Child temperament and parental personality: continuity and transactional change

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Abstract

Studying the continuity and underlying mechanisms of temperament change from early childhood through adulthood is clinically and theoretically relevant. Knowledge of the continuity and change of temperament from infancy onwards, especially as perceived by both parents is, however, still scanty. Only in recent years have researchers become aware that personality, long considered as stable in adulthood, may also change. Further, studies that focus on the transactional change of child temperament and parental personality also seem to be lacking, as are studies focusing on transactions between child temperament and more transient parental characteristics, like parental stress. Therefore, this longitudinal study examined the degree of continuity of temperament over five years from the infant’s age of six months to the child’s age of five and a half years, as perceived by both biological parents, and also investigated the bidirectional effects between child temperament and parents’ personality traits and overall stress experienced during that time.

First, moderate to high levels of continuity of temperament from infancy to middle childhood were shown, depicting the developmental links between affectively positive and well-adjusted temperament characteristics, and between characteristics of early and later negative affectivity. The continuity of temperament was quantitatively and qualitatively similar in both parents’ ratings. The findings also demonstrate that infant and childhood temperament characteristics cluster to form temperament types that resemble personality types shown in child and adult personality studies.

Second, the parental personality traits of extraversion and neuroticism were shown to be highly stable over five years, but evidence of change in relation to parents’ views of their child’s temperament was also shown: an infant’s higher positive affectivity predicted an increase in parental extraversion, while the infant’s higher activity level predicted a decrease in parental neuroticism over five years. Furthermore, initially higher parental extraversion predicted higher ratings of the child’s effortful control, while initially higher parental neuroticism predicted the child’s higher negative affectivity. In terms of changes in parental stress, the infant’s higher activity level predicted a decrease in maternal overall stress, while initially higher maternal stress predicted a higher level of child negative affectivity in middle childhood.
Together, the results demonstrate that the mother- and father-rated temperament of the child shows continuity during the early years of life, but also support the view that the development of temperament is sensitive to important contextual factors such as parental personality and overall stress. While parental personality and experienced stress were shown to have an effect on the child’s developing temperament, the reverse was also true: the parents’ own personality traits and perceived stress seemed to be highly stable, but also susceptible to their experiences of their child’s temperament.
Tiivistelmä

Tulokset osoittivat lapsen temperamenttiominaisuuksilla olevan kohtalainen tai vahva pysyvyys vauvaiästä viiden ja puolen vuoden ikään. Kehityksellisiä yhteyksiä löydettiin sekä myönteiseen affektiivisuuteen ja sopeutuvuuteen liittyvien ominaisuuksien välillä, että negatiiviseen affektiivisuuteen liittyvien ominaisuuksien välillä. Temperamentin pysyvyys näyttäytyi samanlaisena molempien vanhempien arvioisssa. Tutkimus osoitti myös miten temperamenttipiirteet vauvaiästä lähtien yhdistyvät persoonallisuustutkimuksessa vakiintuneita lasten ja aikuisten persoonallisuustyypejä vastaaviksi temperamenttityypeiksi.

Vanhempien ekstraversio- ja neurotisismi –persoonallisuuspitirteet olivat varsin pysyviä viiden vuoden aikana, mutta tutkimus osoitti myös piirteiden muuttumisen suhteessa vanhemman näkemykseen lapsen temperamentista: vauvan korkeammalle arvioitun positiivisen affektiivisuuden ennusti vanhemman korkeampaa ekstraversiota, ja vauvan korkeampi aktiivisuustaso ennusti vanhemman alemppaa neurotisismin tasoa viiden vuoden jälkeen. Samaan aikaan, vanhemman alun perin korkeampi ekstraverstion taso ennusti lapsen temperamentin korkeampaa tahdonalaista itsesäätylä, kun taas alun alkaen korkeampi vanhemman neurotisismi ennusti lapsen korkeampaa negatiivista affektiivisuutta viiden vuoden jälkeen. Vanhemman näkemys vauvasta aktiivisempana
ennusti myös äidin vähäisempää stressiä viiden vuoden jälkeen, ja äidin alun alkaen korkeampi stressitaso ennusti lapsen kasvavaa negatiivista affektiivisuutta viiden vuoden jälkeen.

Kokonaisuudessaan tutkimus osoittaa lapsen temperamentin pysyvyyden ensimmäisten viiden vuoden aikana, sekä äidin että isän arvioimana, mutta tukee myös käsitystä temperamentin kehityksen altiudesta tärkeille ympäristötekijöille, kuten vanhempien persoonallisuuspiirteille ja vanhemman stressin määrälle. Samalla kun vanhemman persoonallisuus ja koetun stressin määrä vaikuttivat lapsen temperamentin kehitykseen, nämä vanhemman sinänsä varsin pysyvät osoittautuneet ominaisuuksiin olivat myös alttiita lapsen temperamenttiomaisuuksien vaikutukselle.
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Niina Komsi
LIST OF ORIGINAL PUBLICATIONS


1 INTRODUCTION

1.1 Temperament dimensions and personality traits: theoretically, temporally and practically related constructs

The main assumption in personality trait theory is that traits represent partly heritable, temperament-based individual predispositions, which show consistency across time and situations (McCrae et al., 2000). In other words, the structure of adult personality is presumed to emerge from early temperament that serves as a substrate for personality development (Costa & McCrae, 2000). In recent literature, the phenomena described by temperament and personality constructs have been concluded to be more alike than different (Caspi, Roberts, & Shiner, 2005; Mervielde, De Clercq, De Fruyt, & Van Leeuwen, 2005), and even in the temperament dimensions emerging from infancy research, similarities with the higher order factor structures extracted from adult studies of personality can be seen (Rothbart & Ahadi, 1994; Rothbart, Ahadi, & Evans, 2000a). Therefore, it is not surprising that research on temperament and personality has increasingly concentrated on questions of development.

Temperament in childhood has generally been described as the constellation of inborn traits that determines a child’s unique behavioral style and the way he or she experiences and reacts to the world (Goldsmith et al., 1987; Rothbart & Bates, 2006). There is general agreement between different temperament theorists on the biologically-based individual differences that show modest to moderate degrees of continuity during infancy and from early childhood onwards (Lemery, Goldsmith, Klinnert, & Mrazek, 1999; Goldsmith et al., 1987; Rothbart & Bates, 2006): temperament is thus thought to describe those aspects of behavioral response that are not due to interactions with caregivers or other environmental influences, but rather those aspects that are present from birth and biologically based. Further, although temperament is traditionally viewed as consisting of these biologically-based behavioral traits, its manifestation in behavioral patterns is of interest: it is such patterns that influence children’s interactions in the world, and to which parents, teachers, and peers respond (Calkins, Blandon, Williford, & Keane, 2007).

In developmental research, the study of the underlying mechanisms that account for stability and/or change in temperament and personality from the early years onwards and during adulthood bears great theoretical as well as clinical relevance. From a
theoretical point of view, research on temporal stability and change and its correlates can shed light on the relative influence of maturational and environmental factors on temperament and personality development. In order to be able to examine the dynamics and correlates of developmental stability and change, the researchers are, however, first challenged to detect and establish the degree of continuity and developmental courses of the manifestations of temperament and personality from the very early stages onwards (Caspi & Roberts, 1999; Goldsmith, 1996; Rothbart, 1989; Rothbart & Bates, 2006).

From a practical or clinical point of view, a better understanding of temporal stability and change in temperament and personality characteristics can inform therapeutic approaches to personality-related psychological problems and help to develop interventions tailored to the needs of individual clients (Widiger, Costa, & McCrae, 2002). Given the importance of such questions, it is no wonder that recent years have seen a surge in meta-analyses examining longitudinal stability and change in personality traits during adulthood (see Ardelt, 2000; Roberts & DelVecchio, 2000; Roberts, Walton, & Viechtbauer, 2006), along with increasing evidence of temperament- and personality-related antecedents and correlates of health and adjustment at all age stages (Nigg, 2006; Hampson, 2008; Roberts, Kuncel, Shiner, Caspi, & Goldberg, 2007; Shipley, Weiss, Der, Taylor, & Deary, 2007). However, generalizations from previous studies on personality development are still limited. Our knowledge of the development of early temperament in itself is also still scanty, as is our knowledge of individual differences in change and its predictors in adult personality.

1.2 Temperament in childhood within the developmental framework of Mary K. Rothbart

According to Mary K. Rothbart and her colleagues, temperament refers to constitutionally-based individual differences in reactivity and self-regulation (Rothbart & Bates, 2006). Constitutional in this sense (Rothbart & Derryberry, 1981) refers to the biological basis of temperament, which becomes influenced over time by heredity, maturation, and experience. The general factor of reactivity is seen as being directly related to the responsivity of the nervous system to sensory stimulation, referring to the excitability, responsivity or arousability of the physiological and behavioral systems.
Self-regulation, in turn, refers to the neural and behavioral processes functioning to modulate this reactivity (Rothbart & Derryberry, 1981).

In Rothbart’s conceptualization, temperament in infancy refers to early differences in motor activity, smile-proneness, soothability, attention span, anger-proneness and fearful distress, operationalized either in a laboratory observation (Goldsmith & Rothbart, 1991, 1996), or in parent reports (Rothbart, 1981). The subscales further form two latent superconstructs, labeled positive and negative affectivity. Not all of these infant temperament characteristics are present at birth (smile, fear), or are not sufficiently matured to function as valid predictors of later temperamental development. Therefore, temperamental continuity measured either through distinct behavioral characteristics or through positive/negative affectivity superconstructs, is assumed to become apparent only after the early months of infancy.

In childhood, the central concepts of temperament, such as reactivity, arousability, and self regulation remain, but it is the individual differences in the ability to utilize inhibitory and attentional mechanisms in the service of regulation that begin to characterize childhood temperament (Rothbart & Derryberry, 1981). By the third year of life, initial reactivity as the dominant developmental theme is replaced by behavior regulation (Rothbart, Derryberry, & Posner, 1994). That is, as the child develops, initial reactivity and early efforts to regulate the reactivity will be supplemented by an increasing capacity for voluntary forms of control (Rothbart & Bates, 2006).

Childhood temperament can be depicted by the individual domains of activity level, anger-proneness, positive anticipation, attentional focusing, discomfort related to sensory qualities of stimulation, soothability, fear, the amount of pleasure related to high or low stimulus intensity, impulsivity, inhibitory control, low intensity pleasure, perceptual sensitivity, sadness, shyness, and the amount of smiling and laughter (Rothbart, Ahadi, Hershey, & Fisher, 2001). These domains can be further combined into the distinct superconstructs of extraversion, effortful control and negative affectivity (Rothbart et al., 2001).

1.2.1 Continuity of temperament from infancy onwards
The continuity of temperamental characteristics over time and in different contexts is, by definition, among the hallmarks of Rothbart’s theory, and the early appearing
temperamental differences are assumed to provide a foundation for later emotional and personality development (Derryberry & Rothbart, 1997). Within this framework, the developmental discontinuity or lawful change (Caspi & Roberts, 1999; Kagan, 1971; Rothbart & Bates, 2006) in early temperament can also be theoretically defined and understood. As a developing entity with increasing and differentiating manifestations from infancy onwards (Rothbart & Bates, 2006), temperament can thus be defined in terms of both homotypic and heterotypic continuity over time. Further, also dynamic relations between genetically unrelated traits are acknowledged, i.e. the development of one trait can implicate changes in the development of another, genetically unrelated trait (Putnam et al., 2008).

By the concept homotypic continuity, the literal continuity, or stability over time of a temperament characteristic is indicated, whereas heterotypic continuity refers to the continuity between phenotypically different, but genotypically related attributes of temperament (see Caspi & Roberts, 1999). To be interpreted as heterotypic continuity, or coherence, as it has also been called, temperamental continuity has to be theoretically defined a priori: the models of continuity require theoretically derived predictions relating certain types of infant temperament to specific behaviors in childhood; these predictions ought to be based upon theories of development that allow one to predict age-appropriate changes in the phenotypic expression of a common genotype (Caspi & Roberts, 1999). For example, one might predict that the same pattern of fear responses to novelty observed in infancy would be found in later childhood, depicting homotypic continuity, while heterotypic continuity would refer to relations between earlier and later fearful behavior that are based upon age-appropriate and logical associations rather than similarities in exact behaviors. That is, although infant negative affectivity can be composed of fear and anger, the manifestations of negative affectivity in later childhood are proposed to encompass more behavioral characteristics, such as proneness to discomfort and expressions of sadness.

As the measures for infant and childhood temperament conceptualize temperament similarly, but differ in the number of dimensions, the structural continuity of temperament in this work is also not explored as defined by Caspi, i.e., the persistence of correlational patterns among a set of variables across time (Caspi & Roberts, 1999), but will rather describe associations across time between temperament constructs that
are based on individual dimensions of temperament in infancy and on individual dimensions of temperament in childhood.

Furthermore, these descriptions of variable-level continuity of temperament do not, however, mirror continuity at the person (within-subject) level. While the research focusing on temperament-variables assesses their interpersonal correlational structure, utilizing the above-mentioned concepts, the person-centered approach examines typical within-person configurations (Asendorpf & van Aken, 1999; Bergman & Magnusson, 2001; see also Robins & Tracy, 2003), and suggests yet another type of continuity, i.e., ipsative continuity (Caspi & Roberts, 1999). Essentially, ipsative continuity is equivalent to structural continuity except it is considered at the level of the individual rather than a group or population. The person-centered approach thus depicts the development of temperament by individual temperament types or profiles, where each temperament dimension derives its meaning from its relations to the other dimensions within the individual.

