defenses in middle childhood. These results support the view that children learn from sensitive parents how to regulate one's own emotions, but when the family climate evokes a sense of insecurity, children develop reliance on defense mechanisms. As such, difficulties in regulating one's own emotions seem to co-occur with reliance on defense mechanisms (see the dotted arrows between Inefficient emotion regulation and Defense mechanisms in Figure 13).

To better understand the family environment during pregnancy and children's first year of life, we identified family system types (FSTs) in *Study II* using a person-oriented approach. The FSTs were based on both the marital and parental relationships, as well as their longitudinal dynamics over time (see the left side of Figure 13). As hypothesized, the seven FSTs involved Cohesive (35%), Disengaged (5%), and two enmeshed family types, that is, Enmeshed Declining (6%) and Enmeshed Quadratic (5%). Extending previous research, we also identified Authoritarian (14%), Escalating Crisis (4%) and Discrepant (15%) family types. The results demonstrated high heterogeneity in the FSTs, which function as children's primary developmental environment during infancy.

In *Study III*, we modeled the effects of the FSTs on children's emotion regulation, anxiety and depression in middle childhood. In this study, the original seven FSTs were merged into five larger groups (see the small rectangles within the

larger ones in Figure 13). In line with our hypotheses, first, the FSTs predicted children's emotion regulation, and second, the emotion regulation mediated the effects of the FSTs on children's depression (see the FSTs with blue rectangles in Figure 13). Furthermore, some of the effects of the FSTs were moderated by family-related factors. Counter to our hypothesis, emotion regulation did not mediate the effects of the FSTs on anxiety. Altogether, these results suggest that early development of emotion regulation in the family context is an essential developmental mechanism linking early family problems to later depression.

Contrary to our hypotheses, the FSTs had highly similar direct effects on both anxiety and depression. However, some symptom-specific effects emerged when the mediating role of emotion regulation was included in the analysis. Distant families predicted children's heightened depression symptoms (among naturally conceiving parents), and Discrepant families predicted children's heightened anxiety symptoms.

Finally, in *Study IV,* we examined emotional attention biases among children from Cohesive, Distant, Enmeshed Declining and Authoritarian families. As hypothesized, the FSTs predicted children's unique profiles of attention biases. We interpreted these profiles as indicating either attention bias towards threat, vigilance-and-avoidance of threat, or efficient disengagement from threat (see Attentional biases in Figure 13). Although not directly tested in this dissertation, we theorize that these attentional bias patterns function as integral parts of children's emotion regulation and defense mechanisms. Contrary to our hypothesis, however, situational priming of threat and security did not moderate the effects of the FSTs on children's attentional biases.

Taken together, the results of this dissertation suggest that early family relationships may have longstanding influences on children's affect regulation, evident at the levels of basic attentional processes, unconscious defense mechanisms, and emotion regulation. Our results further demonstrate that family-related alterations in children's affect regulation may have important consequences for their mental health in the form of depression. In general, our results coincide with major developmental theories focusing on the significance of parent-child relationships and the interparental relationship. However, our approach is unique in the sense that we have extended the focus from dyadic relationships to holistic family systems, in line with family systems theory. In the following we discuss the results in more detail, including consideration of the family dynamics and developmental mechanisms that underpin the effects of each of the FSTs on child development.

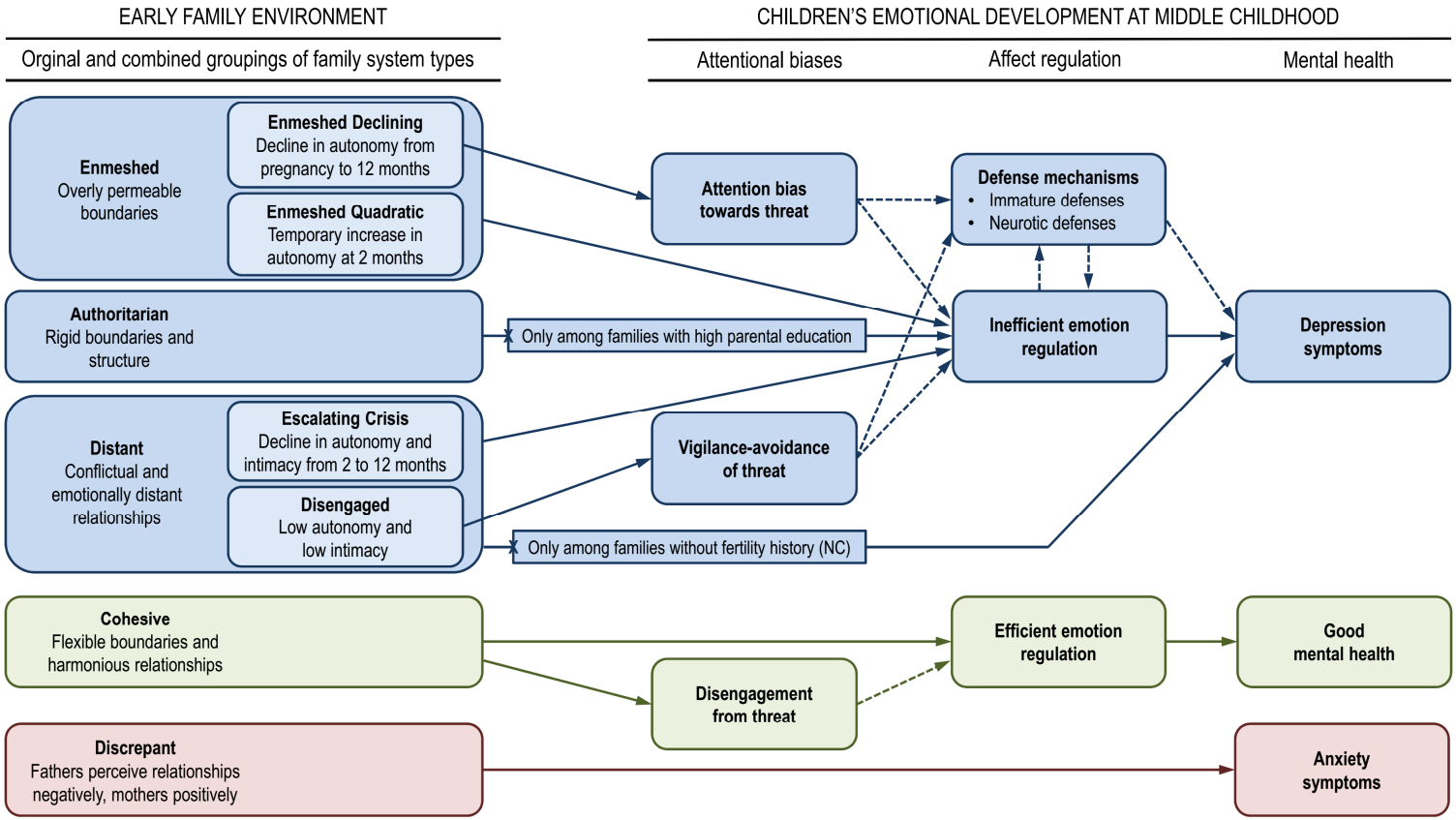

Figure 13. Conceptual summary of the main results from all studies (I-IV). Solid lines denote empirically supported findings. Dashed lines denote hypothetical relations not tested in this dissertation. Blue color denotes effects related to inefficient emotion regulation and depression; green color denotes effects related to efficient emotion regulation and good mental health; red color denotes effects related to anxiety.

10.1 Early family relationships and children's affect regulation

The results of the variable-oriented *Study I* provided support for the *different family preconditions hypothesis* by showing that high quality of family relationships, characterized by high autonomy and intimacy during the transition to parenthood, predicted children's efficient emotion regulation. In contrast, low quality of family relationships, characterized by low autonomy and intimacy, predicted children's reliance on neurotic and immature defenses. Regarding the quality of parenting, these results concur with attachment research, which has demonstrated the importance of early caregiving quality for children's affect regulation, encompassing both emotion regulation and defensive processes (Calkins & Hill, 2007). When interacting with their infants, parents with a high sense of autonomy in the parent-child relationship are likely to show emotional acceptance and be skillful in supporting their infant's emotion regulation development. Parents with a low sense of relational autonomy, in turn, can be fearful or intrusive in their interactions, forcing the infant to defensively regulate their own experiences and limit emotional expressions (Beebe, Lachmann, Markese, & Bahrick, 2012; Lyons-Ruth, 1999). Such early defensive strategies on the part of the infant within parent-child relationships may form the basis for later reliance on neurotic and immature defenses, involving limited awareness of one's own needs and distorted interpersonal representations.

The results further confirmed that problems in the marital subsystem, indicated by parents' low autonomy in the marital relationship, and to some extent also by parents' low marital intimacy, predicted children's inefficient emotion regulation and reliance on defense mechanisms. Low marital autonomy likely indicates conflictual interparental interactions, involving, for example, heightened verbal conflicts and expressions of negative emotions (Gavazzi, McKenry, Jacobson, Julian, & Lohman, 2000). In line with the emotional security theory (Davies & Martin, 2013), our results indicate that early exposure to conflictual interparental interactions are detrimental to children's emotion regulation development and heighten children's reliance on defensive coping. Early interpersonal strategies used to cope with emotional insecurity may also predispose children to rely on neurotic and immature defenses in middle childhood.

The results largely refuted our *age-specific hypothesis* in that we found age-specific effect within the first year for neurotic defenses, but not for emotion regulation or immature defenses. This lack of age-specific results likely reflects the high plasticity

in infant development, here witnessed in the domain of affect regulation. Interestingly, however, in line with our age-specific hypothesis, low autonomy in the parenting subsystem at the age of 2 months was an especially important predictor of children's reliance on neurotic defenses in middle childhood. Neurotic defenses, such as repression and reaction formation, are characterized by limited awareness of threat-provoking thoughts and unacceptable emotions. Research suggests that early development of emotional self-awareness takes place within sensitive and well-attuned parent-child interactions, during which the infant receives consistent feedback about his or her own emotional states from the parent (Beebe et al., 2012; Gergely & Watson, 1996). In line with this, it is possible that an infant's early representations of his or her own emotional states are left "underdeveloped" with insensitive and rejecting caregivers, making the child more likely to use defense mechanisms to avoid painful experiences (Lyons-Ruth, 1999). Alternatively, it is possible that the poor quality of early interactions alter children's neural (i.e., amygdala and hippocampus) and endocrinal (i.e., HPA-axis) development, with detrimental consequences on children's declarative memory function and the experience of the self (Pechtel & Pizzagalli, 2011). Such early psychobiological alterations could lead to reliance on neurotic defenses in later development (Axmacher et al., 2010). Naturally, further studies are needed to test the hypothetical roles of interactive, neural, and endocrinal processes on neurotic defenses.

10.2 FSTs during the transition to parenthood

In line with our hypothesis, we identified in *Study II* Cohesive and Disengaged family system types, as well as two types of enmeshed families, labeled as Enmeshed Quadratic and Enmeshed Declining. In addition, we identified Authoritarian, Escalating Crisis and Discrepant FSTs. The FSTs are shown in Figure 13 (see boxes on the left). Cohesive families were characterized by high levels of both intimacy and autonomy, whereas Disengaged families were characterized by low levels of both intimacy and autonomy. Furthermore, Cohesive families experienced a slight increase in family autonomy from pregnancy to 2 and 12 months postpartum, whereas Disengaged families experienced considerable decline in family intimacy during this time. These results concur with studies showing that problems in the marital relationship tend to get worse across the transition to parenthood and can spill over into parenting, whereas well-

functioning relationships can act as resources and even lead to positive growth (Doss et al., 2009; Volling et al., 2015). It is likely that parents in Cohesive families had, for example, positive expectations of parenthood along with constructive problem-solving skills, helping them to maintain a satisfying marital relationship and to establish new roles as parents (Biehle & Mickelson, 2011; Christopher et al., 2015). In contrast, it is likely that the initial marital problems and lack of emotional resources in Disengaged families disturbed coping with the transitional challenges typical to early parenthood.

Both of the enmeshed families were characterized by low levels of autonomy and relatively high intimacy. The low levels of autonomy indicate overly permeable family boundaries, which can cause spillover between family subsystems (Minuchin, 1985; Sturge-Apple, et al., 2014). In line with such a view, both Enmeshed Declining and Enmeshed Quadratic families experienced moderate changes in family intimacy from child's age of 2 months to 12 months. It is possible that couples in these families experienced difficulties in maintaining a constructive balance between the marital relationship (e.g., being taken care of) and new demands in the parent-child relationship (e.g., being the emotional caregiver). To our knowledge, our study was the first to empirically identify two variants of enmeshed families with different longitudinal dynamics. While the reason for the emergence of these subtypes is not clear, it might be explained by intra-family patterns involving, for example, triadic alliances (Johnson, 2003, 2010), parental differences in satisfaction with family relationships (Malinen et al., 2010), or power relationships in the family (Lindahl, Malik, Kaczynski, & Simons, 2004). The intra-family patterns were not, however, studied in this dissertation.

In contrast to enmeshed families, Authoritarian families were highly stable during the transition to parenthood. They were characterized by an average level of autonomy and low intimacy. In line with the structural view of families (Minuchin, 1985), it is likely that strong interpersonal boundaries made Authoritarian families resistant to changes. However, this may have occurred at some cost to the overall family intimacy.

Previous studies have shown stability in the overall quality of family interactions across the transition to parenthood (e.g., Favez et al., 2012). Our results contribute to this by showing stability also in the more qualitative aspects of the families, including autonomy and intimacy. All the identified FSTs except Escalating Crisis maintained the core characteristics of the family (i.e., the relative ratio of family autonomy and intimacy). Apparently, even though all family systems seem to experience some changes during the transition, they also maintain stability and

organization by adhering to their own family rules (Minuchin, 1985; Olson, 2000). Regarding the dramatic changes in Escalating Crisis families, it is possible that they encountered overwhelming postnatal challenges, originating from interparental (e.g., marital problems), child-related (e.g., infant sleep problems) or parent-related factors (e.g., mental health problems). Such challenges, especially if occurring together, could have contributed to a breakdown of family organization and initiated the transformation from relatively well functioning to distant families.

Identification of Discrepant families was a novel finding. On average, they were characterized by moderate levels of both autonomy and intimacy. Interestingly, however, the fathers in Discrepant families perceived family relations (both those of their own and those of the mother) more negatively than the mothers, involving perceptions of low overall family autonomy and intimacy. Previous variable-oriented studies have showed that mothers tend to perceive the marital relationship more negatively than fathers during the transition (Doss et al., 2009; Twenge et al., 2003), but mothers tend to derive more satisfaction from new parenthood than fathers (Elek, Hudson, & Bouffard, 2003). At the same time, studies indicate that fathers may be less prepared for the challenges of early parenthood, including decreased emotional and sexual intimacy in the marital relationship (Condon, Boyce, & Corkindale, 2004; Ahlborg & Strandmark, 2001). It is possible that such gendered processes result in parental discrepancies in some families, perhaps further hindering interparental coordination and heightening family problems (Byng-Hall, 1995; Johnson, 2005). Discrepant families represented a relatively large proportion of families in this study (15%), indicating that such dynamics are not uncommon in the transition to parenthood. This should be acknowledged in future studies.

Contrary to our hypothesis, the duration of the interparental partnership and primiparity did not directly predict belonging to FSTs. It is possible that the FSTs capture such a complex family pattern that it could not be predicted by any single factor. In line with this, some theoretically meaningful associations appeared in specific subgroups. For example, among couples with low education levels, a short duration of partnership predicted membership of the Escalating Crisis family, and multiparity predicted membership of Authoritarian and Disengaged families. Among naturally conceiving (NC) couples, a long duration of partnership predicted membership of Authoritarian and Disengaged families. These results concur partially with our hypotheses; for example, in showing that couples with multiple children often experience diminished marital quality due to decreased family resources, and that young couples tend to experience a steep decline in marital

satisfaction due to the abrupt termination of the passionate interparental relationship. Interestingly, however, our results suggest that high parental education levels and previous infertility may actually protect families against such transitional changes.

10.3 FSTs and children's emotion regulation and attentional biases

We conceptualized affect regulation to involve both children's emotion regulation and attentional processing. In *Study III* children's emotion regulation was assessed as an ability to calm down after experiencing negative emotions. In *Study IV* children's attentional biases were assessed at both the early and late stages of processing, reflecting both early attentional monitoring and later regulation of emotional responses. More specifically, we assumed that emotional attention biases are the basic underlying processes of affect regulation. Thus, here we discuss the results from these two studies together.

In line with the *direct effects hypothesis*, the results showed that both Enmeshed (i.e., Enmeshed Declining and Enmeshed Quadratic) and Distant (i.e., Disengaged and Escalating Crisis) families predicted children's inefficient emotion regulation in middle childhood. In line with the *unique attentional biases hypothesis*, children from Enmeshed Declining and Disengaged families also showed differences in their attention bias patterns. More specifically, children from Enmeshed Declining families showed attention bias toward threat (i.e., angry faces) at the late stage of processing (i.e., at the SOA of 1250 ms). In line with emotional security (Davies & Martin, 2013) and attachment (Mikulincer & Shaver, 2016) theories, the late-stage threat bias may be part of children's mobilizing and hyperactivation strategies, characterized by exaggeration of their own distress and helplessness. Directing one's attention to threat may function to heighten one's own negative emotions, and may have helped children to cope with family enmeshment (e.g., to resist parent-child role-reversals) and to ensure protection from volatile caregivers. However, strategic heightening of emotions also likely undermines the development of emotion regulation.

Children from Disengaged families showed attention bias towards threat at the early stage of processing (i.e., at the SOA of 500 ms), but showed attention bias away from emotional faces (i.e., both angry and happy) at the late stage of processing. In some studies, a similar vigilance-avoidance attention pattern has

been found among insecurely attached children (Dykas & Cassidy, 2010; Zimmermann & Iwansky, 2015) and among highly defensive adults (Derakshan et al., 2007). Accordingly, we interpret this attention bias pattern to indicate early-stage monitoring of threat cues and late-stage defensive exclusion of emotion-provoking information. This attentional pattern could be part of children's demobilizing and deactivation strategies, which aim to evade parental hostility and to prevent parental rejection (Davies et al., 2013; Mikulincer & Shaver, 2016). Early-stage attention to threat cues may have allowed children to anticipate and monitor cues of family conflicts, whereas late-stage inhibition of emotional processing may help children to minimize their own distress and emotional expressions. Over the course of development, such a self-protective strategy, involving somewhat contradictory attentional tendencies, might undermine the development of more efficient emotion regulation.

As hypothesized, children from Cohesive families had more efficient emotion regulation than children from Disengaged families. Contrary to our hypothesis, however, children from both Cohesive and Disengaged families showed similar early-stage attention biases towards threat. The Adaptive Calibration Model (Del Giudice et al., 2013) provides one plausible explanation for this surprising result by positing that threat-related attentional biases can serve different functions depending on the safety of the environment. In the highly safe Cohesive families, the threat bias may have developed to foster communality and sensitivity to the cues of collaborative others among children (i.e., sensitive profile). In contrast, in the highly threatening Disengaged families, the threat bias may have developed to foster self-protection and anticipation of threatening encounters with others (i.e., vigilant profile). Importantly, as hypothesized, children from Cohesive families showed no attention biases at the late stage of processing. This indicates that the children were able to inhibit further processing of threat-provoking information without relying on attentional avoidance. It is likely that the harmonious family climate of Cohesive families fostered children's sense of safety, which supported the development of efficient emotion regulation and "open", non-defensive processing of emotions.

Contrary to our hypothesis, children from Authoritarian families had, on average, efficient emotion regulation. Furthermore, children from Authoritarian families did not have threat-specific attentional biases, but instead had an attentional bias toward emotional faces at the late-stage of processing. Again, the Adaptive Calibration Model (Del Giudice et al., 2013) provides one explanation for these unexpected results by positing that children's stress responsivity tends to

become down-regulated in moderately threatening environments (i.e., buffered profile). In line with this, some previous studies have found a moderate degree of negative expressivity in the family to decrease children's negative emotionality and to even foster emotional understanding (Halberstadt & Kimberly, 2002). Authoritarian families in our study were characterized by moderately high autonomy and strong family boundaries, which likely functioned to protect the child against family spillover effects (see e.g., Sturge-Apple, et al., 2014). It is possible that children from Authoritarian families were "hardened" against minor stress, which led to the development of efficient emotion regulation and the lack of threat-specific attention biases.

Interestingly, in line with the *contextual factors hypothesis*, children from Authoritarian families had inefficient emotion regulation if the parents had a high education level. This result concurs with the meta-analysis by McLeod, Weisz et al. (2007) showing that high parental education level increased the effects of parental rejection on children's and adolescents' depression. Parents with high socioeconomic status tend to highly value their children's autonomy but may provide somewhat limited emotional support for them (Luthar & Latendresse, 2005). It is therefore possible that the combination of Authoritarian family type and high parental education level result in a rigid family climate involving, for example, low parental nurturance, emphasis on achievements, and parental work-related absences (Arnott & Brown, 2013; Luthar, 2003). Such a family climate could have hampered children's developmental needs of intimacy with detrimental consequences on emotion regulation development. Unfortunately, the small sample size in *Study IV* did not allow testing of the potential moderating role of parental education level on children's attention biases.

10.4 Pathways from FSTs to internalizing symptoms

In line with our *direct effects hypothesis*, the results of *Study III* showed that Enmeshed, Distant and Discrepant families predicted children's heightened anxiety and depression. Yet, against the *symptom specificity hypotheses*, the effects of these FSTs were highly similar on anxiety and depression. Thus, our results concur with those of previous variable-oriented studies showing little evidence of symptom specificity (see 5.2). It is possible that early family dysfunctions heighten children's general vulnerability, and that only later life adversities (e.g., interpersonal threats and

losses) channel the development towards more specific forms of psychopathology (Brumariu & Kerns, 2010).

We also hypothesized that previous infertility and other contextual factors would interact with the FSTs in predicting children's internalizing symptoms. In line with this *contextual factors hypothesis*, previous infertility provided protection against depression in Distant families, and multiparity provided protection against peer exclusion in Enmeshed families. These results can be understood in terms of contextual factors affecting family boundaries, which regulate how family subsystems influence each other. Formerly infertile parents often have high motivation for parenthood and tend to be more protective towards their children (Barnes et al., 2004). Thus, in Distant families, experiences of previous infertility may help the parents to maintain warm and sensitive parenting despite distress in the marital subsystem, thus protecting children's mental health. Regarding Enmeshed families, it is possible that older siblings help to strengthen boundaries between the parental and sibling subsystems. This may protect children from the Enmeshed family interactions, involving for example, intrusive parenting and parent-child role reversals. Interestingly, the protective role of siblings was specific to peer problems, and did not extend to children's internalizing problems.

In line with the *mediating role of emotion regulation hypothesis*, the results showed that inefficient emotion regulation mediated the effects of Enmeshed and Distant families on children's depression. Furthermore, inefficient emotion regulation mediated the effects of Authoritarian families with highly educated parents on children's depression. These results are in line with the developmental emotion regulation model of psychopathology (see 5.3), and suggest that family dysfunctions impair children's mental health by hindering the development of emotion regulation. The centrality of emotion regulation is further strengthened by our finding that peer exclusion, an alternative mediating mechanism, did not mediate the effects of FSTs on children's depression.

Interestingly, we found some direct effects of the FSTs on children's internalizing symptoms, which were not mediated through children's emotion regulation. Distant families with naturally conceiving (NC) parents predicted children's heightened depression, and Discrepant families predicted children's heightened anxiety. Although not hypothesized, these results are intriguing in that they indicate some symptom-specific effects of families on children's anxiety and depression. As indicated by the results regarding attentional avoidance in *Study IV*, children from Distant families may rely on a demobilizing strategy in order to cope with family discord, involving withdrawal, submissiveness, and minimization of

emotional expressions. While such a strategy may be adaptive for the child in the context of Distant families, it is likely maladaptive in most other contexts and may heighten the risk for later depression.

Only a few previous studies have examined how parental discrepancies in family perceptions predict children's mental health. Our results regarding Discrepant families suggest that disconnected parental perceptions may have a specific effect on children's anxiety. While the exact reason for this is unclear, there are a few plausible explanations. Firstly, father-child interactions, involving e.g., rough-and-tumble play, may have a special role in teaching the child to cope with challenges and uncertainty (Möller, Nikolić, Majdandžić, & Bögels, 2016). In Discrepant families the fathers were more pessimistic than mothers in their family perceptions. Thus, it is possible that fathers in Discrepant families failed to support their children's self-reliance, and instead, provoked children's senses of vulnerability and cautiousness. Secondly, it is possible that the lack of shared parental perceptions hindered the coordination of complex family interactions, especially ones involving both parents and the child (Favez et al., 2012; Johnson, 2005). For example, entrapment between parents in a triadic conflict could increase children's ambivalence and anxiety, without necessarily disrupting children's emotion regulation development in the more intact dyadic relationships.

Contrary to our hypothesis about the mediating role of emotion regulation, children's emotion regulation did not predict anxiety and thus did not mediate the effects of the FSTs on children's anxiety. We assessed emotion regulation as an ability to calm down from negative emotions. The result, therefore, may partially be explained by previous research suggesting that anxiety is more strongly associated with high reliance on dysfunctional emotion regulation strategies (e.g., rumination), rather than low reliance on efficient emotion regulation strategies (e.g., reappraisal) (Aldao et al., 2010).

10.5 Experimental activation of threat and attention biases

We hypothesized that situational priming of safety and threat would moderate the effects of the FSTs on children's attention biases. However, contrary to the *activation of threat hypothesis*, the results of *Study IV* showed no moderation effects on children's attention biases. Furthermore, there were no main effects of the situational priming on children's attention biases. One explanation would be that the audiotaped priming stories failed to activate children's mental representations

and the related affect regulation processes. However, examination of children's ratings of the story events indicated that children perceived the events in autonomy- and intimacy-threat stories as highly threatening and personally important (see Table A1 in Lindblom, Peltola et al., 2017). Providing further validity for the priming procedure, we found that highly anxious children showed a late-stage attentional bias toward emotional faces only in the secure situation priming condition (see Lindblom, Peltola et al., 2017), perhaps indicating that security priming decreased these children's need for defensive processes (e.g., Norman, Lawrence, Iles, Benattayallah, & Karl, 2014).

A more substantial explanation for the null result could be that the children's attentional biases operated regardless of the specific nature of the situational context. Indeed, both the threat- and security-priming stories involved references to parent-child and peer relationships. Perhaps this was sufficient to activate children's interpersonal representations and attentional affect regulation. If this was the case, the attentional biases could have relatively pervasive effects on children's social functioning. Further studies are needed, however, before more definitive conclusions can be drawn about the role of situational context on children's attentional biases.

10.6 General conclusions

The question about the significance of early experiences on child development is a classic one in developmental psychology. In its most basic form, the question is *whether* and *to what extent* early experiences influence children's developmental outcomes. Somewhat surprisingly, there have been only a few prospective studies examining the effects of early family relationships on children's affect regulation, or even on the more commonly studied emotion regulation. Our straightforward answer to the classic question would be that early family relationships account for about 7% to 9% of children's affect regulation in middle childhood. In social sciences these effect sizes have been traditionally considered to fall between small and medium (Cohen, 1992). These effect sizes are comparable to previous prospective studies, which have found small effects of children's attachment (Groh et al., 2012), and parental factors (Yap & Jorm, 2015) on children's internalizing symptoms. It is noteworthy, however, that most attachment studies have focused on dyadic relationships, typically involving the mother and the infant, and most of the parenting studies have been conducted among older children. Our findings

suggest that it is conceivable to consider the whole family as a context for children's early emotional development.

This dissertation also contributed to the basic questions of *for whom* and *how* the early experiences influence children's developmental outcomes. We found a surprisingly strong interaction effect between FSTs and family-related contextual factors in predicting children's social-emotional outcomes. In practice, the interaction effects doubled the explained variance in children's emotion regulation (14%) and internalizing symptoms (17%), corresponding to a medium effect size (Cohen, 1992). This finding corroborates ecological models positing that multiple contexts act together in shaping child development (Bronfenbrenner, 1989; Sameroff, 2010). Yet our finding is novel in family type research, and demonstrates that different FSTs have their unique strengths and vulnerabilities as a developmental context for children.

The more demanding question is *why* the early family experiences influence child development. Research on sensitive periods in development indicates that the exact timing of positive and negative experiences could alter the processes under development leads to different developmental outcomes. Somewhat surprisingly, the idea of sensitive periods within infancy has very rarely been tested. Our study indicated that the quality of the early family relationships at one point of time (i.e., early versus late infancy) had in most cases negligible effects on children's affect regulation in middle childhood. This suggests high plasticity in children's affect regulation development within infancy. It is also likely that relatively stable family characteristics continue to influence children beyond infancy.

The "why" question also concerns the *meaning and function* of developmental alterations. Current theoretical models, derived from psychodynamic and evolutionary paradigms, posit that children attune their affect regulation in order to adapt to the social-emotional demands of their families. If children truly organize their affect regulation to fit the demands of their families, it would be reasonable to expect some specific effects of different kinds of families on child development. To test this, we used a person-oriented methodology to identify the naturally occurring developmental environments, which is to say, the FSTs. Indeed, we found that the FSTs predicted children's unique emotional attention bias profiles. This finding is in line with assumptions about the adaptive nature of these developmental alterations, indicating that children attune both their emotional responsivity and regulatory processes to fit their family environment. However, we found identical effects in two very different FST groups (i.e., Enmeshed and Disengaged families) on children's emotion regulation, anxiety and depression.

These findings indicate developmental equifinality, in that even very different family dysfunctions can lead to the same developmental outcomes. Considered together, these results suggest that early family systems may alter some basic emotional processes to facilitate children's adaptation, but at the same time, dysfunctional families can have a generally detrimental effect on children's emotional development.

Finally, we found that most of the effects of FSTs on children's depression were mediated through children's emotion regulation difficulties. This finding is important, because the mediating role of emotion regulation has rarely been empirically tested in prospective studies. Our findings help to better understand the processes and family conditions which influence depressive symptoms in later life, and support the view of the importance of early families on children's affect regulation. It is equally important to note that, from the perspective of healthy development, our findings indicate the benefits of balanced and harmonious family contexts on children's emotional well-being. Although not tested in this dissertation, it is possible that children's attentional processes, as well as unconscious defense mechanisms, are also part of the link between early families and later mental health.

10.7 Strengths and limitations

The strengths of this dissertation include prospective design with a time span of over seven years. By utilizing the assessment of family relationships from pregnancy onwards, we could minimize the evocative effects of children on the FSTs (involving, e.g., children's difficult temperament). This supports the interpretation that early FSTs do have some causal effects on children.

Another strength is the relatively large sample of over 700 families, involving both mothers and fathers. Although there was considerable attrition in participants at the child's age of 7-8 years, especially of the fathers, the attrition was independent of early family characteristics. Such independence suggests no systematic selection bias. Moreover, we used statistical Full Information Maximum Likelihood approach to handle missing data, which typically produces realistic estimates when the attrition occurs at random.

Furthermore, our study extended previous family research by using a person-oriented approach to model multiple family relationships and their dynamics over time. To our knowledge, previous family studies have not used such rich

information about family relationships to identify family system types. We consider this a novel contribution to the field, as such an approach provides a comprehensive picture about the relational processes that families undergo during the transition to parenthood.

Finally, we have attempted to integrate disparate research paradigms in this dissertation. We conceptualized emotion regulation, defense mechanisms, and attentional biases as distinct aspects of affect regulation. Such integration is rare, especially in the context of family research. We consider the integration of developmental, psychodynamic and cognitive frameworks to be a strength of this study. Hopefully, this will inspire further research to examine how these phenomena are developmentally and functionally interrelated.

This dissertation also has several limitations, of which the most important are discussed below. To begin with, the parents had relatively high education levels and were above the average age at which parents have children within the Finnish population. The children in the sample were healthy, with low levels of clinical anxiety and depression present. This indicates that the sample was, overall, relatively healthy and low-risk. Hence, some caution is warranted when generalizing our results to younger and less educated parents and more high-risk populations.

Regarding the study design, it is noteworthy that we could not control the concurrent FSTs in middle childhood when the child outcomes were assessed. This was due to the high number of relationship dimensions and the incompatibility of the typological and dimensional approaches. Thus, conclusions about the exact timing of the FSTs on child development should be made with caution. Furthermore, both the child's mental health outcomes (e.g., depression) and the mediating mechanisms (e.g., emotion regulation) were assessed concurrently. Using different assessment points when testing mediation would provide more reliable results (MacKinnon, 2008). Consequently, strict conclusions regarding the causality of our results should be made with caution.