All in all, given the fact that Rothbart’s theory is among the most prominent current theories of temperament, and that research activity emphasizing this particular approach is intensifying, studies focusing on the continuity of temperament within Rothbart’s psychobiological framework are still surprisingly scarce. Rothbart’s conceptual and operational definitions have been used in studying continuity of temperament within developmental phases, i.e., during infancy (Carnicero, Pérez-López, Salinas, & Martínéz-Fuentes, 2000; Denham, Lehman, Moser, & Reeves, 1995; Gartstein et al., 2006; Lemery et al., 1999; Rothbart, 1981, 1986; Stifter, Willoughby, & Towe-Goodman, 2008), toddlerhood (Putnam, Gartstein, & Rothbart, 2006) and childhood (Kochanska & Knaack, 2003; Majdandzic & van den Boom, 2008; Rothbart et al., 2001), but to my knowledge, only three studies have extended the scope across different developmental phases from infancy to childhood (Aksan et al., 1999; Putnam, Rothbart, & Gartstein, 2008; Rothbart, Derryberry, & Hershey, 2000b).

In the study by Rothbart and her colleagues (2000b), theoretically relevant continuity of temperament from infancy to the child’s age of seven was shown in a sample of 26 children; however, due to the small sample size, the researchers highlighted the tentative nature of the results (Rothbart et al., 2000b). Recently, Putnam and his colleagues (2008) reported significant homotypic and heterotypic continuity for mother-rated
characteristics of positive and negative affectivity from infancy to toddler and preschool age.

Further, following the ipsative, person-level approach, temperament types in childhood have previously been identified by Aksan and his colleagues (1999). They placed 15% of 488 children in “expressive-noncontrolled” and “nonexpressive-controlled” categories based on maternal ratings of the 31/2 and 41/2 year-old child’s temperament, and considered whether these childhood types were different with respect to infant temperament: relative to the “controlled-nonexpressive” children, the “noncontrolled-expressive” children were found to have exhibited higher levels of activity, distress to limitations, and fear in their infancy. However, the study did not identify whether temperament characteristics in infancy and in middle childhood together clustered to form profiles indicative of different temperament types (Aksan et al., 1999).

Moreover, studies also exist where infant temperament has been used as a predictor of temperament measured in toddlerhood, by using a measure that closely resembles Rothbart’s conceptual definition (Kochanska, Murray, & Harlan, 2000; Lemery et al., 1999). Clearly, more longitudinal research is needed to explore the developmental paths of early temperament across different developmental phases within Rothbart’s theoretical framework, utilizing the conceptual and operational definitions and measures developed within this framework.

1.2.2 Mothers and fathers as informants of the child’s temperament

In temperament research, the question of objectivity in measuring child behavior according to parental reports is open to debate (Kagan, 1994, 1998; Seifer, Sameroff, Dickstein, Schiller, & Hayden, 2004; Stifter et al., 2008). However, parent-rated temperament of the child has frequently shown higher age-to-age stability than observer-rated temperament (Pauli-Pott, Mertesacker, Bade, Haverkock, & Beckmann, 2003; Rothbart et al., 2000b). Besides this greater predictive validity, recent evidence also points to greater situational consistency of parent-ratings in comparison to more objective perceptions (Majdandzic & van den Boom, 2007). From the developmental point of view, it is important to further note that, within a family, especially the
perceptions or views that parents have of their child’s characteristics are considered essential components of development (Belsky, 1984).

Despite the encouragement to use parent-reports, the majority of the research on temperamental continuity to date in Rothbart’s, as in other frameworks, still relies on maternal ratings of the child’s temperament (e.g., Aksan et al., 1999; Putnam et al., 2008; Rothbart et al., 2000b; for another framework, see also Pedlow, Sanson, Prior, & Oberklaid, 1993), or on combinations of mother-rated and observed temperament (Crockenberg & Leerkes, 2006; for other frameworks, see Belsky, Fish, & Isabella, 1991; Fox, Henderson, Rubin, Calkins, & Schmidt, 2001; Stifter et al., 2008). The role of fathers in the family dynamic is, however, already widely acknowledged, and research on the quality of the early father–child dyad and its relation to the behavioral characteristics and developmental outcomes of the child at all ages from infancy to early adulthood is becoming more widespread (e.g., Amato, 1994; Amato & Gilbreth, 1999; Belsky, Woodworth, Crnic, 1996; Parke, 2004; Ramchandani, Stein, & Evans, 2005; Shannon, Tamis-LeMonda, & Cabrera, 2006).

Furthermore, there is mounting evidence of the predictive association between infant temperament and the dynamics of father–child interaction (Belsky, 1996; Kochanska, Friesenborg, Lange, & Martel, 2004; McBride, Shoppe, & Rane, 2002; Sirignano & Lachman, 1985). Fathers and mothers are also increasingly considered comparable informants about their children’s behavior (DeFruyt & Vollrath, 2003). Mother- and father-rated temperament have, according to previous cross-sectional data, been shown to be interrelated, and show a similar structural pattern in infancy, toddlerhood and childhood (Auerbach et al., 2008; Goldsmith & Campos, 1990; Kochanska et al., 1998; Leve, Scaramella, & Fagot, 2001; Majdandzic & van den Boom, 2008; Putnam et al., 2006; Rothbart, 1981; Rothbart et al., 2001; Saudino, Wertz, & Gagne, 2004).

Nevertheless, evidence of the extent to which father-rated temperament shows continuity during development is scanty, and to our knowledge, only a handful of studies to date have focused on this issue. In other temperament frameworks, Van Egeren (2004) found consistency of father-rated characteristics of negative affectivity during the first six months, and Rubin, Nelson, Hastings, and Asendorpf (1999) reported on moderate continuity of father-rated shyness from the age of two to four
years. Bishop, Spence, and McDonald (2003) reported significant continuity of father-rated behavioral inhibition from the age of three to five years. In the framework of Rothbart, the recent study of Putnam and his colleagues (2006) demonstrated that stability estimates for fathers ratings of temperament ranged from .26 to .73 from 18 to 36 months of age, and Rothbart and her colleagues (2001) present stability estimates for father-ratings of temperament that ranged from .48 to .76 from five to seven years of age, for subscales encompassing characteristics of positive and negative affectivity and effortful control. In Majdandzic’s and van den Boom’s study (2008), mother- and father-rated temperament showed similar stabilities over seven months during the child’s fourth year of age. To my knowledge, no previous study has focused on the developmental continuity of father-rated temperament over developmental phases from infancy onwards, or on comparing the mother- and father-rated developmental paths of early temperament.

1.3 Personality traits in adulthood
1.3.1 Stability and change in personality traits
For several decades, personality research has also increasingly concentrated on questions of development. Because the descriptions about personality remain the same across time, the dimensions of adult personality are defined to be homotypically continuous (homotypic referring to literal continuity or stability over time) (Caspi & Roberts, 1999). Recent theoretical discussions have, however, focused on the relative contributions of biological as compared to environmental factors on the homotypic continuity, or temporal stability of personality (e.g., Ardelt, 2000; Johnson, McGue, & Krueger, 2005; Roberts, Walton, & Viechtbauer, 2006b); in the theoretical framework developed by McCrae and his colleagues (2000), the association between personality traits and environment is expressed in the person’s characteristic adaptations, while no external influence on the basic temperament-based tendencies is acknowledged. A more differentiated perspective has also emerged, suggesting that some environment-related change in personality traits is possible even during adulthood (e.g., Caspi & Roberts, 1999; Helson et al., 2002; Roberts & Mroczek, 2008; Scollon & Diener, 2006).

Of the different concepts depicting personality change, normative change is interpreted as the result of intrinsic trends based on rates of species-typical brain
maturation and age-related changes in brain function and gene expression (e.g., McCrae et al., 2000), or a consequence of universal patterns of life experiences and social roles (Elder, 1994). Non-normative or rank-order change, in turn, is viewed as the result of individual differences in genetics, injury, drug abuse, or disease processes that influence brain chemistry on an individual level (e.g., Piedmont, 2001), or as the result of individual life experiences such as career trajectories (Roberts, 1997) or relationship patterns (Robins, Caspi, & Moffitt, 2002). In other words, while traits may change in the same direction for most people (normative change in the average level on any dimension), they may also change, in magnitude or in direction, the extent of change owing more to individual and specific environmental determinants (non-normative change) (Costa & McCrae, 1988; Roberts, Walton, Bogg, & Caspi 2006; see also Tennen, Affleck, & Armeli, 2005). Similar to the variable-level homo- and heterotypic continuity of early temperament, this differential, rank-order stability is often indexed by cross-time correlation coefficients (stability coefficients) which, for the major personality trait domains, have generally been shown to be substantial in magnitude (Fraley & Roberts, 2005; Costa & McCrae, 1994). This rank-order stability also tends to decline in magnitude as the elapsed time interval increases, and to increase systematically with age (Caspi et al., 2005; Clark & Watson, 1999; see also Fraley & Roberts, 2005).

With regard to demographic predictors, most researchers also agree that rank-order stability (or test–retest stability/consistency) is considerably lower among adolescents and young adults than among older age groups (Ardelt, 2000; Roberts & DelVecchio, 2000). However, there is some disagreement regarding the age(s) or lifestages when the age-related increase in the magnitude of the test–retest stability coefficients peaks. Until recently, the dominant perspective has been that once adulthood is reached, which happens around 30 years of age, there is no subsequent change in personality (Costa & McCrae, 1994, 1997; Terracciano, Costa, & McCrae, 2006). Other studies have reported that stability continues to increase from early adulthood to age 50 (Roberts & DelVecchio, 2000), while some have reported curvilinear trajectories with increases until age 50, but declines in old age (Ardelt, 2000). The patterns of rank-order stability for men and women have generally been found to be similar (Roberts & DelVecchio, 2000).
1.3.2 Personality traits of extraversion and neuroticism during adulthood

The current study focuses on the two well-known personality traits, extraversion and neuroticism (Costa & McCrae, 1992), which are included in virtually every prominent trait model developed during the 20th century (e.g., Clark & Watson, 1999). These two traits also have similar meanings in most models of personality, referring to positive and negative emotionality and their regulation. Heritability estimates of extraversion and neuroticism based on twin studies typically fall in the .40 to .60 range, with a median value of approximately .50 (e.g., Bouchard & Loehlin, 2001; Jang, McCrae, Angleitner, Riemann, & Livesley, 1998).

As the understanding of these traits has increased, it has become clear that they represent basic dimensions of temperament (Clark & Watson, 1999): two key features of temperament are that they, first, are at least partly attributable to innate biological factors and second, have emotional processes as core, defining features (Digman, 1994). Accordingly, extraversion and neuroticism have strong and systematic links to emotional experience, and are associated with the basic PA and NA emotions (e.g., Abe & Izard, 1999; Carver, Sutton, & Scheier, 2000; Gross, Sutton, Ketelaar, 1998, Larsen & Ketelaar, 1991). Also in the framework proposed by Gray (1982, 1987), links between neuroticism and behavioral inhibition (BIS), and between extraversion and behavioral activation (BAS), have been reported (Jorm et al., 1999; Smits & Boeck, 2006). Extraversion and neuroticism are also considered most predictive of momentary affect (Yik & Rusell, 2001) and the affective quality of one’s perception of reality (Uziel, 2006) and self-esteem (Watson, Suls, & Haig, 2002).

In the adult’s personality, the level of extraversion describes the quantity and intensity of interpersonal interaction, activity level, need for stimulation, and capacity for joy: a person scoring high on extraversion is considered sociable, active, talkative, person-oriented, optimistic, fun-loving, and affectionate, whereas a low-scoring person is reserved, sober, unexuberant, aloof, task-oriented, retiring, and quiet (McCrae & John, 1992). Neuroticism, in turn, assesses adjustment versus emotional instability and identifies individuals prone to psychological distress, unrealistic ideas, excessive cravings or urges, and maladaptive coping responses: a person scoring high on this trait worries a lot and is nervous, emotional, insecure, and feels inadequate, whereas a person
scoring low is calm, relaxed, unemotional, hardy, secure and self-satisfied (McCrae & John, 1992).

The reports of rank-order stabilities of extraversion and neuroticism during adulthood for both genders have generally been relatively high, ranging from .61 to .80 between periods from two years to several decades (e.g., Costa & McCrae, 1988; Scollon & Diener, 2006; Vaidya, Gray, & Haig, 2002; Van Aken, Denissen, Branje, Dubas, & Goossens, 2006). However, existing evidence shows that rank-order change in these two temperament-based traits during adulthood also occurs, which obviously has raised the compelling question of why these changes occur.

1.4 Transactional development of parental personality and child temperament

There are many potential processes that can either support or discourage developmental continuity in child and adult temperament- and personality-related characteristics. These processes have been described as involving transactions between a person and the environment. During development, these transactions may lead some individuals to experience changes not shared with others in their cohort, the extent of change owing more to individual and specific, rather than shared environmental determinants.

Caspi (1998) describes three transactional processes that will influence the degree of continuity of behavior over time: reactive, evocative, and proactive transactions. Within a family, these person-environment transactions may lead to discontinuities as well as continuities in temperament and personality. Reactive transactions emphasize individual characteristics that impact a person’s own experience of identical environmental conditions. Applied to models of early temperament, temperamental traits will affect the ways in which environmental information is processed and thereby interpreted. These temperamentally based biases in responding to the caregiving environment may be a powerful force in maintaining and promoting early individual differences and their stability and/or change over time. Therefore, in order to understand the origins of various temperamental outcomes, it is essential to pay attention to the period of infancy and the appearance of temperamental characteristics during that time. In adulthood, temperament-based personality characteristics that impact a person’s own experience of
environmental conditions may also be suggested to have an effect on the way the adult reacts to, for example, his/her child’s temperament.

Evocative transactions, in turn, refer to the manner in which unique individual differences evoke particular responses from the environment. Those responses further influence the manner in which the individual will respond to the environment, establishing a self-perpetuating cycle of interaction between the individual and the environment. This cycle may maintain continuity, but may also be suggested to promote change in temperament and personality. For example, infants of different temperaments may evoke different caregiving behaviors from the same parent. Or, an infant’s temperament may evoke distinctive responses from different parents. These differences in child and parental behaviors could serve to either maintain or diminish the expression of temperamental and personality differences over time. The final process, proactive transactions, refers to the manner in which individuals move beyond the environments into which they are born and actively select and construct environments of their own (Caspi, 1998). Within a family, the newborn infant’s environment is largely defined by the parents, but as the child grows, both the child and the parents may be actively constructing their mutual environment. However, within a family context, one can also suggest that parents may try to construct an environment that is in harmony with the child’s characteristics, even if it is not what the parents’ own personality would lead them to choose.

Stability and change of personality characteristics and relationship qualities can thus be considered both prerequisites and consequences of dynamic transactions between a person and his/her relationship experiences (Lehnart & Neyer, 2006). These dynamic transactions between individual characteristics and relationship quality are more likely to occur in stable social environments like the family, where the individual characteristics of parent and child represent the specific environmental determinants that may promote stability or rank-order change in both partners of the interaction (Belsky, 1984; Caspi & Roberts, 2001; Neyer & Asendorpf, 2001). In the family, a parent and a child can be seen as active agents who, acting according to their individual characteristics, co-create their emerging and enduring relationship (Collins, Maccoby, Steinberg, Hetherington & Bornstein, 2000; Kochanska et al., 2004; Lengua & Kovacs, 2005; Rubin et al., 1999; Wachs, 2006; van den Boom & Hoeksma, 1994).
In the existing literature, the direct links between various behavioral, physiological, and genetic characteristics in parent and child have been reasonably well established (e.g., Crnic & Low, 2002; Propper & Moore, 2006). In terms of longitudinal causality, the parent’s effects on child development seem better known than the effects that children might have on their parents’ psychological characteristics. Also the bidirectional associations between parent and child characteristics over time still remain less studied. Transactional models in which individual characteristics of parent and child have been shown to be mutually influential have, so far, mainly been reported in relation to clinically relevant outcomes like difficult temperament, psychosocial problems and compliance of the child, or adequacy of parental behavior (e.g., Ge et al., 1996, Lengua 2006; Patterson & Fisher, 2002).

For instance, Rubin et al. (1999) reported that child shyness at the age of two predicted a decrease in maternal and paternal encouragement of independence over two years, whereas parenting behaviors towards 2-year-olds did not predict the 4-year-old child’s shyness (Rubin et al., 1999). In line with this kind of directionality, Belsky et al. (2000) reported that during the child’s third year, a child’s inhibited behavior was likely to increase parental reactivity in terms of both discouraging and encouraging behaviors, whereas parental reactions to the child’s inhibition were poor predictors of inhibited behavior. However, the existing literature of associations between parental psychological characteristics (e.g., Belsky et al., 1991; Kochanska et al., 2004) and subsequent child behavior indicate towards parental effects as well, and raise the question of possible bidirectional causality for these inhibition-related, as well as other aspects of child temperament from infancy onwards.

Further, according to Belsky’s (1984) ecological model, the quality of parenting is especially influenced by three main classes of factors: parent, child and situational characteristics, like contextual stress and supports. Within a family system, parental views of their own and the child’s characteristics, feelings and behavior can thereby be understood as psychological resources or contextual components that will determine the degree to which a parent and child will affect each other from the child’s early years onwards (Belsky, 1984). These perceived characteristics may also be differentially susceptible to each other’s influence. That is, parents’ own characteristics may lead to changes in their views of their children’s temperament-related behavior, or it may be
that parents who view their children as initially higher in some but not other temperamental characteristics may be prone to such parenting experiences that will eventually lead to changes in their views of their own characteristics.

In this study, the environment where the rank-order stability or change in parental and child characteristics is examined is conceptualized in terms of child temperament and parental personality traits and, as a more situational characteristic, the amount of overall parental stress. Even though the existing studies regarding associations between the child’s temperament and parental personality-related characteristics are still relatively ambiguous in regard to causal influence, an attempt of categorizing the studies into those where child effects on the parent are indicated and those indicating parent effects on the child may be of help in forming a general picture of the current knowledge.

1.4.1 Implications of child temperament for parental extraversion and neuroticism

So far, research on the rank-order stability of extraversion and neuroticism has already provided some evidence of possible environmental promoters of change: recent evidence shows that higher life- and work-related satisfaction associates with an increase in extraversion, while lower satisfaction, stress and unemployment relate to an increase in neuroticism (Roberts, Caspi, & Moffitt, 2003; Roberts & Chapman, 2000; Scollon & Diener, 2006; Van Aken et al., 2006). Neyer and Asendorpf (2001), in turn, have proposed that it is interpersonal relations, such as marital and family experiences, that have the highest potential to affect personality change in adulthood: they found that young adults who had recently begun dating showed greater declines in neuroticism and shyness (a reverse facet of extraversion) and larger increases in extraversion compared to participants whose relationship status had not changed. Similarly, getting married and living in a more satisfying relationship has been shown to be associated with an increase in emotional stability and a decrease in neuroticism, while marital tensions, lower marital satisfaction and divorce associate with an increase in neuroticism (Costa, Herbst, McCrae, & Siegler, 2000; Roberts & Chapman, 2000; Robins et al., 2002). Still, questions regarding potential promoters of change in personality during adulthood
(Roberts et al., 2006b; Scollon & Diener, 2006; Terracciano, McCrae, Brant, & Costa, 2005) have so far remained largely unresolved.

Of the important stages and roles of adult life, parenting a young child can be considered a very significant and intimate interpersonal experience that has the potential to cause enduring effects on an individual. While the parental self-concept gradually changes during parenthood (Cowan, Cowan, Heming, & Miller, 1991), this identity process, involving the commitment to a new social role, is also likely to involve at least some change in parental personality over time (Roberts, Wood, & Smith, 2005). Therefore, through their unique impact on parental behavior and on the quality of the parent–child relationship (Calkins, Hungerford, & Dedmon, 2004; Collins et al., 2000; Rubin et al., 1999), temperamentally different children may, in the course of time, also have a unique impact on parents’ own personality traits.

Evidence already exists that positively affective babies evoke more positive reactions from their caregivers than negatively affective babies (e.g., Kochanska et al., 2004; Scarr, 1992; Van den Boom, 1989). In terms of changes in maternal psychological well being, Gartstein and Sheeber (2004) reported that within a group of mothers having parenting difficulties with their 3 to 6-year-old children, child externalizing behavior was predictive of a decline in maternal self-perceived parenting competence: this, in turn, contributed to an increase in maternal depressive symptoms over one year. Further, associations between the child’s early temperament and changes in parents’ sense of global efficacy, personal control, anxiety, and dispositional optimism over time have been shown to exist (Heinonen, Räikkönen, Scheier, Pesonen, Järvenpää, & Strandberg, 2006; Sirignano & Lachman, 1985). Parenting experiences have also been shown to be associated with changes in maternal personality-related characteristics like ego resiliency, feelings of dependency and fearfulness (Paris & Helson, 2002). Still, the influence that the child may actually have on the parents’ personality traits, and especially on the two ‘best-known’ traits extraversion and neuroticism, is less known.

1.4.2 Implications of parental extraversion and neuroticism for child temperament

As Rothbart and Putnam (2002) suggested, a child’s temperament as it interacts with the environment is likely a better predictor of developmental outcomes than temperament
alone. Environmental pressures within the social context, especially at an early age, provide the structure around which temperamental dispositions will be modified. In evaluating the associations between parental personality and child temperament, it is thus essential to pay attention to the period of infancy and the early appearance of the child’s temperamental characteristics that will strongly affect the child’s concurrent and subsequent behavior.

The continuity estimates of childhood temperament reported so far (Putnam et al., 2008; Rothbart et al., 2000b) also leave room for contextual factors. In other words, instead of conceptualizing temperament as a set of highly stable traits inherent in the child, its continuity, especially in terms of self-regulative functions, can be seen as relating to the child’s social environment (Rothbart & Bates, 2006). Accordingly, the development of infant temperament has consistently been shown to be affected by, besides genetic influence, the unique environment of the child (e.g. Goldsmith, Lemery, Buss & Campos, 1999; Propper & Moore, 2006; Stright, Gallagher, & Kelley, 2008).

Among the most significant contextual elements in a child’s environment are parental characteristics. Given the role temperament plays in later behavior and adjustment problems, testing the effects of parental personality on their child’s temperament (e.g., Rothbart et al., 2000; Caspi, 2000), along with their influence in proximal interactions (Crockenberg & Smith, 2002; van den Boom & Hoeksma, 1994) and in various other processes in the child’s development (e.g., Kochanska, 1997) is of particular importance.

In terms of parental extraversion and neuroticism, previous studies have revealed that parents with high extraversion and low neuroticism display more positive, supportive, and responsive parenting and less negative, controlling parenting (Belsky & Barends, 2002; Belsky, Crnic, & Woodworth, 1995; Clark, Kochanska, & Ready, 2000; Losoya, Goldsmith, Callor, & Rowe, 1997; Metsäpelto & Pulkkinen, 2003). In contrast, parents’ high neuroticism is often found to be associated with less sensitive, less affective and less stimulating parenting (Belsky et al., 1995). Associations between higher parental extraversion and more positive evaluations and more positive outcomes of the child, as well as between higher parental negative affectivity and neuroticism and more negative evaluations and outcomes of the child have also been hitherto quite consistently established (e.g., Belsky et al., 1991; Gartstein & Marmion, 2008; Kochanska et al.,
2004; Kurdek, 2003; Propper & Moore, 2006). In general, no significant differences in the effects of parent-related determinants on maternal and paternal behavior have been detected (Metsäpelto & Pulkkinen, 2003; Verhoeven, Junger, Van Aken, Dekovic, & Van Aken, 2007).

1.4.3 Child temperament and parental situational factors: the case of parental stress

Besides parents’ own personality- or temperament-related psychological characteristics, situational factors within the parents’ life may also have a significant effect on parental feelings and behavior within a family, and especially within the parent’s relationship with the child. Despite the origin of those situational experiences, i.e., whether they originate from within or outside of the family, parents’ individual interpretations of and feelings related to those experiences may further influence the parents’ and the child’s behavior at home.

Because parents in modern societies are under various pressures, one of the most important and influential situational factors in an adult’s life may be the amount of perceived stress. Stress in the family context, especially when that stress is chronic and present early in the child’s development, can further have detrimental effects on the wellbeing of the family and the quality of parent–child relationships. Accordingly, the existing literature shows associations between parental parenting-, daily-, life-event, and other environment-related stress and parent- and/or teacher-reported child behavioral problems, adjustment difficulties, and internalizing or externalizing problems in the early childhood period (Anthony et al., 2005; Conger, McCarty, Yang, Lahey, & Kropp, 1984; Coplan, Bowker, & Cooper, 2003; Creasey & Reese, 1996; Deater-Deckard & Scarr, 1996; Kliewer & Kung, 1998; Peterson & Hawley, 1998).

However, the majority of research in this area has mainly focused on a specific concept, ‘parenting stress’, that is defined in terms of dysfunctional parent–child interaction, parental anxiety or depression, and ‘difficult’ or challenging child-behavior characteristics (Abidin, 1990; Crnic & Greenberg, 1990). This kind of parenting stress does not necessarily reflect the more global appraisal of stress that may result from various life domains other than parenting (e.g., work and marital discord). The existing evidence, however, implies that it is not only stress that is roused by parenting
experiences that may have an influence on family functioning, parental behavior and dyadic interaction between a parent and a child at home (Crnic, Gaze, & Hoffman, 2005; Deater-Deckard & Scarr, 1996).

The stability of parental stress is an assumption that seems to underlie much of the research within the field, although, due to the relative lack of longitudinal research, it has not been established to any reliable extent. As in studies of adult personality, studies of parental stress show greater stability for shorter time periods between assessments (Crnic et al., 2005). In the study of Mulsow and her colleagues (2002), maternal parenting stress was shown to be stable between the child’s ages of 15 and 36 months (Mulsow, Caldera, Pursley, Reifman, & Huston, 2002), and in the recent Rantanen et al. (2008) study, parenting stress of mothers and fathers with children living at home showed moderate to high stability, but was more stable across a one-year period than across a six-year period (Rantanen, Kinnunen, Feldt, & Pulkkinen, 2008). Further, in Crnic et al. 2005, two indices of maternal stress, namely experiences of major life events and parenting daily hassles, appeared to be stable over two years across the preschool period: stressed mothers at child age three were likely to report higher stress at child age five. However, in the study of Östberg, Hagekull and Hagelin (2007), the individual stability of maternal parenting stress over a six-year period in a clinical intervention group with infant sleeping and feeding problems was only moderate, decreasing slightly over time from infancy to the child’s age of six to seven.

Similar to the development and over-time stability reported for the more constitutionally based characteristics of child temperament and parental personality traits, the stabilities found for the level of parental stress make it clear that there is ample room for change. The parents’ experience of overall stress can increase or ease off over time, and many parents do change; the intriguing question is whether these changes can be predicted from some internal family factors. The idea of being able to predict or define some typical correlates of change in parents’ experience of stress makes the efforts to identify such factors within a family an exciting area for inquiry.

1.4.3.1 Implications of child temperament for parental stress

In evaluating the associations between parental stress and child temperament, periods in infancy and early childhood are again considered to be of greatest importance.
Concurrent associations between so called ‘difficult temperament’ and parenting stress have provided evidence in support of the notion that infant difficultness can undermine parental functioning (Belsky, 1984; Belsky, Rha, & Park, 2000; Calkins et al., 2004; Collins, Maccoby, Steinberg, Hetherington, & Bornstein, 2000; Gartstein & Sheeber, 2004; Heinonen et al., 2006; Kochanska et al., 2004; Rubin et al., 1999; van den Boom & Hoeksma, 1994), although evidence concerning these effects is not altogether coherent (Putnam, Sanson & Rothbart, 2002; Rothbart, 1986). In terms of concurrent associations between early temperament and parental stress, Gelfand, Teti and Fox (1992) reported a significant association between the mothers’ parenting stress and difficult temperament among three- to 13-month-old infants. Mulsow and her colleagues (2002) also reported a significant association between maternal parenting stress and infant difficultness at one month, but not at six or 15 months, and Honjo and his colleagues (1999) found maternal child-rearing stress to be related to infant-temperamental difficulty at 18 months, but not at six months. Associations between parental stress and child temperament have also been reported among 21-month-old toddlers (Östberg & Hagekull, 2000) and among 48-month-old children (Coplan et al., 2003).