Our assessments, with the exception of the experimental part, were based on parental reports. Relying on parental reports may have introduced some common-method variance, biasing estimated associations between the family relationships and the child outcomes. Nevertheless, we used latent structural equation modeling when modeling the child outcomes to minimize common-method variance. Furthermore, in mixture analyses we used discrepancies in parental reports of the family relationships as added information in the analyses. Despite these efforts, some common-method variance may have occurred if the parents shared the same

response biases. Inevitably, observational methods, as well as child self-reports, would have increased the validity of the assessments.

The person-oriented approach also has its limitations. Given the complexity of the family relationships and the scope of this dissertation work, we could not describe the intra-family relationship patterns of the FSTs. Thus, it is not clear to what degree our results were driven by some specific family patterns (e.g., strong mother-child alliance and excluded father), by the more general family climate (e.g., lack of autonomy) or by both of them together. Further research is needed to characterize the FSTs in more detail and to identify their developmentally salient aspects.

We used the dot-probe task to assess children's emotional attention biases. Despite the task being widely used in research, some concerns have been raised about its reliability (e.g., Waechter, Nelson, Wright, Hyatt, & Oakman, 2014). Indeed, eye-tracking methods would have provided more reliable and continuous assessment of attentional biases. Furthermore, considering the complexity of the experiment (i.e., priming under three conditions) our sample size was relatively small. Further studies with greater statistical power are needed to confirm our results, especially concerning the lack of situational priming effects.

It is also important to note that many of our theoretical assumptions were not directly tested in this dissertation. For example, we posited that emotion regulation and defense mechanisms are distinct processes, characterized by different accessibility to consciousness and developmental functions. Alternatively, emotion regulation and defense mechanisms have been suggested as opposing ends of the same phenomena, that is, adaptive and maladaptive self-regulation (Sala et al., 2015). Furthermore, we were unable to test the functions and correlates of attentional biases. It is thus not entirely clear to what extent the attention biases reflected children's affect regulation, and to what extent some other processes may be involved. Further studies are needed to empirically test the psychological functions of different aspects of affect regulation and their developmental interrelations.

Finally, given the limited scope of this dissertation, we focused on the unidirectional effects of family relations on child development. Yet, we agree that the more complete picture of child development involves complex interactions and transactions between the child, the child's biological factors, and the parents (Sameroff, 2010). For example, depending on their temperamental characteristics children may evoke different responses from their parents (Sameroff, 2010), and some children are innately more susceptible to parental rearing influences than

others (Belsky & Pluess, 2009). A more ideal study would have modeled bidirectional influences between the families and children, involving early assessment of children's innate temperament and repeated assessments of both the child and family relationships, spanning from infancy to middle childhood.

10.8 Clinical implications

With regard to clinical practice, our findings emphasize the importance of early preventive and promotive support for families during the transition to parenthood. Infancy is an important time period for both the child's development and organization of the family system. Our studies indicate the importance of considering mothers and fathers, as well as the marital relationship, as an integral part of young children's developmental environment. In practice, this could mean that prenatal clinics and child health clinics should consistently consider the parents-to-be as a couple and foster their co-operation. At the same time, as suggested by the high heterogeneity of the FSTs, public services should be prepared to offer equal support to families with highly different relational dynamics. For example, some couples may favor highly traditional family roles, whereas others strive for more egalitarian roles.

Remarkably, in about 15% of the families the fathers had strikingly negative family perceptions during the transition to parenthood, and both parents in these families reported elevated child anxiety in middle childhood. Despite increasing awareness of the importance of fathers' participation in the transition to parenthood, we deem it necessary to remind clinicians working in prenatal clinics and child health clinics that fathers play an important role in the formation of early family systems. Although mothers typically act as children's primary caregivers, the mother-child relationship is always influenced by the marital relationship. In clinical practice, fostering interparental communication regarding expectations, experiences, and wishes about being parents and a romantic couple could help prevent some of the problems in these families.

The identified FSTs provide a conceptual map which can be used to identify different types of families during the transition to parenthood. This can help tailor targeted interventions for specific types of families. For example, Disengaged families, characterized by distant family relationships, may benefit from interventions that promote emotional connection and mutual respect, whereas Enmeshed families, characterized by lack of interpersonal boundaries, may benefit

from interventions that promote self-confidence and respect of individuality. Furthermore, our findings suggest specific protective and vulnerability factors for different types of families, which can help to identify families with heightened risk for developmental problems. As an example, Authoritarian families predicted children's emotional problems only among highly educated parents. Some of these families with highly educated parents may have special types of family problems involving, for example, over-emphasis on family organization and rules. Our findings guide clinicians to pay attention to such covert family problems, which can occur in otherwise highly resourceful families.

Some caution is needed when generalizing our results to clinical populations. Yet, our findings indicate potential targets for therapeutic child interventions. First, children experiencing heightened depressive symptoms could benefit from learning more efficient emotion regulation. This may be especially true among children with problematic family backgrounds who may have difficulties in restoring their sense of safety and calming down after being upset. These children could benefit from learning self-compassion and mindfulness-based emotion regulation strategies in therapeutic setting, for example. Second, it is an intriguing possibility that children who have had adverse family experiences, and suffer emotional problems, could benefit from the direct modification of their attentional processes (e.g., Lowther & Newman, 2014). For example, we found that children from enmeshed families experienced heightened internalizing symptoms, peer problems (if being the only child of the family), inefficient emotion regulation and late-stage attentional biases toward cues of threats. If the automatically operating attention biases have a developmental role in children's problems, then attention bias modification treatments might prove to be a highly focused and efficient treatment for these children. As such, it could complement traditional therapeutic work with children, and provide a noninvasive, behavioral alternative to drug treatments.

10.9 Suggestions for future research

We hope that our studies encourage future family researchers to model families as dynamic and holistic systems. Variable-oriented approaches focusing on specific aspects of families do provide essential information about family processes and their effects on child development. However, the person-oriented approach to families may better capture the unique systemic properties of families. Knowledge of holistic family environments provides multiple ways to analyze the

preconditions for both optimal and problematic child development, and focuses on understanding how children organize their development according to their specific family environment. Future studies should directly weigh the potential benefits of person-oriented and dimensional approaches in predicting child development. Furthermore, efforts should be made to replicate the identification of family types in different samples and with different measurement methods, in the hopes of obtaining a universal map of common family types.

Regarding affect regulation, further research is needed to depict the developmental and functional relations between emotion regulation, defense mechanisms, and emotional attention biases. For example, future studies should examine how trait-like differences in emotion regulation and defense mechanisms are associated with emotional attentional biases. This would help to build a theoretical bridge between the typically separate fields of experimental research of basic processes and personality research. Furthermore, prospective studies which examine continuity in children's affect regulation from the early to later developmental periods would be welcome. Both contextual (e.g., the quality of family environment) and intraindividual (e.g., children's sense of security and emotional self-awareness) factors should be considered in accounting for the continuity.

Finally, more research is needed to depict the ways in which family-related alterations in children's affect regulation influence their later mental health. We studied, and found, links between children's emotion regulation efficiency, the early FSTs, and children's depression. However, we found no link between the FSTs and children's anxiety, and did not examine the mediating role of defense mechanisms. It would be illuminating to test how specific emotion regulation strategies (e.g., rumination and acceptance), emotion-specific emotion regulation (e.g., regulation of fear and sadness) and defense mechanisms (e.g., neurotic and immature defenses) mediate the effects of early families on children's later mental health.

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Early Family Relationships Predict Children's Emotion Regulation and Defense Mechanisms

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Abstract

Early family relationships have been suggested to influence the development of children's affect regulation, involving both emotion regulation and defense mechanisms. However, we lack research on the specific family predictors for these two forms of affect regulation, which have been conceptualized to differ in their functions and accessibility to consciousness. Accordingly, we examine how the (a) quality and (b) timing of family relationships during infancy predict child's later emotion regulation and defense mechanisms. Parents (N = 703) reported autonomy and intimacy in marital and parenting relationships at the child's ages of 2 and 12 months, and the child's use of emotion regulation and immature and neurotic defenses at 7 to 8 years. As hypothesized, the results showed that functional early family relationships predicted children's efficient emotion regulation, whereas dysfunctional relationships predicted reliance on defense mechanisms in middle childhood. Further, results showed a timing effect for neurotic defenses, partially confirming our hypothesis of early infancy being an especially important period for the development of defense mechanisms. The findings are discussed from the viewpoints of attachment and family dynamics, emotional self-awareness, and sense of security.

Keywords

family relationships, emotion regulation, defense mechanisms, infancy, caregiving

Learning to regulate emotional experiences and impulses is one of the most important developmental tasks during child's early years. There is robust evidence that both emotion regulation (Aldao, Nolen-Hoeksema, & Schweizer, 2010) and defense mechanisms (Bond, 2004) are important for one's mental health and socioemotional functioning. However, few empirical studies have considered emotion regulation and defense mechanisms together, probably because of their different origins in cognitive versus psychodynamic and clinical research traditions (Sala, Testa, Pons, & Molina, 2015). Furthermore, whereas substantial empirical research is available on the development of emotion regulation (e.g., Calkins & Hill, 2007; Eisenberg, Spinrad, & Eggum, 2010; Kopp & Neufeld, 2003), research on children's defense mechanisms and their early predictors is more scarce (see Cramer, 2006). Thus, the present study aims to increase knowledge concerning the differences and similarities between early predictors of emotion regulation and defense mechanisms. We analyze how the quality of family relationships during infancy predicts children's emotion regulation and defense mechanisms in middle childhood. We expand earlier research by considering emotion regulation and defense mechanisms together, and by testing the importance of timing of the family relationships during early and late infancy.

Emotion Regulation and Defense Mechanisms

Regulation of affective states, such as emotions, mood, stress, and motivational impulses, involves multiple processes which help to maintain, for example, goal-directed behaviors, positive mood, and sense of security (Gross & Thompson, 2007; Hart, 2014; Koole, 2009). According to Gross and Thompson, such *affect regulation* processes involve both emotion regulation and defense mechanisms (Gross, 1998; Gross & Thompson, 2007). Although the differences and similarities

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between these two are inadequately understood, emotion regulation is conceptualized to focus on managing discrete emotional states (Gross, 1998; Gross & Thompson, 2007), and defense mechanisms on managing motivational impulses and needs (Hart, 2014; Vaillant, 1995). Furthermore, whereas emotion regulation has been suggested to operate both consciously and unconsciously (Gross & Thompson, 2007; Mauss, Bunge, & Gross, 2007), defense mechanisms are thought to operate unconsciously (Cramer, 2008; Gross & Thompson, 2007; Vaillant, 1995).

Emotion regulation refers to the processes individuals use to influence which emotions they experience and when and how they experience and express them (Gross, 1998; Gross & Thompson, 2007). Voluntary emotion regulation typically occurs when an individual becomes aware of own emotional states and shapes them according to situational demands and personal goals (Gross, Richards, & John, 2006). Emotions can be regulated, for example, by attending toward less emotion-provoking aspects of the situation or by cognitively reappraising the meaning of the situation. Self-awareness of one's own emotions fosters efficient emotion regulation, likely because this allows internal states to be better understood and modified (Herwig, Kaffenberger, Jäncke, & Brühl, 2010; Subic-Wrana et al., 2014). Interestingly, however, research suggests that emotion regulation can also occur automatically outside of awareness (Bargh, Schwader, Hailey, Dyer, & Boothby, 2012; Mauss, Bunge, & Gross, 2007). For example, Mauss, Cook, and Gross (2007) demonstrated that subliminally priming emotion regulation (by presenting words related to emotional control) helped participants to downregulate their emotional responses to anger provocation. Such automatic emotion regulation probably reflects the activation of previously learned and routinized emotion regulation strategies (Mauss, Bunge, & Gross, 2007).

Defense mechanisms modulate emotional experiences unconsciously, without being consciously accessible (Cramer & Brilliant, 2001; Gross & Thompson, 2007). They aim to maintain psychological sense of security by producing cognitive distortions and by limiting the conscious experience of negative emotions (Hart, 2014; Steiner, Araujo, & Koopman, 2001). Research suggests that defensive self-deception, involving biased attention and memory, is inherently unconscious because awareness of it would impede its effectiveness (von Hippel & Trivers, 2011). For example, conscious and deliberate attempts to suppress unwanted thoughts often result in their reappearance into consciousness (Abramowitz, Tolin, & Street, 2001), whereas unconscious and automatic repression of unwanted thoughts is more efficient (Geraerts, Dritschel, Kreplin, Miyagawa, & Waddington, 2012; Lambie & Kevin, 2003). Thus, it seems essential for defense mechanisms to fulfill their function by operating unconsciously. From developmental perspective, Cramer and Brilliant (2001) found that children's understanding of defense mechanisms increased from 7 to 11 years. Importantly, those children who understood the defensive function of denial and projection in vignettes were less likely to use these defenses themselves. Such findings support the view that children typically rely on primitive and cognitively simple defense mechanisms (e.g., denial) during infancy and early childhood (Fraiberg, 1982), but progress toward more complex defenses (e.g., projection and identification) as their cognitive abilities and self-awareness develop in middle childhood and beyond (Cramer, 2006).

Vaillant (1971, 1995) categorized defenses according to their developmental maturity and mental complexity. Empirical studies have confirmed the existence of two to three defense dimensions among adults (e.g., Andrews, Pollock, & Stewart, 1989; Bond, 1995, 2004) and children and adolescents (Araujo, Medic, Yasnovsky, & Steiner, 2006; Steiner et al., 2001). *Immature defenses* produce severe cognitive distortions about self and others. For example, in projection, unacceptable emotions are attributed to emancipate from others, and in omnipotence, self is perceived superior in comparison with others. *Neurotic defenses* typically alter subjective experiences by dissociating emotional and cognitive mental contents. For example, in repression, a threatening thought is shut out of consciousness, and in reaction formation, it is transformed into its opposite. In contrast, *mature defenses* typically cause only minor cognitive distortions (Vaillant, 2000) and they have been suggested to be more conscious and deliberate (Conte & Plutchik, 1993; Cramer, 2006; Vaillant, 2000). Indeed, reliance on mature defenses has been found to associate with high emotional self-awareness and efficient emotion regulation (Besharat & Khajavi, 2013; Sala et al., 2015). As mature defenses cannot be clearly differentiated from emotion regulation, the present study focuses on immature and neurotic defenses.

According to Hart's (2014) integrative defense theory, reliance on self-deceptive defense mechanisms is primarily motivated by sense of insecurity, characterized by experiences of vulnerability and lack of confidence about one's ability to cope with threats. Insecurity can stem from various sources, involving attachment relationships, self-esteem, and conflicts in beliefs. In line with the theory, studies have shown reliance on defense mechanisms to increase after being rejected by an important peer among 9- to 11-year-old girls (Sandstrom & Cramer, 2003) and to associate with low emotional upset after traumatic event among 10- to 13-year-old boys (Dollinger & Cramer, 1990). Furthermore, retrospective and cross-sectional adult studies have shown reliance on immature and neurotic defenses to associate with childhood experiences of harsh parenting (Finzi-Dottan & Karu, 2006), attachment insecurity (Besharat & Khajavi, 2013), and beliefs of abandonment (Walburg & Chiaramello, 2015) and one's own emotions being unacceptable (Sala et al., 2015). While such associations have not been studied among children, they suggest that reliance on defense mechanisms can be shaped by early social and emotional experiences.

Early Family Relationships and Development of Affect Regulation

During infancy, children rely heavily on their mothers and fathers for aid to regulate their arousal and distress (Ekas, Braungart-Rieker, Lickenbrock, Zentall, & Maxwell, 2011; Kopp & Neufeld, 2003). Sensitive and supportive caregiving facilitates children's cognitive development, such as attention and executive skills (Bernier, Carlson, Deschênes, & Matte-Gagné, 2012; Evans & Porter, 2009), which in turn promotes efficient emotion regulation (Eisenberg et al., 2010). Furthermore, as depicted by attachment theory, sensitive caregivers foster children's sense of security by providing emotional acceptance, expertise, and continuous support on which the child can rely on (Cassidy, 1994; Thompson & Meyer, 2007). This helps children to develop emotional awareness and effective emotion regulation with potentially long-term positive impact on later development (Dykas & Cassidy, 2011; Moutsiana et al., 2015).

In contrast, insensitive caregiving impairs children's cognitive development and sense of security (Bernier et al., 2012; Cassidy, 1994). Children with insecure attachment style tend to either exaggerate or suppress their emotional expressions to ensure parental proximity and protection (Ainsworth, Blehar, Waters, & Wall, 1978). Attachment research suggests that insecurely attached children and adults process attachment-related information defensively, to avoid psychological pain (for a review, see Dykas & Cassidy, 2011). For example, Kirsh and Cassidy (1997) found that insecurely attached 3-year-old children showed attentional avoidance of attachment cues (e.g., mother-child drawings) and deficits in remembering threatening information (e.g., story about maternal rejection). However, to the best of our knowledge, previous studies have not examined whether insensitive caregiving predicts children's reliance on defense mechanisms during later development.

To gain a comprehensive understanding about children's developmental environment, it is important to broaden the focus from dyadic relationships to the wider family system (Morris, Silk, Steinberg, Myers, & Robinson, 2007; Thompson & Meyer, 2007). According to emotional security theory, children adapt their regulatory strategies to fit the quality of family relationships, involving interparental conflicts and interactions (Davies & Martin, 2013). Children may, for example, suppress or exaggerate their expression of emotional distress to defuse or avoid interparental conflicts. In line with this, infant studies have demonstrated that interparental conflicts increase children's emotion dysregulation and attentional avoidance of stress-provoking stimuli (Crockenberg, Leerkes, & Lekka, 2007; Du Rocher Schudlich, White, Fleischhauer, & Fitzgerald, 2011). In our previous study, we found that dysfunctional family systems during infancy, involving both parental and marital subsystems, predicted both children's attentional avoidance and attentional bias toward threats (i.e., angry facial expressions) in middle childhood (Lindblom, et al., 2015). Altogether, these studies suggest that children's development of emotion regulation and defense mechanism is malleable by the early interpersonal experiences within the family.

Results of attachment and family studies concur with Hart's (2014) integrative defense theory, by demonstrating that insecurity-provoking family relationships heighten children's defensiveness, as indicated by their self-protective behaviors and information processing biases. Surprisingly, however, previous prospective studies have not examined how the quality of family relationships during infancy predicts children's affect regulation during middle childhood or beyond. Furthermore, most research about affect regulation has focused on the quality of maternal caregiving, excluding fathers and interparental relationships. Thus, in the current prospective study, we assess the quality of children's interactional environment at the family level, including both the parenting and the marital subsystems. Autonomy and intimacy, two of the very most basic relational dimensions (Byng-Hall, 1999), are applied to define the relationship quality in marital and parenting subsystems. In relationship with the spouse or child, *autonomy* refers to individuality and a sense of agency, reflecting functional family boundaries, and *intimacy* refers to feelings of love and sharing of emotions (Mattejat & Scholz, 1994). Low autonomy and intimacy in the marital subsystem indicate poor relationship quality and associate with interparental conflicts and verbal aggression (Gavazzi, McKenry, Jacobson, Julian, & Lohman, 2000; Rankin-Esquer, Burnett, Baucom, & Epstein, 1997), whereas low autonomy and intimacy in parenting indicate insensitive parenting and associate with overly hesitant, intrusive, and emotionally disengaged caregiving (Leung, Miller, Lumeng, Kaciroti, & Rosenblum, 2015; Sokolowski, Hans, Bernstein, & Cox, 2007).

Age-Specific Development During Infancy

Neurodevelopmental and behavioral studies suggest that sensitive periods exist in child development with potential long-term consequences on later functioning (Pechtel & Pizzagalli, 2011; Tottenham & Sheridan, 2010). As an example of sensitive period, animal studies have demonstrated that very early disruptions in maternal care can permanently alter attachment-related neural functioning and emotional learning (Rincón-Cortés & Sullivan, 2014). Furthermore, the studies of institutionalized and then adopted children suggest that the first 2 years of life are especially important for social skills (Almas et al., 2012), and the second year of life is especially important for executive functions (Merz, McCall, Wright, & Luna, 2013). However, research is lacking about the more normative social experiences within the infancy period. For example, one study found that high amount of maternal stroking at the infant's age of 2 months was beneficial on children's emotional well-being at the age of 2.5 years (Sharp,

Hill, Hellier, & Pickles, 2015). Yet, the study did not test whether the timing of maternal stroking (e.g., early vs. late infancy) would moderate the effect. To our knowledge, only one study has explicitly tested for the existence of age-specific timing effects during infancy. The person-oriented study analyzed the course of maternal psychological distress across the pre- and postpartum period, and found that children of mothers who were symptomatic at the child's age of 2 months (but not during the pregnancy or the child's age of 12 months) showed increased internalizing symptoms at 7 to 8 years, compared with children of mothers who were symptomatic only at pregnancy or at the child's age of 12 months (Vänskä et al., 2011). The results are indicative of potential age-specific effects during infancy on the development of affect regulation.

Neurodevelopmental research suggests that simple and involuntary functions, such as implicit emotional learning, develop earlier than complex and voluntarily controlled functions, such as executive skills (Pechtel & Pizzagalli, 2011). Considering the functional differences between emotion regulation and defense mechanisms, it can be hypothesized that the automatized processes related to defense mechanisms develop earlier than those of the more cognitively complex emotion regulation. Regarding defense mechanisms, it has been suggested that repression, that is, defensive exclusion of threatening thoughts from consciousness, is related to impaired memory formation and recall, involving altered amygdala and hippocampus function (Axmacher, Do Lam, Kessler, & Fell, 2010). Interestingly, developmental research suggests that the development of these brain structures is malleable to stress-induced alterations already during early infancy (Tottenham & Sheridan, 2010). Regarding emotion regulation, there is some evidence that the underlying brain structures, related to conscious monitoring of and controlling own emotions (e.g., orbitofrontal cortex and anterior cingulate gyrus), are malleable to experiences during the late infancy and later on (Moutsiana et al, 2014; Zelazo, Qu, & Kesek, 2010).

Research Tasks and Hypotheses

We examined how the quality and timing of early family relationships predict children's later emotion regulation and defense mechanisms. Autonomy and intimacy in marital and parental family subsystems were assessed at the child's age of 2 months and 12 months. Emotion regulation, immature defenses, and neurotic defenses were assessed when the children were 7 to 8 years old.

As our first research task, we tested a *different family preconditions hypothesis* that the quality of family relationships during infancy predicts children's later emotion regulation and defense mechanisms. We hypothesized that well-functioning family relationships, involving high levels of autonomy and intimacy, would predict children's efficient emotion regulation, and dysfunctional family relationships, involving low level of autonomy and intimacy, would predict children's reliance on immature and neurotic defenses.

As our second research task, we tested an *age-specific hypothesis* that the timing of family relationship quality at the ages of 2 months and 12 months would differently predict emotion regulation and defense mechanisms. We hypothesized that relationship quality at 12 months would predict effectiveness of emotion regulation more strongly than at 2 months. Further, we hypothesized that family-relationship quality at 2 months would predict reliance on immature and neurotic defenses more strongly than at 12 months.

Child's early characteristics, involving temperamental traits and developmental achievements, can influence the quality of early parenting (e.g., Biringen, Emde, Campos, & Appelbaum, 1995) and child's self-regulation development (e.g., Ursache, Blair, Stifter, Voegtline, & Family Life Project Investigators, 2013). Furthermore, half of the couples participating in our sample had achieved parenthood through assisted reproductive treatment (ART). Thus, we controlled for the potentially confounding effects of the first year developmental achievements and ART status in addition to other background variables. Finally, when modeling age-specific effects, we controlled for the effects of concurrent family relationships at the age of 7 to 8 years.

Method

Participants and Procedure

The study sample consisted of 703 Finnish married or cohabitant couples. Of the participating couples, 56% had received successful ART ($n = 392$) and were recruited from five infertility clinics in Finland, whereas 44% were naturally conceiving couples (NC; $n = 311$) and were recruited at Helsinki University Central Hospital while participating in routine ultrasonographic examination. Couples with multiple pregnancies were excluded from the study sample and only women above the age of 25 years were included in the NC group. The participants provided informed consent at the beginning of the study and at T3. The ethics committees of the responsible clinics approved the study at each stage of the data collection.

The ART couples were more often primiparous (65.70%) than the NC couples (34.30%), $\chi^2(1, N = 703) = 49.91$, $p < .001$. In the whole sample, the education level was relatively high: 29% of the mothers and 31% of the fathers had a university-level education, 40% of the mothers and 27% of the fathers had a college-level education, 14% of the mothers and 23% of the fathers had vocational training, and 17% of the mothers and 19% of the fathers had basic education or were students. The mean age of the mothers was 33.19 years ($SD = 3.73$) and fathers 34.60 ($SD = 4.95$).

This study is based on questionnaires completed separately by mothers and fathers when their child was 2 months (T1), 12 months (T2), and 7 to 8 years (T3) of age. Response

rates (at least one parent participating) were 94% at T1 (n = 656), 78% at T2 (n = 547), and 60% at T3 (n = 420). Attrition at T2 and T3 was independent of the mothers' or fathers' level of education, the length of their relationship, the parents' ages, and the child's gender. Attrition at T2 and T3 was also independent of the ART status of the mothers, but it was greater among NC (8.9%) than ART (5.4%) fathers at T2, $\chi^2(1, N = 656) = 3.18$, $p = .052$.

Measures

Family relationships. Family relationships were measured by the Subjective Family Picture Test (SFPT; Mattejat & Scholz, 1994) at the child's ages of 2 months (T1), 12 months (T2), and 7 to 8 years (T3). Both parents rated the quality of four family relationships: wife-to-husband, husband-to-wife, mother-to-child, and father-to-child. These relationships were rated in terms of autonomy (four pairs of items, e.g., *determined–indecisive*, *shy–self-assured*) and emotional intimacy (four pairs of items, e.g., *rejecting–loving*, *warm–cool*) using a 7-point scale. Higher scores on autonomy indicate relational self-assurance, agency, and independence, whereas high scores on intimacy indicate emotional attachment, interest, and acceptance. To measure autonomy or intimacy in the marital subsystem and in the family subsystem, the corresponding two items were averaged across parenting relationships (mother-to-child and father-to-child) and across marital relationships (wife-to-husband and husband-to-wife) separately for both parents' reports. This averaging was justified as there were medium-sized correlations between the items (average r = .44, ranging from .27 to .79, all $p < .001$). However, the correlation was small for the item *determined–indecisive* between mothers' reports of wife-to-husband and husband-to-wife relationships at T3, $r = .15$, $p < .001$. The resulting variables were used as indicator variables for latent constructs of marital autonomy, marital intimacy, parental autonomy, and parental intimacy, separately for fathers' and mothers' reports, at T1, T2, and T3. The validity and reliability of SFPT scales have been demonstrated, for example, by large correlations (average r = .60) with other family diagnostic questionnaires, and acceptable retest reliability over 2 weeks interval (r = .77; Mattejat & Scholz, 1994).

Child's emotion regulation. The child's emotional self-regulation at the age of 7 to 8 years (T3) was assessed by the self-regulation subscale of the Emotion Questionnaire (EQ; Rydell, Berlin, & Bohlin, 2003). EQ consists of vignettes describing emotion-evoking situations for different emotions. For each vignette, parents estimated on a 5-point Likert scale how easily the child was able to calm down by him- or herself (1 = *doesn't apply at all*, 5 = *applies very well to my child*). We used nine vignettes for negative emotions of anger (e.g., *My child gets into a conflict with a peer*), sadness (e.g., *A toy is lost or broken*), and fear (e.g., *My child gets frightened and worried*). To include more complex emotions as well, we added six vignettes for shame/guilt (e.g., *My child gets caught doing something forbidden*). First, items were averaged separately for each emotion of anger (three items), sadness (three items), fear (three items), and shame/guilt (six items). Second, these four variables were averaged to represent efficiency of emotion regulation separately for mothers (α = .84) and fathers (α = .93). These two variables were used as indicator variables in structural equation models. The validity and reliability of EQ has been demonstrated by showing high scores on EQ at the age of 6 years to predict low behavioral and emotional problems and prosocial behaviors at the age of 8 years, and acceptable retest reliability over 5 weeks interval (ranging from r = .74 to .97; Rydell et al., 2003).

Child's defense mechanisms. The child's defense mechanisms were measured at the age of 7 to 8 years (T3) with the parent version of the Response Evaluation Measure for Parents (REM-P: Steiner et al., 2001; Yasnovsky et al., 2003). REM-P is based on Vaillant's (1971, 1995) model of defense mechanisms and is similar to the widely studied Defense Style Questionnaire (Andrews et al., 1989; Bond, 1995). However, REM-P is modified to be suitable for adolescents and children and to avoid overly pathological wording. It comprises 71 items that describe 21 defenses ranging from immature to neurotic and mature defense mechanisms, such as repression (three items; e.g., *My child doesn't show his/her true feelings)*, projection (three items; e.g., *My child feels that s/he is always treated unfairly*), and intellectualization (four items; e.g., *My Child uses reason and logic, not feelings, to understand people*). Both parents independently estimated the child's typical defensive behaviors on a 5-point Likert scale (1 = *totally disagree*, 9 = *totally agree*). Although defense mechanisms are considered to operate unconsciously, their operation can be assessed through their residuals in behavior and emotional responding (Bond, 1995).

First, to obtain defense scores, 21 sum variables were computed by averaging the items representing each defense mechanism (three to four items per defense mechanism). Second, to examine the factor structure of parental reports of defense mechanisms in this age group of children, we performed exploratory factor analyses (using averaged values between the parents' reports and the principal extraction method with oblimin rotation). The analysis yielded a three-factor solution: (a) *immature defenses* (22.19% variance explained; e.g., acting out, projection, displacement, omnipotence, passive aggression), (b) *mature defenses* (16.12%; e.g., humor, intellectualization, sublimation, reaction formation, altruism), and (c) *neurotic defenses* (8.17%; e.g., repression, denial, dissociation, withdrawal, suppression). Two sum variables of individual defense mechanisms had to be excluded from the analyses because of low variability (conversion) or low initial eigenvalues in factor analysis (<0.20 for somatization). Third, based on this three-factor solution, defense-style scores were computed by averaging the

corresponding sum variables to represent the child's reliance on immature defenses (five variables; mother, α = .74; father, α = .72) and neurotic defenses (six variables; mother, α = .64; father, α = .67) separately for both parents' reports. The resulting four variables were used as indicator variables in structural equation models. Mature defenses were excluded from the main analyses because our hypotheses did not concern them. The validity of the self-report version of the questionnaire has been demonstrated, for example, by showing correlations with anxiety and psychosocial functioning among 8- to 15-year-old children (Araujo et al., 2006). However, the parent version has been previously used only in one study of 34 mothers and their 7- to 10-year-old children (Yasnovsky et al., 2003). The study showed acceptable retest reliability over 2 weeks interval (r = .81), but only modest convergence with children's self-reports of defense mechanisms (r = .36; immature and neurotic defenses were considered as a joint factor).

Early developmental achievements. Early developmental achievements (or delays) were measured with parental reports. At child's age of 2 months (T2), parents reported the emergence of the child's contact smile (0 = no, 1 = yes), eye contact (0 = no, 1 = yes), and regularity of eating and sleeping rhythms (0 = no, 1 = yes). At the age of 12 months (T3), parents reported the child's ability to walk without support (0 = no, 1 = yes), ability to stand (0 = no, 1 = yes), and regularity of sleeping rhythms (0 = no, 1 = yes). The six items were standardized and averaged to form a developmental achievement index. The reliability of this index was poor (α = .53), indicating that the developmental domains were independent of each other. Yet, to obtain a balanced assessment of developmental achievements during the first year, we decided to use this variable as a rough cumulative index (for a similar approach, see Appleyard, Egeland, van Dulmen, & Sroufe, 2005). Providing some validity for the index, we found in our previous study a highly similar index to associate negatively with birth complications and poor neonatal health (e.g., low agpar scores) (Punamäki et al., 2006).

Background variables. Background variables were child's gender, mothers' age, ART status, parents' average education level (academic level, college level, vocational training, basic education/student), and number of previous children (primi- or multiparity).