However, the possible over-time effects of the child’s initial temperamental characteristics on the parents’ stress experience remain largely unexplored. With regard to specific caregiving-related problems during infancy, namely problems with feeding and sleeping, it has been shown that parenting stress at the child’s age of six to seven can, at least partly, be predicted by these early child and family problems and associated early stress (Östberg et al., 2007). It can thus be assumed that, similar to the changes in parental self-concept and personality characteristics induced by the parenting role (Cowan et al., 1991; Roberts et al, 2005; Paris & Helson, 2002), the parental role may also be accompanied by changes in the level of parental experience of stress over time.

The existing evidence further shows, that mothers and fathers are generally more similar than different in their specific levels of stress experience (Creasey & Reese, 1996; Deater-Deckard & Scarr, 1996) and associated experiences (Deater-Deckard, Scarr, McCartney, & Eisenberg, 1994). For example, Crnic and Booth (1991) reported no differences in the absolute number or intensity of the everyday parenting hassles that mothers and fathers experienced. The stability of parental stress and the associations
between stress and child outcomes have also generally been shown to be independent of the parent’s or child’s gender (Mulso et al., 2002; Rantanen et al., 2008; Räikkönen et al., 2006).

1.4.3.2 Implications of parental stress for child temperament

Both parental overall stress and parenting-related stress have been proven to be significant predictors of parent and child behavior and dyadic interaction (e.g., Bergman, Sarkar, Glover, & O’Connor, 2008; Conger et al., 2002; Crnic et al., 2005; Repetti & Wood, 1997), but so far only a few studies have investigated the associations between a more global experience of parental stress and child temperament. Especially in terms of early temperament, the causality of associations between parental stress and infant/child temperament over time is, to a large degree, still an unexplored area.

Support for the idea that it is parenting stress that plays a causal role in the emergence of problematic child temperament is provided by the evidence of predictive associations between maternal prenatal stress and subsequent negative views of the child’s temperament and mental health morbidity. Huizink and her colleagues (2002) reported associations between increased maternal prenatal and/or postnatal stress and infant ‘unadaptability’ (Huizink, Robles de Medina, Mulder, Visser, & Buitelaar, 2002). In the same cohort, increased levels of maternal prenatal stress further appeared to be associated with temperamental and behavioral problems at the child’s age of two years (Gutteling et al., 2005). Likewise, in the study of Pesonen and her colleagues (2005), mothers who reported continuous high stress from the pre- to the postnatal period over six months perceived the temperament of their six-month-old infants as more negatively and less positively tuned than did mothers who experienced increasing, decreasing or continuous low stress over the same periods. Maternal stress across child ages two to three years has also been shown to play a causal role in the emergence of problematic child behavior (Belsky et al., 1996). Also in the recent studies of Robinson, Oddy et al. (2008) and Bergman, Sarkar et al. (2008), high or increasing stress during pregnancy was predictive of child mental health morbidity or fearfulness in toddlerhood and at the age of five.

In terms of a more global experience of stress, evidence of the predictive link between parental overall stress and subsequent child temperament can be drawn from
the above-mentioned studies of prenatal stress (Bergman et al., 2008; Huizink et al., 2002; Pesonen et al., 2005; Robinson et al., 2008). Further, Räikkönen and her colleagues (2006) reported associations between parents’ higher perceived global stress and more negatively tuned perceptions of the child’s temperament during infancy. In the study of Crnic, Gaze and Hoffman (2005), the intercorrelation between two indices of parental stress, namely more general life stress and more specific parenting daily hassles at the child’s age of three, was low, indicating that those two indexes of stressfulness were predominantly independent, but they were both still predictive of parent and child behavior and dyadic interaction at the child’s age of five. The authors thus concluded that cumulative stress, resulting from parenting hassles or other life events, may build across developmental periods to create an increased risk for parenting and child functioning (Crnic et al., 2005).

However, studies that focus on the predictive associations between parental overall stress and child temperament from infancy to childhood still seem to be lacking. Further, even though temperament is a neutral construct that covers a wide variance of behavior, there still seems to be a lack of longitudinal studies moving from global ‘child-difficultness’, or problematic behavior –measures to linking parental overall stress with their perceptions of a wider range of infant/child temperamental characteristics over time.

### 1.5 Aims of the study

The overall aim of the current study was to examine the degree of continuity of temperament over five years from the infant’s age of six months to the child’s age of five and a half years, and to investigate the bidirectional effects between child temperament and parents’ personality traits and experienced overall stress during that time. Figure 1 shows the general outline of the current study.
1.5.1 Continuity of temperament from infancy to middle childhood

1.5.1.1 Study I. Continuity of mother-rated temperament

First, I addressed the question of temperamental continuity among 231 Finnish children within the theoretical framework and operational definitions developed by Rothbart and her co-workers (e.g., Rothbart & Bates, 2006; Rothbart et al., 2001). I assessed differential homotypic and heterotypic continuity between individual subscales and latent superconstructs of temperament as rated by the mother when the child was aged six months and when the child was aged five and a half years. Based primarily on Rothbart’s theory emphasizing developmental continuity and structural change of temperament, and partly on the prior findings (Rothbart & Bates, 2006), I hypothesized that all individual temperament subscales in infancy would show differential homotypic and/or heterotypic continuity up until middle childhood.
As for the latent temperament superconstructs, I hypothesized that significant continuities would be found between infant positive affectivity and middle childhood extraversion, and between infant and middle childhood negative affectivity. I also hypothesized that infant positive affectivity would predict effortful control in middle childhood, as the positive affectivity construct contains early characteristics of self-regulation, i.e. duration of orienting (Kochanska et al., 1998). Additionally, based on previous literature on the associations between early activity and later extraversion (Eaton, 1994; Hagekull & Bohlin, 1998), specific effects of infant activity were also tested by including specific paths from infant activity to the middle childhood superconstructs in the model of latent superconstructs.

Moreover, by taking an ipsative, person-level approach to temperamental continuity, I aimed to explore whether temperament from infancy to middle childhood clustered to form profiles indicative of the personality types characterized in research on personality. As there are both empirical and conceptual links between temperament and personality traits, I hypothesized that temperament in infancy and in childhood would cluster to form profiles indicative of three different temperament types that would correspond conceptually to the personality types consistently identified in childhood and adulthood, i.e., the resilient, undercontrolled and overcontrolled personality types (Asendorpf et al., 2001; Asendorpf & van Aken, 1999; Caspi & Silva, 1995; Robins et al., 1996). Infant activity level was included as a separate dimension in the cluster formation.

I hypothesized that, first, the temperament type corresponding to the resilient type would be marked by a relatively high level of positive emotionality in infancy and low levels of negative affectivity both in infancy and in childhood, and relatively high effortful control in childhood. Second, the temperament type corresponding to the undercontrolled type would be characterized by relatively high levels of negative affectivity both in infancy and in childhood, and a high level of extraversion and relatively weak self-regulative capacities in childhood. Finally, the overcontrolled temperament type would be marked by relatively high negative affectivity in infancy and by low extraversion and relatively high self-regulative capacities in childhood. The level of infant activity was hypothesized to be positively associated with childhood extraversion and, accordingly, be relatively high in the second, more undercontrolled type, and low in the third, more overcontrolled type.
1.5.1.2 Study II. Continuity of father-rated temperament

Second, I aimed to fill the gap in our knowledge of father-rated temperamental continuity from infancy to middle childhood within a sample of 115 father-infant-child dyads. Within this second study, I also examined whether the developmental paths in father-rated temperament were similar to those of mother-rated temperament within a sample of 109 father–mother–infant/child -triads. The smaller sample size in father-ratings, however, restricted me to the variable level analyses, and did not allow a reliable enough ipsative level analysis.

Because mother- and father-rated temperament have, according to previous cross-sectional data, been shown to be interrelated, and show a similar structural pattern in infancy, toddlerhood and childhood, I hypothesized that father-rated temperament would also show significant homo- and heterotypic continuity from infancy to five and a half years of age. I also hypothesized that paternal and maternal ratings of temperament would show congruent continuity.

1.5.2 Transactional development of parent and child characteristics from infancy to middle childhood

After demonstrating the continuity of parent-rated temperament in itself from infancy to middle childhood, the next step of the present study was to capture the transactions between parental characteristics and child temperament over the same period of time. The bidirectional effects between child temperament and parental characteristics were investigated in terms of parents’ personality traits and overall stress experienced during that time.

1.5.2.1 Study III. Parental personality traits extraversion and neuroticism and infant/child temperament

In the third study, I aimed to examine rank-order stability and transactional associations between parents’ personality traits extraversion and neuroticism (McCrae & Costa, 1987; McCrae & John, 1992) and the parents’ views of their infant’s/child’s temperament within a sample of 109 mother-father-infant/child triads. The stability and change in parental extraversion and neuroticism were examined in relation to parent-rated infant activity and sumscores of positive and negative affectivity and ratings of the
child’s temperamental sumscores extraversion, effortful control, and negative affectivity.

In line with existing literature, parental extraversion and neuroticism were expected to show high stability over five years. In terms of parental personality change, I hypothesized that parental ratings of the infant’s higher positive affectivity would predict an increase in parental extraversion and a decrease in neuroticism, and that ratings of the infant’s higher negative affectivity would predict an increase in parental neuroticism and a decrease in extraversion. Infant activity was examined with no specific direction of change in parental personality hypothesized. Further, initially higher parental extraversion was expected to predict higher parent-rated extraversion and effortful control and lower negative affectivity in the child, and initially higher parental neuroticism was expected to predict ratings of lower extraversion and effortful control, and higher negative affectivity in the child.

1.5.2.2 Study IV. Mother’s overall stress and infant/child temperament

Next, I aimed to depict the over-time stability and transactional associations between mothers’ perceived overall stress and infant/child temperament over the same time period within a sample of 231 mothers and their infants/children. In this fourth study, the first aim was to test the transactional associations between maternal stress and six individual temperament subscales that represented conceptual equivalents in the infants’ as in the children’s temperament questionnaires. The subscales activity level, anger/frustration, fear, soothability, attentional focusing, and smiling and laughter were chosen for the analyses. Second, I aimed to test whether there were transactions between maternal stress and the latent infant/child temperament superconstructs.

I hypothesized that temperament characteristics reflecting higher negative emotionality and lower positive affectivity in infants would contribute to an increase in maternal stress over five years beginning in infancy, and that higher maternal stress would contribute to an increase in the child’s negative affectivity and a decrease in positive affectivity characteristics and self-regulative functioning over the same period.

In sum, the current study first aimed at establishing the continuity of temperament within a family context, as perceived by both parents, and examining whether the developmental paths of infant/child temperament are similar in both parents’ eyes.
Second, the study aimed to examine the transactional associations between parental personality traits of extraversion and neuroticism and infant/child temperament, and further, explore the transactional development of maternal perceived stress and maternal ratings of infant/child temperament over this five-year period.
2 METHODS

2.1 Outline of the study

The ongoing Glaku project was initiated in 1998. It was designed to examine the neonatal and early childhood predictors of hypertension development, as well as normative psychological development in childhood. The Glaku project is a collaborative study involving the Departments of Psychology and Medicine at Helsinki University, and the Department of Pediatrics and Neonatology at Helsinki City Maternity hospital. At the baseline of the study in 1998 the infants averaged six months of age (M= 6.3, S.D. = 1.4 months). A follow-up was conducted five years later in 2003–2004, at which point the children averaged five and a half years of age (M= 66.1, S.D. = 2.9 months). These two time-points served as the sample for the current study. A second follow-up was conducted in 2006, and a further follow-up will be conducted in 2009.

The initial study sample was collected between March 1st and November 30th of 1998 in Helsinki City Maternity hospital (Kätilöopiston sairaala). The hospital is one of the principal maternity hospitals in Helsinki, with approximately 4500 births per year. The midwives in four regular maternity wards were asked to give a questionnaire to all women with singleton healthy births in which both parents were of Finnish origin. During this period there were 2746 births that would have been eligible. For reasons connected with the vacation period of the midwives, some mothers did not receive the questionnaire (only 30 of the invited mothers refused to participate). However, it is not likely that this involved selection bias, because the midwives were unaware of the exact aims of the study (Strandberg, Järvenpää, Vanhanen, & McKeigue, 2001).

2.2 Participants

In 1998, a total of 1049 mothers completed the questionnaire, which included questions on antenatal stress and nutrition, and on other lifestyle variables, as well as a question eliciting permission to examine their maternity records. Of these 1049 mothers, the first 500, along with the biological fathers of the baby, were invited to participate in a psychological survey on child development.

Of these 500 families, a total of 328 (65.6%) family units (mother and/or father) returned the questionnaire sent to them by mail approximately six months after the delivery. Of these family units, data on both biological parents was simultaneously
available on 180 units, 141 questionnaires were returned only by the mother and seven only by the father. In total, 321 mothers and 187 fathers returned the questionnaire. Details of the research protocol and of the recruitment of the initial sample are described in Strandberg et al. (2001). The participants in Studies I – IV were taken from the same sample consisting of families that participated in the Glaku project at baseline in 1998 when the infant was six months of age and again at follow-up in 2003-2004, at the child’s age of five and a half years. The institutional Review Board at the University of Helsinki approved this project, and the participating parents gave their informed consent.

A total of 231 mother-infant/child dyads providing data at both data-collection points formed the sample for Study I. A total of 115 father-infant/child dyads, providing data at both data-collection points formed the sample for the first aim of Study II, and a total of 109 father–mother–infant/child triads, providing data at both data-collection points formed the sample for the second aim of Study II. A sample of 109 mother-father-infant/child triads providing complete parental and child data at both time points formed the sample for Study III, and a total of 231 mother–infant/child dyads providing complete parental and child data at both time points formed the Study IV sample.

2.3 Measures

2.3.1 Infant temperament

Parental ratings of infant temperament were derived using the Infant Behavior Questionnaire (the IBQ, Rothbart, 1981). The questionnaire is designed to refer to specific, concrete behaviors of the infant, occurring during the past week (previous two weeks for some items). The 96 items in the IBQ are evaluated on a seven-point scale reflecting the relative frequency of specified infant reactions. There are six subscales (Rothbart, 1986). Activity level describes the level of the infant’s gross motor activity, including movement of the arms and legs, squirming, and locomotor activity. Smiling and laughter is related to expressions of joy. Soothability (the recovery parameter of distress) is defined as the effectiveness of soothing techniques when the child is experiencing negative affects. Duration of orienting refers to sustained involvement with a single object or activity when there has been no sudden change in stimulation. Distress to limitations refers to distress when goal achievement has been blocked or a
desirable object removed. Fear is expressed by crying or fussing and/or extended latency to approach intense or novel stimuli.

Infant positive affectivity superconstruct has in previous studies been comprised of slightly differing combinations of smiling and laughter, duration of orienting, soothability and activity level (see, e.g., Goldsmith & Campos, 1990; Kochanska et al., 1998; Rothbart, 1986; Worobey & Blajda, 1989), while distress to limitations and fear have quite consistently been used in defining a negative affectivity superconstruct (see, e.g., Kochanska et al., 1998; Rothbart, 1986). Infant activity has been shown to associate, besides positive affectivity, with negative affectivity as well (Goldsmith & Campos, 1990; Goldsmith et al., 1999; Kochanska et al., 1998; Lemery et al., 1999; Rothbart, 1986; Worobey & Blajda, 1989).

The temperament superconstructs in the first, second and fourth study were devised by defining the latent factors in the structural equation model, and in the third study by computing the sumscores. The infant positive affectivity factor was defined by smiling and laughter, duration of orienting and soothability, and infant negative affectivity was defined by distress to limitations and fear, while infant activity was allowed to load on both positive and negative affectivity latent factor in the structural equation model. In the cluster analysis in Study I and in the multilevel analysis in Study III, infant positive and negative affectivity superconstructs were computed as described in previous studies (Kochanska et al., 1998; Rothbart et al., 2001), with the exception that infant activity was not included in the superconstructs, but was used as a separate dimension in the analyses.

Previous studies have reported good test-retest and alpha reliabilities for the IBQ (Gartstein, Slobodskaya, & Kinsht, 2006; Gartstein & Rothbart, 2003; Rothbart, 1986). Convergence between laboratory observation ratings of temperament and the IBQ scales has also been reported (Bridges, Palmer, Morales, Hurtado & Tsai, 1993; Goldsmith & Rothbart, 1991). In the current study the Cronbach’s alphas for the subscales ranged from 0.74 to 0.93. Moreover, the confirmatory factor analyses conducted in Studies I and II confirmed the construct validity in the Finnish sample.
2.3.2 Child temperament

Parental ratings of the child’s temperament were elicited by using the Children’s Behavior Questionnaire (the CBQ, Rothbart et al., 2001). The 195 items in the CBQ are evaluated on a seven-point scale reflecting the relative frequency of specified child reactions in concrete situations in previous weeks. There are 15 subscales. Activity level describes the level of the child’s gross motor activity. Anger/Frustration refers to negative affectivity related to the interruption of an ongoing task, or goal blocking. Approach anticipation refers to the amount of excitement and anticipation expressed toward expected pleasurable activities. Attentional focusing refers to the capacity to maintain attentional focus on task-related channels. Discomfort means negative affectivity related to sensory qualities of stimulation, including intensity, rate, and complexities of light, movement, sound and texture. Falling reactivity and soothability (the recovery parameter of distress) is the rate of recovery from peak distress, excitement, or general arousal. Fear is expressed by negative affectivity including unease, worry or nervousness, which is related to anticipated pain or distress and/or potentially threatening situations. High intensity pleasure refers to enjoyment related to situations involving high stimulus intensity, rate, complexity, novelty, and incongruity. Impulsivity is the speed of response initiation. Inhibitory control is the capacity to plan and to suppress inappropriate approach responses under instructions or in novel or uncertain situations. Low intensity pleasure means enjoyment related to situations involving low stimulus intensity, rate, complexity, novelty, and incongruity. Perceptual sensitivity is the detection of slight, low-intensity stimuli from the external environment. Sadness refers to negative affectivity and lowered mood and energy related to exposure to suffering, disappointment, and object loss. Shyness refers to slow or inhibited speed of approach and discomfort in social situations. Finally, Smiling and laughter is related to positive affect in response to daily happenings.

According to Rothbart et al. (2001), high levels of impulsivity, high intensity pleasure, activity level, smiling and laughter, and positive anticipation, and a low level of shyness form an extraversion superconstruct; high levels of low intensity pleasure, inhibitory control, perceptual sensitivity and attentional focusing form an effortful control superconstruct; and high levels of fear, sadness, discomfort, and anger/frustration and a low level of soothability form a negative affectivity
superconstruct. These superconstructs were devised in the current study by defining the latent factors in the structural equation models and computing the sumscores. Previous studies have reported good test-retest and alpha reliabilities for the CBQ (Rothbart et al., 2001). In the current study, the Cronbach’s alphas for the subscales ranged from 0.65 to 0.90. Moreover, the confirmatory factor analyses conducted in Studies I and II confirmed the construct validity in the Finnish sample.

2.3.3 Parental personality traits
Parental personality traits were assessed on the extraversion and neuroticism scales derived from the authorized adaptation of the NEO personality inventory (NEO-PI; Costa & McCrae, 1985; Pulver, Allik, Pulkkinen, & Hämäläinen, 1995). The self-report questionnaire contains 48 items measuring extraversion and 48 items measuring neuroticism, and these 96 items were included in the assessment of parental personality at both time points. Extraversion is defined in terms of warmth, gregariousness, assertiveness, activity, excitement-seeking and positive emotions, and neuroticism in terms of anxiety, anger, depression, self-consciousness, impulsiveness, and vulnerability. The items are scored on a five-point Likert scale (strongly disagree to strongly agree), and support for the validity and reliability of the domains has been consistent (Costa & McCrae, 1992; McCrae & Costa, 1987). In the current study, the Cronbach’s alphas for extraversion and neuroticism ranged from .91 to .94 at both data-collection points.

2.3.4 Perceived stress
The mothers self-reported their level of perceived overall stress approximately six months postpartum and again five years later using the shortened version of the original 14-item perceived stress scale (the PSS; Cohen, Kamarck, & Mermelstein, 1983). PSS is sensitive to chronic stress deriving from ongoing life circumstances, expectations concerning future events, or from any life-events. The items are designed to tap the degree to which respondents find their lives unpredictable, uncontrollable, and overwhelming. These three issues have been repeatedly found to be central components of the experience of stress (Cohen et al., 1983).
The short version, constructed as suggested by Cohen and his colleagues (1983), consisted of the four items that were originally most highly correlated with the 14-item scale: the scale thus includes statements such as ‘How often have you found that you could not cope with all the things that you had to do’ and ‘How often have you felt that you were on top of things (a reversed item)’. In the current study, an additional fifth question, derived from the original scale, asking directly about the level of experienced stress was added: ‘In the last month, how often have you felt nervous and stressed’? Mothers evaluated the degree to which they had appraised situations in their lives as stressful (unpredictable, uncontrollable, overwhelming) in recent weeks on these five items, using a scale ranging from never (1) to all the time (5). The scale has shown good reliability and validity in prior studies (Cohen et al., 1983). Cronbach’s alpha in the current study was .79.

2.4 Statistical analyses

Structural equation modeling was the main statistical method used in all four studies. Several analyses were used for comparative purposes, such as the t-tests for independent and dependent variables. In Study I, the k-means clustering algorithm was used to test how the study variables (sumscores) in infancy and in middle childhood clustered to profiles. Univariate analysis of variance (ANOVA) was used in verifying that the clusters were significantly different on the criterion variables. Structural equation modeling and path analyses were performed using the Mplus statistical package 2.13-4.1 (Muthén & Muthén, 1998 - 2006). Standard model-fitting procedures and the maximum-likelihood-estimation method were adopted. Table 1 summarizes the information on participants, research design, measures, and main statistical analyses in the current study.
<table>
<thead>
<tr>
<th>Study</th>
<th>Participants</th>
<th>Measures</th>
<th>Main statistical methods</th>
</tr>
</thead>
</table>
| I     | N=231 mother-infant/child-dyads | *Baseline 1998, infant age 6 months:* Infant Temperament Questionnaire (IBQ)  
*Follow-up 2004, child age 5½ years:* Children’s Behavior Questionnaire (CBQ)  
*Follow-up 2004, child age 5½ years:* Children’s Behavior Questionnaire (CBQ)  
Follow-up 2004, child age 5½ years: Children’s Behavior Questionnaire (CBQ)  
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Follow-up 2004, child age 5½ years: Children’s Behavior Questionnaire (CBQ)  
Follow-up 2004, child age 5½ years: Children’s Behavior Questionnaire (CBQ)  
Follow-up 2004, child age 5½ years: Children’s Behavior Questionnaire (CBQ) | Confirmatory factor analysis, Structural equation modeling,  
t-test for independent samples,  
k-means clustering algorithm,  
ANOVA, post hoc t-tests  
(Pearson correlations) |
*Follow-up 2004, child age 5½ years:* Children’s Behavior Questionnaire (CBQ)  
*Follow-up 2004, child age 5½ years:* Children’s Behavior Questionnaire (CBQ)  
Follow-up 2004, child age 5½ years: Children’s Behavior Questionnaire (CBQ)  
Follow-up 2004, child age 5½ years: Children’s Behavior Questionnaire (CBQ)  
Follow-up 2004, child age 5½ years: Children’s Behavior Questionnaire (CBQ)  
Follow-up 2004, child age 5½ years: Children’s Behavior Questionnaire (CBQ)  
Follow-up 2004, child age 5½ years: Children’s Behavior Questionnaire (CBQ)  
Follow-up 2004, child age 5½ years: Children’s Behavior Questionnaire (CBQ)  
Follow-up 2004, child age 5½ years: Children’s Behavior Questionnaire (CBQ) | Confirmatory factor analysis, Structural equation modeling,  
t-tests for independent and dependent samples,  
(Pearson correlations) |
| III   | N=109 mother-father-infant/child-triads | *Baseline 1998, infant age 6 months:* Infant Temperament Questionnaire (IBQ)  
NEO personality inventory (NEO-PI)  
*Follow-up 2004, child age 5½ years:* Children’s Behavior Questionnaire (CBQ)  
NEO personality inventory (NEO-PI) | Confirmatory factor analysis, Structural equation modeling  
multilevel technique,  
t-tests for independent and dependent samples,  
(Pearson correlations) |
| IV    | N=231 mother-infant/child-dyads | *Baseline 1998, infant age 6 months:* Infant Temperament Questionnaire (IBQ)  
Perceived Stress Scale (PSS)  
*Follow-up 2004, child age 5½ years:* Children’s Behavior Questionnaire (CBQ)  
Perceived Stress Scale (PSS) | Confirmatory factor analysis, Structural equation modeling,  
(Pearson correlations) |
3 RESULTS

The main results of the four separate studies are summarized below. The details are to be found in the original publications.

3.1 Study I. Continuity of mother-rated temperament from infancy to middle childhood

3.1.1 Continuity of temperament subscales and superconstructs

Pearson correlations were computed to test differential homotypic and heterotypic continuity between the individual subscales of temperament measured in infancy (IBQ) and in middle childhood (CBQ) over five years (Table 2). Activity level, smiling and laughter, distress to limitations and fear showed significant homo- and heterotypic continuity from infancy to middle childhood, whereas there was evidence only of heterotypic continuity for soothability and duration of orienting. Heterotypic continuity was shown, for example, between higher infant activity and later aspects of extraversion (e.g. approach anticipation and high-intensity pleasure) and between higher infant smiling and laughter and later low-intensity pleasure, and between higher levels of infant distress to limitations and fear and later sadness. Associations indicating developmental interaction between traits that are controlled by separate genetic mechanisms were also shown, for example, between higher infant soothability and later high-intensity pleasure, and between higher infant fear and lower levels of low-intensity pleasure and smiling and laughter in middle childhood.

Confirmatory factor analysis (CFA) was used to verify the factor structures of infant positive and negative affectivity (Kochanska et al., 1998) and middle childhood extraversion, effortful control and negative affectivity latent superconstructs (Rothbart et al., 2001), and the confirmed factor structure was used as a foundation for the structural analyses. Figure 2 shows the a priori hypothesized model including all possible paths from the positive and negative affectivity latent superconstructs in infancy to the extraversion, effortful control and negative affectivity latent superconstructs in middle childhood.

The positive affectivity latent superconstruct in infancy predicted extraversion and effortful control in middle childhood, while negative affectivity in infancy predicted
negative affectivity in middle childhood. The model showed an adequate fit ($\chi^2$/df = 1.9; RMSEA= 0.06; CFI = 0.914), and temperament in infancy accounted for 4.6, 22.3 and 6.0% of the variance in extraversion, effortful control, and negative affectivity in middle childhood, respectively.