Statistical Analyses

Statistical analyses were carried out using structural equation modeling with the Mplus 5 program (Muthén & Muthén, 1998-2007) using maximum likelihood estimation with robust standard errors. This estimation method handles missing data using full information maximum likelihood. The overall fit of the models was evaluated with the comparative fit index (CFI), the Tucker–Lewis index (TLI), the root mean square errors of approximation (RMSEA), and the chi-square (χ^2). As a criterion of acceptable fit, we used values of >0.95 for CFI and TLI (Hu & Bentler, 1999), and <0.08 for RMSEA (Browne & Cudeck, 1993). R-squared values were reported to indicate absolute (R^2) and incremental (ΔR^2) variance accounted by the independent variables over and above the control variables. Benjamini-Hochberg procedure was used to protect significance levels against false positive discoveries (Benjamini & Hochberg, 1995). In all models, child's developmental achievements and background variables were used as covariates.

The *different family preconditions hypothesis* was tested by regressing the latent variables of early family-relationship quality on emotion regulation and defense mechanisms. To examine whether the quality of family relationships decreased or increased the child's efficacy of emotion regulation and reliance on the neurotic and immature defenses, regression coefficients were estimated separately for both assessments at 2 months (T1) and at 12 months (T2).

To test the *age-specific hypothesis*, age-specific models were built separately for each family-relationship dimension predicting children's affect regulation, that is, emotion regulation, neurotic defenses, and immature defenses (for a conceptual depiction, see Figure 1). Two criteria, adapted from Budescu (1993), were used to compare the relative importance of family relationships at 2 months and at 12 months. The age-specific predictor is more important than another predictor if it both (a) explains a larger proportion of the dependent variable when examined without the another predictor and (b) explains a unique proportion of the dependent variable when shared variance with another predictor is taken into account. As shown in Figure 1, the concurrent effects of family relationships at the child's age of 7 to 8 years (T3) were controlled in all age-specific models.

First, we used Akaike's information criterion (AIC; Akaike, 1973) to test which of the two age-specific models (Model T1 or Model T2 in Figure 1) *explained a larger proportion* of emotion regulation and neurotic and immature defenses. A difference of ≥ |2.00| in AIC was used as a rule of thumb to indicate meaningful significance in the explanatory power between the non-nested age-specific models (Burnham & Anderson, 2002). Negative values indicate greater predictive power of family relationships at 2 months (Model T1) over 12 months (Model T2). Conversely, positive values indicate greater predictive power of family relationships at 12 months (Model T2) over 2 months (Model T1).

Second, we used the Satorra-Bentler adjusted chi-square test ($\Delta\chi^2$; Satorra & Bentler, 2001) to test whether each of the age-specific model had *unique predictive power* over and above the other age-specific model. This was achieved by nested comparisons between the age-specific models (Model T1 and Model T2 in Figure 1) and the baseline model (Models T1 and T2). To test the unique contribution of 2 months over 12 months, the fit of Model T2 was tested against that of Models T1 and T2. Conversely, to test the

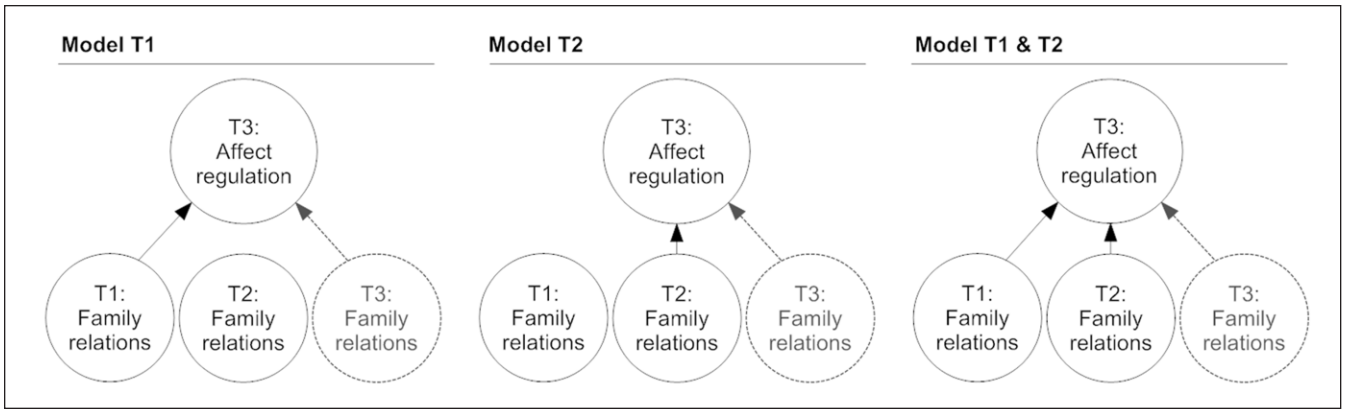

Figure 1. Conceptualization of the models used to test age-specific effects of family relationships on affect regulation.
Note. T1, T2, and T3 refer respectively to child's ages of 2 months, 12 months, and 7 to 8 years. Family relationships at T3 (marked with dashed lines) are included in all age-specific models as a covariate. T = time.

unique contribution of family relationships quality at 12 months over 2 months, the fit of Model T1 was tested against that of Models T1 and T2. Poorer fit of the age-specific (e.g., Model T1) model compared with that of the baseline model (Models T1 and T2) indicates unique predictive power of the excluded age-specific predictor (e.g., 12 months).

Both non-nested and nested comparisons of age-specific models were based on the total fit of the models because this is not influenced by the possible problem of multicollinearity biasing individual path coefficients (e.g., Marsh, Dowson, Pietsch, & Walker, 2004). In other words, the comparisons reflect the combined total effects of both parents' reports of family relationships.

Results

Measurement and Structural Model

Family relationships. Figures 2 to 5 present the measurement models for marital autonomy, parental autonomy, marital intimacy, and parental intimacy. All models showed good fit, and tests of longitudinal factorial invariance confirmed stability over time, indicating that the latent constructs captured identical content across T1, T2, and T3. However, we had to exclude one indicator variable (*independent–dependent*) due to low factor loading from models of autonomy. Tests of factorial invariance between mothers' and fathers' reports showed similarity in reports of parental autonomy, marital autonomy, and marital intimacy, but not in reports of parental intimacy. The lack of interparental factorial invariance for parental intimacy indicates that mothers and fathers perceived the latent concept of parental intimacy differently. In all models, error terms were correlated across time (T1-T2, T2-T3, and T1-T3) within each respondent (mother or father) to control for item-related biases. These error correlations were constrained to be the same when this did not impair the model fit.

Affect regulation. The measurement model for the child's emotion regulation and defense mechanisms, presented in Figure 6, showed good fit, CFI = .99; TLI = .99; RMSEA = .00, 90% CI = [.00, .08]; $\chi^2(3) = 2.83$, $p = .860$. Efficient emotion regulation correlated negatively with use of both neurotic, $r = -.40$, $p < .001$, and immature, $r = -.71$, $p < .001$, defenses. Only a marginally significant positive correlation was found between immature and neurotic defenses, $r = .21$, $p = .070$. There was some fluctuation of factor loadings between mothers (.54-.81) and fathers (.66-.78). Thus, to ensure in subsequent analyses that both the fathers' and the mothers' reports contributed equally to affect regulation variables, the factor loadings for indicator variables were fixed at one. Despite this technical restriction, the resulting model showed good fit, CFI = .99; TLI = .99; RMSEA = .02, 90% CI = [.00, .09]; $\chi^2(3) = 3.29$, $p = .907$, and practically replicated the correlations between emotion regulation and defense mechanisms.

Equality of structural models between subgroups. Before testing the research hypotheses, we examined whether modeling should be done separately for the mothers' and fathers' reports of family relationships, separately for families with a boy or a girl as the target child, or separately for families with or without fertility treatment history (ART or NC). The similarity of the latent correlations, that is, structural equality assumption, was tested in models combining the family relationships (Figures 2-5) and affect regulation (Figure 6). In these combined models, family relationships at T1, T2, and T3 were allowed to correlate with the child's emotion regulation, neurotic defenses, and immature defenses at T3.

Chi-square difference tests showed similar correlations between the mothers' and fathers' reports of family relationships and emotion regulation, neurotic defenses, and immature defenses regarding parental autonomy, $\chi^2(9) = 12.76$, $p = .174$; marital intimacy, $\chi^2(9) = 10.02$, $p = .349$; and marital autonomy, $\chi^2(9) = 9.76$, $p = .371$. However, the

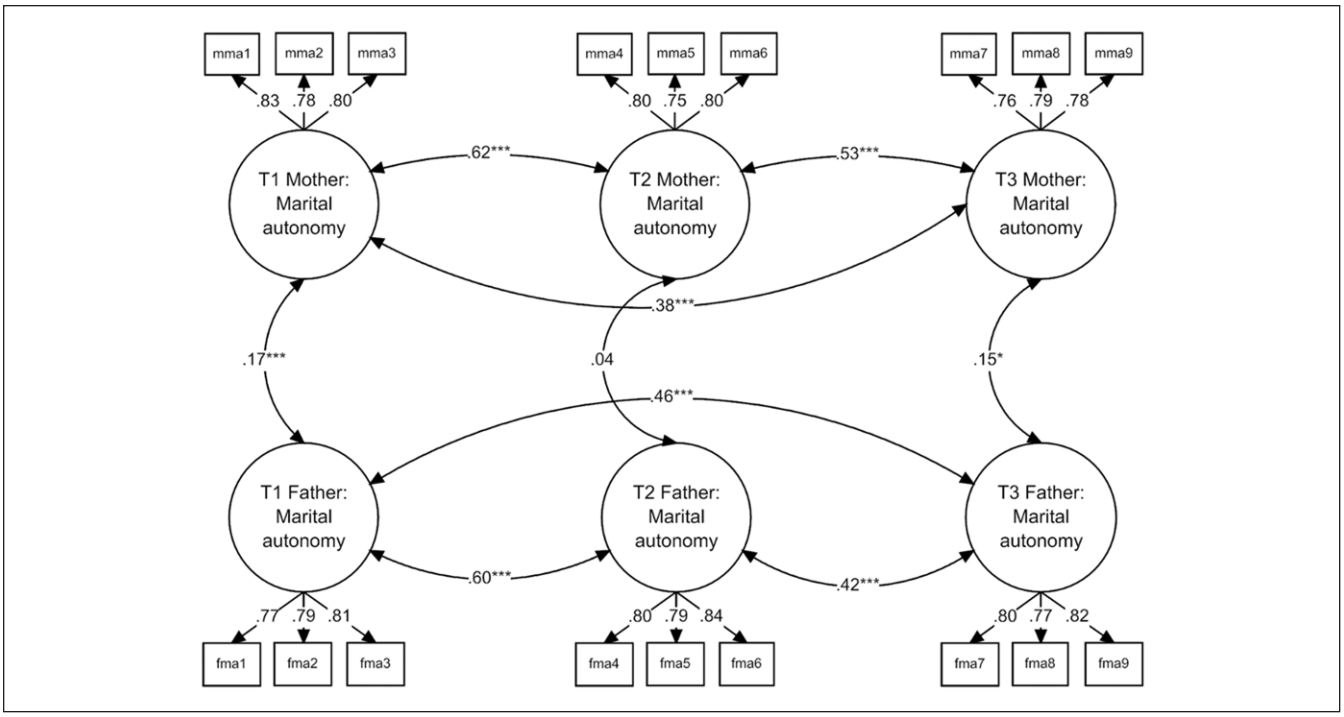

Figure 2. Measurement model for mother's and father's reports of marital autonomy.
Note. Mma1-mmal9 = mothers' reports of marital autonomy; fma1-fma9 = fathers' reports of marital autonomy. Error correlations are not shown. Model fit: $\chi^2(129) = 200.861$, $p < .001$, CFI = 0.98, TLI = 0.97, RMSEA = 0.03, 90% CI = [0.02, 0.04]. T = time; CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA = root mean square errors of approximation; CI = confidence interval.
*$p < .05$. ***$p < .001$.

correlations differed between mothers' and fathers' reports of parental intimacy and emotion regulation, neurotic defenses, and immature defenses, $\chi^2(9) = 17.06$, $p = .047$. Thus, subsequent analyses were done separately for mothers' and fathers' reports of parental intimacy.

The multi-group comparison between boys and girls showed similar correlations for all family relationships and emotion regulation, neurotic defenses, and immature defenses: parental autonomy, $\chi^2(18) = 16.64$, $p = .549$; parental intimacy, $\chi^2(18) = 21.99$, $p = .233$; marital autonomy, $\chi^2(18) = 26.06$, $p = .100$; marital intimacy, $\chi^2(18) = 20.74$, $p = .293$. Furthermore, the multi-group comparison between ART and NC families showed similar correlations for all family relationships and emotion regulation, neurotic defenses, and immature defenses: parental autonomy, $\chi^2(18) = 8.82$, $p = .946$; parental intimacy, $\chi^2(18) = 24.29$, $p = .150$; marital autonomy, $\chi^2(18) = 9.26$, $p = .987$; marital intimacy, $\chi^2(18) = 18.36$, $p = .433$. Therefore, these subgroups were analyzed together in subsequent analyses.

Effects of Background Variables and Developmental Achievements

Before testing our research hypotheses, we examined the influence of background variables and early developmental achievements on affect regulation. The model showed that children from multiparous families had more efficient emotion regulation, $B = -0.20$, $SE = 0.07$, $p = .006$, and used fewer neurotic defenses, $B = -0.20$, $SE = 0.07$, $p = .005$, and fewer immature defenses, $B = -0.19$, $SE = 0.09$, $p = .024$, than children in primiparous families. Boys used more immature defenses than girls, $B = 0.27$, $SE = 0.08$, $p = .001$, and there was also a non-significant trend for boys to have poorer emotion regulation, $B = 0.10$, $SE = 0.07$, $p = .054$, than girls. Higher early developmental achievements predicted more efficient emotion regulation, $B = -0.13$, $SE = 0.08$, $p = .001$, and less use of immature defenses, $B = -0.21$, $SE = 0.10$, $p = .025$. These variables accounted for 7.0% of the variance for emotion regulation, 10.6% for immature defenses, and 9.1% for neurotic defenses. ART status, mothers' age, and parents' level of education did not predict affect regulation. The model had acceptable fit, CFI = .973; TLI = .934; RMSEA = .03, 90% CI = [.02, .05]; $\chi^2(21) = 36.45$, $p = .019$.

Family Relationships Predicting Emotion Regulation and Defense Mechanisms

Table 1 presents the regression coefficients for each family relationship dimension separately predicting emotion regulation and defense mechanisms. The results, for the most part, confirmed our different family preconditions hypothesis. As

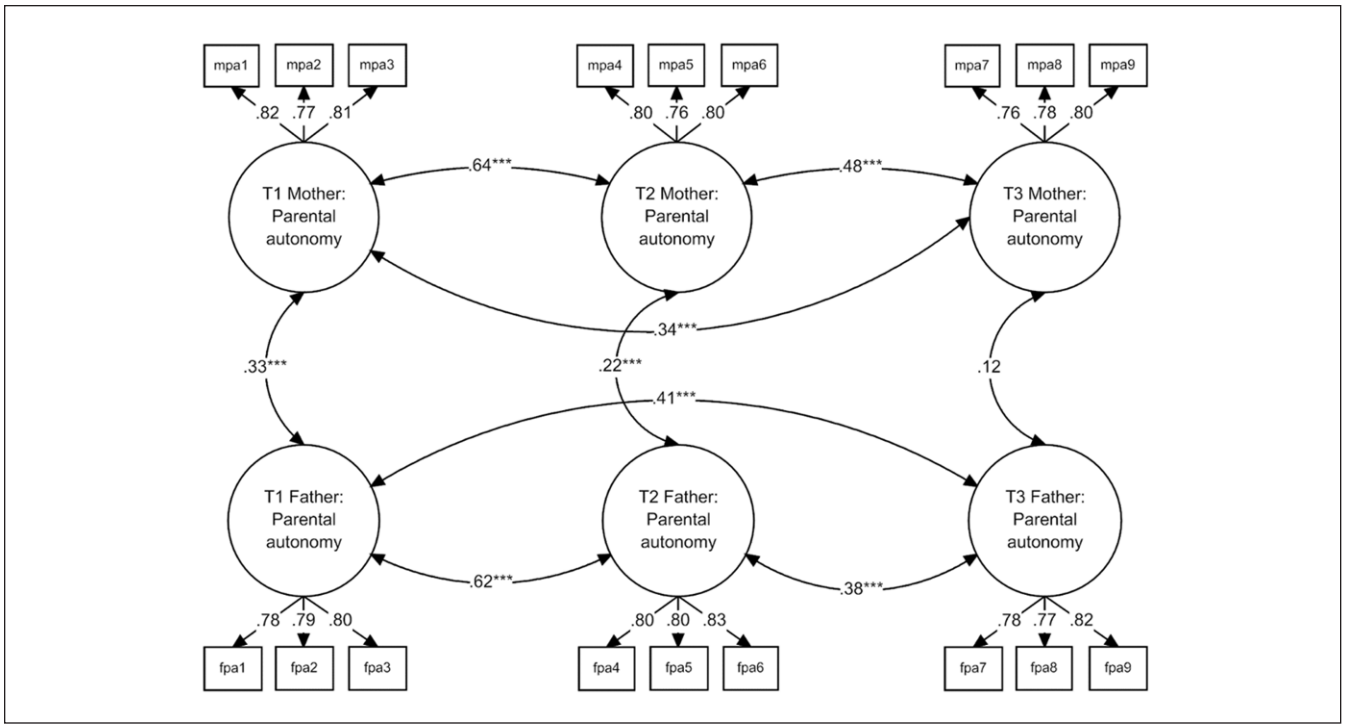

Figure 3. Measurement model for mother's and father's reports of parental autonomy.
Note. Mpa1-mpa9 = mothers' reports of parental autonomy; fpa1-fpa9 = fathers' reports of parental autonomy. Error correlations are not shown. Model fit: $\chi^2(127) = 164.61$, $p = .014$, CFI = 0.99, TLI = 0.99, RMSEA = 0.02, 90% CI = [0.01, 0.03]. T = time; CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA = root mean square errors of approximation; CI = confidence interval.
***$p < .001$.

hypothesized, high levels of marital autonomy and parental autonomy at the child's ages of 2 and 12 months predicted children's efficient emotion regulation (column "Emotion regulation" in Table 1). Further, as hypothesized, low levels of marital autonomy and parental autonomy at the child's ages of 2 and 12 months predicted children's high reliance on neurotic defenses and immature defenses (columns "Neurotic defenses" and "Immature defenses" in Table 1). Finally, low marital intimacy at the child's age of 12 months predicted children's reliance on immature defenses and on neurotic defenses. Marital autonomy accounted for an average of 4% of affect regulation, parental autonomy accounted for an average of 6% of affect regulation, and marital intimacy accounted for an average of 2% of affect regulation over and above children's developmental achievements and background variables.

Table 1 (rows with "Parental intimacy") presents the regression coefficients for parental intimacy, analyzed separately for mothers' and fathers' reports because initial analyses indicated structural inequality between the parents' reports. In line with our hypotheses, father's reports of low parental intimacy at the child's age of 12 months predicted reliance on immature defenses (accounting for 4% of the variance over and above the control variables). However, against our hypothesis, mothers' or fathers' reports of parental intimacy at the child's age of 2 months did not predict emotion regulation, neurotic defenses, or immature defenses.

Age Specificity in Family Relationships Predicting Emotion Regulation and Defense Mechanisms

Table 2 shows the results of non-nested and nested comparisons to determine the relative importance of family relationships at the child's ages of 2 months and 12 months in predicting emotion regulation and defense mechanisms (for a conceptual depiction, see Figure 1). In all age-specific models, we controlled for the effects of concurrent family relationships at the age of 7 to 8 years (T3), children's developmental achievements, and background variables.

The results confirmed the age-specific hypothesis only regarding neurotic defenses (column "Neurotic defenses" in Table 2). Non-nested comparisons showed that parental autonomy at 2 months (T1) explained a larger proportion of neurotic defenses, $\Delta AIC = -6.42$, than parental autonomy at 12 months (T2). Further, nested comparisons showed that parental autonomy at 2 months (T1) explained a unique proportion of neurotic defenses, $\Delta\chi^2 = 15.52$, $p < .001$, over parental autonomy at 12 months (T2) and 7 to 8 years (T3). Thus, we concluded that parental autonomy at the age of 2 months was more important predictor of children's reliance on neurotic defenses than parental autonomy at the age of 12 months.

Against our hypotheses, non-nested comparisons suggested that both marital autonomy, $\Delta AIC = 6.38$, and marital

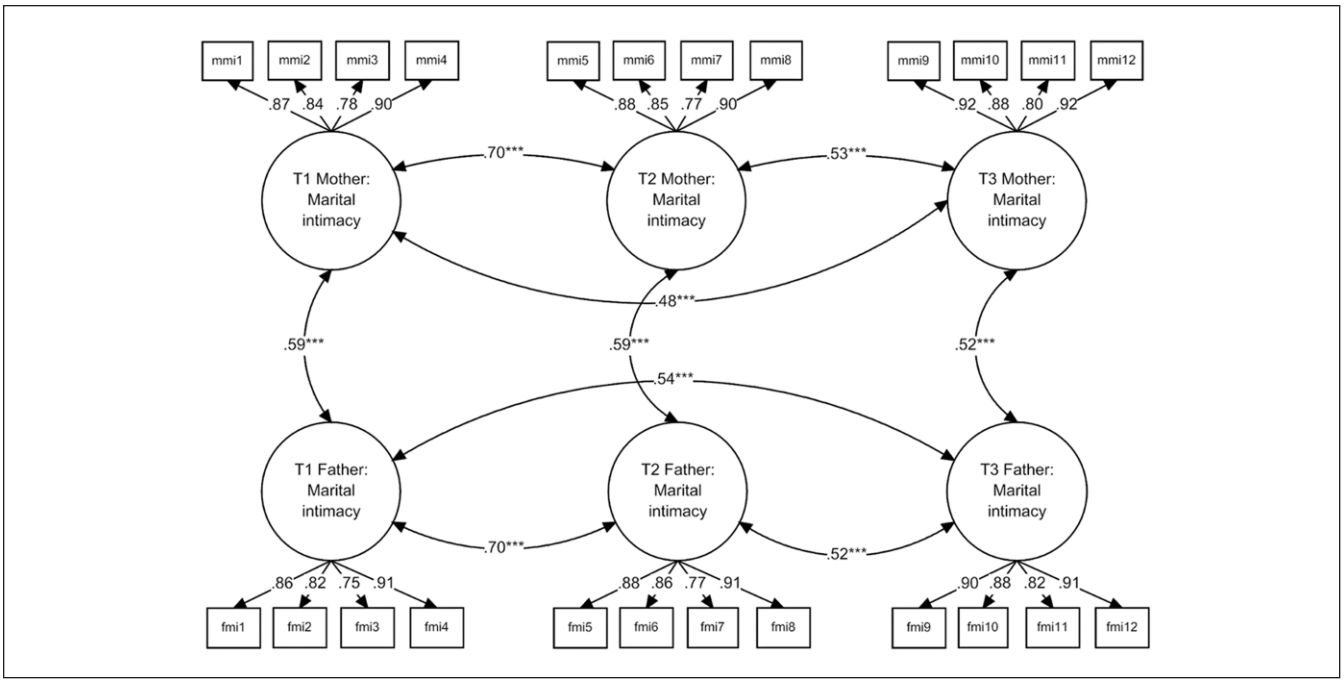

Figure 4. Measurement model for mother's and father's reports of marital intimacy.
Note. Mmi1-mmi12 = mothers' reports of marital intimacy; fmi1-fmi12 = fathers' reports of marital intimacy. Error correlations are not shown. Model fit: $\chi^2(245) = 471.03$, $p < .001$, CFI = 0.97, TLI = 0.96, RMSEA = 0.04, 90% CI = [0.03, 0.04]. T = time; CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA = root mean square errors of approximation; CI = confidence interval.
***$p < .001$.

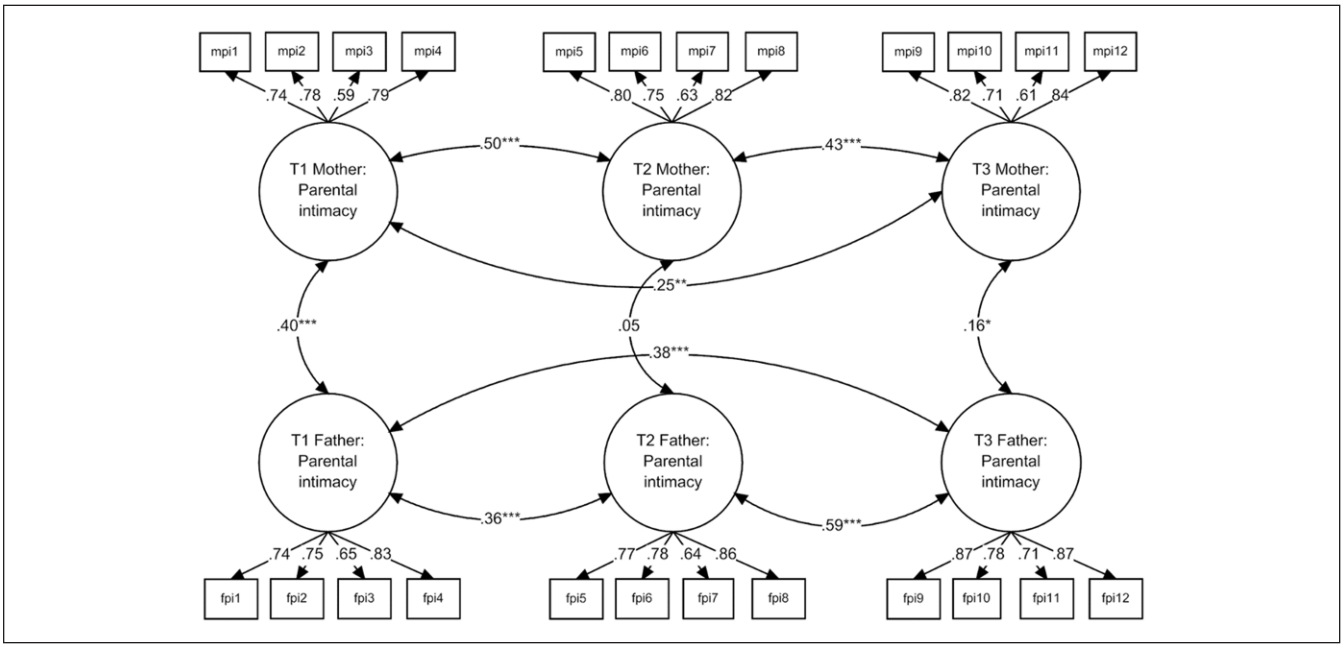

Figure 5. Measurement model for mother's and father's reports of parental intimacy.
Note. Mpi1-mpi12 = Mothers' reports of parental intimacy, fpi1-fpi12 = Fathers' reports of parental intimacy. Error correlations are not shown. Model fit: $\chi^2(246) = 351.239$, $p < .001$, CFI = 0.97, TLI = 0.96, RMSEA = 0.03, 90% CI = [0.02, 0.03]. T = time; CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA = root mean square errors of approximation; CI = confidence interval.
*$p < .05$. **$p < .01$. ***$p < .001$.

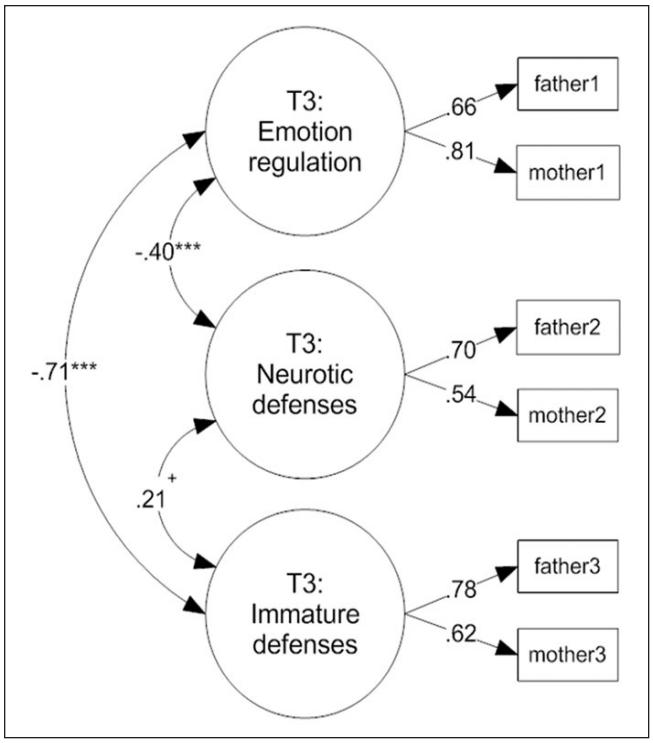

Figure 6. Measurement model for affect regulation.
Note. Error correlations are not shown. T = time.
$^{\dagger}p < .070$. $^{**}p < .01$. $^{***}p < .001$.

intimacy, ΔAIC = 8.73, at 12 months (T2) would explain a larger proportion of neurotic defenses than at 2 months (T1). However, after considering the Benjamini-Hochberg correction (with the critical p value of .0083), marital autonomy, $\Delta\chi^2 = 8.72$, $p = .013$, and marital intimacy, $\Delta\chi^2 = 9.39$, $p = .009$, at 12 months (T2) did not explain statistically significant unique proportion of neurotic defenses over corresponding marital relationships at 2 months (T1) and 7 to 8 years (T3). Thus, we concluded no age-specific effects for marital autonomy and marital intimacy.

Against our hypotheses, the results did not provide support for the age-specific hypothesis regarding emotion regulation (column "Emotion regulation" in Table 2). Although non-nested comparisons showed that marital autonomy at 12 months (T2) explained a larger proportion of emotion regulation, ΔAIC = 3.11, than marital autonomy at 2 months (T1); the nested comparisons showed that marital autonomy at 12 months (T2) explained only a non-significant unique proportion of emotion regulation, $\Delta\chi^2 = 4.93$, $p = .085$, over marital autonomy at 2 months (T1) and 7 to 8 years (T3).

Against our hypotheses, the results did not support the age-specific hypothesis regarding immature defenses (column "Immature defenses" in Table 2). All results of non-nested (ΔAIC ranging from 0.53 to 1.60) and nested ($\Delta\chi^2$ ranging from 0.20 to 3.62, all $p > .164$) comparisons were non-significant, indicating that there was no age-specificity in how family relationships predicted immature defenses.

Age-specific tests were run separately for mothers' and fathers' reports of parental intimacy because initial analyses indicated structural inequality between the parent's reports. Against our hypotheses, all results of non-nested (ΔAIC ranging from −0.97 to 1.98) and nested ($\Delta\chi^2$ ranging from 0.02 to 2.01, all $p > .157$) comparisons were non-significant. Thus, we concluded no age-specific effects of parental intimacy in predicting emotion regulation, neurotic defenses, or immature defenses.

Discussion

Research considering both emotion regulation and defense mechanisms is scarce, and there are no previous studies on the early predictors of children's defense mechanisms. Thus, the current study is novel in analyzing the early family preconditions of children's emotion regulation and neurotic and immature defenses in middle childhood, as well as in testing for age-specific timing effects during infancy. The results provided support for the *different family preconditions hypothesis*, by showing that well-functioning family relationships predicted children's efficient emotion regulation and dysfunctional family relationships predicted children's reliance on defense mechanisms. However, the results showed only limited support for the *age-specific hypothesis*. Parental autonomy at the child's age of 2 months was a more important predictor of children's reliance on neurotic defenses than parental autonomy at the age of 12 months. Against to our hypothesis, no age-specific effects during infancy were found for emotion regulation or immature defenses.

The different family preconditions hypothesis was valid for parenting and marital subsystems. High autonomy in the parenting subsystem predicted children's efficient emotion regulation, whereas low autonomy predicted children's reliance on neurotic and immature defenses. These results are in line with attachment research, which has demonstrated the importance of early caregiving quality for children's emotion regulation and attachment-related regulatory strategies (e.g., Calkins & Hill, 2007). It is noteworthy, however, that our study is the first to prospectively show that parental autonomy during the first year predicts children's emotion regulation and defense mechanisms in middle childhood. When interacting with their infants, autonomous parents are likely to show emotional acceptance and be skillful in supporting their infant's emotion regulation development. Parents with low sense of autonomy, in turn, can be fearful or intrusive in their interactions, forcing the infant to defensively regulate their own experiences and expressions (Beebe, Lachmann, Markese, & Bahrick, 2012; Lyons-Ruth, 1999). It is possible that the infant's early interpersonal strategies form the basis for later reliance on immature and neurotic defenses, involving distorted mental representations of self and others, and limited conscious awareness of one's own interpersonal needs.

Table 1. Family Relationships at 2 Months (T1) and 12 Months (T2) Predicting Children's Affect Regulation at the Age of 7 to 8 Years (T3).

	Emotion regulation			Neurotic defenses			Immature defenses		
	B	*SE*	Δr^2	*B*	*SE*	Δr^2	*B*	*SE*	Δr^2
T1: 2 months									
Marital autonomy	0.09**	0.03	0.03	−0.10**	0.04	0.03	−0.11**	0.04	0.02
Parental autonomy	0.10***	0.03	0.05	−0.14***	0.03	0.09	−0.15***	0.04	0.05
Marital intimacy	0.05(*)	0.03	0.01	−0.06(*)	0.03	0.02	−0.09*	0.04	0.01
Parental intimacy, mothers' reports	0.09	0.05	0.01	−0.01	0.07	0.00	−0.04	0.07	0.00
Parental intimacy, fathers' reports	0.03	0.06	0.00	−0.05	0.06	0.00	−0.05	0.06	0.00
T2: 12 months									
Marital autonomy	0.11***	0.03	0.05	−0.14***	0.04	0.07	−0.10*	0.05	0.01
Parental autonomy	0.13***	0.03	0.07	−0.13**	0.04	0.06	−0.17***	0.05	0.05
Marital intimacy	0.05(*)	0.03	0.02	−0.08**	0.03	0.04	−0.09**	0.04	0.02
Parental intimacy, mothers' reports	0.11(*)	0.06	0.02	−0.01	0.07	0.00	−0.13(*)	0.06	0.02
Parental intimacy, fathers' reports	0.04	0.05	0.01	−0.23*	0.10	0.04	−0.06	0.06	0.00

Note. Δr^2 = incremental change in r^2 over and above the early developmental achievements and background variables. Coefficients are constrained to be the same between mothers' and fathers' reports, except for parental intimacy. Asterisks in parentheses refer to non-significance after the Benjamini-Hochberg correction ($p > .0266$). The models showed acceptable fit, CFI = 0.942-0.967; TLI = 0.932-0.959; RMSEA = 0.03-0.03, 90% CI = [0.02, 0.04]; $\chi^2(341\text{-}530) = 482.92\text{-}849.92$, all *p*s < .001. T = time; CFI = comparative fit index; TLI = Tucker–Lewis index; RMSEA = root mean square errors of approximation; CI = confidence interval.
*$p < .05$. **$p < .01$. ***$p < .001$.

Table 2. Comparisons Between Age-Specific Models of Family Relationships at 2 Months (T1) and 12 Months (T2) Predicting Children's Affect Regulation at the Age of 7 to 8 Years (T3).

	Emotion regulation						Neurotic defenses						Immature defenses					
	AIC	ΔAIC	χ^2	*df*	r^2	$\Delta\chi^2$	AIC	ΔAIC	χ^2	*df*	r^2	$\Delta\chi^2$	AIC	ΔAIC	χ^2	*df*	r^2	$\Delta\chi^2$
Marital autonomy																		
T1	95.07		560.27	340	0.10	1.82	95.45		560.55	340	0.12	1.12	99.31		564.30	340	0.11	1.67
T2	91.97	**3.11**	557.41	340	0.10	4.93	89.07	**6.38**	554.19	340	0.16	8.72(*)	97.72	1.60	562.63	340	0.12	3.62
T1 and T2	94.17		555.35	338	0.11		92.09		552.72	338	0.17		100.27		560.72	338	0.12	
Parental autonomy																		
T1	77.49		505.14	340	0.10	0.46	69.78		497.52	340	0.17	15.53***	70.00		498.38	340	0.16	0.20
T2	75.85	1.64	503.28	340	0.10	2.01	76.20	**-6.42**	504.57	340	0.14	5.93	69.48	0.53	497.58	340	0.17	0.71
T1 and T2	79.81		502.82	338	0.10		66.95		491.10	338	0.23		73.08		496.94	338	0.17	
Marital intimacy																		
T1	44.23		857.47	528	0.07	0.31	42.41		855.61	528	0.10	1.24	39.00		852.12	528	0.12	0.63
T2	43.55	0.68	857.23	528	0.08	0.54	33.68	**8.73**	847.95	528	0.16	9.39(**)	38.20	0.81	851.30	528	0.13	0.88
T1 and T2	47.52		856.93	526	0.08		36.37		846.23	526	0.18		42.17		850.68	526	0.13	

Note. All models involve early developmental achievements, background variables, and the corresponding family relationships at the child's age of 7 to 8 years (T3) as covariates. ΔAIC = difference in (truncated) AIC between *non-nested* models (T1 vs. T2). Bolded positive values (≥2.00) indicate greater predictive power of T2 over T1, whereas bolded negative values (≤−2.00) indicate greater predictive power of T1 over T2. $\Delta\chi^2$ = difference of chi-square (*df* = 1) between *nested* models (T1 vs. T1 and T2; T2 vs. T1 and T2). Significant results indicate unique contribution of the time point (T1 or T2) over the other time point. Asterisks in parentheses refer to non-significance after the Benjamini-Hochberg correction ($p > .0083$). T = time; AIC = Akaike's information criterion
*$p < .05$. **$p < .01$. ***$p < .001$.

Our findings further confirmed that problems in the marital subsystem, indicated by low marital autonomy, and to some extent also by low marital intimacy, predicted children's inefficient emotion regulation and reliance on neurotic and immature defenses. These results are in line with the emotional security theory (Davies & Martin, 2013), which proposes that children develop unique strategies to maintain sense of security in the context of interparental relationship. Low marital autonomy likely indicates conflictual interparental interactions, involving heightened verbal aggression and expressions of negative emotions (Gavazzi et al., 2000). In line with this, previous studies have found that exposure to marital disagreements increase infant's avoidance behaviors and emotional expressiveness (Crockenberg et al., 2007; Du Rocher Schudlich et al., 2011), presumably to either avoid or defuse interparental conflicts (Davies & Martin, 2013). It is possible that infant's exposure to conflictual interparental interactions hinders children's

sense of security, which hinders children's emotion regulation development and heightens reliance on defense mechanisms.

It is important, however, also to consider the potential family dynamic mechanisms which could explain the significance of the marital subsystem on children's later affect regulation. According to family systems perspective, problems in the marital subsystem can spillover into the parenting subsystem and thereby influence children (Stroud, Durbin, Wilson, & Mendelsohn, 2011), although the marital subsystem has at least some unique contribution over the parenting subsystem (Crockenberg et al., 2007; Finger, Hans, Bernstein, & Cox, 2009). Thus, it is possible that in our study, to some extent, the effects of marital problems on children's emotion regulation and defense mechanisms were mediated through the quality of parenting. Family dynamic mechanism could also help explain why only fathers', but not mothers', reports of parental intimacy predicted children's reliance on neurotic defenses. Marital satisfaction is known to decrease during the transition to parenthood (Doss, Rhoades, Stanley, & Markman, 2009) and fathers are more prone than mothers to withdraw from parenting when experiencing marital dissatisfaction (Elliston, McHale, Talbot, Parmley, & Kuersten-Hogan, 2008). Thus, it is possible that fathers' perceptions of parenting were especially susceptible for the negative spillover from the marital subsystem.

In our previous study, we found that children from disengaged families, characterized by low emotional intimacy during infancy, showed attentional avoidance of threat (i.e., angry facial expression), whereas children from enmeshed families, characterized by low autonomy, showed attentional bias toward threat at the age of 10 years (Lindblom et al., 2015). Such attentional processes, developing already during infancy (Hoehl, 2014), could be one mediating link between early family experiences and later emotion regulation and reliance on defense mechanisms. Further longitudinal studies are needed, however, to test such mediating processes. As an alternative hypothesis, it should also be considered whether children's sense of insecurity, rather than early regulatory processes, account for the effects of early family relationships on children's later affect regulation.

The results largely disconfirmed our *age-specific hypothesis* in that we found age-specific effect within the first year only for neurotic defenses, but not for emotion regulation or immature defenses. We find the lack of age-specific effects intriguing, because developmental research suggests existence of sensitive periods (Pechtel & Pizzagalli, 2011) and infancy is considered to be especially important period for emotional development (Bernier et al., 2012; Sharp, Hill, Hellier, & Pickles, 2015). However, our study is one of the first to stringently test for the existence of age-specific effects within infancy (i.e., 2 months vs. 12 months) on later development. The lack of age-specific results likely indicates high plasticity in the development of emotion regulation and immature defenses after infancy. Indeed, studies focusing on older children suggest a sensitive period for executive functions during preschool-age (Zelazo et al., 2010), and a potentially sensitive period for immature defenses, such as projection, during middle childhood (Cramer, 2006). Even as the quality of the early family relationships is undeniably important for infant's well-being, its age-specific effects on children's later emotion regulation and immature defenses seem to be negligible in our normative sample.

Interestingly, however, in line with the age-specific hypothesis, low autonomy in the parenting subsystem at the age of 2 months was an especially important predictor of children's reliance on neurotic defenses in middle childhood. It is tempting to speculate about the underlying psychological and neural mechanisms. Neurotic defenses, such as repression and reaction formation, are characterized by limited awareness of threat provoking thoughts and unacceptable emotions. Research suggests that early development of emotional self-awareness takes place within sensitive and well-attuned dyadic interactions, which provide the infant feedback about his/her own emotional states (Beebe et al., 2012; Gergely & Watson, 1996). In line with this, psychodynamic theory suggests that infants' symbolic representations of their own emotional needs are left "underdeveloped" with insensitive and rejecting caregivers, making them difficult to be consciously reflected later on (Lyons-Ruth, 1999). Such a dyadic process could explain the importance of early parental autonomy on children's later reliance on neurotic defenses.

Furthermore, in an integrative model of the neural basis of defensiveness, Axmacher et al. (2010) suggested that repression is related to disruptions in declarative memory function. Excessive amygdala activation disrupts declarative memory function in the hippocampus that can prevent the integration of threatening experiences in the autobiographical memory. Consequently, reminiscent of the operation of neurotic defenses, the memories about threatening events may be consciously accessible but lack the component of self-referral. Interestingly, studies suggest that early experiences of excessive stress, such as harsh parenting, can produce alterations in infant's hormonal stress regulation, with consequences on amygdala volume (Moutsiana et al., 2015; Pechtel & Pizzagalli, 2011) and memory function in the hippocampus (Tottenham & Sheridan, 2010). It is possible that such neural and endocrinal alterations during early infancy could underlie children's later reliance on neurotic defenses. Naturally, further studies are needed to test the hypothesized roles of dyadic and neural processes underlying children's reliance on neurotic defenses.

In general, we found that highly functional family relationships during infancy predicted children's efficient emotion regulation and less reliance on neurotic and immature defenses. In line with Gross and Thompson (2007), we conceptualized emotion regulation and defense mechanisms as separate affect regulation processes, but they have also been suggested to present the opposite ends of the same dimension (e.g., adaptive–maladaptive regulation; Sala et al., 2015). In line with this view, we found that the early family predictors

of emotion regulation and immature and neurotic defenses were highly similar, despite the effects being in the opposite direction. One expectation for this was, however, the finding about the importance of very early parental parenting autonomy on neurotic defenses, but not on emotion regulation. Although this age-specific finding warrants replication, it is noteworthy that the effect was found even after controlling for multiple comparisons and the concurrent parental autonomy in middle childhood. To better understand the differences and similarities between emotion regulation and defense mechanisms, further studies may need to more directly compare their cognitive and psychodynamic processes (e.g., attention, memory, self-awareness, and motivational factors).

Limitations of the Study

Our study has several limitations. First, the modeling of family relationships was based only on three measurement assessments. This warrants the definite conclusions made about the absolute timing of age-specific effects, in that, for example, the assessment at child's age of 12 months may reflect the later ongoing family relationships in early childhood. Further studies should involve more assessment points within the infancy.

Second, our relatively large sample was based on questionnaires and might have been susceptible to reporter bias. The Response Evaluation Measure has been found to be valid in assessing defense mechanisms based on children's self-reports (Araujo et al., 2006), but only one previous study has used the parent version of the questionnaire (Yasnovsky et al., 2003). It is not completely clear to what extent parents can reliably report their children's defense mechanisms. However, supporting the validity of the parent version questionnaire, our measurement model showed that mothers' and father's reports adequately captured the same latent constructs. Yet, more studies are needed to further validate the parent version of the questionnaire.

Furthermore, mothers' and fathers' reports regarding some family relationships did not correlate significantly. Such inconsistencies are relatively common in family research, suggesting that parents may have equally valid but unique perspectives on family relationships (e.g., Driscoll & Pianta, 2011). Indeed, we confirmed the validity of parents' reports by demonstrating (a) similar associations between parents' reports of family relationships and children's affect regulation and (b) similar structure of the latent family relationship constructs between the parents, with the exception of parental intimacy. However, observational methods might have yielded more reliable information about family relationships, as well as children defense mechanisms.

Third, it is possible that some child characteristics (e.g., infant's temperament traits) influenced both family relationships during infancy and children's affect regulation in middle childhood. To control for such bias, we controlled for the effects of children's developmental achievements, such as social contact and regularity of sleep patterns. Ideally, however, the models should take into account the more complex and continuous bidirectional influences between family relationships and infant characteristics.

Finally, although the results were theoretically meaningful, it is important to note that their effect sizes were small. This may be because of the families in our sample were relatively low-risk families, and also because of the relatively long follow-up period. Further studies with more heterogeneous samples are needed to replicate our results.

Conclusions

To the best of our knowledge, our study is the first long-term study to examine age-specific effects of family relationships within infancy on children's affect regulation, involving both emotion regulation and defense mechanisms. In line with the attachment (Thompson & Meyer, 2007) and emotional security (Davies & Martin, 2013) theories, our findings support the notion that both parental and marital relationships contribute to children's ways of modulating their emotional experiences and interpersonal needs. Furthermore, in line with Hart's (2014) integrative defense theory, our results suggest that children may develop reliance on self-deceptive defense mechanisms to cope with the insecurity stemming from early dysfunctional family relationships. This may help to understand the role of defense mechanisms mediating between early adversity and later mental health, as previously suggested by retrospective adult studies (e.g., Finzi-Dottan & Karu, 2006). Finally, our finding about the importance of very early parental autonomy on children's later neurotic defenses was novel. To better understand this tentative finding, further studies are needed to look for potential sensitive periods during early infancy and to test the hypothesized neurocognitive and psychodynamic pathways.

Declaration of Conflicting Interests

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Dynamic Family System Trajectories From Pregnancy to Child's First Year

*Family systems reorganize during transitional periods, such as the birth of a new child. Longitudinal research, however, on family dynamics during the transition to parenthood is lacking. Accordingly, the authors aimed to identify family system trajectories from pregnancy to the child's first birthday and to examine their contextual predictors. Both parents (*N = *702) reported autonomy and intimacy in marital (wife-to-husband, husband-to-wife) and parenting (mother-to-child, father-to-child) relations during pregnancy and at child's ages of 2 months and 12 months. Finite mixture modeling revealed 7 unique family system trajectories: (a) Cohesive (35%), (b) Disengaged (5%), (c) Enmeshed Declining (6%), (d) Enmeshed Quadratic (5%), (e) Authoritarian (14%), (f) Escalating Crisis (4%), and (g) Discrepant (15%) families. Parental education in interaction with duration of partnership and parity predicted family trajectory membership. The study demonstrates how different family types reorganize during the transition to parenthood; this includes decline, growth, and stability in autonomy and intimacy.*

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According to family systems theory, families consist of hierarchically ordered parts, from basic dyadic relations to marital and parental subsystems (Minuchin, 1985). In the transition to parenthood, family relationships change as the family system adapts to the new situation. The changes, such as improvements and declines in relationship quality, are different and unique,

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depending on how emotions and responsibilities are shared in the family. For instance, families with well-functioning relationships during pregnancy tend also to fare well in the postpartum period, whereas families with problematic relationships often experience further decline in their relationship quality across the transition (Doss, Rhoades, Stanley, & Markman, 2009).

Two basic dimensions, autonomy and intimacy, define different family systems and typical relationship patterns. *Autonomy* refers to individuality and a sense of agency in relations with others, reflecting family boundaries, whereas *intimacy* refers to sharing or withholding emotions (Kagitcibasi, 2005; Olson, 2000). Well-functioning family systems are high and balanced on both dimensions, whereas a lack of one or both indicates potential problems (Sturge-Apple, Davies, & Cummings, 2010). Despite understanding families as dynamic systems changing over time, earlier researchers have mainly focused on separate aspects of marital and parenting quality. Our aim was therefore to identify naturally occurring, dynamic family system types during the transition to parenthood and to examine their contextual predictors.

Family System Types and Their Longitudinal Change

The *typological approach* depicts families as holistic systems that can be classified according to their unique patterns in relational dimensions (Mandara, 2003). Research suggests that there are at least four family types varying in levels of autonomy and intimacy (e.g., Baumrind, 1971; Minuchin, 1985; Sturge-Apple et al., 2010). The first type, *Cohesive* families, have an optimal balance between autonomy and intimacy, allowing members to maintain sufficient individuality but also to receive emotional support from each other (Stevenson-Hinde, 1990). They are characterized by high emotional warmth and absence of discord (Davies, Cummings, & Winter, 2004; Sturge-Apple et al., 2010). Second, *Disengaged* families lack both autonomy and intimacy, resulting in negative and poorly organized family interactions (Stevenson-Hinde, 1990). They are characterized by poor overall interpersonal functioning, withdrawal between spouses, and low parental acceptance of the child (Davies et al., 2004; V. K. Johnson, 2003). The third type, *Enmeshed* families, lack autonomy between family members but have moderate to high levels of intimacy, often resulting in boundary disturbances and dependency (Kerig, 2005). They are characterized by hostility between spouses and intrusive parental control, but at least moderate levels of parental intimacy (Davies et al., 2004; Sturge-Apple et al., 2010). Fourth and finally, *Authoritarian* families have relatively low intimacy but high levels of autonomy, suggesting rigid boundaries between family members (Kerig, 2005; Olson, 2000). In these families obedience typically overrides affective sharing (Jory, Xia, Freeborn, & Greer, 1997; Kagitcibasi, 2005).

Despite the central assumption of families as dynamic systems that are prone to qualitative shifts in new situations (Cox & Paley, 2003; Mandara, 2003), only two studies have empirically examined longitudinal changes in holistic family systems. Favez et al. (2012) identified longitudinal family trajectories based on the overall quality of triadic interactions among primiparous couples from the prenatal period to child's ages of 3, 9, and 18 months. Prenatal interactions with the baby were simulated using a baby doll. Such prenatal interactions reflect both parental representations and direct experiences of the baby (achieved, i.e., via fetal movements), which are known to predict the actual postnatal interactions. The results showed that in about three quarters of the families triadic interaction quality was stable (high or low), whereas in about one third it declined from high to low. Although Favez et al.'s study showed both stability and change in family systems, it was limited in that the trajectories were based on overall relational quality, thus failing to depict qualitatively different family types. Another study, conducted by V. K. Johnson (2003), identified family types on the basis of the observed quality of mother–father and parent–child interactions at the child's ages of 5 years (*Cohesive*, *Father–Child Alliance,* or *Mother–Child Alliance*) and 9 years (*Cohesive*, *Triangulated*, or *Disengaged*). There was no longitudinal stability in family type memberships between the time points, suggesting that family systems are open to radical reorganization at least over a long time period, yet the study could not provide information about the dynamic short-term changes in different family types and was not focused on the transition to parenthood.

Thus, we still lack knowledge about the specific and unique ways in which family system types change and reorganize during the transition to parenthood.

Factors Influencing the Transition to Parenthood

Various contextual factors influence family dynamics during the transition to parenthood, including, for example, the duration of the partnership and parity. Earlier studies have analyzed the impacts of contextual factors on the separate aspects of the marital relation and parenting, but research on holistic family systems combining these two aspects is still lacking. There is evidence that a short duration of partnership increases the risk for a steep decline in marital satisfaction due to high conflict between romantic dedication and the demands of new parenthood (Belsky & Rovine, 1990). First-time parents tend to experience stronger prenatal attachment to the child but lower parenting self-efficacy than multiparous parents (Mercer & Ferketich, 1995). In contrast, couples with multiple children and a long duration of partnership report poor marital quality due to normative routinization of the marital relationship and increased demands of parenthood (Doss et al., 2009; D. Johnson, Amoloza, & Booth, 1992). Research also suggests that a couple's high educational level predicts sensitive parenting (Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004) but, on the other hand, a steeper decline in marital satisfaction (Twenge, Campbell, & Foster, 2003). It is likely that high educational level ensures social and financial resources but also increases parental stress due to role conflicts between work and home. Some couples experience involuntary infertility, which may affect later family relations, for example, by increasing child centeredness at the expense of the marital relationship (Cairo et al., 2012). Yet most studies on parenting after assisted reproductive treatment (ART) report good family functioning and high resilience (Hammarberg, Fisher, & Wynter, 2008). Thus, in light of earlier research, it is reasonable to expect that these contextual factors would also predict holistic family systems.

The process of becoming a parent varies according to parental gender. Mothers often act as primary caregivers for the infant and experience more parenting satisfaction than fathers (Elek, Hudson, & Bouffard, 2003). Conversely, fathers more often have a provider role, and some experience exclusion from close intimacy with the child (Nyström & Öhrling, 2004) or the spouse (Condon, Boyce, & Corkindale, 2004). Such gender differences may yield discrepant perceptions of family relations between spouses, with negative consequences for family dynamics (Byng-Hall, 1999).

Research Tasks and Questions

Our first aim was to identify holistic and dynamic family trajectories that integrate both typological and longitudinal aspects of families. The trajectories depict the extent of and changes in autonomy and intimacy in family relationships, namely, in marital (mother-to-father and father-to-mother) and parenting (mother-to-child and father-to-child) relationships, from pregnancy (Time 1 [T1]) to 2 months (Time 2 [T2]) and 12 months (Time 3 [T3]) of child's age. Second, we examined how contextual factors predict membership of the identified family trajectories. Despite the exploratory nature of our study, prior cross-sectional family-type research allowed us to hypothesize the identification of at least Cohesive, Disengaged, Enmeshed, and Authoritarian family trajectories. Furthermore, research on gender differences in the transition to parenthood allowed us to hypothesize about the identification of discrepant family trajectory or trajectories, depicting incongruent family perceptions between parents.

Method

Participants and Procedure

The study sample consisted of 705 Finnish married or cohabiting couples, including spontaneously conceiving (SC, $n = 371$) couples with no history of infertility and couples whose pregnancies started after ART ($n = 334$). SC couples were recruited from Helsinki University Central Hospital while attending ultrasonographic examinations, and ART couples were recruited from five Finnish infertility clinics in which they were treated with their own gametes. Recruitment took place during 1999–2000. Only couples with singleton pregnancies were included in the study, and only women above age 25 years were included in the SC group. All participants were Caucasian. All eligible couples

were systematically asked to participate until approximately 1,000 had consented. The ethics committees of the participating clinics approved the study.

Women and men completed questionnaires independently at three time points: (a) during the second trimester of pregnancy (T1; 18–20 weeks of gestation) and when the child was (b) 2 months (T2) and (c) 12 months old (T3). Participation rates at T1 were 671 (95%) for mothers and 634 (89%) for fathers, at T2 the rates were 654 (92%) for mothers and 615 (86%) for fathers, and at T3 the rates were 546 (77%) for mothers and 506 (71%) for fathers. Five hundred fifteen (73%) mothers and 467 (66%) fathers participated in all assessments (T1–T3). Attrition at T2 and T3 was independent of T1 autonomy and intimacy dimensions of family relations in both parents. It was also independent of parents' educational level, number of children, duration of the partnership, and parental age, yet attrition at T2 was greater in the SC group than in the ART group for both fathers (SC 17% vs. ART 9%), $\chi^2(1, N = 705) = 10.54$, $p = .001$; and mothers (SC 9% vs. ART 5%), $\chi^2(1, N = 705) = 3.97$, $p = .046$; and at T3 for fathers (SC 33% vs. ART 25%), $\chi^2(1, N = 705) = 6.52$, $p = .011$.

Measures

Family relations were measured with the Subjective Family Picture Test (Mattejat & Scholz, 1994), which assesses autonomy and intimacy in marital and parenting subsystems. Both parents rated the quality of four family relationships, namely, (a) wife to husband, (b) husband to wife, (c) mother to child, and (d) father to child, during the second trimester of pregnancy (T1) and at child's age of 2 months (T1) and 12 months (T2). For each relationship, parents rated four pairs of items for autonomy (e.g., determined–indecisive, self-confident–uncertain) and four pairs of items for emotional intimacy (e.g., loving–rejecting, warm–distant) using a 7-point scale. The item pairs were identical for each relationship, but the questions varied according to each relationship (e.g., "In relation to me my husband is . . ." or "In relation to our child I am . . ."). At T1, parents were asked to report their expectations of the future relationships with the unborn child. High scores on autonomy indicate relational self-assurance, agency, and independence, whereas high scores on intimacy indicate emotional closeness, interest, and acceptance. The Subjective Family Picture Test has been shown to be a valid and reliable measure of family relationships with an average between-scale correlation of .60 with other family diagnostic questionnaires and a test–retest correlation of .77 (Mattejat & Scholz, 1994).

Sum variables were computed for self- and spousal reports of family relations at T1, T2, and T3. The Cronbach's alpha reliability coefficients were acceptable for mothers' (.68–.81) and fathers' (.73–.79) reports of marital autonomy and for mothers' (.80–.91) and fathers' (.73–.88) reports of marital intimacy. These coefficients are similar to those reported in the test manual (Mattejat & Scholz, 1994). Nevertheless, the reliability coefficients were lower for both mothers' and fathers' reports of parenting autonomy and intimacy (.52–.82). These variables were highly skewed (ranging from −0.77 to −4.34) and had high kurtosis (ranging from 0.19 to 24.17), indicating that parents reported high levels of parenting autonomy and intimacy. Such deviations from the normal distribution tend to cause unrealistically low reliability coefficients (Sheng & Sheng, 2012), and indeed, when logarithmic transformations were used, the reliabilities increased to a satisfactory level ($\alpha = .65$–$.80$, except mothers' self-reports of intimacy at T1, $\alpha = .59$). The validity of prenatal parenting measures of the Subjective Family Picture Test is supported by the finding that they predict the level of parenting stress at 2 and 12 months (Flykt et al., 2009). We therefore used the original variables in our analyses, which were robust against nonnormality (see Analytic Strategy section).

Contextual factors were *education level* (1 = higher education, 2 = secondary education, or 3 = only basic education) averaged over both parents, *duration of the partnership* (years of marriage or cohabitation), *parity* (primi- vs. multiparous), and *former infertility* (ART vs. SC).

Analytic Strategy

To identify family system trajectories, we used mixture modeling with Mplus 5 (L. K. Muthén & Muthén, 2007). Identification of latent classes was based on the means of

48 variables depicting autonomy and intimacy in mother-to-father, father-to-mother, father-to-child and mother-to-child relations, measured at T1, T2, and T3 and reported by both mothers (variables M1–M24) and fathers (variables F1–F24). Mixture modeling identifies naturally occurring subpopulations from the data, called *latent classes*, and provides criteria to evaluate the number of these classes (B. Muthén, 2001). To avoid identifying an artificially high number of latent classes due to highly correlating variables (Lubke & Neale, 2006), we added two common latent factors into the model with constant loadings of 1 for all maternal (i.e., mother-level) and paternal (i.e., father-level) reports. The inclusion of these latent factors reduced redundant variation, such as parental response biases. A model consisting of categorical classes, indicator variables, and continuous latent factors is a *factor mixture model*.

In the first phase of the analysis we identified the number of family system trajectories. In the second phase, we identified family trajectories in which mother's and father's reports of family relations were either equal or discrepant by constraining the means of corresponding variables to be the same between maternal and paternal reports (M1 = F1, M2 = F2, M3 = F3, etc.). To find the optimal number of (un)constrained trajectories, this was done in successive steps, ranging from 0 to all trajectories being constrained.

In both phases of the analysis the number of identified classes was based on the Bayesian Information Criterion (BIC) because simulation studies have shown it to be a highly reliable criterion for factor mixture models (Nylund, Asparouhov, & Muthén, 2007; Tolvanen, 2007). Smaller BIC values indicate better goodness of fit between theoretical model and empirical data. We further evaluated the quality of the resulting family system trajectory classification with entropy and average posterior probabilities for most likely latent class membership. These range from 0 to 1, with higher values indicating better discrimination of the classes. We estimated model parameters using the maximum-likelihood method with robust standard errors against nonnormality, and missing data were handled by the full-information maximum-likelihood estimation implemented in Mplus. We could not use the bootstrapped likelihood ratio test to identify the number of classes because of high computational demands, but we ensured that the analysis found the best solution of all local maximums by using a large number (5,000) of randomized initial starting values. Finally, we conducted power analyses to ensure that the identified family trajectories were large enough to be described with statistical tests. We used a medium effect size ($d = 0.50$) and error probability of $\alpha = .05$ for two-tailed tests in these power analyses.

We describe the family trajectories using repeated-measures analyses of variance with marginal means aggregated over relationship (marital and parenting) and parent (mother and father) factors. Longitudinal changes are described by linear and quadratic trends. In these descriptive analyses, relationship variables were standardized using pooled variance over mother and father. Partial eta-squared (η_p^2) coefficients are reported to indicate the strength of the effects. Greenhouse–Geisser corrections were used to correct the violation of sphericity when needed.

To answer our second research question concerning the contextual predictors, we used multinomial regression analysis. Contextual variables and their interaction terms were used as independent variables, and family trajectory membership was the dependent variable. We conducted post hoc analyses with additional multinomial regression analyses separately for related subgroups (creating two groups using the median as a cutpoint when needed).

Results

Descriptive Statistics

The mean age at T1 in the whole sample was 33.21 years ($SD = 3.71$) for mothers and 34.61 ($SD = 4.91$) for fathers. The mothers in our sample were older than the Finnish national average of mothers giving birth ($M = 29.9$ years; Statistics Finland, 2013). About one third of mothers ($n = 220$, 34%) and fathers ($n = 224$, 36%) had tertiary education (a bachelor's or master's degree), more than half of mothers ($n = 391$, 60%) and fathers ($n = 357$, 57%) had secondary education (typically 1–3 years of vocational training), and about one-tenth of mothers ($n = 43$, 7%) and fathers ($n = 42$, 7%) had only basic education (elementary and junior high school). SC mothers were better educated

than ART mothers, $\chi^2(2, N = 649) = 11.21$, $p = .024$, in that they more often had tertiary education (SC = 39% vs. ART = 30%). Overall, the sample was better educated than the corresponding national age group (Statistics Finland, 2013). The mean duration of partnership at T1 was 8.8 years ($SD = 5.73$). Predictably, ART couples ($M = 9.63$ years, $SD = 4.47$) had longer partnerships than SC couples ($M = 7.69$ years, $SD = 4.45$), $t(656) = 5.59$, $p < .001$. Half of the couples were having their first child ($n = 439$, 53%), one third were having their second child ($n = 208$, 32%) and 15% already had two or more children ($n = 96$). As expected, ART couples (97%) were more often primiparous than SC couples (73%), $\chi^2(1, N = 636) = 70.38$, $p < .001$.

Identifying Dynamic Family System Trajectories

During the first phase of analysis, the factor mixture modeling identified 11 distinct family system trajectories. As shown in Table 1, the goodness of fit (BIC) decreased as the number of the classes increased until 11 classes were added into the model, suggesting that this was the best model in terms of parsimony and adequate representation of the data. Class sizes for this model were 304, 88, 85, 71, 54, 31, 24, 19, 16, 10, and 8. High entropy (.931) and high average latent class probabilities (.882–.999) indicated that these classes were clearly distinguishable.

During the second phase of the analysis, we estimated 11 classes in the factor mixture modeling and constrained maternal and paternal reports to be the same in successive steps from 0 up to 11 classes. The goodness of fit was smallest (BIC = 52,523.49) when nine out of 11 classes had constraints. Thus, in two out of 11 family system trajectories parents had discrepant views of family relations. Constrained class sizes were 274, 107, 46, 41, 38, 30, 14, 11, and 10, and unconstrained class sizes were 115 and 24. High entropy (.898) and high average latent class probabilities (.855–.998) indicated that the classes were clearly distinguishable.