An additional SEM involving the specific effects of infant activity, as an addition to paths from infancy to middle childhood latent superconstructs, is presented in Figure 3. The model with specific effects of infant activity showed an acceptable fit ($\chi^2$/df = 1.9; RMSEA= 0.06; CFI = 0.922), and the $\chi^2$ difference test showed that the model with the specific effects of infant activity fitted the data significantly better than the initial a priori hypothesized model that did not involve the specific effects. The model involving specific effects revealed significant paths from infant activity to later extraversion and negative affectivity, while the path to effortful control was not significant. In this model, infant temperament accounted for 8.1, 23.0, and 11.7% of the variance in extraversion, effortful control, and negative affectivity in middle childhood, respectively. Adding the specific paths of infant activity in the model eliminated the significant path from infant positive affectivity to extraversion.
Table 2. Pearson correlations between the temperament subscales measured in infancy and in middle childhood (N = 231 mother-infant/child-dyads)

<table>
<thead>
<tr>
<th></th>
<th>Activity Level</th>
<th>Smiling / Laughter</th>
<th>Soothability</th>
<th>Duration of Orienting</th>
<th>Distress to Limitations</th>
<th>Fear</th>
</tr>
</thead>
<tbody>
<tr>
<td>Middle childhood:</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>CBQ</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity Level</td>
<td>.26**</td>
<td>.09</td>
<td>.05</td>
<td>.01</td>
<td>.02</td>
<td>.03</td>
</tr>
<tr>
<td>Anger/Frustration</td>
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<td>-.05</td>
<td>.03</td>
<td>.04</td>
<td>.16*</td>
<td>.12</td>
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<tr>
<td>Approach/Anticipation</td>
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<td>.29**</td>
<td>.20**</td>
<td>.19**</td>
<td>-.01</td>
<td>-.00</td>
</tr>
<tr>
<td>Attentional Focusing</td>
<td>-.10</td>
<td>.10</td>
<td>.12</td>
<td>.05</td>
<td>-.01</td>
<td>-.12</td>
</tr>
<tr>
<td>Discomfort</td>
<td>-.03</td>
<td>-.12</td>
<td>-.02</td>
<td>-.00</td>
<td>.16*</td>
<td>.10</td>
</tr>
<tr>
<td>Falling Reactivity &amp; Soothability</td>
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<td>.20**</td>
<td>.06</td>
<td>.07</td>
<td>-.34**</td>
<td>-.11</td>
</tr>
<tr>
<td>Fear</td>
<td>-.05</td>
<td>-.04</td>
<td>-.04</td>
<td>.01</td>
<td>.16*</td>
<td>.23**</td>
</tr>
<tr>
<td>High-Intensity Pleasure</td>
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<td>.09</td>
<td>.15*</td>
<td>.01</td>
<td>.02</td>
<td>-.08</td>
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<tr>
<td>Impulsivity</td>
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<td>.14*</td>
<td>-.01</td>
<td>.02</td>
<td>.05</td>
</tr>
<tr>
<td>Inhibitory Control</td>
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<td>.06</td>
<td>.08</td>
<td>-.07</td>
<td>-.05</td>
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<tr>
<td>Low-Intensity Pleasure</td>
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<td>.11</td>
<td>.08</td>
<td>-.02</td>
<td>-.14*</td>
</tr>
<tr>
<td>Perceptual Sensitivity</td>
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<td>.12</td>
<td>.26**</td>
<td>-.09</td>
<td>-.03</td>
</tr>
<tr>
<td>Sadness</td>
<td>-.05</td>
<td>.01</td>
<td>.05</td>
<td>.11</td>
<td>.14*</td>
<td>.18**</td>
</tr>
<tr>
<td>Shyness</td>
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<td>-.11</td>
<td>.02</td>
<td>.09</td>
<td>-.02</td>
</tr>
<tr>
<td>Smiling/Laughter</td>
<td>.20**</td>
<td>.34**</td>
<td>.15*</td>
<td>.13*</td>
<td>-.11</td>
<td>-.19**</td>
</tr>
</tbody>
</table>

p < .05, * p < .01, **

Figure 2. Structural equation model showing associations between latent temperament superconstructs measured in infancy and in middle childhood. Standardized values are given for the path coefficients. All the nonsignificant paths are also presented ($\chi^2$/df = 1.9; RMSEA = 0.06; CFI = 0.914)
Figure 3. Structural equation model showing associations between latent temperament superconstructs measured in infancy and in middle childhood, with specific paths from infant activity to the middle childhood superconstructs included in the model. Standardized values are given for the path coefficients. All the nonsignificant paths are also presented ($\chi^2$/df = 1.9; RMSEA = 0.06; CFI = 0.922)

3.1.2 Person-level continuity of temperament: “temperament types”

A $k$-means clustering algorithm was used to test whether the temperament superconstructs (sumscores) in infancy and in middle childhood cluster to form theoretically meaningful and coherent profiles representing different temperament types. The reliability of the cluster solution was tested as recommended by Breckenridge (2000) and Mandara (2003), by examining whether a statistically significant agreement existed in a cross-validation between two randomly divided cluster solutions. As separate SEM and cluster analyses for girls and boys did not show substantial differences, all the analyses were conducted with gender groups combined.

Three “temperament types”, illustrated in Figure 4, profiling infants and children throughout the five-year-period were found: children belonging to the first cluster, named as “resilient”, were characterized by above-average levels of activity, positive affectivity, extraversion and effortful control, and below-average levels of negative affectivity in infancy and middle childhood ($n = 73$). Those in the second cluster, named “undercontrolled”, were characterized by an above average level of activity and a
below-average level of positive affectivity in infancy, by above-average levels of negative affectivity in infancy and middle childhood, by an above-average level of extraversion, and a well below average level of effortful control in middle childhood ($n = 79$). Those in the third cluster, named “overcontrolled”, were characterized by a well below average level of activity and a below-average level of positive affectivity, and an average level of negative affectivity in infancy. In middle childhood, they exhibited above-average levels of effortful control and negative affectivity, and well below the average level of extraversion ($n = 79$).

Figure 4. Cluster analysis identifying three temperament “types” based on sumscors of temperament superconstructs measured in infancy and in middle childhood. Note. All $p$s < 0.001 in ANOVAs testing the significance of differences between the clusters; all $p$s < 0.001 in post hoc pair-wise comparisons, except for $p = 0.34$ between “resilient” and “undercontrolled” in activity; $p = 0.45$ between “undercontrolled” and “overcontrolled” in positive affectivity; $p = 0.04$ between “undercontrolled” and “overcontrolled” in infant negative affectivity; $ps = 1.0$ between “resilient” and “undercontrolled” in extraversion and between “resilient” and “overcontrolled” in childhood negative affectivity.
3.2 Study II. Continuity of father-rated temperament and congruence between mother- and father-rated continuity

3.2.1 Continuity of father-rated temperament subscales and superconstructs

Pearson correlations were computed to test differential homotypic and heterotypic continuity between the individual subscales of temperament measured in infancy (IBQ) and in middle childhood (CBQ) over five years. Father-rated activity level, smiling and laughter and distress to limitations showed significant homo- and heterotypic continuity from infancy to middle childhood, whereas there was evidence only of heterotypic continuity for soothability, duration of orienting and fear (Table 3). Heterotypic continuity was shown, for example, between higher infant smiling and laughter and later low-intensity pleasure and between higher infant distress to limitations and later discomfort and fear. Associations indicating developmental interaction between different traits were also shown: for example, higher infant activity level associated with lower levels of inhibitory control and soothability in middle childhood, and higher infant fear and distress to limitations associated with lower levels of control-related abilities and less smiling and laughter in middle childhood.

The CFA presented in the first study was used in verifying the factor structures of latent infant and child temperament superconstructs, and the confirmed factor structure was used as a foundation for the structural analyses. In the SEM, father-rated positive affectivity in infancy was shown to predict, as hypothesized, effortful control in middle childhood, but it did not predict later extraversion. The SEM with fit indexes is illustrated in Figure 5. As hypothesized, negative affectivity in infancy predicted negative affectivity in middle childhood, but also showed a developmental trend towards a low level of effortful control. The respective variances accounted for by father-rated positive and negative affectivity in infancy were 5.1, 22.7, and 10.0% for extraversion, effortful control and negative affectivity, respectively.

As in the first study, when infant activity was added to the model as a specific path, the significance of a high level of infant activity as a specific determinant of later extraversion was revealed (Figure 6). The predictive associations between negative affectivity in infancy and in middle childhood and between positive affectivity and later effortful control were not affected by the specific activity path. For fathers, adding the
specific effect of infant activity improved the fit of the model only slightly ($\chi^2(1) = 3.8$, $p > .05$). The variances accounted for by activity and positive and negative affectivity in infancy in this additional model were 8.0, 23.7, and 9.8% for extraversion, effortful control and negative affectivity, respectively.

**Table 3.** Pearson correlations between the father-rated temperament subscales measured in infancy and in middle childhood (N = 115 father-infant/child dyads)

<table>
<thead>
<tr>
<th></th>
<th>Activity</th>
<th>Smiling/ Laughter</th>
<th>Soothability</th>
<th>Duration of Orienting</th>
<th>Distress to Limitations</th>
<th>Fear</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Infancy: IBQ</strong></td>
<td></td>
<td></td>
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<td></td>
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<tr>
<td>CBQ</td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Activity Level</td>
<td>.19**</td>
<td>.06</td>
<td>.07</td>
<td>-.10</td>
<td>.03</td>
<td>.01</td>
</tr>
<tr>
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<td>.00</td>
<td>-.04</td>
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<td>.14</td>
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<td>.09</td>
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<tr>
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<td>.20*</td>
<td>-.01</td>
<td>.02</td>
<td>-.23*</td>
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<tr>
<td>&amp; Soothability</td>
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<td>.07</td>
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<tr>
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<td>-.02</td>
<td>.17</td>
<td>-.16</td>
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<td>Impulsivity</td>
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<td></td>
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<td></td>
</tr>
<tr>
<td>Inhibitory Control</td>
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<td>.02</td>
<td>.07</td>
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<td>-.17</td>
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<td>.01</td>
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<td>-.16</td>
<td>-.02</td>
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<td>-.04</td>
<td>.05</td>
<td>.18</td>
</tr>
<tr>
<td>Smiling/ Laughter</td>
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<td>.23*</td>
<td>.16</td>
<td>.07</td>
<td>-.12</td>
<td>-.27**</td>
</tr>
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</table>

p < .05, * p < .01, **
Figure 5. Structural equation model showing associations between father-rated latent temperament superconstructs measured in infancy and in middle childhood ($n = 115$). Standardized values are given for the path coefficients. All the nonsignificant paths are also presented ($\chi^2/df = 1.3; \text{RMSEA} = .05; \text{CFI} = .927$)

Figure 6. Structural equation model showing associations between father-rated latent temperament superconstructs measured in infancy and in middle childhood, with the specific path from infant activity to the middle childhood extraversion superconstruct included in the model. Standardized values are given for the path coefficients. All the nonsignificant paths from infant negative and positive affectivity latent superconstructs are presented ($\chi^2/df = 1.3; \text{RMSEA} = .05; \text{CFI} = .931$)
3.2.2 Congruence between mother- and father-rated continuity of temperament

Congruence between parents’ ratings was investigated within a sample of 109 mother-father-infant/child –triads. Fathers rated their infant higher than mothers in fear, duration of orienting and negative affectivity, and in middle childhood, they rated their child higher in activity and impulsivity, and lower in approach anticipation, low-intensity pleasure, perceptual sensitivity, smiling and laughter and effortful control. Significant agreement between parents’ ratings of individual temperament subscales, except for soothability in infancy was shown (Table 4). Paternal and maternal ratings did not differ by child’s gender.

At the level of temperament subscales, continuity of father-rated temperament was compared with the continuity shown for mothers in Study I. In terms of homotypic continuity, the predictive associations in the father-ratings were similar to mother-rated continuity in the first study. In terms of heterotypic continuity, similar developmental tendencies were also shown, for example, between early activity and later aspects of extraversion, between early smiling and laughter, soothability and duration of orienting and later aspects of effortful-control, and between early distress to limitations and later fear.

Indicators of developmental interaction between different traits were also similar, for example, between early negative affectivity -subscales and lower levels of effortful control -related subscales and smiling and laughter. Some difference in the salience of associations between specific infant and middle childhood subscales could also be detected; for example, father-rated infant distress to limitations and fear showed more salient inverse associations with later effortful control –related subscales.

At the level of latent temperament superconstructs, no statistically significant differences between the father- and mother-rated predictive paths between infancy and middle childhood were found. Figure 7 displays the predictive paths between mother- and father-rated latent temperament superconstructs from infancy to middle childhood, including the specific effect of infant activity. The developmental links between affectively positive and well adjusted characteristics in infancy (i.e., smiling and laughter, orienting capacities and soothability) and later effortful control were especially noteworthy in both father- and mother-ratings, being in line with the literature on the
associations between positive affectivity and well functioning, adaptive control abilities. However, even though no statistically significant difference existed between mother- and father-rated paths, the developmental link between higher infant negative affectivity and a lower level of effortful control in middle childhood was more pronounced in father-ratings.