Power analyses showed that for the smallest classes, with $n < 25$ (ns ranging from 10 to 24), powers of .34 to .65 were achieved, whereas for classes with $n > 25$ (ns ranging from 30 to 115) powers of .74 to .99 were achieved when they were compared to the largest class ($n = 274$). Thus, to ensure that acceptable power of about 0.80 could be assumed for pairwise tests, we decided to exclude the four smallest classes ($n = 14$, 2%; $n = 11$, 2%; $n = 10$, 2%; and $n = 24$, 4%) using a cutoff criterion of $n < 25$. These excluded classes accounted for 9% of the whole sample ($n = 59$), whereas the remaining seven classes accounted for 91% ($n = 646$) of the whole sample.

Table 1. *Fit Statistics for Mixture Modeling Identifying the Number of Family System Trajectories*

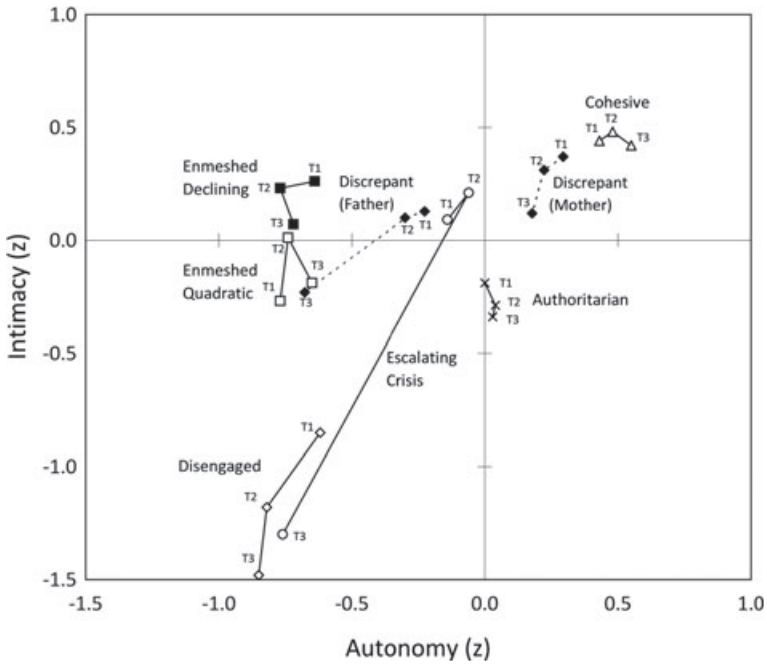
Number of classes	Log likelihood	BIC	Entropy	Average latent class probabilities
1	−27,957.33	56,564.62		
2	−27,005.28	54,982.22	.886	.945–.974
3	−26,501.88	54,297.11	.888	.924–.957
4	−26,166.36	53,947.77	.912	.927–.974
5	−25,858.92	53,654.60	.927	.941–.970
6	−25,583.86	53,426.16	.932	.930–.986
7	−25,368.33	53,316.82	.924	.911–.975
8	−25,106.55	53,114.94	.928	.908–1.000
9	−24,900.10	53,023.75	.927	.912–.999
10	−24,717.32	52,979.89	.934	.908–1.000
11	−24,540.13	52,947.21	.931	.882–1.000
12	−24,439.46	53,067.55	.886	.911–1.000
13	−24,264.40	53,039.13	.941	.909–1.000

Note: BIC = Bayesian Information Criterion.

The seven identified family trajectories are shown in Figure 1. They differed in their overall level of autonomy, $F(6, 467) = 131.43$, $p < .001$, $\eta_p^2 = .63$, and intimacy, $F(6, 467) = 119.94$, $p < .001$, $\eta_p^2 = .61$, indicating that the trajectories represent qualitatively different family types. Furthermore, these trajectories differed in how overall autonomy, $F(12, 934) = 11.13$, $p < .001$, $\eta_p^2 = .13$, and intimacy, $F(12, 934) = 30.87$, $p < .001$, $\eta_p^2 = .29$, changed over time, indicating that different family system types had unique longitudinal dynamics during the transition. To further examine these trajectories, we compared overall autonomy and intimacy between trajectories at T1, T2, and T3 (see Table 2), and we examined both linear and quadratic trends within each family trajectory.

The first family trajectory was called *Cohesive* ($n = 274$, 35%) because it had the highest levels of autonomy and intimacy compared to other trajectories at all time points. Autonomy

Figure 1. Family System Trajectories From Pregnancy (Time 1 [T1]) to Child's Ages of 2 Months (Time 2 [T2]) and 12 Months (Time 3 [T3]).



Note: Values are marginal means aggregated over parent (father or mother), relationship (parental or marital), and reporter (father or mother). However, separate values are presented for mother's and father's reports for Discrepant families, marked with dashed line.

in this trajectory increased from pregnancy to 12 months, $F(1, 195) = 14.66$, $p < .001$, $\eta_p^2 = .07$.

The second family trajectory was called *Disengaged* ($n = 41$, 5%) because it had the lowest levels of both autonomy and intimacy compared to other family trajectories at all time points. Intimacy in this trajectory declined from pregnancy to 12 months, $F(1, 27) = 15.33$, $p = .004$, $\eta_p^2 = .36$.

The third and fourth family trajectories were both interpreted to be enmeshed because they had the lowest levels of autonomy, but somewhat higher levels of intimacy, namely, higher intimacy than in Disengaged family systems. The third trajectory was called *Enmeshed Declining* ($n = 46$, 6%) because intimacy declined from pregnancy to 12 months, $F(1, 31) = 8.52$, $p = .042$, $\eta_p^2 = .22$. The fourth trajectory was called *Enmeshed Quadratic* ($n = 38$, 5%), because intimacy first increased from pregnancy to 2 months but then declined by 12 months, $F(1,31) = 16.15$, $p = .002$, $\eta_p^2 = .34$. Enmeshed Declining families had a higher level of intimacy than Enmeshed Quadratic families at all time points.

The fifth family trajectory was called *Authoritarian* ($n = 107$, 14%) because it had a low level of intimacy combined with an average level of autonomy compared to other trajectories at all time points. Intimacy in this trajectory declined from pregnancy to 12 months of child's age, $F(1, 77) = 7.82$, $p = .049$, $\eta_p^2 = .09$.

The sixth family trajectory was called *Escalating Crisis* ($n = 30$, 4%) because it had average levels of autonomy and intimacy during pregnancy and at 2 months but the lowest level of autonomy and intimacy at 12 months, not differing significantly from those of Disengaged families. Both intimacy, $F(1, 25) = 94.59$, $p < .001$, $\eta_p^2 = .79$, and autonomy, $F(1, 25) = .18.59$, $p < .001$, $\eta_p^2 = .43$, were stable from pregnancy to 2 months but then declined by 12 months. As a result, both intimacy, $F(1, 25) = 113.80$, $p < .001$, $\eta_p^2 = .82$, and autonomy, $F(1, 25) = 55.23$, $p < .001$, $\eta_p^2 = .69$, declined from pregnancy to 12 months.

Table 2. *Differences Between Family System Trajectories in Autonomy and Intimacy at Pregnancy (Time 1 [T1]) and Child's Ages of 2 Months (Time 2 [T2]) and 12 Months (Time 3 [T3])*

	T1		T2		T3	
Family system trajectory	*M*	*SE*	*M*	*SE*	*M*	*SE*
Autonomy[a]						
Cohesive ($n = 274$, 35%)	0.43_{a}	0.03	0.48_{a}	0.03	0.55_{a}	0.03
Disengaged ($n = 41$, 5%)	-0.62_{d}	0.11	-0.82_{c}	0.11	-0.85_{d}	0.10
Enmeshed Declining ($n = 46$, 6%)	$-0.64_{d,e}$	0.08	-0.77_{c}	0.10	-0.72_{d}	0.09
Enmeshed Quadratic ($n = 38$, 5%)	-0.77_{e}	0.09	-0.74_{c}	0.01	-0.65_{d}	0.01
Authoritarian ($n = 107$, 14%)	$0.00_{b,c}$	0.05	0.04_{b}	0.05	0.03_{b}	0.05
Escalating Crisis ($n = 30$, 4%)	-0.14_{c}	0.11	-0.06_{b}	0.10	-0.76_{d}	0.09
Discrepant ($n = 115$, 15%)	0.03_{b}	0.05	-0.03_{b}	0.05	-0.24_{c}	0.05
Intimacy[b]						
Cohesive ($n = 274$, 35%)	0.44_{a}	0.03	0.48_{a}	0.03	0.42_{a}	0.03
Disengaged ($n = 41$, 5%)	-0.85_{d}	0.14	-1.18_{e}	0.12	-1.48_{e}	0.16
Enmeshed Declining ($n = 46$, 6%)	0.26_{b}	0.07	0.23_{b}	0.07	0.07_{b}	0.08
Enmeshed Quadratic ($n = 38$, 5%)	-0.27_{c}	0.09	0.01_{c}	0.08	$-0.19_{c,d}$	0.09
Authoritarian ($n = 107$, 14%)	-0.19_{c}	0.05	-0.29_{d}	0.05	-0.34_{d}	0.05
Escalating Crisis ($n = 30$, 4%)	0.09_{b}	0.08	0.21_{b}	0.07	-1.30_{e}	0.13
Discrepant ($n = 115$, 15%)	0.25_{b}	0.05	0.21_{b}	0.05	$-0.06_{c,b}$	0.05

Note: Different subscripts (a–e) denote statistically significant differences between values separately for each column (T1, T2, or T3) and for autonomy or intimacy. Values are marginal means aggregated over parent (father or mother), relationship (parental or marital), and reporter (father or mother).

[a]Between-trajectories effects were as follows: T1, $F(6, 612) = 92.05$, $p < .001$, $\eta_p^2 = .48$; T2, $F(6, 592) = 12.43$, $p < .001$, $\eta_p^2 = .54$; T3, $F(6, 496) = 129.81$, $p < .001$, $\eta_p^2 = .61$. [b]Between-trajectories effects were as follows: T1, $F(6, 612) = 86.68$, $p < .001$, $\eta_p^2 = .46$; T2, $F(6, 592) = 22.55$, $\eta_p^2 = .56$; T3, $F(6, 496) = 120.77$, $p < .001$, $\eta_p^2 = .60$.

The seventh family trajectory was called *Discrepant* ($n = 115$, 15%) because parents in this trajectory had discrepant views of family relations. On average, the Discrepant trajectory had moderate levels of both autonomy and intimacy compared to other family trajectories during pregnancy and at 2 months. At 12 months, however, autonomy was relatively low, actually lower than in Authoritarian families but higher than in Disengaged families. As shown in Figure 1, fathers perceived family relations as less intimate than did mothers, $F(1, 77) = 14.74$, $p = .002$, $\eta_p^2 = .16$. Furthermore, fathers perceived family relations as less autonomous than did mothers, $F(1, 77) = 81.56$, $p < .001$, $\eta_p^2 = .27$, and perceived a steeper decline in autonomy than did mothers, $F(1, 77) = 7.80$, $p = .046$, $\eta_p^2 = .09$. Nevertheless both parents perceived that intimacy declined over time, $F(1, 77) = 41.30$, $p < .001$, $\eta_p^2 = .35$, in particular from 2 months to 12 months, $F(1, 77) = 13.15$, $p = .004$, $\eta_p^2 = .15$.

Factors Predicting Family System Trajectories

Our second task was to determine the role of contextual factors in predicting family system trajectories. The analysis revealed no simple main effects of duration of partnership, parity, parents' educational level, or former infertility on trajectory membership. Instead, significant interactions were found between parents' educational level and duration of partnership, $\chi^2(6, N = 586) = 24.68$, $p < .001$; between education and parity, $\chi^2(6, N = 586) = 13.87$, $p = .037$; between education and former infertility, $\chi^2(6, N = 586) = 21.17$, $p = .002$; and between duration of partnership and former infertility, $\chi^2(6, N = 586) = 14.46$, $p = .025$, on predicting family trajectory membership. These explained about 17% of trajectory membership, $\chi^2(48, N = 586) = 103.82$, $p < .001$, Cox and Snell $R^2 = .17$. We examined the interaction effects further in post hoc analyses. We used the Cohesive family trajectory type as a reference group because it was the largest family trajectory and had the highest levels of autonomy and intimacy.

Post hoc analyses showed first that, among couples with low education levels, multiparity predicted membership in both the Disengaged ($B = 0.85$, $SE = 0.33$, $p = .009$) and Authoritarian trajectories ($B = 0.76$, $SE = 0.24$, $p = .001$) and that short duration of partnership predicted membership in the Escalating Crisis trajectory ($B = -0.03$, $SE = 0.01$, $p = .002$). Second, among couples with high education levels, former infertility predicted membership in both the Enmeshed Quadratic ($B = -0.80$, $SE = 0.37$, $p = .029$) and Enmeshed Declining ($B = -0.85$, $SE = 0.29$, $p = .003$) trajectories, and primiparity predicted membership in the Authoritarian family trajectory ($B = -0.60$, $SE = 0.26$, $p = .019$). Third, among couples with no former infertility, long duration of partnership predicted membership in both the Authoritarian ($B = 0.12$, $SE = 0.01$, $p = .003$) and Disengaged ($B = 0.12$, $SE = .01$, $p = .021$) trajectories, and low educational level predicted membership in the Enmeshed Quadratic trajectory ($B = 0.96$, $SE = 0.33$, $p = .003$).

Discussion

We used a novel approach to identify seven family trajectories during the transition to parenthood based on longitudinal changes in autonomy and intimacy in both marital and parenting relations. In line with earlier research, we identified Cohesive, Disengaged, Authoritarian, and two enmeshed family systems characterized by varying levels of autonomy and intimacy. We further identified a Discrepant family system characterized by differing perceptions of family relations among mothers and fathers, and an Escalating Crisis family system characterized by a strong decline in autonomy and intimacy from the pre- to postnatal period.

Our study is the first to report on the longitudinal dynamics of family types during the transition to parenthood, indicating systemic reorganizations of these families. Cohesive families experienced a slight increase in family autonomy, whereas Disengaged families experienced considerable decline in family intimacy from pregnancy to 12 months of child's age. These results concur with earlier research showing that dysfunctional family relations tend to be exacerbated during the transition, whereas functional family relations can protect the family or even lead to positive growth (Doss et al., 2009). Furthermore, in line with family systems theory (Olson, 2000), both types of enmeshed families experienced declines in family intimacy from child's age of 2 months to 12 months, whereas Authoritarian families showed only a slight decline in intimacy. The lack of boundaries in enmeshed families may cause spillover between family members and thereby increase difficulties in maintaining high family intimacy, whereas the strong boundaries of Authoritarian families may help to clarify family roles and stabilize family systems during transitional periods.

All identified family types except Escalating Crisis demonstrated strong longitudinal stability during the transition to parenthood. This extends the results of Favez et al. (2012) by showing stability not only in the overall quality of family interactions but also in the qualitative types of families. Apparently, even as family systems reorganize during the transition, they maintain homeostasis and adhere to the rules of the respective family type (Olson, 2000). For example, whereas new parents may renegotiate their family responsibilities and experience distancing in the marital relationship, the more fundamental family type is often resistant to change during the transition to parenthood. Regarding dramatic changes in Escalating Crisis families, we can speculate that these families may have encountered severe transitional challenges, such as a child's illness or maternal postpartum depression. Such challenges could have disturbed these families' homeostasis and initiated their transformation from average to disengaged families.

Mothers and fathers had different perceptions of their family relationships in Discrepant families, with fathers perceiving family relations more negatively than mothers. This differs somewhat from research showing that during the transition, on average, mothers often perceive the marital relationship more negatively than do fathers (Doss et al., 2009). On the other hand, some studies have suggested that mothers often experience new parenthood more positively than fathers (Elek et al., 2003), and fathers' parenting is more susceptible to the influence of marital difficulties (Stroud, Durbin, Wilson, & Mendelsohn, 2011). It is therefore possible that in families with severely discrepant perceptions the mother's perceptions are colored positively by the experience of new motherhood, whereas the father's perceptions are colored negatively by the transitional distancing in the marital relationship. It is interesting that, despite the differences

in family perceptions, both parents experience moderate declines in family intimacy during the postnatal period. Our study found a relatively large number of these families (15%), indicating that future studies should acknowledge the significance of gendered family dynamics.

None of the contextual factors alone predicted family trajectory membership among the entire sample. Interaction effects showed, however, that among either spontaneously conceiving couples or those with low educational levels, long duration of partnership and multiparity predicted membership in the Disengaged and Authoritarian trajectories, whereas short duration of partnership predicted membership in the Escalating Crisis trajectory. These results are similar to those of studies of marital relationships showing that couples with several children and a long partnership often experience compromised marital quality, whereas couples with a short partnership may experience a steeper decline during the transition to parenthood due to abrupt termination of the marital honeymoon period (Doss et al., 2009). These results also suggest that high education level and experiencing former infertility may protect against such detrimental effects on family relations. We further found that high education level, together with infertility history, predicted membership in both the Enmeshed Quadratic and Enmeshed Declining trajectories. Earlier research suggests that the experience of involuntary infertility may increase child-centered family interactions and difficulties in maintaining family boundaries (Cairo et al., 2012), and our study specifies that such processes may be especially intensified among highly educated parents.

Our study had several limitations. First, we described family trajectories in regard to their overall levels of autonomy and intimacy, even though we used more relationship-specific information (e.g., the mother's autonomy toward the child) to identify them. This approach produces a realistic typology of family systems but warrants further research on detailed differences in family dynamics between mothers and fathers and between marital and parenting subsystems. Second, the generalizability of our results should be viewed with caution. All the couples in our sample were over age 25 years and relatively highly educated. Furthermore, we excluded four small family trajectories (ns = 10, 11, 14, and 24) from our analyses to ensure adequate statistical power. Thus some family trajectories, especially those common among young and uneducated parents, may have been underrepresented or absent from our analyses. In other populations, contextual factors may affect family trajectories differently and family trajectories missed in our analyses may emerge. Third, we did not analyze the associations between the family types and indicators of psychopathology, and therefore whether any of the family trajectories represent problematic or merely normative transitional processes remains unknown. Finally, our data were based on questionnaire methods, making the results susceptible to reporter biases. To account for such biases, we explicitly modeled discrepancies in parents' reports, although observational methods might have yielded more objective results.

By using rich data on family relations, we were able to present a family typology that integrates longitudinal and typological aspects of family systems. The family trajectories we identified were meaningfully associated with specific contextual factors, which lends some support regarding their validity. In regard to clinical implications, our results may be useful in identifying families at risk. Early preventive and focused interventions should be favored, as family enmeshment, disengagement, and discrepant parental perceptions are already present during pregnancy. This study took the first steps toward understanding how different types of families reorganize and change during transitions. Our novel approach opens up new possibilities for understanding, for instance, how relationship patterns in different families are shaped and formed during transitions and how such dynamic family environments influence child development. We hope that this study will encourage more researchers to model families as dynamic and holistic systems.

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From Early Family Systems to Internalizing Symptoms: The Role of Emotion Regulation and Peer Relations

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Research has demonstrated the importance of early family characteristics, such as the quality of caregiving, on children's later mental health. Information is, however, needed about the role of more holistic family systems and specific child-related socioemotional mechanisms. In this study, we conceptualize families as dynamic family system types, consisting of both marital and parenting trajectories over the transition to parenthood. *First,* we examine how early family system types predict children's anxiety, depression, peer exclusion and emotion regulation. *Second,* we test whether couple's infertility history and other family-related contextual factors moderate the effects of family system types on child outcomes. *Third,* we test whether children's emotion regulation and peer exclusion mediate the effects of family system types on anxiety and depression. The participants were 452 families representing cohesive, distant, authoritative, enmeshed, and discrepant family types, identified on the basis of relationship autonomy and intimacy from pregnancy to the child's age of 2 and 12 months. Children's anxiety, depression, emotion regulation, and peer exclusion were assessed at the age of 7-8 years. Structural equation modeling showed that distant, enmeshed, and discrepant families similarly predicted children's heightened anxiety and depression. Infertility history, parental education, and parity moderated the associations between certain family system types and child outcomes. Finally, emotion regulation, but not peer exclusion, was a common mediating mechanism between distant and enmeshed families and children's depression. The results emphasize the importance of early family environments on children's emotion regulation development and internalizing psychopathology.

Keywords: anxiety; depression; emotion regulation; emotional problems; family relationships; infancy; infertility; peer exclusion; trajectories; transition to parenthood

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Child development fundamentally takes place within family relationships. Both parent-child and interparental interactions shape how children express and regulate their emotions (Morris, Silk, Steinberg, Myers, & Robinson, 2007) and relate to self and others (Davies & Martin, 2013). Early developmental alterations in these socioemotional processes can heighten the risk for emotional problems in later life (Brumariu & Kerns, 2010). Indeed, there is some evidence about the mediating role of emotion regulation and peer relationships between early family experiences and children's later internalizing symptoms (e.g., Kim & Cicchetti, 2010). Further, families interact with a number of contextual factors. In the current study, half of the participating couples had infertility history. Involuntary infertility can influence both family dynamics and children's vulnerability to family dysfunctions (Barnes et al., 2004). However, it is not yet well understood how family system types and contextual factors shape children's socioemotional processes and specific internalizing disorders. In this study, we conceptualize family system types as parental and marital trajectories from pregnancy to child's infancy. We model how these complex family system types, together with former infertility and other contextual factors, predict children's anxiety and depression in middle childhood. Furthermore, we test the mediating role of children's emotion regulation and peer exclusion between early family system types and child anxiety and depression.

Families and Children's Internalizing Symptoms

Anxiety and depression are often considered together as internalizing symptoms due to their phenomenological similarities. *Evolutionary models of psychopathology* suggest, however, that anxiety and depression have evolved to serve different adaptive functions (Stevens & Price, 2000). For example, anxiety may foster coping with threats and dangers, and depression with interpersonal conflicts and losses (Eley & Stevenson, 2000; Sloman, Farvolden, Gilbert, & Price, 2006). Emotional security theory extends evolutionary perspective to family context, and suggests that children may develop anxiety and worry to ensure parental protection in enmeshed families, and depression and withdrawal to avoid conflicts in distant families (Davies & Martin, 2013). In line with this, a meta-analysis of parenting, based mostly on cross-sectional studies, provided some evidence that enmeshed parenting (e.g., parental overprotection and lack of autonomy support) would predict child anxiety (McLeod, Wood, & Weisz, 2007), whereas distant parenting (e.g., parental hostility and rejection) would predict child depression (McLeod, Weisz, & Wood, 2007). However, a more recent meta-analysis of parenting, based on longitudinal studies, found only weak evidence of symptom-specificity (Yap & Jorm, 2015). One explanation for the lack of symptom-specificity could be that children develop anxiety and depression as a response to more complex family patterns, involving both the parenting and the marital relationships.

According to *emotion regulation models of psychopathology,* dysfunctional family relationships are detrimental because they disturb children's ability to modulate their emotional experiences and responses (Morris et al., 2007; Suveg, Morelen, Brewer, & Thomassin, 2010). Family conflicts, as well as overly strict, intrusive or distant caregiving, decrease children's sense of safety and limit experiences of emotional scaffolding, both essential for the development of emotion regulation (Davies & Martin, 2013; Thompson & Meyer, 2007). Intriguingly, inefficient regulation of negative emotions could heighten children's general risk for internalizing symptoms, and thus explain the lack of symptom-specificity (i.e., developmental equifinality) in previous family studies. In line with this, some studies have found inefficient emotion regulation to mediate the effects of child maltreatment on internalizing symptoms in middle childhood (e.g., Kim & Cicchetti, 2010), as well as on depression in adulthood (Abravanel & Sinha, 2015). Yet, studies in the context of more normative family relationships are scarce: In one retrospective study, Suveg et al. (2010) found inefficient emotion regulation to mediate the effects of emotionally distant and conflictual families on anxiety among young adults.

Peer relationships become increasingly important in middle childhood. Thus, it is not

surprising that peer victimization and exclusion predict heightened internalizing symptoms among 7- to 12-year-olds (Reijntjes, Kamphuis, Prinzie, & Telch, 2010). Emotional security theory suggests that harmonious families foster children's internal security and social skills, both needed to form and maintain mutually beneficial peer relationships (Davies & Martin, 2013). In line with this, there is robust evidence from attachment research that early parent-child attachment security predicts children's competence with peers (Groh et al., 2014). Thus, peer exclusion is a potential linking mechanism between early family relationships and later internalizing symptoms. Because peer relationships and emotion regulation are developmentally interrelated (e.g., Kim & Cicchetti, 2010), it is important to consider them together when examining their unique mediating roles on internalizing symptoms.

Former Infertility and Other Family-Related Contextual Factors

Family relations are affected by various contextual factors, which together shape child development (Lucas-Thompson & Goldberg, 2011). Contextual factors can increase children's vulnerability to mental health problems or provide protection against them. Half of the couples participating in the current study had experienced involuntary *infertility*. Infertility is considered an emotionally burdening life challenge, and the assisted reproductive treatments (ART) can last years before pregnancy is achieved (Barnes et al., 2004). However, most studies suggest that ART parents have similar marital and parenting quality compared to naturally conceiving (NC) parents (Wilson, Fisher, Hammarberg, Amor, & Halliday, 2011), and some studies suggest even higher resilience in parenting among ART families (Repokari et al., 2006). Yet, there is some indication that ART parents experience difficulties in coordinating triadic family interactions (Cairo et al., 2012) and tend to be overly protective of their children (Barnes et al., 2004). ART children also have somewhat heightened risk for internalizing symptoms, perhaps due to family dynamic (e.g., enmeshment) and infertility- or treatment-related biological factors (Barnes et al., 2004; Wilson et al., 2011). However, previous studies have not examined the combined effects of early family relationships and former infertility on children's later mental health.

Due to the nature of infertility, ART parents are more often primiparous. Primi- as compared to multiparous parents tend to experience higher marital satisfaction (Twenge, Campbell, & Foster, 2003) and stronger parent-child attachment (Lorensen, Wilson, & White, 2004) during the transition to parenthood. Furthermore, high *parental education level* has been shown to decrease marital satisfaction (Twenge et al., 2003), but also to increase parenting sensitivity (Tamis-LeMonda, Shannon, Cabrera, & Lamb, 2004). Interestingly, Buehler et al. (1997) found in their meta-analysis that high parental education level protected adolescent's mental health against marital conflicts, whereas McLeod, Weisz et al. (2007) found high parental education level to be a vulnerability factor for adolescent's depression when facing parenting problems. Considering the ambiguous findings of previous research, it seems possible that former infertility, parity, and parental education level may act as either protective or vulnerability factors, depending on the relational quality of the family.

Families as Complex and Dynamic Systems

Family systems theory conceptualizes families as dynamic systems in which all dyadic relationships and the marital and parenting subsystems influence each other (Cox & Paley, 2003). For example, interparental conflicts and power asymmetries tend to disturb family boundaries, increase negative spillover from marital to parenting subsystem and thus increase the risk for child psychopathology (e.g., Lindahl, Malimk, Kaczynski, & Simons, 2004). Such complex interactions between subsystems constitute the holistic and dynamic family system. A person-oriented approach is well suited for holistic family research as it enables identifying family types based simultaneously on multiple family relationships and their dynamics over time (Bergman & Magnusson, 1997). Furthermore, it opens up an opportunity to examine how the naturally occurring family environments influence developmental psychopathology.

However, only few person-oriented studies have focused on early family systems and children's mental health. For example, Sturge-Apple et al. (2014) identified three family types based on family patterns of interparental conflict and parenting when the children were two years old: *adequate families* were characterized by low levels of interparental conflicts and average parenting quality, *spillover families* by severe interparental conflicts and highly insensitive parenting, and *compartmentalizing families* by high levels of interparental conflicts coupled with sensitive parenting. Interestingly, children from spillover families showed decreased cortisol levels and increased anxiety and depression at the age of 3 years, demonstrating the detrimental effects of overly permeable family boundaries on children's psychophysiological stress regulation and mental health. Favez et al. (2012) identified three family types based on longitudinal changes in family interactions during the transition to parenthood: two types of *stable families* were characterized by either low or high overall interaction quality, and *deteriorating families* were characterized by decreasing interaction quality from pregnancy to the postnatal period. At the age of 5 years, children from stable families with low interaction quality showed poor social understanding and children from deteriorating families showed increased mental health problems.

Despite the progress in person-oriented family research, studies modeling both multiple family relationships and their longitudinal changes are lacking. To fill this research gap, in our previous study, we used factor mixture modeling to identify family system types as multidimensional relationship trajectories from pregnancy to the child's ages of 2 and 12 months (ref_blinded, xxxx). In that study, 710 mothers and fathers reported relational *autonomy* and *intimacy* in the marital subsystem, i.e., mother-to-father and father-to-mother, and in the parenting subsystem, i.e., mother-to-child and father-to-child, at each of the three assessments (i.e., 48 variables). Autonomy refers to the degree of relational self-assurance and independence, and intimacy to the degree of emotional closeness and acceptance (Mattejat & Scholz, 1994), reflecting together the two most basic psychological needs expressed in family relationships (Luyten & Blatt, 2011). During pregnancy, parents reported their expectations of the future relationships with the unborn child, which have been shown to predict and guide the actual postnatal parent-child interactions (Harwood, Neil, & Kevin, 2007). The assessment of both parents' perceptions of the same family relationships allowed us to identify parental discrepancies that have been found to predict developmental problems, such as academic underachievement and aggression at the school age (Johnson, 2005).

The identified family system types differed in overall levels of autonomy and intimacy, in longitudinal dynamics, relationship patterns, as well as in parental discrepancies. The current study focuses on five family system types, shown in Figure 1: *Cohesive families* (39%) had the highest levels of both emotional intimacy and autonomy. Family autonomy increased slightly from pregnancy to the child's age of 12 months. Such dynamics indicate harmonious and egalitarian family relationships.

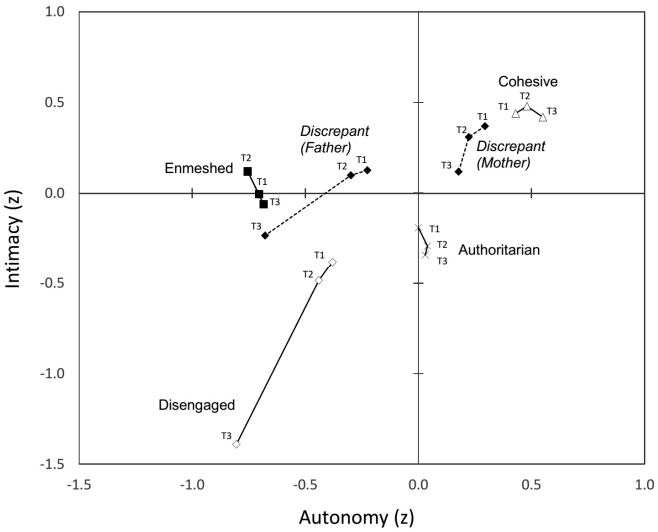

Figure 1. Family system types as trajectories from pregnancy (T1) to child's ages of 2 months (T2) and 12 months (T3). Adapted from "Dynamic family system trajectories from pregnancy to child's first year" by J. Lindblom, M. Flykt, A. Tolvanen, M. Vänskä, A. Tiitinen, M. Tulppala, and R.-L. Punamäki, 2014, Journal of Marriage and Family, 76, p. 802. Copyright 2014 by the National Council on Family Relations. Note. Values are averaged over the parent (father or mother), relationship (parental or marital), and reporter (father or mother), providing a simplified overview of the family system types. However, separate values are presented for mother's and father's reports for discrepant families, marked with dashed line.

Authoritarian families (16%) showed a relative lack of intimacy combined with average levels of autonomy. Family intimacy declined only slightly from pregnancy to the age of 12 months. Such dynamics indicate strong family boundaries and resistance against change. *Discrepant families* (16%) were the only family system type in which parents differed in their perceptions of family relationships. Fathers perceived less family autonomy and intimacy than mothers, whereas both parents perceived a decline in intimacy from 2 to 12 months. Such dynamics indicate highly different transitional processes between the parents. *Enmeshed families* (12%) had low levels of autonomy combined with moderately high levels of intimacy. Family intimacy declined from 2 to 12 months. Such dynamics indicate permeable family boundaries and enmeshed family relationships. *Distant families* (10%) had the lowest levels of both emotional intimacy and autonomy. Family intimacy declined from pregnancy to the age of 12 months. Such dynamics indicate emotionally distant and conflictual family relationships. Our original analysis identified seven family system types, but in this study we grouped two small enmeshed families (both lacking autonomy but not intimacy) and two highly distant families (both lacking autonomy and intimacy at 12 months) to enmeshed and distant families, respectively. For statistical justification of the grouping, see the structural invariance tests in Results.

The Current Study

The aim of the study is to model how the early family system types, contextual factors and socioemotional processes together shape children's anxiety and depression. As shown in Figure 2, we model how early family system types (cohesive, authoritarian, discrepant, enmeshed and distant) predict children's anxiety, depression, emotion regulation and peer exclusion at the age of 7-8 years. We use cohesive families as a reference group because it represents the most harmonious and the most common group of families.

First, we examine how early family system types directly predict children's depression, anxiety, emotion regulation and peer exclusion (a_1 and a_2 - paths in Figure 2). According to our *specificity hypothesis,* derived from evolutionary models of psychopathology, we expect family system types to differentially predict anxiety and depression. More precisely, we expect enmeshed families to predict children's heightened anxiety, and distant families to predict children's heightened depression.

Second, we test how former infertility and other family-related contextual factors moderate the effects of early family system types on anxiety, depression, emotion regulation and peer exclusion (b-paths in Figure 2).

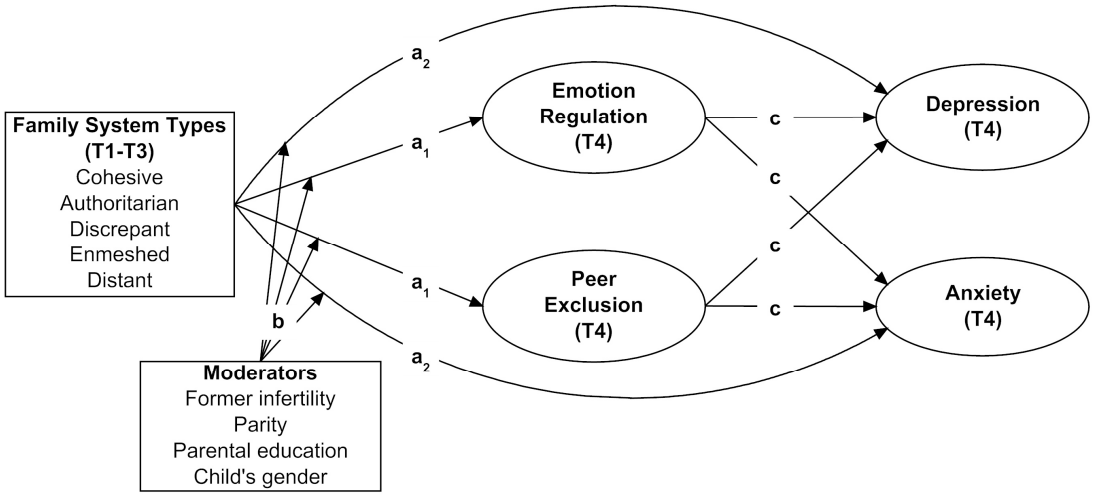

Figure 2. Conceptual Model Depicting Direct, Moderated and Mediated Pathways from Early Family System Types (T1-T3) to Children's Depression and Anxiety (T4). *Note.* T1 = 2nd trimester of pregnancy; T2 = Child's age of 2 months; T3 = Child's age of 12 months; T4 = Child's age of 7-8 years.

According to our *contextual factors hypothesis,* we expect former infertility, parity and parental education level to either protect or heighten vulnerability for internalizing symptoms and socioemotional problems depending on the family system type. Additionally, we test the moderating role of child's gender. Due to previous ambiguous findings, we do not pose family system type -specific hypotheses.

Third, we test whether children's emotion regulation and peer exclusion mediate the effects of early family system types on depression and anxiety (a_1 and c-paths in Figure 2). According to our *emotion regulation hypothesis,* derived from emotion regulation models of psychopathology, we expect emotion regulation to account for the associations between family system types and anxiety and depression. As a parallel mediating process, we also expect peer exclusion to mediate between family system types and anxiety and depression.

Methods

Participants

The participants were married or cohabiting Finnish Caucasian couples (N = 710). In our previous study, we used the same sample to identify different family system types (ref_blinded, xxxx). In the previous study, couples completed questionnaires about family relationships during pregnancy (T1; 18–20 weeks of gestation), and when the child was 2 months (T2) and 12 months old (T3). Response rates ranged from 71% to 89% for fathers, and from 77% to 95% for mothers. Approximately half of the couples had conceived naturally (NC; n = 374, 53%); the other half had achieved pregnancy after assisted reproductive treatment (ART; n = 336, 47%). Participants were recruited from infertility clinics and while attending routine ultrasonographic examinations. Couples with multiple pregnancies were excluded from the study sample and only women above the age of 25 years were included in the NC-group. The recruited mothers (M = 33.21 years, SD = 3.71) were older than the Finnish national average of mothers giving birth (M = 29.9 years) and had higher education levels than the corresponding population (Statistics Finland, 2013). For a more detailed description of the larger longitudinal sample, see ref_blinded (xxxx).

At the child's age of 7-8 years (T4) both mothers and fathers were contacted and asked to fill in child-related questionnaires. Response rate at T4 was 69% (n = 491) for at least one parent participating, 68% (n = 485) for mothers, and 42% (n = 299) for fathers. Attrition at T4 was independent of the early family system type, former infertility, child's gender, parents' education level and parity. Families whose system type could not be reliably identified in our previous study due to excessively small group size were excluded (8%; n = 39) (see ref_blinded, xxxx). Thus, the final sample of the current study consisted of n = 452 families, involving n = 447 maternal and n = 281 paternal reports. The ethics committees of the participating clinics approved the study at all time-points (T1–T4).

Measures

Identification of family system types (T1–T3). Family relationships were measured with the Subjective Family Picture Test (Mattejat & Scholz, 1994) during pregnancy (T1), and when the child was 2 months (T2) and 12 months old (T3). Parents rated four family relationships (mother-to-father, father-to-mother, mother-to-child, and father-to-child) regarding autonomy (four pairs of items; e.g., *self-confident – uncertain*) and intimacy (four pairs of items; e.g., *loving – rejecting*) using a 7-point scale.

Factor mixture modeling in Mplus 5 (Muthén & Muthén, 1998-2012) was used to identify family system types based on relationship ratings of autonomy and intimacy from mothers (24 variables) and fathers (24 variables). To avoid identifying an artificially high number of latent classes due to highly correlating variables, common factors were added for parents' reports (Lubke & Neale, 2006). Missing values were handled using full information maximum likelihood approach. The first phase of the analysis identified the number of family system types, and the second phase of the analysis identified the number of family system types in which parents' reports were discrepant (or convergent). The number of classes was determined by the Bayesian Information Criterion, which has been shown to be highly reliable criterion in factor mixture modeling (Nylund,

Asparouhov, & Muthén, 2007).

The analysis yielded seven trajectories depicting different family system types. They were described based on the overall levels (i.e., averaged values over the target parents, family subsystems, and reporting parents) and longitudinal changes (T1–T3) in autonomy and intimacy. Altogether, the family system types accounted 63% and 61% of the variance in the overall levels, and 13% and 29% of the overall longitudinal changes in autonomy and intimacy, respectively (all *p*'s < .001). To achieve sufficient statistical power in the current study, we grouped enmeshed quadratic (*n* = 26) and enmeshed declining (*n* = 32) families to one group of enmeshed families, and disengaged (*n* = 29) and escalating crisis (*n* = 22) families to one group of distant families. Thus, the families in the present study represent either cohesive (*n* = 200), discrepant (*n* = 70), enmeshed (*n* = 58), distant (*n* = 51) or authoritarian (*n* = 72) family system types. For a description of the five family system types see Introduction and for more details about the procedure, see ref_blinded (xxxx).

Depression and anxiety (T4). Children's depression (12 items) and anxiety (11 items) were measured using corresponding subscales of the Behavior Assessment System for Children (Reynolds & Kamphaus, 1992). Both parents reported their child's symptoms using 4-point Likert scale, ranging from 1 (*never*) to 4 (*almost always*). Items for each subscale were averaged separately for both parents and showed satisfactory internal reliability for mothers (depression α = .82; anxiety α = .76) and fathers (depression α = .80; anxiety α = .82).

Emotion regulation (T4). Child's emotion regulation was measured using the self-regulation subscale of the Emotion Questionnaire (Rydell et al., 2003). The questionnaire consists of 11 vignettes describing emotion-evoking situations for different emotions. We used nine vignettes for negative emotions of fear (e.g., *My child gets frightened and worried*), anger (e.g., *My child gets into a conflict with a peer*) and sadness (e.g., *A toy is lost or broken*). For each vignette, both parents estimated how easily the child was able to calm down by him- or herself using 5-point Likert scale, ranging from 1 (*doesn't apply at all*) to 5 (*applies very well*). All nine items were averaged separately for both parents and showed satisfactory internal reliability for mothers (α = .88) and fathers (α = .87).

Peer exclusion (T4). Peer exclusion was measured using the corresponding subscale of the Child Behavioral Scale (Ladd & Profilet, 1996). For the purposes of this study four of the eight items were reverse worded to indicate positive peer acceptance (e.g., *Child is often accepted to join peer play*). Both parents estimated how well the descriptions fit their child on a 4-point Likert scale, ranging from 1 (*never*) to 4 (*almost always*). All eight items were averaged separately for both parents and showed satisfactory internal reliability for mothers (α = .78) and fathers (α = .80).

Moderators and background variables. Moderator variables were former infertility (0 = NC, 1 = ART), parity (0 = primiparity, 1 = multiparity), parents' averaged education level (1 = basic education, 2 = vocational training, 3 = college level, 4 = academic level), and child's gender (0 = girl, 1 = boy).

Analytic Strategy

Statistical analyses were carried out using structural equation modeling in Mplus 7.11 (Muthén & Muthén, 1998-2012) based on maximum likelihood estimation with robust standard errors. This estimation method handles missing data using full information maximum likelihood. The fit of the models was evaluated with the comparative fit index (CFI), the Tucker-Lewis index (TLI) and the root mean square errors of approximation (RMSEA). Chi-square ($\chi 2$) was also reported, even though it is inflated with large sample size. As a criterion of acceptable fit, values of > 0.95 for CFI and < 0.08 for RMSEA were used (Hooper, Coughlan, & Mullen, 2008). The fit of nested models was compared with the Satorra-Bentler Scaled chi-square test ($\Delta\chi 2$). R-squared values were reported to indicate absolute (R^2) and incremental (ΔR^2) variance accounted by the independent variables over and above the covariates. Standardized coefficients (β) were reported for individual paths. Mediation was tested using the delta method, based on the product term between the coefficients (MacKinnon, 2008). The Benjamini-

Hochberg procedure was used to protect significance levels against false positive discoveries for each research question (Benjamini & Hochberg, 1995). Bias corrected bootstrapping was used to estimate 95% confidence intervals (CIs) under maximum likelihood estimation.

To test the direct and moderated effects of family system types on child outcomes, we built a model in which early family system types predicted children's anxiety, depression, emotion regulation and peer exclusion (a_1 and a_2 -paths in Figure 2). Two indicator variables, one from each parent, were used to form the latent variables for each child outcome. Family system types were dummy coded to represent contrasts between Cohesive and other family system types (0 vs 1). Wald test was used to test differences between the path coefficients (i.e., specific effects of family system types). To test the moderated effects, we computed interaction terms between the family system type variables and former infertility, parity, parental education level, and child's gender (b-paths in Figure 2).

To test the mediated effects we added the regression paths from emotion regulation and peer exclusion to depression and anxiety (c–paths in Figure 2). Main effects of family system types (a-paths in Figure 2) and significant interaction terms (b-paths in Figure 2) were retained in the model to control for their effects and to test moderated mediation. All models included parental education level, former infertility, parity and child's gender as covariates.

Results

Measurement Model and Tests of Invariance

Combined measurement model, consisting of latent constructs of children's anxiety, depression, emotion regulation, peer exclusion and their covariances, had acceptable fit, $\chi 2(8) = 7.01$, $p = .535$, CFI = 1.000, TLI = 1.000, RMSEA < 0.01; 90% CI [0.00, 0.05]. To ensure that the subsequent results were not biased because of differences in factor loadings between mothers (range: .61-.81) and fathers (range: .56-.72), all the factor loadings were fixed to one. This was acceptable, as it did not decrease model fit, $\Delta\chi 2(4) = 0.631$, $p = .959$.

Multiple group analyses confirmed equal covariances between latent constructs (i.e., structural invariance) between formerly infertile and naturally conceiving families, $\Delta\chi 2(6) = 1.82$, $p = .936$, between boys and girls, $\Delta\chi 2(6) = 3.06$, $p = .801$, and between primi- and multiparous families, $\Delta\chi 2(6) = 4.18$, $p = .653$. Thus, in subsequent analyses, these subgroups were analyzed together.

As described in the introduction and methods, we had grouped two family system types representing enmeshed and distant families together to achieve sufficient group sizes. We tested the plausibility of this grouping by examining whether the grouped family system types had similar effects on child outcomes (a_1 and a_2 –paths in Figure 2). The results showed that the path coefficients could be constrained to be the same between the two original enmeshed, Wald(4) = 4.49, $p = .344$, and between the two original distant, Wald(4) = 7.38, $p = .120$, family system types. Thus, the grouping was maintained in subsequent analyses.

Descriptive Statistics

Means, standard deviations and latent correlations between the study variables are shown in Table A1. Enmeshed families were more often primiparous (74.4%) and distant families less often primiparous (26.6%) compared to the other family system types, $\chi^2(4) = 26.75$, $p < .001$. Based on the guidelines provided by Reynolds and Kamphaus (1992), we considered 14.0% and 15.8% of the children to be at-risk for (T ≥ 60), and 3.1% and 2.5% of the children to have clinically significant symptoms of (T ≥ 70) anxiety and depression, respectively. As shown in Table A2, 20% to 25% of the children in discrepant, enmeshed or distant families were at-risk, whereas only 5% to 11% of the children in cohesive and authoritarian families were at-risk for anxiety and depression. We further examined the associations between background variables and child outcomes, shown in Table 1 (see Background variables). The results showed that primiparity predicted heightened anxiety, depression, and inefficient emotion regulation. Background variables accounted for 13.4% of anxiety, 5.0% of depression, 3.3% of peer exclusion and 6.8% of emotion regulation.

Table 1. Effects of Background Variables and Early Family System Types on Children's Anxiety and Depression Symptoms, Emotion Regulation and Peer Exclusion.

	Anxiety				Depression				Emotion Regulation				Peer Exclusion			
	β	*SE*	*p*	95% CI	*β*	*SE*	*p*	95% CI	*β*	*SE*	*p*	95% CI	*β*	*SE*	*p*	95% CI
Background variables																
Former infertility	-0.17	0.08	(.020)	[-0.12, 0.01]	-0.15	0.07	(.020)	[-0.11, 0.01]	-0.07	0.06	.300	[-0.11, 0.03]	0.09	0.07	.190	[-0.04, 0.18]
Multiparity	-0.39	0.08	<.001	[-0.21, -0.09]	-0.21	0.07	.001	[-0.13, -0.03]	0.23	0.07	<.001	[0.08, 0.30]	-0.08	0.06	.193	[-0.11, 0.03]
Parental education	-0.01	0.07	.904	[-0.04, 0.03]	-0.12	0.06	.057	[-0.06, 0.00]	0.03	0.07	.747	[-0.06, 0.08]	-0.15	0.06	(.012)	[-0.09, -0.01]
Gender (boy)	0.05	0.07	.539	[-0.04, 0.07]	-0.01	0.07	.925	[-0.05, 0.05]	-0.15	0.07	(.022)	[-0.23, -0.02]	0.08	0.06	.169	[-0.03, 0.12]
Family system types																
Authoritarian	0.03	0.07	.666	[-0.06, 0.09]	0.06	0.06	.391	[-0.04, 0.10]	-0.13	0.07	.057	[-0.29, 0.01]	-0.01	0.07	.982	[-0.10, 0.10]
Discrepant	0.23	0.08	.002	[0.05, 0.19]	0.16	0.07	.012	[0.02, 0.15]	-0.09	0.06	.141	[-0.23, 0.03]	0.04	0.07	.592	[-0.08, 0.13]
Enmeshed	0.22	0.08	.004	[0.04, 0.20]	0.21	0.08	.004	[0.04, 0.21]	-0.28	0.08	.000	[-0.50, -0.16]	0.13	0.07	(.047)	[0.01, 0.21]
Distant	0.23	0.08	.005	[0.04, 0.24]	0.19	0.07	.004	[0.04, 0.20]	-0.21	0.08	.005	[-0.46, -0.10]	0.02	0.06	.837	[-0.09, 0.12]

Note. The model including both background variables and family system types showed acceptable fit, $\chi 2(54) = 57.10$, $p = .361$, CFI = .996, TLI = .990, RMSEA = 0.01; 90% CI [0.00–0.03]. *P*-values in parentheses refer to nonsignificance according to the Benjamini-Hochberg correction.

Direct Pathways from Family System Types to Child Outcomes

Regarding internalizing symptoms, the results presented in Table 1 (see Family system types) showed that discrepant, enmeshed and distant families predicted children's heightened anxiety and depression. Against the *specificity hypothesis,* these effects of discrepant, enmeshed and distant families were similar on anxiety and depression, Wald(4) = 1.07, $p = .899$. Authoritarian family type did not predict children's anxiety or depression. These direct effects accounted for 9.7% of anxiety and 6.5% of depression over and above the covariates.

Regarding socioemotional development, the results presented in Table 1 showed that enmeshed and distant families predicted children's inefficient emotion regulation. Their effects on emotion regulation were similar, Wald(1) = 0.34, $p = .563$. Discrepant or authoritarian families did not predict children's emotion regulation, and unexpectedly, none of the family system types predicted children's peer exclusion. These direct effects accounted for 8.7% of emotion regulation and 1.0% of peer exclusion over and above the covariates.

Moderated Pathways from Family System Types to Child Outcomes

The results supported the *contextual factors hypothesis* by showing that former infertility, Wald(16) = 27.21, $p = .039$, parity, Wald(16) = 32.41, $p = .009$, and parental education, Wald(16) = 30.65, $p = .015$, moderated the effects of family system types on child outcomes. Child's gender did not have a protective or vulnerability role, Wald(16) = 13.51, $p = .636$.

Parent's former infertility moderated the effects of distant families on children's depression, $\beta = 0.59$, $SE = 0.21$, $p = .005$, 95% CI [0.07, 0.38]. As shown in Figure 3, distant families did not predict children's depression in families with infertility history, but predicted children's heightened depression in naturally conceiving families.

Parity moderated the effects of enmeshed families on children's peer exclusion, $\beta = -0.20$, $SE = 0.07$, $p = .004$, 95% CI [-0.53, -0.08]. As shown in Figure 4, enmeshed families did not predict children's peer exclusion when the child had older siblings, but predicted heightened peer exclusion when the child was the first born.

Finally, parental education level moderated the effects of authoritarian families on children's emotion regulation, $\beta = -0.19$, $SE = 0.07$, $p = .003$, 95% CI [-0.39, -0.07], and depression, $\beta = 0.21$, $SE = 0.07$, p

= .001, 95% CI [0.05, 0.20]. As shown in Figure 5, authoritarian families predicted children's inefficient emotion regulation only when the parents had high education level. Similarly, authoritarian families predicted children's depression only when the parents had high education level.

The moderated effects accounted for 7.9% of depression, 7.7% of anxiety, 6.8% of emotion regulation and 6.4% of peer exclusion over and above the direct effects and covariates. The model had acceptable fit, $\chi 2(102) = 121.27$, $p = .094$, CFI = 0.977, TLI = 0.950, RMSEA = 0.02; 90% CI [0.00, 0.04].

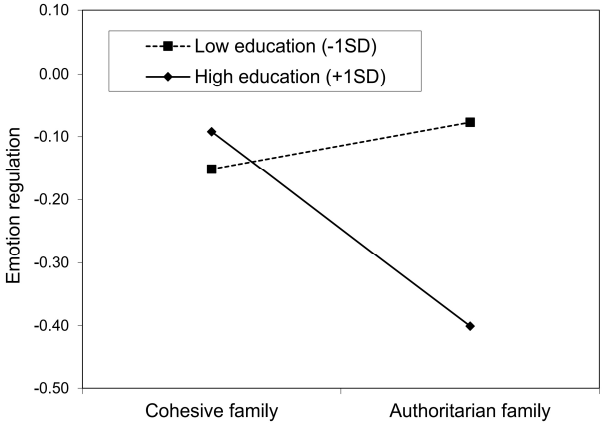

Figure 3. Parental Education level Moderates the Effects of Authoritarian (vs Cohesive) Families on Children's Emotion Regulation. *Note.* In authoritarian families high parental education predicted inefficient emotion regulation, β = -0.51, *SE* = 0.233, p = .029, whereas in cohesive families parental education did not predict emotion regulation, β = 0.05, *SE* = 0.10, p = .599.

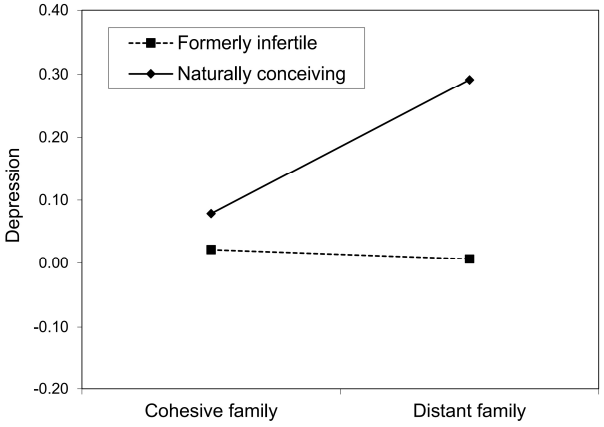

Figure 4. Former Infertility Moderates the Effects of Distant (vs Cohesive) Families on Children's Depression Symptoms. Note. Among naturally conceiving parents distant family predicted children's heightened depression, β = 0.38, SE = 0.11, $p < .001$, whereas among formerly infertile parents distant family did not predict depression, β = 0.11, SE = 0.13, p = .400.

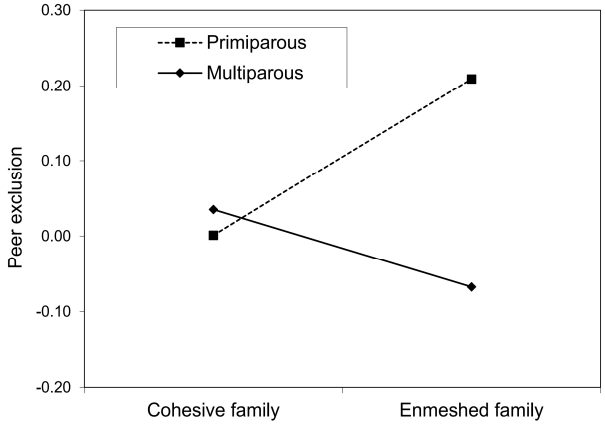

Figure 5. Parity Moderates the Effects of Enmeshed (vs Cohesive) Families on Children's Peer Exclusion. Note. Among primiparous parents enmeshed family predicted children's heightened peer exclusion, β = 0.31, SE = 0.09, p = .001, whereas among multiparous families enmeshed family did not predict children's peer exclusion, β = -0.14, SE = 0.13, p = .264.00

Mediated Pathways via Emotion Regulation and Peer Exclusion

The path coefficients in the mediation model, shown in Figure 6, indicated that mediated pathways were possible from family system types via children's emotion regulation to depression, but not to anxiety. In line with the *emotion regulation hypothesis,* the detrimental effects of enmeshed, z = 0.15, *SE* = 0.06, p = .010, 95% CI [0.06, 0.36], and distant families, z = 0.11, *SE* = 0.05, p = .034, 95% CI [0.03, 0.27], on children's depression were both mediated via inefficient emotion regulation. Furthermore, the interaction effect between authoritarian families and parental education on children's depression was mediated via inefficient emotion regulation, z = 0.11, *SE* = 0.05, p = .019, 95% CI [0.04, 0.25]. In other words, only when the parents had high education level the authoritarian families predicted children's inefficient emotion regulation which led to heightened depression.

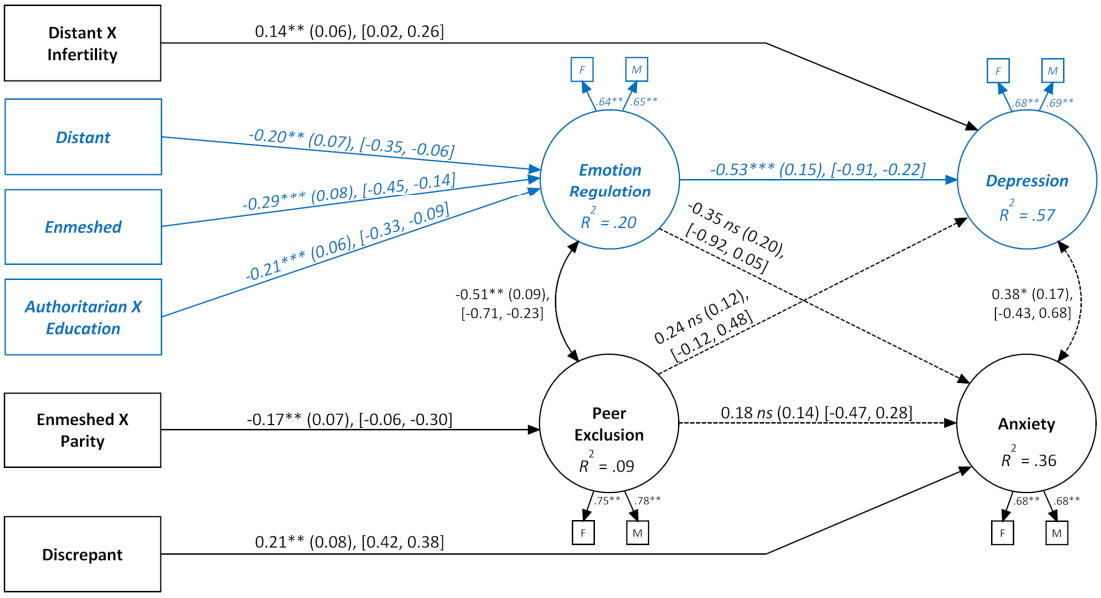

Figure 6. Mediation Model Depicting Pathways from Early Family System Types on Children's Anxiety and Depression at the Age of 7-8 Years. Note. Values refer to standardized beta coefficients, standard errors and 95% confidence intervals, respectively. Blue color (text in italics) denote significant mediating pathway. Dashed lines denote nonsignificant paths. Letters F and M refer to fathers' and mothers' reports, respectively. Covariates and nonsignificant effects of family system types are not depicted. The model showed acceptable fit, $\chi 2(50) = 44.59$, $p = .689$, CFI = 1.000, TLI = 1.000, RMSEA < 0.01; 90% CI [0.00, 0.03]. * p < .05, ** p < .01, *** p < .001

Against the *emotion regulation hypothesis,* effect of discrepant families and the effect of distant families with naturally conceiving (NC) parents on children's internalizing symptoms were not mediated via emotion regulation. Instead, as shown in Figure 6, discrepant families directly predicted children's heightened anxiety, and distant NC families directly predicted children's heightened depression. Finally, against our hypotheses, peer exclusion did not predict either depression or anxiety, indicating that it did not mediate between the family system types and internalizing symptoms.

Discussion

The aim of this study was to model how early family systems, contextual factors and socioemotional processes together shape children's internalizing symptoms. We used a novel approach to identify families as complex and dynamic family system types, composed of parental and marital trajectories from pregnancy to child's infancy. Against the *specificity hypothesis,* the results showed that discrepant, enmeshed and distant families similarly predicted children's heightened anxiety and depression. In line with the *contextual factors hypothesis,* the results showed that former infertility, parity, and parental education level moderated some effects of the family system types. Finally, in line with the *emotion regulation hypothesis,* the results showed that emotion regulation mediated the effects of enmeshed, distant and authoritarian families on children's depression. Against the hypothesis, however, the effects of discrepant families on children's anxiety occurred irrespective of children's emotion regulation efficiency. Altogether, the results suggest that early family systems, together with contextual factors, predict children's internalizing symptoms, and children's emotion regulation largely accounts for the effects on depression.

In line with the evolutionary models of psychopathology, we hypothesized that early family system types would have specific effects on children's anxiety and depression, reflecting different strategies children use to adapt to their family environments. However, against this *specificity hypothesis,* we found that enmeshed, distant and discrepant families similarly predicted both anxiety and depression. These results concur with the recent meta-analysis of parenting showing little evidence of symptom

specificity (Yap & Jorm, 2015). Thus, it seems that very different family problems, ranging from emotionally distant to overly enmeshed, can similarly lead to heightened risk of internalizing problems. This general effect could be due to both psychological and psychophysiological mechanisms, involving, for example, children's increased insecure representations of the family (Davies & Martin, 2013) and early developmental alterations of psychophysiological stress regulation (e.g., HPA axis; Brumariu & Kerns, 2010). Finally, it is possible that children's temperamental characteristics, such as behavioral inhibition, or later life experiences, such as interpersonal threats and losses, shape the more general early vulnerability into specific disorders (Brumariu & Kerns, 2010).

We also hypothesized that former infertility and other contextual factors would interact with family types in predicting children's internalizing symptoms and socioemotional development. In line with this *contextual factors hypothesis,* former infertility provided protection against depression in distant families, and having siblings in the family protected children against peer exclusion in enmeshed families. These results can be understood in terms of contextual factors affecting family boundaries, which regulate how family subsystems influence each other (e.g., Sturge-Apple, et al., 2014). Formerly infertile parents often have high motivation for parenthood and tend to be protective towards their children (Barnes et al., 2004). In distant ART families this may help the parents to maintain sensitive parenting despite conflicts in the marital subsystem, thus protecting children's mental health. Regarding enmeshed families, it is possible that older siblings help to strengthen boundaries between the parental and sibling subsystems. This may protect children from the detrimental family interactions, such as parent-child role reversals. Interestingly, the protective role of siblings was restricted to social development, and did not extend to internalizing problems.

Regarding the moderating role of parental education, we found that the authoritarian family type predicted children's depression and inefficient emotion regulation only in families with high parental education level. This intriguing result concurs with the meta-analysis by McLeod, Weisz et al. (2007) which showed that high parental education level increased the effects of parental rejection on children's depression. Research suggests that parents with high socioeconomic status value highly their children's autonomy but may provide somewhat limited emotional support for them (Luthar, 2003). Thus, it is possible that the combination of authoritarian family type and high parental education level result in rigid family climate, involving, for example, low nurturance and undue emphasis on discipline and routines (Arnott & Brown, 2013). Such family environment could hamper children's developmental needs for both autonomy and intimacy, with detrimental consequences on emotional well-being and mental health (Luyten & Blatt, 2011).

In line with the *emotion regulation hypothesis,* the results showed that inefficient emotion regulation mediated the effects of enmeshed, distant and authoritarian families on children's depression. These results support the emotion regulation model of psychopathology, suggesting that family dysfunctions impair children's mental health through emotion regulation development (e.g., Morris et al., 2007). Our prospective study extend existing knowledge by demonstrating the importance of very early holistic family systems. Furthermore, our results help explain the equifinality paradox in developmental family research, by suggesting that inefficient emotion regulation is a common developmental consequence of various family dysfunctions. Such explanation is in line with both the attachment (Thompson & Meyer, 2007) and emotional security (Davies & Martin, 2013) theories, which posit that early sensitive caregiving and security in the family context are essential for the development of emotion regulation. When these are lacking, children develop self-protective strategies rather than more efficient ways of emotion regulation.

Interestingly, against the emotion regulation hypothesis, the results showed that distant families with naturally conceiving (NC) parents directly predicted heightened depression, and discrepant families (both ART and NC) directly predicted heightened anxiety. Although not hypothesized, these

results provide some indication of specific effects of families on children's anxiety and depression, occurring irrespective of emotion regulation efficiency. As suggested by the emotional security theory (Davies & Martin, 2013), it is possible that children in distant NC families acquire a demobilizing strategy to defuse and avoid threat-provoking family conflicts, involving social withdrawal, submissiveness and blunted emotions. While such a strategy may have some adaptive value in the context of distant families, it is likely maladaptive in many other contexts and increases risk for depression.