Table 4. Mean values of the infant’s (IBQ) and 5.5-year-old child’s (CBQ) temperament variables separately for the mothers (n = 109) and the fathers (n = 109), comparisons of the variables within couples, and intraclass correlations between parents’ ratings of their child

<table>
<thead>
<tr>
<th></th>
<th>Mothers M</th>
<th>Mothers SD</th>
<th>Fathers M</th>
<th>Fathers SD</th>
<th>t (paired)</th>
<th>r (intraclass)</th>
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<tr>
<td><strong>Infancy: IBQ</strong></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>Activity level</td>
<td>4.54</td>
<td>0.79</td>
<td>4.59</td>
<td>0.69</td>
<td>-0.55</td>
<td>.45**</td>
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<tr>
<td>Smiling/Laughter</td>
<td>5.25</td>
<td>0.82</td>
<td>5.35</td>
<td>0.78</td>
<td>-1.09</td>
<td>.53***</td>
</tr>
<tr>
<td>Soothability</td>
<td>4.95</td>
<td>1.03</td>
<td>4.80</td>
<td>1.15</td>
<td>1.09</td>
<td>.25</td>
</tr>
<tr>
<td>Duration of Orienting</td>
<td>3.77</td>
<td>1.10</td>
<td>4.10</td>
<td>1.17</td>
<td>-2.59</td>
<td>.46**</td>
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<tr>
<td>Distress to Limitations</td>
<td>2.92</td>
<td>0.70</td>
<td>3.05</td>
<td>0.69</td>
<td>-1.84</td>
<td>.61***</td>
</tr>
<tr>
<td>Fear</td>
<td>2.16</td>
<td>0.65</td>
<td>2.33</td>
<td>0.68</td>
<td>-2.17</td>
<td>.47**</td>
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<td>Positive Affectivity</td>
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<td>0.80</td>
<td>-1.04</td>
<td>.39***</td>
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<tr>
<td>Negative Affectivity</td>
<td>2.54</td>
<td>0.56</td>
<td>2.69</td>
<td>0.57</td>
<td>-2.46</td>
<td>.58***</td>
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<td><strong>Middle childhood: CBQ</strong></td>
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</tr>
<tr>
<td>Activity level</td>
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<td>4.82</td>
<td>0.75</td>
<td>-2.13</td>
<td>.74***</td>
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<td>Anger/Frustration</td>
<td>3.81</td>
<td>0.92</td>
<td>3.80</td>
<td>0.83</td>
<td>0.20</td>
<td>.66***</td>
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<td>Approach/Anticipation</td>
<td>5.27</td>
<td>0.64</td>
<td>5.06</td>
<td>0.57</td>
<td>3.71***</td>
<td>.69***</td>
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<tr>
<td>Attentional Focusing</td>
<td>5.16</td>
<td>0.76</td>
<td>5.17</td>
<td>0.69</td>
<td>-0.06</td>
<td>.64***</td>
</tr>
<tr>
<td>Discomfort</td>
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<td>0.98</td>
<td>3.57</td>
<td>0.83</td>
<td>1.50</td>
<td>.65***</td>
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<td>Falling Reactivity &amp; Soothability</td>
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<tr>
<td>Fear</td>
<td>3.63</td>
<td>1.02</td>
<td>3.50</td>
<td>0.84</td>
<td>1.40</td>
<td>.64***</td>
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<tr>
<td>High-Intensity Pleasure</td>
<td>4.96</td>
<td>0.86</td>
<td>4.94</td>
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<td>0.75</td>
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<td>.77***</td>
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<tr>
<td>Inhibitory Control</td>
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<td>0.87</td>
<td>5.03</td>
<td>0.80</td>
<td>1.48</td>
<td>.46**</td>
</tr>
<tr>
<td>Low-Intensity Pleasure</td>
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<td>5.51</td>
<td>0.56</td>
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<td>.41**</td>
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<td>5.09</td>
<td>0.66</td>
<td>2.95**</td>
<td>.67***</td>
</tr>
<tr>
<td>Sadness</td>
<td>3.49</td>
<td>0.84</td>
<td>3.41</td>
<td>0.69</td>
<td>0.94</td>
<td>.52***</td>
</tr>
<tr>
<td>Shyness</td>
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<td>3.24</td>
<td>1.08</td>
<td>-0.53</td>
<td>.81***</td>
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<tr>
<td>Smiling/Laughter</td>
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<td>5.65</td>
<td>0.66</td>
<td>2.90**</td>
<td>.44**</td>
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<tr>
<td>Extraversion</td>
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<td>4.94</td>
<td>0.51</td>
<td>0.67</td>
<td>.85***</td>
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<tr>
<td>Effortful Control</td>
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<td>5.20</td>
<td>0.49</td>
<td>2.98**</td>
<td>.56***</td>
</tr>
<tr>
<td>Negative Affectivity</td>
<td>3.50</td>
<td>0.70</td>
<td>3.46</td>
<td>0.57</td>
<td>0.59</td>
<td>.62***</td>
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p < .05, * p < .01, ** p < .001 ***
Figure 7. Structural equation model showing associations between latent temperament superconstructs measured in infancy and in middle childhood for mothers (n = 109) and fathers (n = 109), with the specific path from infant activity to the middle childhood extraversion superconstruct included in the model (path coefficients: mother/father). All the nonsignificant paths from infant negative and positive affectivity latent superconstructs are presented.

Note. While the SEM allowing for father- and mother-rated across-time paths to form freely fitted the data well ($\chi^2$/df = 1.3; RMSEA = .05; CFI = .902), so did the model where the across-time paths were constrained ($\chi^2$/df = 1.3; RMSEA = .05; CFI = .901); the $\chi^2$ difference test demonstrated no significant difference between these two models. In addition to intra-parental across-time paths, the models also specified cross-parental across-time paths. None of the cross-parental paths between the latent superconstructs were significant, and are, for the clarity of illustration, excluded from the figure.

3.3 Study III. Developmental transaction between parental personality traits and child temperament

Preliminary analyses of the concurrent associations between study variables demonstrated significant agreement between parents’ ratings of the child’s temperament that also increased over time, while no association between maternal and paternal personality traits extraversion and neuroticism within a family was shown. At baseline, mothers’ and fathers’ higher extraversion correlated significantly with higher infant positive affectivity, $r_s = .23$ and .35, respectively, and parents’ higher neuroticism with higher infant negative affectivity, .23 and .46, respectively. At follow-up, mothers’ and fathers’ higher extraversion correlated significantly with higher child effortful control, $r_s = .24$ and .26, respectively, and for fathers also with higher child extraversion.
$r = .24$ and for mothers with lower child negative affectivity, $r = -.19$. Mothers’ and fathers’ higher neuroticism correlated significantly with higher child negative affectivity, $rs = .42$ and .35, respectively, and for fathers, with lower child effortful control, $r = -.22$ (for mothers, this association was nearly significant).

There were significant over-time Pearson correlations between parental personality and infant/child temperament: mothers’ and fathers’ higher extraversion at baseline associated significantly with the child’s higher effortful control five years later, $rs = .24$ and .20, respectively, and the parents’ higher neuroticism at baseline associated with the child’s higher negative affectivity five years later, $rs = .34$ and .25, respectively. The infants’ higher positive affectivity associated significantly with the mothers’ and fathers’ higher extraversion 5 years later, $rs = .29$ and .42, respectively, and the infants’ higher negative affectivity associated with parents’ higher neuroticism, $rs = .19$ and .39, respectively (for mothers, the association was nearly significant), and with lower extraversion in fathers, $r = -.25$.

Multi-level analysis: Before proceeding to the multi-level analysis, a $\chi^2$-significance test was performed showing that the cross-lagged paths between parental personality and the infant’s/child’s temperament were similar in the maternal and paternal ratings ($p > .10$). The multilevel model including statistically significant paths of the stability/homotypic continuity of parental personality and the heterotypic continuity of child’s temperament, and the statistically significant cross-lagged paths between the child’s temperament and parental personality over five years are presented in Figure 8. The model showed an excellent fit ($\chi^2$/df =1.6; RMSEA =.05; CFI =.989).

While parental personality ($ps < .001$) and child temperament ($ps < .01$) showed significant continuity over five years, the infant’s higher positive affectivity significantly predicted higher parental extraversion five years later ($p < .001$), and higher infant activity significantly predicted lower parental neuroticism ($p < .05$) after five years. The infant’s negative affectivity did not significantly predict parental extraversion or neuroticism after five years.

Further, initially higher parental extraversion significantly predicted the child’s higher level of effortful control over time ($p < .05$), but the association between parental and child extraversion did not reach statistical significance. Initially higher parental
neuroticism significantly predicted the child’s higher negative affectivity \( (p < .001) \), after controlling for the infant’s initial temperament.

In addition to these cross-lagged effects, the model further revealed parallel changes in parental personality and the child’s temperament: decreases in parents’ views of the levels of the child’s extraversion and effortful control \( (ps < .05) \) and an increase in views of negative affectivity \( (p < .001) \) were significantly associated with an increase in parental neuroticism. Changes in parental views of the child’s temperament were not significantly associated with changes in parental extraversion at the follow-up. When the analyses were re-run with the gender of the child as a predictor of parental personality and the child’s temperament at the follow-up, no gender effects on the results were found.

![Diagram](image.png)

**Figure 8.** A multilevel structural equation model showing the associations between parental extraversion and neuroticism and infant/child temperament \( (\chi^2/df=1.6; \text{RMSEA}=0.05; \text{CFI}=0.989) \). In the interest of clarity, only the statistically significant paths \( (p<.05) \) are presented. The values stand for unstandardized estimates and standard errors.
3.4 Study IV. Transaction between maternal stress and child temperament

3.4.1 Transaction between maternal stress and individual temperament subscales

Maternal stress measured in the infancy period correlated significantly with maternal stress five years later, $r = .48$, and mother’s initially higher stress was also correlated with the infant’s higher fear $r = .18$, distress to limitations, $r = .31$, and lower smiling and laughter $r = -.15$. Maternal higher stress experience in middle childhood correlated with the child’s higher fear, $r = .21$, and anger, $r = .21$, and with lower soothability, $r = -.18$, and attentional focusing, $r = -.14$.

In the SEM, only one infant temperament subscale significantly predicted change in maternal stress over five years: a higher level of infant activity predicted a decrease in maternal stress from infancy to middle childhood when stress in the infancy period was controlled for ($p < .05$). Maternal stress in the infancy period did not predict a change in child activity from infancy to childhood when the activity level in infancy was controlled for (Figure 9).

Maternal higher stress predicted, as hypothesized, an increase in child anger ($p < .05$) and a decrease in attentional focusing ($p < .05$) and soothability ($p < .001$), when the initial infant temperament dimensions were controlled for. Attentional focusing, anger, and soothability did not predict any changes in the maternal stress experience when stress in the infancy period was controlled for.

![Figure 9](image)

Figure 9. Change in maternal stress predicted by infant activity level. Standardized values are given for the path coefficients
3.4.2 Transaction between maternal stress and latent temperament superconstructs

The factor structure for the latent superconstructs of positive affectivity and negative affectivity in infancy, and for those of extraversion, effortful control, and negative affectivity in middle childhood were confirmed in Study I and II. Figure 10 shows the path coefficients for a transactional model of maternal stress and latent temperament constructs in infancy and middle childhood. The model gave a good fit to the data ($\chi^2$/df = 1.6; RMSEA = .04; CFI = .92), and showed that maternal stress experience in the infancy period predicted an increase in negative affectivity from infancy to middle childhood when initial infant negative affectivity was controlled for, but it did not predict extraversion or effortful control in middle childhood when infant temperamental affectivity was controlled. Infant positive and negative affectivity did not predict any changes in maternal stress experience over time.

Figure 10. A Transactional model of maternal stress and infant and child temperamental superconstructs. Straight lines are statistically significant * $p < .05$, ** $p < .001$.

Note. Non-significant paths have been omitted from this final model with the exception of the path for the continuity from infant to child negative affectivity that controls for the continuity in estimating the change in negative affectivity ($\chi^2$/df = 1.6, RMSEA = .04, CFI = .92)
4 DISCUSSION

The current study aimed, first, to establish the continuity of temperament from the infant’s age of six months to the child’s age of five and a half years as perceived by both parents, and examine whether the developmental paths of infant/child temperament are similar in both parents’ eyes. Second, the study aimed to explore the transactional development of parental personality traits extraversion and neuroticism and ratings of infant/child temperament. Further, the transactional associations between parental more situational characteristics, namely maternal perceived overall stress, and ratings of infant/child temperament over this five-year period were examined.

4.1 Continuity of parent-rated temperament from infancy to middle childhood

The present study conceptualized temperament as constitutional individual differences in reactivity and self-regulation, influenced over time by the interactions of heredity, maturation, and experience (Rothbart & Bates, 2006). Compared to, for example, the early stylistic framework of Chess and Thomas (1986), and the more dimensional approaches that identify basic temperamental traits, like Buss and Plomin’s (1984) genetically based emotionality-activity-sociability model, Goldsmith’s primary-emotion-based reactions (Goldsmith et al., 1987), or Kagan’s (1994) individual differences in behavioral inhibition to the unfamiliar, the present conceptualization of temperament also included self-regulative processes that serve to modulate (enhance or inhibit) reactivity (Rothbart & Bates, 2006). As the arousal and intensity of basic emotions and reactions in the child’s life are influenced by the child’s regulative capacities, defining and measuring these capacities supplements the picture of temperament and the measurement of predictive associations between early and later temperament and adjustment.

Besides depicting temperament as a within-person characteristic, temperament was also presented as an interactive construct. First, the child’s expressed temperament is assumed to affect and be affected by others; for example, the child’s level of reactivity may not stay the same during development, but be permanently and profoundly changed by regulative capacities that develop within interaction with the developmental context. Second, developmental interaction between temperamental behaviors that are controlled
by separate genetic mechanisms is also acknowledged; for example, the child’s developing regulative capacities may affect the child’s tendency to express fear or distress over time, or negative affectivity may also downplay the development of effortful control.

In the present study, theoretically relevant associations between temperamental dimensions at six months of age and at the age of five-and-a-half years were shown, and the results of the homotypic and heterotypic continuity of individual temperament subscales as perceived by both parents were, to a great extent, similar. Significant homotypic continuity was shown for infant activity level, smiling and laughter, distress to limitations and fear (nearly significant in father-ratings), while significant heterotypic continuity was shown for infant soothability and duration of orienting in both parents’ ratings. In general, the continuity of temperament subscales from infancy to middle childhood fulfilled the criteria of heterotypic continuity or coherence, reflecting, besides over-time stability, also theory-based lawful change (Caspi & Roberts, 2001): associations of infant temperament were found with phenotypically different but closely correlated attributes, i.e., with attributes belonging to the same temperament superconstruct in middle childhood, and subscales belonging to the broad categories of infant positive and negative affectivity showed differential developmental paths. It must, however, be acknowledged, that in Rothbart’s more recent work, a more fine-grained measure of infant temperament has been developed (Gartstein & Slobodskaya, 2003); if this more recent version of IBQ with more subscales had been used, some of the present heterotypic continuities might even have proved to be homotypic in nature.