Only a few studies have examined how parental discrepancies in family perceptions predict children's mental health (e.g., Johnson, 2005). Our results suggest that early parental discrepancy may have specific effect on children's anxiety. While the exact reason for this is unclear, there are a few plausible explanations. First, research suggests that father-child interactions, involving e.g., rough-and-tumble play, have a special role in teaching the child to cope with challenges and uncertainty (Möller, Nikolić, Majdandžić, & Bögels, 2016). In discrepant families fathers were more pessimistic than mothers in their family perceptions. Thus, it is possible that fathers in discrepant families tend to provoke a sense of vulnerability in their children, thereby increasing children's cautiousness and anxiety. Second, it is possible that the lack of shared parental perceptions hinder the coordination of family interactions (Johnson, 2005), especially complex ones, involving both parents and the child (Favez et al., 2012). For example, entrapment between the parents in a conflict could increase children's ambivalence and anxiety, without necessarily disrupting their emotion regulation.

Unexpectedly, children's emotion regulation did not predict anxiety and thus did not mediate the effects of early family system types on children's anxiety. We assessed emotion regulation as an ability to down-regulate negative emotions. Our result may thus partially be explained by previous research suggesting that anxiety is more strongly associated with high reliance on inefficient (e.g., rumination) rather than low reliance on efficient (e.g., reappraisal) emotion regulation strategies (Aldao, Nolen-Hoeksema, & Schweizer, 2010). Further studies are needed to test whether some specific emotion regulation strategies mediate between early family problems and later anxiety. Finally, against our hypothesis, peer exclusion did not predict children's internalizing symptoms. It is important to note, however, that in our correlation analyses peer exclusion was associated with both anxiety and depression, but these disappeared when peer exclusion and emotion regulation were modeled as parallel mediators. This suggests that emotion regulation and peer exclusion share some common variance, but the unique variance of emotion regulation is more important in mediating between early family system types and later internalizing symptoms.

Limitations

Despite having relatively large sample and using rich information to identify the family system types, our study has several limitations. First, we were unable to control the potential continuity of the family system types during the children's later developmental phases. Thus, conclusions about age-specificity should be made with caution. Second, despite the prospective design over 8 years, the child outcomes were assessed at the same time point. Having more assessment points would have allowed to more reliably model the child- and family-related mediating mechanisms. Third, our study was based on parent's reports, and attrition at the child's age of 7-8 years was larger among fathers than among mothers. Despite using structural equation modeling to reduce measurement error and full information maximum likelihood to handle missingness, it is possible that some reporter biases have occurred. For example, parents may have shared some biased perceptions about their families and the child. Observational methods as well as child self-reports could have yielded more objective results. Finally, the participating parents were relatively highly educated and only few children experienced clinical levels of anxiety and depression. Hence, some caution is warranted when generalizing our results to more disadvantaged and clinical populations.

Conclusions

Our results emphasize the significance of whole family systems, including both mothers and fathers as well as the marital and parenting subsystems, for children's early development. Further, our results indicate that emotion regulation is an important developmental mechanism linking early family dysfunctions to children's depression. This can help to explain equifinality in developmental family research, by suggesting that various types of family problems similarly disrupt children's emotion regulation development. Intriguingly, our results also suggest that parental discrepancies in family perceptions may have a specific role on children's anxiety. This calls for further research on the topic, because specific family predictors of children's anxiety have not been very well recognized (Möller et al., 2016; Yap & Jorm, 2015). As practical implications, our results help to understand and identify family risks in transition to parenthood. They highlight the importance of early preventive help aimed for whole families, and suggest that children with adverse family experiences, especially those with depressive symptoms, may benefit from therapeutic interventions focusing on emotion regulation.

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APPENDIX

Table A1. Means, Standard Deviations and Latent Correlations among the Study Variables

Variable	*M (SD)*	1	2	3	4	5	6	7	8	9	10	11	12
1. Emotion regulation	3.88 (0.56)	1.00											
2. Peer exclusion	1.45 (0.35)	-0.52***	1.00										
3. Anxiety	1.63 (0.29)	-0.46***	0.21***	1.00									
4. Depression	1.46 (0.26)	-0.69***	0.53***	0.57***	1.00								
5. Gender (boy)	0.52 (0.49)	-0.14**	0.08	0.03	0.01	1.00							
6. Multiparity	0.47 (0.49)	0.19***	-0.07	-0.33***	-0.15***	0.03	1.00						
7. Former infertility	0.48 (0.50)	-0.01	-0.01	-0.02	-0.06	-0.03	-0.38***	1.00					
8. Parental education	2.92 (0.85)	0.02	-0.14**	0.01	-0.10*	-0.07	0.01	0.07	1.00				
9. Discrepant family	0.17 (0.37)	0.01	0.01	0.17***	0.09*	-0.02	-0.04	-0.01	0.02	1.00			
10. Enmeshed family	0.12 (0.32)	-0.22***	0.12**	0.17***	0.16***	-0.04	-0.15***	-0.08	0.04	-0.18***	1.00		
11. Distant family	0.10 (0.30)	-0.12**	0.01	0.12**	0.12**	0.03	0.13**	0.08	-0.07	-0.17***	-0.13**	1.00	
12. Authoritarian family	0.15 (0.36)	-0.01	-0.04	-0.12**	-0.07	0.01	0.09*	0.01	0.06	-0.21***	-0.16***	-0.15***	1.00

Note. Means and standard deviations are based on the observed variables, averaged over mothers' and fathers' reports. Scores range from 1 to 5 for emotion regulation (higher scores indicating efficient emotion regulation). Scores range from 1 to 4 for peer exclusion, anxiety and depression (higher scores indicating greater problems). Gender (0 = girl, 1 = boy), multiparity (0 = primi, 1 = multi), and infertility (0 = NC, 1 = ART) are dichotomous variables. Scores range from 1 to 4 for parental education level (1 = basic education to 4 = academic education). Family system type variables are dummy coded (0/1) using cohesive families as the reference group.
* $p < .05$. ** $p < .01$. *** $p < .001$.

APPENDIX

Table A2. Children at Risk for Anxiety and Depression at the Children's Age of 7-8 Years According to the Early Family System Types.

	Anxiety				Depression			
	Not at risk (T < 60)		At risk (T ≥ 60)		Not at risk (T < 60)		At risk (T ≥ 60)	
	n	%	*n*	%	*n*	%	*n*	%
Cohesive families	178	90.4%	19	9.6%[a]	176	89.3%	21	10.7%[a]
Authoritarian families	68	95.8%	3	4.2%[a]	66	93.0%	5	7.0%[a]
Discrepant families	56	78.9%	15	21.1%[b]	54	76.1%	17	23.9%[b]
Enmeshed families	46	79.3%	12	20.7%[b]	44	75.9%	14	24.1%[b]
Distant families	39	76.5%	12	23.5%[b]	39	76.5%	12	23.5%[b]

Note. Chi-square tests showed significant differences between the family system types regarding at risk scores, for anxiety, $\chi^2(4) = 18.09$, $p < .001$, and for depression, $\chi^2(4) = 17.17$, $p = .002$. Different subscript letters within columns indicate statistically significant differences between the family system types, $p < .05$. Due to the overly small cell sizes the children with clinically significant symptoms (T ≥ 70) were analyzed together with the risk groups.

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Early family system types predict children's emotional attention biases at school age

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Abstract

The family environment shapes children's social information processing and emotion regulation. Yet, the long-term effects of early family systems have rarely been studied. This study investigated how family system types predict children's attentional biases toward facial expressions at the age of 10 years. The participants were 79 children from Cohesive, Disengaged, Enmeshed, and Authoritarian family types based on marital and parental relationship trajectories from pregnancy to the age of 12 months. A dot-probe task was used to assess children's emotional attention biases toward threatening (angry) and affiliative (happy) faces at the early (500 ms) and late (1250 ms) stages of processing. Situational priming was applied to activate children's sense of danger or safety. Results showed that children from Cohesive families had an early-stage attentional bias toward threat, whereas children from Enmeshed families had a late-stage bias toward threat. Children from Disengaged families had an early-stage attentional bias toward threat, but showed in addition a late-stage bias away from emotional faces (i.e., both angry and happy). Children from Authoritarian families, in turn, showed a late-stage attentional bias toward emotional faces. Situational priming did not moderate the effects of family system types on children's attentional biases. The findings confirm the influence of early family systems on the attentional biases, suggesting differences in the emotion regulation strategies children have developed to adapt to their family environments.

Keywords

Attentional bias, emotion regulation, early experiences, family types, family relationships

Early family environment is an important context for children's socioemotional development. Within the family, children learn to adapt their emotional responses to match the demands of interpersonal relationships, which may shape children's social information processing and result in attentional biases to certain emotional cues (Dykas & Cassidy, 2011; Pine, 2007). Emotional attention biases, such as attending toward or away from anger cues, help children to focus on relevant social signals and regulate emotional responses. Yet, overly strong attentional biases may distort children's social perceptions with maladaptive consequences for well-being (e.g., Gulley, Oppenheimer, & Hankin, 2014).

Research on the contextual factors shaping children's attentional biases has largely focused on atypical rearing environments, such as institutional neglect (Tottenham et al., 2010) or family maltreatment (Shackman, Shackman, & Pollak, 2007). However, less is known about the role of normative family environments in predicting children's emotional attention biases. This study focuses on normative early family systems consisting of both the parenting and the marital relationships. We analyze how different family system types during pregnancy and infancy predict children's attentional biases toward emotional expressions at 10 years of age. Furthermore, we use a situational priming procedure to examine whether attentional biases are conditional to children's activated mental representations.

Children's Adaptation to Early Family Environment

During early childhood, stress-regulatory systems are under profound development and are especially malleable to interpersonal experiences (Loman & Gunnar, 2010). Such malleability may foster children's adaptation to the prevailing ecological and familial environment by tuning their stress responsivity (Del Giudice, Ellis, & Shirtcliff, 2013). Attachment theory illustrates how children adapt their emotional responses to different styles of caregiving in order to ensure parental protection (Ainsworth, Blehar, Waters, & Wall, 1978). More recently, emotional security theory has extended this view to the larger family system by suggesting that children adapt their emotion regulation strategies to fit the quality of family interactions, such as interparental interactions and conflicts (Davies, Sturge-Apple, & Martin, 2013). Children may learn to heighten their emotional responses to intervene in interparental conflicts or suppress responses to avoid drawing parental aggression to themselves. Complex family patterns, involving family boundaries and power hierarchies, likely determine children's reliance on specific emotion regulation strategies, but the precise associations are currently not well known (Davies et al., 2013).

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Attentional Biases and Emotion Regulation

Attention is an important mechanism of emotion regulation as it influences the extent to which emotion-provoking information undergoes deeper processing or is disregarded (Todd, Cunningham, Anderson, & Thompson, 2012). Children can direct attention away to down-regulate or toward certain emotional information to up-regulate their emotional states (Hakamata et al., 2010). However, children's emotional states can bias their attention toward emotion-congruent information (Bar-Haim, Lamy, Pergamin, Bakermans-Kranenburg, & van IJzendoorn 2007).

Emotional attention biases are commonly assessed using the dot-probe task (MacLeod, Mathews, & Tata, 1986). The task simultaneously presents one neutral and one emotional stimulus (e.g., facial expressions), which compete for attention. The participant is instructed to indicate the location of a probe that is appearing randomly at the location of either the neutral (neutral cue trials) or the emotional stimulus (emotional cue trials). Attention-bias scores are computed as differences in response times between the neutral and emotional cue trials, indicating either a tendency to attend toward (positive score) or away (negative score) from the emotional stimulus. Importantly, the direction of attentional biases can be investigated at different time points by varying *stimulus onset asynchrony*, the time between the appearance of the emotional stimulus and the probe.

Attentional biases at the early stage of processing (e.g., stimulus onset asynchrony of 500 ms) have been suggested to reflect relatively automatic responses that serve adaptive threat detection (Cisler & Koster, 2010; LoBue & Rakison, 2013). Children growing up in highly threatening environments (e.g., in abusive families) often show a strong attentional bias toward threat (i.e., angry faces) at this stage of processing (Shackman et al., 2007). Yet, some studies have found physically abused children to attend away from threat (Pine et al., 2005), and children from normative families to attend toward threat at the early stage of processing (Lindström et al., 2009). Such mixed findings suggest that there is high heterogeneity in how children attend toward threat at the early stage of processing, perhaps reflecting developmental differences in the monitoring of and automatic responding to threats (Del Giudice et al., 2013).

Attentional biases at the late stage of processing (e.g., stimulus onset asynchrony of 1000 ms), in turn, have been suggested to reflect higher-level processing of emotional information involving the activation of learned emotion regulation responses (Bar-Haim et al., 2007; Cisler & Koster, 2010). Avoiding threat at a later stage of processing is considered to indicate defensive exclusion of threatening information and is characteristic of avoidantly attached children and adults (Dewitte, Koster, De Houwer, & Byusse, 2007; Dykas & Cassidy, 2011). In contrast, maintaining attention toward threat may indicate difficulties in emotion regulation (Derryberry & Reed, 2002) and is characteristic of highly anxious and anxiously attached children and adults (Bar-Haim et al., 2007; Dykas & Cassidy, 2011). Finally, disengaging attention from threat after initially attending toward it is considered to reflect adaptive emotion regulation and evaluation of the stimulus as signaling only minor threat (Bar-Haim et al., 2007; Dykas & Cassidy, 2011).

Research on the influence of more normative family relationships on children's attentional biases is surprisingly scarce. Two studies have shown that negative and insensitive parenting was associated with children's attentional bias toward threat, whereas supportive and sensitive parenting was associated with a smaller attentional bias toward threat (Gibb, Johnson, Benas, Uhrlass, Knopik, & McGeary, 2011; Gulley et al., 2014). These studies were, however, cross-sectional and focused only on late-stage attentional biases (i.e., stimulus onset asynchrony of 1000 ms). Furthermore, only mother–child relationships were assessed, leaving open the question of how more comprehensive family systems, involving also the father–child and marital relationships, influence children's attentional biases.

Typological Approach to Family Systems

Family systems theory conceptualizes families as holistic and dynamic systems in which all dyadic relationships and the marital and parenting subsystems influence each other (Cox & Paley, 2003). For example, interparental conflicts and power asymmetries tend to disturb family boundaries and increase the risks for problematic parent–child relationships (Fosco & Grych, 2012). Such complex interactions between the family subsystems constitute the holistic and organized family systems. A person-oriented approach is well suited for family research as it enables identifying family system types based on multiple family relationships and their dynamics over time (Bergman & Magnusson, 1997).

Person-oriented studies have typically identified family system types based either on relationship patterns or longitudinal changes in family relationships. Johnson (2003) identified three family types on the basis of parental relationship patterns: *cohesive families* were characterized by high marital functioning and equally strong parenting between both parents, while two types of *triangulating families* were characterized by an overall lack of cohesiveness, poor marital functioning, and weak parenting by either the father or the mother. Favez et al. (2012) identified three family types based on longitudinal changes in family interactions during the transition to parenthood: two types of *stable families* were characterized by either low or high overall interaction quality, and *deteriorating families* were characterized by decreasing interaction quality during the postnatal period. Some research is available, demonstrating the impact of family system types on children's later mental health, social skills, and cognitive development (e.g., Favez et al., 2012; Johnson, 2003; Sturge-Apple, Davies, Cicchetti, & Fittoria, 2014).

Despite the progress in person-oriented family research, studies modeling both multiple family relationships and their longitudinal changes over time have been lacking. Such an approach would allow to more precisely identify family types based on the complex relationship dynamics, which is thought to reflect the systemic and often implicit rules of each family (Minuchin, 1985). To fill this research gap, in our previous study, we identified family system types as multidimensional relationship trajectories from pregnancy to the child's ages of 2 and 12 months (Lindblom et al., 2014). In that study, 710 couples reported relational autonomy and intimacy in the marital subsystem (i.e., mother-to-father and father-to-mother) and in the parenting subsystem (i.e., mother-to-child and father-to-child) at each of the three assessments. Autonomy refers to the degree of relational self-assurance and independence, and intimacy to the degree of emotional closeness and acceptance (Mattejat & Scholz, 1994). As Figure 1 shows, family trajectories were identified using factor mixture modeling with 24 relationship variables based on mothers' and fathers' reports. The analysis identified seven family trajectories.

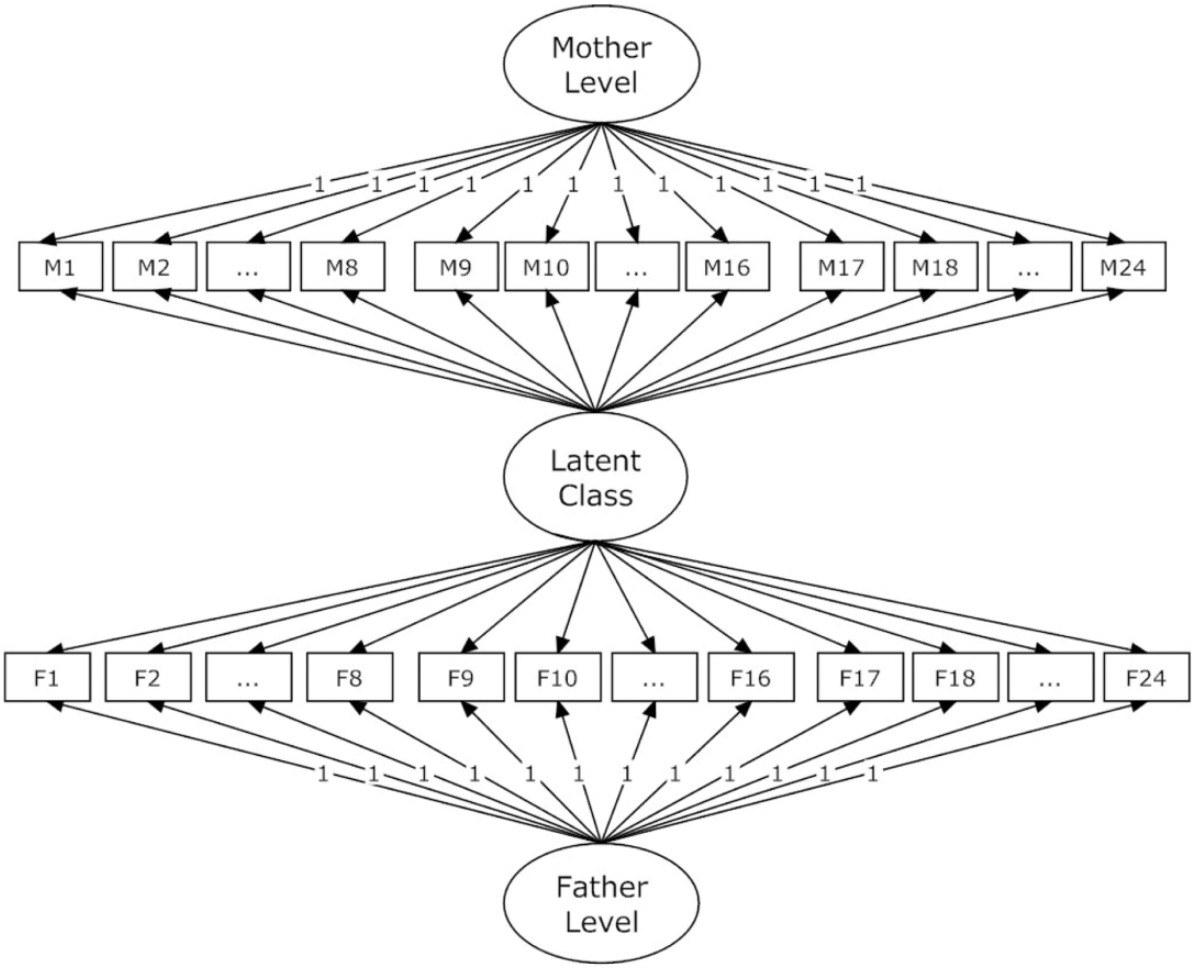

Figure 1. The Finite Mixture Model Used to Identify Family System Trajectories (Lindblom et al., 2014). *Note.* Two general factors (Mother and Father level) were included to prevent the identification of spuriously large number of latent classes. Variables M1 to M24 are based on mothers' and F1 to F24 on fathers' reports of family relationships during pregnancy (T1) and at the child's ages of 2 months (T2) and 12 months (T3). Parent's reports were fixed to be the same when indicated by fit indices.

The current study examines how four of the identified family system types predict children's emotional attention biases. These family system types, depicted in Figure 2, were selected because of their theoretical clarity and representativeness of the four family quadrants (e.g., Olson, 2011). *Cohesive families* had the highest levels of emotional intimacy and autonomy, and both parents had a relatively similar amount of autonomy in all family relationships. Family autonomy increased slightly from pregnancy to the child's age of 12 months. Such dynamics indicate harmonious and egalitarian family relationships. *Disengaged families* had the lowest levels of intimacy and autonomy, and the marital subsystem especially was characterized by a lack of intimacy and autonomy. Family intimacy declined from pregnancy to the child's age of 12 months. Such dynamics indicate emotionally distant and conflictual family relationships. *Enmeshed families* had low levels of autonomy combined with high levels of intimacy. The mothers especially lacked marital autonomy and the family intimacy declined from pregnancy to the child's age of 12 months. Such dynamics indicate diffuse family boundaries and interparental power asymmetries. Finally, *Authoritarian families* showed a relative lack of intimacy combined with average levels of autonomy. Fathers were more autonomous than mothers in the marital relationship, whereas mothers were more autonomous in parenting. Family intimacy declined only slightly from pregnancy to the child's age of 12 months. Such dynamics indicate strong family boundaries and clear family roles between the parents.

Research Questions

Our *first research question* was how family system types (Cohesive, Enmeshed, Disengaged, and Authoritarian) during pregnancy and infancy predict children's emotional attention biases at the age of 10 years. To assess attentional biases at the early and late stage of processing, we used stimulus onset asynchronies of 500 ms and 1250 ms. Both threatening (angry) and affiliative (happy) emotional faces were used as attentional cues. Given the lack of previous studies regarding family system types and attentional biases, we could not form family system type specific hypotheses. However, we hypothesized that children from Enmeshed, Disengaged, and Authoritarian families would show a) an early-stage attentional bias toward threat, indicating high threat responsivity; b) a late-stage attentional bias away from threat, indicating defensive exclusion of threatening information; or c) a late-stage attentional bias toward

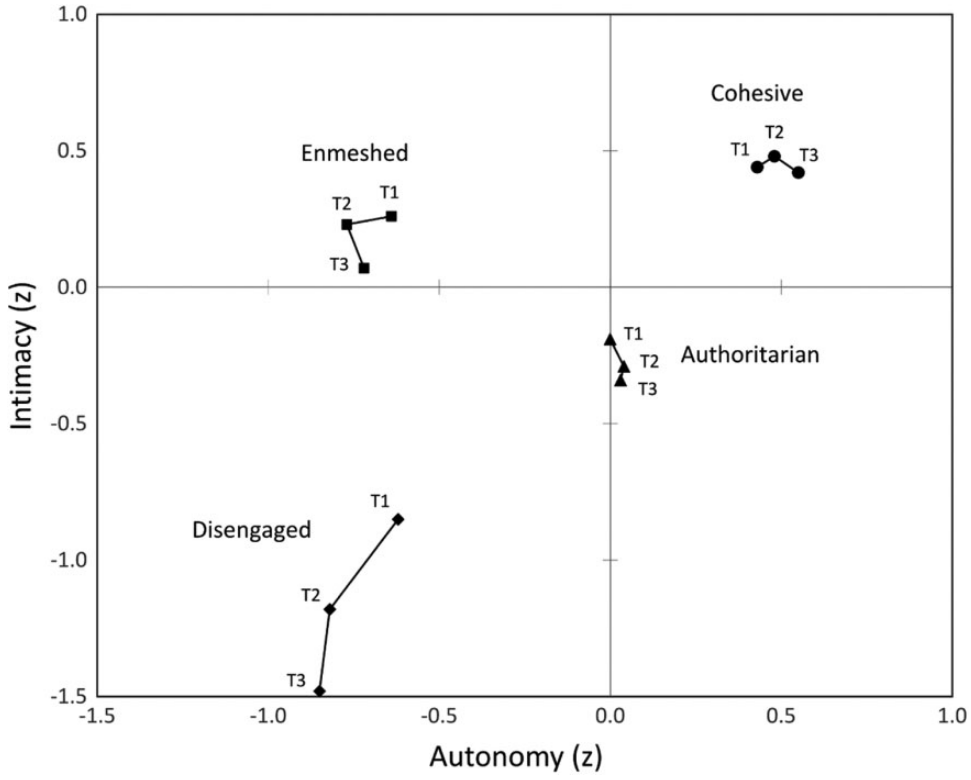

Figure 2. Early Family System Types and Their Longitudinal Trajectories in Autonomy and Intimacy from Pregnancy (T1) to Child's Ages of 2 Months (T2) and 12 Months (T2). Adapted from "Dynamic family system trajectories from pregnancy to child's first year" by J. Lindblom, M. Flykt, A. Tolvanen, M. Vänskä, A. Tiitinen, M. Tulppala, and R-L. Punamäki, 2014, *Journal of Marriage and Family*, 76, p. 802. Copyright 2014 by the National Council on Family Relations.

threat, indicating inefficient emotion regulation. Further, we hypothesized that children from Cohesive families would show d) no threat-related attentional biases or e) a late-stage attention disengagement from threat, indicating efficient emotion regulation.

Some studies suggest that children's emotional attention biases may emerge only in emotionally arousing situations (e.g., Romens & Pollak, 2012). Such situations prime children's mental representations and guide the processing of emotional information (Stupica & Cassidy, 2014). Thus, our *second research question* was whether situational priming moderates the effects of family system types on children's attentional biases. To test this, we used audiotaped stories to prime the following: 1) *threat to intimacy*, 2) *threat to autonomy*, and 3) *secure situation* (i.e., positive fulfillment of both autonomy and intimacy). These themes were selected because the needs for intimacy (e.g., communion with others) and autonomy (e.g., competent sense of self) are the two most basic developmental needs expressed in family relationships (Luyten & Blatt, 2011; Olsson, 2011).

Methods

Participants

The participants of a larger longitudinal sample consisted of married or cohabiting Finnish Caucasian couples ($N = 710$). This larger sample was used to identify different family system types (Lindblom et al., 2014). Couples completed questionnaires about family relationships during pregnancy (T1; 18–20 weeks of gestation), and when the child was 2 months (T2) and 12 months old (T3). Approximately half of the couples had naturally conceived ($n = 374$, 53%); the other half had achieved pregnancy after assisted reproductive treatment ($n = 336$, 48%). Participants were recruited from infertility clinics and while attending routine ultrasonographic examinations. Couples with multiple pregnancies were excluded from the study sample and only women above the age of 25 years were included in the naturally conceived group. The recruited mothers ($M = 33.21$ years, $SD = 3.71$) were older than the Finnish national average of mothers giving birth ($M = 29.9$ years) and had higher educational levels than the corresponding population (Statistics Finland, 2013). The ethics committees of the participating clinics approved the study at all timepoints (T1–T4). (For a more detailed description of the larger longitudinal sample, see Lindblom et al., 2014.)

A subsample of children participated ($n = 79$) in the current study at the age of 10 years (T4; $M = 10.63$ years, $SD = 0.60$, range: 9.58–11.84 years). We aimed to collect a purposive subsample of 20 children from each of the four family system types. Quota sampling was used to ensure that in each family system type, half of the families had a history of infertility and both genders were equally represented. One family canceled their participation at the end of the data collection period. The final sample consisted of children from Cohesive ($n = 20$), Disengaged ($n = 19$), Enmeshed ($n = 20$), and Authoritarian ($n = 20$) family types. This subsample was similar to the larger sample concerning infertility history, children's gender, parity, mother's age, and parents' educational levels (all *ns*).

At the age of 10 years (T4), children's attentional biases were measured using a dot-probe task either at their homes or at the university facility. Family system types in the final sample were similar regarding children's ages and mother's age and parents' educational levels (all *ns*) during pregnancy (T1). However, 40% ($n = 8$) of Cohesive, 50% ($n = 10$) of Authoritarian, and 21% ($n = 4$) of Disengaged families were primiparous, whereas 75% ($n = 15$) of Enmeshed families were primiparous, $\chi^2(3, n = 79) = 11.90$, $p = .008$. Thus parity (primi- vs. multiparity) was controlled in the main analyses.

Procedure and Measures

Identification of family system types (T1–T3). Family relationships were measured with the Subjective Family Picture Test (Mattejat & Scholz, 1994) during pregnancy (T1), and when the child was 2 months (T2) and 12 months old (T3). Parents rated four family relationships (mother-to-father, father-to-mother, mother-to-child, and father-to-child) regarding autonomy (four pairs of items; e.g., *self-confident–uncertain*) and intimacy (four pairs of items; e.g., *loving–rejecting*) using a seven-point scale. During pregnancy (T1), parents were asked to report their expectations of the future relationships with the unborn child. High scores on autonomy indicate relational self-assurance, agency, and independence. High scores on intimacy indicate emotional closeness, interest, and acceptance.

Factor mixture modeling was used to identify family system types based on relationship ratings of autonomy and intimacy from mothers (24 variables) and fathers (24 variables). The statistical model is shown in Figure 1. The analysis yielded one family trajectory with discrepant reports between the parents, and six family trajectories with similar reports of the family relationship between the parents. These seven trajectories depicting different family system types were described and labeled based on the overall levels (i.e., averaged values over the target parent in the dyad, the parental and marital relationship, and the reporting parent) and longitudinal changes (T1–T3) of autonomy and intimacy. In this study, we focus on Cohesive ($n = 274$, 39%), Disengaged ($n = 41$, 6%), Enmeshed ($n = 46$, 7%), and Authoritarian ($n = 107$, 15%) family types (group sizes and percentages from the previous study). In all four family system types, mothers' and fathers' reports of the same family relationships were similar. (For more details about the procedure, see Lindblom et al., 2014.)

Children's attentional biases (T4). A dot-probe task controlled by E-Prime 2.0 software (Psychology Software Tools, Pittsburgh, PA) was used to investigate children's attentional biases. Children performed the task three times after different situational priming conditions (see the "Situational priming procedure" section below). Each of the three blocks included 90 dot-probe trials. The children were instructed to focus their eyes on the fixation cross appearing for 500 ms in the beginning of each trial. This was followed by the presentation of a face pair for 500 ms in 40 of the trials and for 1250 ms in 40 of the trials, that is, stimulus onset asynchronies (SOAs) of 500 ms and 1250 ms. In 40 trials, the face pair consisted of an angry and a neutral face (20 trials in both SOA conditions), while in another 40 trials it consisted of a happy and a neutral face. In 10 filler trials the face pair consisted of two neutral faces.

After the disappearance of the face pair, an asterisk probe was displayed on the left or right side of the screen, replacing one of the faces. The children were instructed to indicate the location of the probe (left or right) as quickly and accurately as possible by using computer mouse buttons. The probe appeared either at the location of the neutral or emotional face (40 trials in each) and was presented for a maximum of 3000 ms or until the child responded.

The interval between the child's response and the next trial varied randomly between 750 ms and 1250 ms. All conditions were presented in random order and were completely balanced. A one-minute break was allowed after every 30 trials. Photographs of five male and five female models from the Karolinska Directed Emotional Faces stimulus set were used as stimuli (Lundqvist, Flykt, & Öhman, 1998), cropped to fit within an oval window (20 x 15 cm) on the monitor.

Before computing attention bias scores, incorrect responses and outlier responses (response times < 150 ms or > 1500 ms) were removed from the data, followed by the removal of responses with response times deviating by $\pm$ 2.5 SD from the individual mean. Due to equipment failure, four children completed only two of the three blocks of the experiment. Little's MCAR test showed this missingness to occur completely at random, $\chi^2(8) = 9.70$, $p = .286$. The final data consisted, on average, of 223.77 ($SD = 21.23$) out of 240 trials for each child.

Attention bias scores were computed separately for different stimulus onset asynchronies (500 ms and 1250 ms) and for different emotional faces (angry and happy). This was achieved by subtracting the mean response time for emotional-cue trials from the mean response time for neutral-cue trials. Positive and negative bias scores therefore indicate attentional biases toward and away from the emotional faces, respectively.

Situational priming procedure (T4). We created nine stories (three stories per theme) to activate children's mental representations related to 1) threat to intimacy (e.g., parental denigration after being physically hurt); 2) threat to autonomy (e.g., failing a school exam); and 3) secure situation, involving fulfillment of both autonomy and intimacy (e.g., winning in a team game with one's peers). The stories were adapted from previous research (Reijntjes, Stegge, Terwogt, Kamphuis, & Telch, 2006; Rijo, 2000; Zimmer-Gembeck, Lees, Bradley, & Skinner, 2009). A female actress narrated the stories expressing the emotional experiences of the story's protagonist (e.g., sad after parental denigration, anxious when failing a school exam, happy when winning in a team game). Recorded stories (mean length = 1:17 min, ranging from 0:54 to 1:43 min) were edited to contain different protagonist names to match each participant's gender.

In the situational priming procedure, the children heard the three thematically related stories before completing the dot-probe task. The three story themes and the three individual stories within each theme were presented in a balanced, randomized order. However, due to the distressing content of the threat stories, the secure situation stories were always presented between the autonomy-threat and intimacy-threat stories. Immediately after hearing each individual story, children reported their perceptions about the story events regarding the degree of threat ("That would be a bad thing to happen"), personal importance ("I would care if that happened to me"), and whether they had experienced similar events in their own life ("Something similar has happened to me in reality") using five-point Likert scales (see Hood, Power, & Hill, 2009). The primary purpose of these questions was to ensure that the children engaged with the story events and empathized with the story protagonist.

Table 1. Parental Perceptions of Family Relationships at the Child's Age of 2 Months (T2) and Children's State Anxiety at the Age of 10 Years (T4) According to Early Family System Type.

	Cohesive family (C)		Disengaged family (D)		Enmeshed family (E)		Authoritarian family (A)		K-W test		
	M	SD	M	SD	M	SD	M	SD	$\chi^2(3)$	p	Pairwise tests
Mother's reports ($n = 75$)											
Marital adjustment	119.00	9.77	96.40	17.44	116.59	9.04	104.16	7.42	32.91	<.001	C, E > D, A
Parental distress	19.21	4.53	28.56	9.45	22.58	4.65	23.05	5.20	14.45	.002	C < E, A < D
Parent–child interaction	17.00	4.83	20.39	4.55	19.95	4.72	18.53	4.28	6.14	.105	
Difficult child	20.05	6.30	21.11	9.58	20.84	4.58	19.74	6.07	1.06	.785	
Father's reports ($n = 73$)											
Marital adjustment	118.69	12.66	100.90	11.39	115.92	9.81	106.13	12.13	20.20	<.001	C, E > D, A
Parental distress	19.45	4.85	26.82	5.25	21.71	4.99	20.77	5.55	15.00	.002	C, A < D
Parent–child interaction	16.61	4.36	20.53	5.50	19.79	3.72	19.23	4.52	7.45	.059	
Difficult child	18.00	3.89	22.52	6.72	20.06	4.39	19.62	3.59	5.15	.161	
Child's report ($n = 79$)											
State anxiety	48.65	3.87	49.26	3.49	47.53	3.81	49.20	2.80	2.04	.565	

Note. Scores range from 0 (poor) to 151 (good) for marital adjustment. Scores range from 0 (low stress) to 60 (high stress) for parental distress, parent–child interaction, and difficult child. Scores range from 20 (low) to 60 (high) for state anxiety. K-W denotes Kruskall-Wallis test. Pairwise tests refer to Welch's t-test ($p < .05$).

After each block (i.e., hearing three thematically related stories and completing 90 dot-probe trials), the children had a rest period during which they watched animal videos (4:00 min) with cheerful classical music as a soundtrack. In the beginning of the experiment, children practiced the dot-probe task and the story-related questions with the instructor until they were familiar with the tasks.

Descriptive variables. To cross-validate and describe the early family system types, we examined how the family system types differed in the quality of the marital and the parenting subsystems at the child's age of 2 months (T2). Mothers ($n = 75$) and fathers ($n = 73$) reported the quality of their marital relationship using the Dyadic Adjustment Scale (Spanier, 1976) and their parenting experience using the Parenting Stress Index – Short Form (Abidin, 1995). The Dyadic Adjustment Scale provides a total score of *marital adjustment* (mothers: $\alpha = .90$, fathers: $\alpha = .91$) representing, for example, marital consensus and affection. The Parenting Stress Index provides scores for three domains. The *parental distress* domain represents lack of resources as a parent (e.g., feelings of being in trouble with responsibilities; mothers: $\alpha = .83$, fathers: $\alpha = .81$). The *parent–child interaction* domain represents unsatisfying relationship with the child (e.g., bothered by not feeling closer with the child; mothers: $\alpha = .78$, fathers: $\alpha = .75$). The *difficult child* domain represents child characteristics that contribute to parenting stress (e.g., the child cries and gets nervous easily; mothers: $\alpha = .78$, fathers: $\alpha = .79$).

Children's state of anxiety at the age of 10 years (T4) was assessed at the beginning of the experiment using the *state anxiety* subscale ($n = 79$; $\alpha = .76$) of the State-Trait Anxiety Inventory for Children (Spielberger, 1973). Children's perceptions of the priming story events were assessed using questions concerning perceived *threat*, perceived *importance*, and their *own experiences*, averaged over the three thematically related stories.

Analytic Strategy

To answer our research questions about how family system types and situational priming predict children's attentional biases, we built linear mixed-effect models using IBM SPSS Statistics 20. Mixed-effect models are effective in handling missing values because they use maximum-likelihood estimation, which utilizes all the information available in the data. Attention-bias scores from the dot-probe tasks were the dependent variables in the models. Emotion (angry or happy face), SOA, that is, stimulus onset asynchrony (500 ms or 1250 ms), and situational priming (intimacy-threat, autonomy-threat, or secure situation) were used as fixed within-subject factors. Family system type (Cohesive, Disengaged, Enmeshed, Authoritative) was used as a fixed between-subjects factor. Parity and children's state anxiety were used as covariates to control for family differences and to ensure that pre-experiment anxiety did not confound the results. Unstructured covariance structure was used, making no a priori assumptions about correlations between the study variables. To achieve parsimonious models, non-significant interactions involving family system types or covariates were removed from the model (except when their higher-order interactions were significant). Post hoc analyses were run using separate mixed-effects modeling for the relevant factors. 95% confidence intervals (CIs) were used to test the absolute presence of attentional biases (i.e., whether the difference in response times between emotional-cue and neutral-cue trials deviated from zero) and Cohen's d was reported to indicate effect sizes.

Results

Descriptive Statistics

First, to cross-validate and describe the family system types, we analyzed the differences between the family types in marital quality and parenting stress when the child was 2 months old (T2) and in children's state anxiety at the age of 10 years (T4). As Table 1 shows, family types differed in marital adjustment and in parental distress, but not in parent–child interaction or difficult child characteristics. Parents in Cohesive families had better marital adjustment than in Disengaged families, mothers: $t(26.41) = 4.96$, $p < .001$, $d = 1.63$; fathers: $t(32.93) = 4.38$, $p < .001$, $d = 1.44$; or in Authoritarian families, mothers: $t(33.58) = 5.50$, $p < .001$, $d = 1.78$; fathers: $t(34.66) = 3.08$, $p = .004$, $d = 1.01$. Similarly, parents in Enmeshed families had better marital adjustment than in Disengaged families, mothers: $t(25.20) = 4.39$, $p < .001$, $d = 1.44$; fathers: $t(31.83) = 4.22$, $p < .001$, $d = 1.41$; or in Authoritarian families, mothers: $t(34.69) = 4.64$, $p < .001$, $d = 1.51$; fathers: $t(34.50) = 2.74$, $p = .010$, $d = 0.91$.

Table 2. Attentional Biases to Emotional Faces (i.e., both Angry and Happy) Among Children with Low ($n = 39$) and High ($n = 40$) State Anxiety in Different Situational Priming Conditions.

		Intimacy-threat			Autonomy-threat			Secure situation		
	Stimulus onset asynchrony	M	SE	95% CI	M	SE	95% CI	M	SE	95% CI
High anxiety ($n = 39$)	500 ms	7.61	6.41	[-5.15, 20.30]	0.90	5.37	[-9.78, 11.50]	-3.09	4.94	[-12.91, 6.74]
	1250 ms	3.89	5.02	[-6.11, 13.80]	-4.81	5.80	[-20.30, 1.89]	17.55	6.29	[5.03, 30.05]
Low anxiety ($n = 40$)	500 ms	-8.28	6.33	[-20.88, 4.32]	4.12	5.18	[-6.19, 14.40]	7.50	4.76	[-1.97, 16.96]
	1250 ms	-2.14	4.94	[-11.97, 7.70]	-9.24	5.59	[-20.37, 1.89]	-3.26	6.07	[-15.33, 8.82]

Note. High and low anxiety groups are based on median split of the children's state anxiety variable. Positive and negative values indicate attentional biases toward and away from emotional expressions, respectively.

Table 3. Children's Attentional Biases to Angry and Happy Faces at the Stimulus Onset Asynchronies of 500 ms and 1250 ms According to Early Family System Type.

		Cohesive family ($n = 20$)			Disengaged family ($n = 19$)			Enmeshed family ($n = 20$)			Authoritarian family ($n = 20$)		
	Stimulus onset asynchrony	M	SE	95% CI	M	SE	95% CI	M	SE	95% CI	M	SE	95% CI
Angry face	500 ms	18.83	6.47	[5.95, 31.70]	15.13	6.65	[1.89, 28.36]	-0.26	6.48	[-13.14, 12.63]	-9.90	6.43	[-22.69, 2.90]
	1250 ms	0.56	6.09	[-11.54, 12.66]	-8.05	6.25	[-20.47, 4.37]	18.00	6.08	[5.90, 30.09]	2.51	6.05	[-9.51, 14.53]
Happy face	500 ms	-4.30	6.23	[-16.70, 8.10]	-1.22	6.41	[-13.99, 11.54]	-1.29	6.25	[-13.73, 11.16]	-4.26	6.20	[-16.59, 8.08]
	1250 ms	2.71	5.87	[-8.98, 14.41]	-10.47	6.03	[-22.49, 1.55]	-3.71	5.87	[-15.40, 7.98]	-1.30	5.83	[-12.91, 10.31]

Note. Positive and negative values indicate attentional biases toward and away from emotional faces, respectively.

Concerning parenting stress, Table 1 shows that mothers in Disengaged families experienced greater parental distress than in Cohesive families, $t(24.12) = -3.80$, $p = .001$, $d = 1.25$; in Enmeshed families, $t(24.46) = -2.46$, $p < .001$, $d = 0.81$; or in Authoritarian families, $t(26.13) = 2.18$, $p = .039$, $d = 0.71$. Mothers in Cohesive families experienced less parental distress than in Enmeshed families, $t(35.98) = -2.27$, $p = .030$, $d = 0.74$; or in Authoritarian families, $t(35.33) = -2.43$, $p = .020$, $d = 0.80$. Fathers in Disengaged families experienced greater parental distress than in Cohesive families, $t(32.41) = -4.31$, $p < .001$, $d = 1.46$; or in Authoritarian families, $t(33.89) = 3.36$, $p = .002$, $d = 1.12$. The results validated the family system types by showing large differences in marital adjustment and parental distress. Finally, as Table 1 shows, there were no differences in children's state anxiety as a function of the family types.

Second, we analyzed children's ratings regarding the story events between different priming conditions. The results confirmed that children perceived the events in autonomy- and intimacy-threat stories as highly threatening and personally important (see Table A1 in Appendix). There were no differences in children's perceptions of the story events as a function of family system type (see Table A2 in Appendix). These results provided validation for our priming procedure by showing that children perceived the content of the priming stories as expected.

Third, we analyzed the effects of situational priming and state anxiety on attentional biases. As Table 2 shows, there was a three-way Priming x SOA x Anxiety interaction on attentional biases, $F(2, 823.89) = 3.12$, $p = .045$. Post hoc analyses showed a SOA x Anxiety interaction in the secure situation condition, $F(1, 77) = 8.73$, $p = .004$, indicating that children with high anxiety showed a greater attentional bias toward angry and happy faces at the stimulus onset asynchrony (SOA) of 1250 ms than at the SOA of 500 ms, $diff = 19.57$, $SE = 8.99$, $t(37) = 2.17$, $p = .036$, $d = 0.35$. These results provided validation for our priming procedure by demonstrating that the task was sensitive for individual differences in state anxiety. Table A3 in Appendix shows attention bias scores, response times, and number of incorrect responses across situational priming conditions.

How Early Family System Types Predict Attentional Biases

In response to our first research question regarding how early family system types predict attentional biases, a linear mixed-effects model was built. Based on descriptive analyses, the effect of state anxiety was covaried by including the three-way Priming x SOA x Anxiety interaction in the model. To improve model parsimony, the two-, three-, and four-way interactions involving both the situational priming and the family type were excluded from the model, all being nonsignificant, F's < 1.30, p's > .274, in initial analyses.

The model showed a three-way Family x SOA x Emotion interaction effect on attentional biases, $F(3, 75.08) = 3.79$, $p = .014$. Table 3 and Figure 3 depict the attention bias scores among children from different family types. To further examine the three-way interaction, we first analyzed the two-way Family x SOA interaction separately for angry and happy faces, and then analyzed the two-way Emotion x SOA interaction separately for each family type. The three-way Priming x SOA x Anxiety interaction was also significant, $F(2, 71.30) = 3.88$, $p = .025$, showing effects similar to those reported in the Descriptive statistics.

First, the results showed a significant two-way Family x SOA interaction in the angry face condition, $F(3, 72.21) = 2.92$, $p = .040$, but not in the happy face condition, $F(3, 72.47) = 0.98$, $p = .406$. Pairwise comparisons between family types showed that at the stimulus onset asynchrony (SOA) of 500 ms, children from Cohesive families, $diff = -25.20$, $SE = 9.30$, $t(73.78) = -2.72$, $p = .008$, $d = 0.86$; and Disengaged families, $diff = -20.30$, $SE = 9.58$, $t(73.36) = -2.12$, $p = .037$, $d = 0.68$, had greater

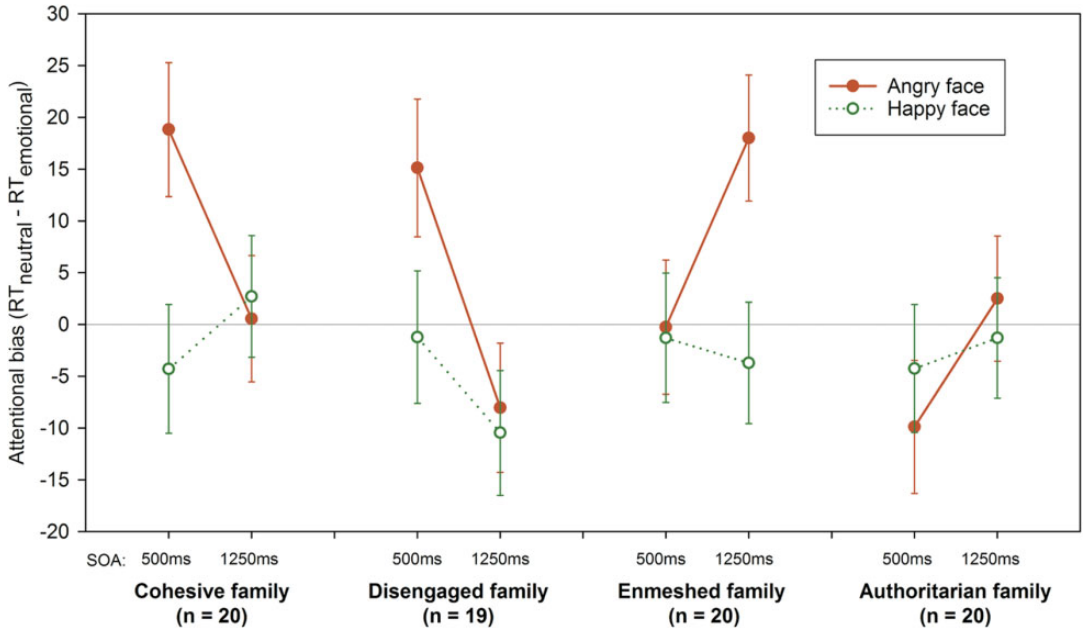

Figure 3. Children's Attentional Biases to Angry and Happy Faces at the Stimulus Onset Asynchronies of 500 ms and 1250 ms According to Early Family System Type. *Note.* SOA = stimulus onset asynchrony. Positive and negative values indicate attentional biases toward and away from emotional faces, respectively. Error bars represent ±1 standard errors.

attentional bias toward angry faces than children from Authoritarian families. Examination of the 95% CIs (Table 3) showed that children from Cohesive and Disengaged families had a significant attentional bias toward angry faces at the SOA of 500 ms, whereas children from Enmeshed families had a significant attentional bias toward angry faces at the SOA of 1250 ms.

Second, the results showed a significant two-way Emotion x SOA interaction effect among children from Cohesive families, $F(1, 17.27) = 5.63$, $p = .030$. Pairwise comparisons showed that these children had a marginally greater attentional bias toward angry faces at the stimulus onset asynchrony (SOA) of 500 ms than at the SOA of 1250 ms, $diff = -17.71$, $SE = 8.83$, $t(18.31) = 2.01$, $p = .060$, $d = 0.32$. There was no such effect of SOA for happy faces, $diff = 2.63$, $SE = 7.48$, $t(12.97) = 0.35$, $p = .731$, $d = 0.06$.

There were no significant Emotion x SOA interaction effects among children from Disengaged families, $F(1, 17.12) = 2.09$, $p = .166$; Enmeshed families, $F(1, 19) = 1.66$, $p = .214$; or Authoritarian families, $F(1, 18.58)$, $p = .831$. However, there was a significant main effect of stimulus onset asynchrony (SOA) among children from Disengaged families, $F(1, 17.61) = 9.98$, $p = .006$; and Authoritarian families, $F(1, 16.79) = 6.28$, $p = .023$, indicating that attentional biases occurred similarly for both emotional faces among these children (i.e., angry and happy). Pairwise comparisons showed that children from Disengaged families had a greater attentional bias toward emotional faces at the SOA of 500 ms than at the SOA of 1250 ms, $diff = -20.53$, $SE = 6.62$, $t(17.49) = -3.10$, $p = .006$, $d = 0.71$. In contrast, children from Authoritarian families had a greater attentional bias toward emotional faces at the SOA of 1250 ms than at the SOA of 500 ms, $diff = 9.95$, $SE = 3.57$, $t(16.38) = 2.79$, $p = .013$, $d = 0.69$. Examination of the 95% CIs showed that children from Disengaged families had a significant attentional bias toward emotional faces at the SOA of 500 ms, $M = 9.05$, $SE = 2.93$, 95% CI [2.88, 15.24], and away from emotional faces at the SOA of 1250 ms, $M = -11.48$, $SE = 5.28$, 95% CI [-22.55, -0.41]. Children from Authoritarian families had a significant attentional bias toward emotional faces at the SOA of 1250 ms, $M = 5.23$, $SE = 2.20$, 95% CI [0.59, 9.87].

Regarding our second research question, we included the interactions between the family system types and situational priming in the mixed-effects model. The results were nonsignificant for the four-way interaction, Priming x Emotion x SOA x Family, $F(6, 72.97) = 0.60$, $p = .729$; for the three-way interactions, Priming x Emotion x Family, $F(6, 74.34) = 1.29$, $p = .274$, and Priming x SOA x Family, $F(6, 69.70) = 0.46$, $p = .838$; and for the two-way interaction, Priming x Family, $F(6, 67.03) = 0.56$, $p = .745$. The results remained nonsignificant after the model was simplified by removing the four-way interaction, all F's < 1.44, p's > .213. Thus, we concluded that situational priming did not moderate the effects of family type on children's attentional biases. Parity did not have significant main or interaction effects on attentional biases.

Discussion

We examined how family system types identified during pregnancy and infancy prospectively predict children's attentional biases at the age of 10 years. The results indicated that children from Disengaged families showed an early-stage attentional bias toward threat (i.e., angry faces), followed by a late-stage attentional bias away from emotional faces (i.e., both angry and happy). Children from Enmeshed families showed a late-stage attentional bias toward threat. Children from Cohesive families showed a late-stage attentional disengagement from threat after an early-stage attentional bias toward threat. Finally, children from Authoritarian families did not show threat-related attentional biases, but instead showed a late-stage attentional bias toward emotional faces. Situational priming did not moderate the effects of family types on children's attentional biases. These results suggest that children develop unique attention biases that may reflect the regulatory strategies they use to adapt to their early family systems.

In line with our hypotheses, children from Disengaged families showed an attentional bias toward threat at the early stage of processing, that is, at the stimulus onset asynchrony (SOA) of 500 ms, but away from emotional faces at the later stage of processing, that is, at SOA of 1250 ms. Children from Disengaged families have likely grown up in conflictual and emotionally distant family environments. Research on child maltreatment suggests that early-stage vigilance toward cues of interpersonal threat may help children living in abusive families to forecast interpersonal aggression (e.g., Shackman et al., 2007). In line with this, it is possible that children from Disengaged families have developed vigilance toward cues of interpersonal threat in order to forecast threatening family interactions. Interestingly, children from Disengaged families also showed an attentional bias away from emotional faces at the later stage of processing. Attachment research suggests that such attentional avoidance indicates attempts to suppress the processing of emotion-provoking information (e.g., Dewitte et al., 2007). Thus, it is possible that children from Disengaged families attempt to down-regulate their emotional responses by limiting the processing of emotion-provoking information, a salient strategy observed among children in conflictual and unsupportive families (Davies & Sturge-Apple, 2007).

Children from Enmeshed families showed an attentional bias toward threat at the late stage of processing, that is, at stimulus onset asynchrony of 1250 ms. This result concurs with the previous studies that found an association between insensitive parenting and late-stage attentional biases toward threat (Gibb et al., 2011; Gulley et al., 2014). Late-stage attentional bias toward threat has been considered to indicate children's difficulties in regulating exposure to emotion-provoking information (Derryberry & Reed, 2002). In Enmeshed families, the diffuse family boundaries often increase intrusive parent–child interactions and involve children in marital conflicts (Kerig, 2005). Such stress-inducing family interactions have been shown to influence the development of both cognitive and motivational aspects of self-regulation (e.g., Bernier, Carlson, Deschênes, & Matte-Gagné, 2012; Fosco & Grych, 2012). It is possible that the threat-related bias among children from Enmeshed families reflects a cognitive deficit, such as difficulties in inhibiting attentional responses to task-irrelevant stimuli. Alternatively, in line with both the attachment (Dykas & Cassidy, 2011) and the emotional security theory (Davies & Sturge-Apple, 2007), the threat-related attentional bias may reflect strategic up-regulation of emotional arousal. Up-regulation of emotional arousal may help children to elicit parental protection and interrupt interparental conflicts, especially in enmeshed families where diffuse family boundaries prevent withdrawal from threatening interactions.

Children from Cohesive families showed an attentional bias toward threat at the early stage of processing, but did not show any attentional biases at the later stage of processing. Such attentional disengagement from threat has been considered to reflect adaptive emotion regulation, involving the evaluation of the stimulus as signaling only a minor threat (Bar-Haim et al., 2007). The harmonious family relationships in Cohesive families have likely increased children's sense of safety and fostered the development of emotion regulation (Davies & Sturge-Apple, 2007). Interestingly, however, children from both Cohesive and Disengaged families showed a similar early-stage attentional bias toward threat. Considering the large difference in the relationship quality between these families, it is tempting to speculate that the threat-related attentional bias has developed to serve different functions among children from these families. In line with an evolutionary perspective (Del Giudice et al., 2013), high responsivity toward cues of threat may have served prosocial functions among children in Cohesive families (e.g., sensitivity to the distress of others), while it may have served self-protective functions among children in Disengaged families (e.g., anticipation of threatening encounters).

Contrary to our hypotheses, children from Authoritarian families did not show threat-related attentional biases, but instead showed a modest attentional bias toward emotional faces at the late-stage of processing. Evolutionary perspective provides one possible explanation for this result by suggesting that children growing up in moderately threatening environments develop low responsivity to threat cues, which helps them to avoid unnecessary stress responses (Del Giudice et al., 2013). A moderate degree of negative expressivity in the family has been shown to decrease children's negative emotionality and foster emotional understanding (Halberstadt & Kimberly, 2002). Authoritarian families in our study were characterized by strong family boundaries, likely providing protection against interparental conflicts (e.g., Sturge-Apple et al., 2014). Thus, children in Authoritarian families may have learned that emotional cues do not necessitate responding because they do not forecast threat to the child.

Based on previous research, we have suggested that children's attentional biases have developed to serve different functions within different family system types. However, it should be noted that we could only test the associations between the family system types and attentional biases, but not the functions of these biases. Further studies are thus needed to examine; for example, whether threat-related attentional biases associate differently with aggressive and prosocial behaviors among children from cohesive and disengaged families, and to what extent cognitive deficits and regulatory strategies mediate the effects of family enmeshment on attentional biases.

Situational priming did not moderate the effects of early family systems on children's attentional biases. The simplest explanation would be that our procedure failed to activate children's mental representations. Yet, providing some validity for the priming procedure, we found that highly anxious children showed a late-stage attentional bias toward emotional faces only in the secure situation priming condition, and all children perceived the threat story events as highly threatening. One alternative explanation for the null results is that the attentional biases developed within the early family systems may operate constantly, regardless of priming to danger or safety. If this was the case, the attentional biases related to early family environments may have pervasive effects on children's socioemotional functioning.

The strengths of our study involve modeling the children's dynamic family systems using rich information about early family relationships. Importantly, the family system types could already be clearly distinguished from each other during pregnancy; thus, the effects of child characteristics (e.g., temperament) are unlikely to have confounded the results. We also demonstrated the validity of the family types by showing large differences in the marital adjustment and parenting distress between family types when the child was 2 months old. Finally, we controlled for the effects of pre-experimental state anxiety and parity on children's attentional biases, ensuring that these factors did not confound the results.

Despite these strengths, our study also has several limitations. First, we were unable to control the potential continuity of the family system types during the children's later developmental phases. Thus, conclusions regarding the age-specificity of our results should be made with caution. Second, our sample size was relatively small considering the complexity of the experimental design. Further studies with greater statistical power are needed to confirm our results, especially concerning the lack of situational priming effects. Finally, attentional biases may have occurred outside of our assessment points (stimulus onset asynchronies of 500 ms and 1250 ms). Eye-tracking methods could be used to obtain more continuous measures of attentional biases.

Research has convincingly shown that children with maltreatment history and those suffering from anxiety show emotional attention biases. Our prospective study contributes to this line of research by showing that more normative family environments also influence children's attentional biases. Our results concur with both the attachment (Dykas & Cassidy, 2011) and emotional security (Davies et al., 2013) theory by showing that the early relational quality of interpersonal relationships is important in shaping children's attentional biases, indicative of children's unique emotion regulation strategies. Our study also extends the focus from the caregiving and interparental relationships to more holistic and dynamic family systems. This may help to understand the patterns in children's social information processing as developmental adaptations to the emotional climate of their families.

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Appendix

Table A1. Children's Perceptions of the Priming Stories.

	Intimacy-threat (I)		Autonomy-threat (A)		Secure situation (S)		Friedman test		
	M	*SD*	*M*	*SD*	*M*	*SD*	$\chi^2(2)$	*p*	Pairwise tests
Threat	4.14	0.76	4.30	0.70	1.39	0.42	117.93	<.001	A > I > S
Importance	4.09	0.68	4.24	0.71	3.74	0.87	30.26	<.001	I, A > S
Own experiences	2.96	0.99	3.10	1.01	2.11	0.77	36.27	<.001	S > I, A

Note. All scores range from 1 (low importance / low threat / no own experiences) to 5 (high importance / high threat / has own experiences). Pairwise tests refer to Wilcoxon-signed ranked tests ($p < .05$): For *threat*, Intimacy-threat > Secure situation, $Z = -7.71$, $p < .001$, $d = -3.49$; Autonomy-threat > Secure situation, $Z = -7.49$, $p < .001$, $d = 3.45$; Autonomy-threat > Intimacy-threat, $Z = -1.98$, $p = .048$, $d = 1.78$. For *importance*, Intimacy-threat > Secure situation, $Z = -4.10$, $p < .001$, $d = 1.04$; Autonomy-threat > Secure situation, $Z = -5.99$, $p < .001$, $d = 1.92$. For *own experiences*, Secure-situation > Intimacy-threat, $Z = -5.52$, $p < .001$, $d = 1.59$; Secure-situation > Autonomy-threat, $Z = -5.77$, $p < .001$, $d = 1.79$.

Table A2. Children's Perceptions of the Priming Stories According to Early Family System Type.

	Cohesive family ($n = 20$)		Disengaged family ($n = 19$)		Enmeshed family ($n = 20$)		Authoritarian family ($n = 20$)		K-W test	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	$\chi^2(3)$	*p*
Intimacy-threat										
Threat	3.83	0.92	4.21	0.88	4.43	0.42	4.08	0.62	4.15	.245
Importance	3.95	0.91	4.19	0.59	4.22	0.63	4.00	0.51	6.94	.074
Own experiences	3.05	1.02	3.33	1.08	2.78	0.97	3.03	0.88	3.49	.322

(continued)

Table A2. (continued)

	Cohesive family ($n = 20$)		Disengaged family ($n = 19$)		Enmeshed family ($n = 20$)		Authoritarian family ($n = 20$)		K-W test	
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	$\chi^2(3)$	*p*
Autonomy-threat										
Threat	4.30	0.94	4.31	0.72	4.47	0.53	4.12	0.58	4.39	.222
Importance	4.11	1.11	4.20	0.54	4.50	0.48	4.12	0.51	3.06	.382
Own experiences	2.85	0.84	2.80	1.22	2.83	1.15	3.11	0.80	3.18	.365
Secure situation										
Threat	1.38	0.33	1.54	0.51	1.25	0.26	1.40	0.49	1.01	.798
Importance	3.83	1.06	3.65	0.88	3.87	0.87	3.62	0.68	3.58	.310
Own experiences	3.77	0.85	4.07	0.65	3.80	0.80	3.95	0.76	1.73	.630

Note. All scores range from 1 (low importance / low threat / no own experiences) to 5 (high importance / high threat / has own experiences). K-W denotes Kruskall-Wallis test.

Table A3. Raw Attention Bias Scores, Response Times and Incorrect Responses In Different Situational Priming Conditions.

			Intimacy-threat			Autonomy-threat			Secure situation		
Emotion	SOA	Cue	*M*	*SD*	95% *CI*	*M*	*SD*	95% *CI*	*M*	*SD*	95% *CI*
Attention bias											
Angry	500 ms		-1.11	58.68	[-116.12, 113.90]	5.29	47.11	[-87.04, 97.62]	12.28	46.72	[-79.30, 103.86]
	1250 ms		4.37	38.62	[-71.34, 80.07]	-7.06	49.18	[-103.46, 89.33]	13.01	59.08	[-102.79, 128.80]
Happy	500 ms		-0.21	43.26	[-85.00, 84.59]	-0.15	45.79	[-89.89, 89.59]	-7.47	47.51	[-100.60, 85.65]
	1250 ms		-3.51	47.98	[-97.55, 90.53]	-7.16	48.67	[-102.56, 88.23]	0.48	49.20	[-95.95, 96.92]
Response time											
Angry	500 ms	Emotion	536.06	107.91	[324.57, 747.56]	539.72	119.52	[305.46, 773.98]	528.05	114.48	[303.67, 752.42]
		Neutral	534.95	111.44	[316.54, 753.37]	545.01	118.80	[312.17, 777.86]	540.33	123.03	[299.18, 781.47]
Angry	1250 ms	Emotion	508.10	102.50	[307.20, 709.00]	526.58	122.09	[287.28, 765.88]	506.11	111.02	[288.51, 723.71]
		Neutral	512.47	96.02	[324.26, 700.67]	519.52	115.46	[293.21, 745.82]	519.12	105.76	[311.83, 726.41]
Happy	500 ms	Emotion	533.71	97.90	[341.83, 725.59]	543.40	131.55	[285.57, 801.23]	531.69	113.17	[309.88, 753.50]
		Neutral	533.50	99.46	[338.57, 728.43]	543.25	116.49	[314.92, 771.58]	524.22	112.08	[304.55, 743.89]
Happy	1250 ms	Emotion	513.67	101.73	[314.27, 713.07]	517.89	109.32	[303.62, 732.17]	516.87	113.95	[293.53, 740.21]
		Neutral	510.16	94.75	[324.46, 695.86]	510.73	105.28	[304.39, 717.07]	517.35	96.29	[328.62, 706.09]
Incorrect responses (*n*)			3.91	3.89	[-3.71, 11.53]	4.58	6.53	[-8.22, 17.38]	4.04	3.84	[-3.49, 11.57]
Children (*n*)			75			79			79		

Note. SOA = stimulus onset asynchrony.