As an example of heterotypic continuity, higher ratings of infant activity level predicted, besides higher activity in middle childhood, also aspects of later extraversion, e.g., approach anticipation and high-intensity pleasure, especially in mother-ratings. However, higher infant activity also showed developmental associations with a lower level of inhibitory control and, especially for fathers, with a higher tendency to express anger and less ability to soothe oneself. In developmental research, a high activity level has typically been associated with the development of extraversion, but also to impulsivity and poor behavioral control in young children (Hagekull & Bohlin, 1998; John, 1990; see also Caspi et al., 2005; Eaton, 1994). The present associations are thus in line with previous research, linking the activity-aspect of surgency with anger and
externalizing behavior (Putnam & Stifter, 2005; Rothbart et al., 2001; Rothbart et al., 2000b). With the father, the child’s initially higher activity level may have, more often than with the mother, resulted in manifestations of this less controlled and more negative aspect of extraversion. For example, during a more active, outgoing and challenging interaction with the father (Paquette, 2004), even an active and energetic infant/child may be also susceptible to frustration and anger.

Higher infant smiling and laughter in maternal and paternal ratings also predicted aspects of effortful control, like a stronger tendency to get pleasure from low-intensity stimuli, and higher levels of self-soothing and attentional capacities. This sign of positive affectivity in the infant may be a marker of self-regulatory capacity, i.e. reflect the developmental change from a largely reactive dimension in infancy towards a more effortfully controlled behavior in the service of cultural standards during childhood (Ahadi et al., 2003; Putnam et al., 2001; Rothbart et al., 2001). Early positive affect may also allow for the development of self-regulation by allowing more frequent encounters with experiences that are cognitively and affectively challenging, leading to greater opportunities to develop willful control, or, it may be that infants who display more positive emotionality elicit guidance from parents that may facilitate the development of attentional skills underpinning effortful control (Putnam et al., 2008).

For infant fear and distress to limitations, that reflect the broad construct of negative affectivity, especially the associations of infant distress to limitations with a broader range of characteristics of negative affectivity in middle childhood supported earlier findings, showing different paths of development from infant fear and frustration/distress-proneness (Derryberry & Rothbart, 2001; Goldsmith et al., 1999; Rothbart et al., 2000b). Further, while higher infant distress/frustration predicted later fear, depicting heterotypic continuity in both parents’ ratings, it also predicted lower soothability, while initially higher fear, in turn, predicted also fewer signs of low intensity pleasure and smiling and laughter in both parents’ ratings. These inverse associations between early negative affect and later difficulties in the ability to recover from distress or excitement and a lack of expressed positive affect are in concordance with the suggestions of developmental interaction between traits, i.e., that temperamental negative reactivity may compromise the effective development of
attentional and inhibitory mechanisms, or that early negative reactivity may compromise the development of expressions of positive affect (Putnam et al., 2008).

Further, the heterogeneity of subscale-level behaviors, reflecting common underlying processes suggests the value of aggregating across narrowly delineated temperament characteristics. Accordingly, at the level of latent temperament superconstructs, no statistically significant differences between the mother- and father-rated predictive paths between infancy and middle childhood were found. The developmental links between affectively positive and well adjusted characteristics in infancy (i.e., smiling and laughter, orienting capacities and soothability) and later effortful control were especially noteworthy in both parents’ ratings, being, again, in line with the literature on the associations between positive affectivity and well functioning, adaptive control abilities. These early-emerging tendencies to focus attention, to enjoy calm activities, and benefit from parental soothing may also contribute to later regulation of negative emotions (Gaertner, Spinrad, & Eisenberg, 2008; Gartstein & Rothbart, 2003; Putnam et al., 2008; Robins, John, Caspi, Moffitt, & Stouthamer-Loeber, 1996; Rothbart et al., 2001).

Continuity of negative affectivity from infancy to middle childhood was also consistently shown in father- and mother-rated temperament. However, for the father-rated high negative affectivity (i.e., distress to limitations and fear) in infancy, a developmental trend towards low levels of effortful control-related characteristics (e.g., inhibitory control, low-intensity pleasure, perceptual sensitivity) in middle childhood appeared, as also in subscale-level associations, somewhat more emphasized. Here, too, early negative reactivity can be assumed to compromise the development of effortful control (Putnam et al., 2008). It has, for example, been suggested that excess crying during early infancy may hamper the development of self-regulatory skills (Stiffter & Spinrad, 2002).

In developmental literature, it has been shown that the child’s self-regulative capacities develop and manifest in transaction with the caregiving environment (e.g., Cole, Teti, & Zahn-Waxler, 2003; Eisenberg, Zhou, & Spinrad, 2005; Feldman, Greenbaum, & Yirmiya, 1999), and some variance in parent ratings of the manifestations of effortful control has been suggested to emerge due to caregivers’ unique experiences with the child (Putnam et al., 2006; Carson & Parke, 1996; Paquette,
Parental agreement of the child’s effortful control in the current study was also a bit lower than for the other scales, a trend seen in other research as well: effortful-control-related characteristic are suggested to be somewhat less discernible or more variably expressed in the presence of different interaction partners (Majdandzic & van den Boom, 2008).

While the child’s temperament is the same, where ever the child is, its overt manifestations may, to some extent, depend on the circumstances. In that respect, it can be suggested that mothers and fathers elicit somewhat different aspects of their child’s temperamental behavior in their individual style of interaction with the child. Due to these behavioral differences in the contexts of relationships, both parents can also be “right” about their child’s temperament, while the two views may represent somewhat different aspects of reality, especially in the characteristics of effortful control.

For example, observations comparing father–child and mother-child interaction have found that fathers frequently engage in play behaviors aimed at making the child more excited (see Paquette, 2004). Hence, with a playfully stimulating father, who may actively encourage the child’s exploration of the environment, these amplifying interactions may ultimately reach a limit; the over-stimulation of a more fearful or distress-prone infant/child may lead to a situation where the child’s control abilities do not quite meet the challenge. Some children may also find it more difficult to calm down the emotional aftermath of the situation (Paquette, 2004; Parke, 1994; Rothbart et al., 2001). Further, the traditional role of fathers may, in some families, mean that the father usually interacts with the infant/child after his day at work, i.e., in the evening time, when the child’s mood and control abilities, as well as energy level may vary as a function of fatigue.

Further, in the combined model of 109 fathers and 109 mothers, the predictive association between high activity and later extraversion (c.f. Eaton, 1994) was similar, but it did not reach statistical significance. However, in the models involving only mothers (n = 231) or only fathers (n = 115), the paths from infant activity to later extraversion were statistically significant. This predictive path from early activity to later extraversion was also shown in the recent study of Putnam and his colleagues (2008), where infant’s higher activity was associated with later characteristics belonging under the construct of extraversion (activity, high-intensity pleasure, impulsivity).
Enriching and complementing the current study, the person-centered approach (Asendorpf & van Aken, 1999; Bergman & Magnusson, 2001) to continuity of mother-rated temperament types further showed that temperament characteristics in infancy and in middle childhood clustered to form profiles indicative of three theoretically-based temperament types: relatively high levels of activity and positive characteristics in infancy and a lack of negative affectivity in infancy and middle childhood clustered in a type labeled as “resilient”. High activity in infancy and high negative affectivity in infancy and middle childhood, combined with relatively weak child self-regulative capacities, clustered in a type labeled “undercontrolled”. Furthermore, characteristics of infant activity and positive affectivity that did not rise to the average, accompanied with an average level of infant negative affectivity and with low childhood extraversion and relatively high levels of effortful control and negative affectivity clustered in a type labeled “overcontrolled”. These three profiles parallel the three widely established types depicting personality in childhood and in adulthood, namely the resilient, undercontrolled, and overcontrolled profiles, respectively (Asendorpf et al., 2001; Asendorpf & van Aken, 1999; Caspi & Silva, 1995; Robins et al., 1996).

The current results thus provide further support for the continuity of childhood personality types by offering a theoretically fruitful way of illustrating how the infant and childhood temperament characteristics cluster to form stable temperament types that resemble personality types shown in personality research. The distinction between the internalizing (“overcontrolled”) and the externalizing (“undercontrolled”) negative affectivity in the profiles is likely to be related to the level of the infant’s initial activity, and to the activity of approach and self-regulation systems. The less intensive, relatively passive and fearful children may, for instance, begin to regulate their fear through inhibition (Kochanska & Knaack, 2003; van Brakel, & Muris, 2006) which, along with the originally low activity level, serves to further restrict approach behaviors and overt expression and sharing of affect. Inhibition may also begin to attenuate the child’s positive affect, resulting in internalizing emotions (Derryberry & Rothbart, 1997).

It has also been suggested that extraversion (high activity and approach tendency) gives direction to manifestations of negative emotions in frustrating situations: while a high level of extraversion may lead the child to increase his or her external force, a lower level of extraversion may lead to more internalized reactions (Putnam et al., 2001,
The different types of negative affectivity are thus assumed to result from combined initial reactivity and developmental interactions between reactivity and self-regulation (Derryberry & Rothbart, 1997, 2001).

### 4.2 Developmental transaction between parent and child characteristics

#### 4.2.1 Transactional development of parental personality traits and child temperament

The continuity estimates of infant/child temperament reported in the first two studies still leave room for contextual factors. Thereby, the third study aimed at complementing our knowledge of reciprocal child-to-parent and parent-to-child effects in the development of temperament and parental personality traits. More specifically, I examined stability and change in parental self-rated personality traits of extraversion and neuroticism in relation to the parents’ views of their child’s temperament. I utilized sumscores and activity level from the infant’s age of six months to the child’s age of five and a half years.

The concurrent and over-time correlations between parental personality and child temperament were essentially similar in both parents’ ratings, but also showed some differences in the salience of associations. Both parents’ higher extraversion at both time points associated with the infant’s higher positive affectivity and the child’s higher effortful control, and fathers’ higher extraversion at follow-up also associated with the child’s higher extraversion, while mothers’ higher extraversion at follow-up associated with the infant’s/child’s lower negative affectivity. This may be suggested to reflect the fathers’ more playful and exploration-encouraging interaction with the child (Paquette, 2004), that may elicit similar behavior from the child; for mothers, positive interaction with the child may attenuate the risk of overstimulation-related negative affect. Further, the over-time associations between infant’s higher negative affectivity and parental lower extraversion and higher neuroticism at follow-up were more salient for fathers: the infant’s higher negative affect may have reduced the opportunities for paternal positive interaction with the child, resulting in lower paternal extraversion and higher neuroticism five years later. However, when the differences in the mother- and father-rated cross-paths between parental personality and the infant’s/child’s temperament
were tested, no statistically significant differences between maternal and paternal ratings were shown.

In the final multilevel model, parents’ self-rated personality traits extraversion and neuroticism exhibited the expected high stability over five years, but also changed over time in relation to parents’ views of their child’s temperament. As hypothesized, perceiving the infant as higher in positive affectivity predicted an increase in parental extraversion over five years. Furthermore, parental views of the infant’s higher activity level predicted a decrease in parental neuroticism over five years. Higher infant negative affectivity was not, however, significantly associated with an increase in parental neuroticism or a decrease in extraversion.

Johnson et al. (2005) proposed that stability and intensification of a personality trait may result from a combination of genetic and continuing environmental influences. This goes well with the current results showing an increase in parental extraversion in response to perceived higher infant positive affectivity. Trait extraversion in itself associates with attention to positive interpersonal information and feedback (Uziel, 2006). Living with a temperamentally positive child may have acted as an environmental constancy factor for the extraverted parent (Fraley & Roberts, 2005; Sameroff, 1995), thus contributing to the stability of and increase in parental extraversion. The more extraverted parent may also have engaged in a parent–child interaction that fits and strengthens his/her own extraversion-related characteristics (Scarr & McCartney, 1983).

To understand the predictive association between the infant’s higher temperamental activity and a decrease in parental neuroticism, the potential significance of the infant’s activity for the parent–child relationship should be considered. First, children’s activity level has been shown to be relatively stable from infancy onwards in the current data as in other studies (Putnam et al., 2006), and it may therefore be considered an important and enduring component at the core of the parent–child relationship. This characteristic of the relationship, stemming from the infant’s constitutional characteristics, is also beyond the control and selection of the parent (Johnson et al., 2005). Second, active infants have also been shown to be in less need of adult stimulation, with respect to the development of their cognitive abilities and mastery motivation (Wachs, 1987, 1992) or exploratory behavior (Gandour, 1989). Thereby, with an initially active infant, the
effects that parental neuroticism might have on the interaction with the child may not be able to reduce the infant’s lively and initiative behavior towards the parent.

In personality research, the closest parallel to temperamental activity is perhaps in the energy or activity dimension within the extraversion factor (McCrae & John, 1992). Because high temperamental activity has thus been shown to underpin later extraversion (Blatny, Jelinek, & Osecka, 2007; Eaton, 1994; Hagekull & Bohlin, 1998), the child’s initially higher activity may also be accompanied by higher levels in other extraversion-related characteristics like positive affect, approach anticipation, lack of shyness and sociability (Blatny et al., 2007; Rothbart et al., 2001). In the current data, the infant’s activity was, likewise, more strongly associated with the infant’s positive than negative affectivity. These extraversion-related characteristics of temperament have also been shown to be highly stable over the early years (Berdan, Keane, Calkins, 2008). Like a more active child, a child high in positive reactivity may also become activated at lower levels of parental stimulation (Rothbart, 1986).

On the other hand, as Neyer and Lehnart (2007) propose, higher neuroticism may in itself include a high motivation for change. It is also important to acknowledge that higher parental neuroticism and related characteristics do not necessarily or automatically decrease the positive qualities of parenting, such as parental responsiveness, tracking, or compliance to the children (Kochanska et al., 2004). It may be suggested that an infant, seen by the parent as high in activity, may promote positive qualities in a parent, or offer a chance for change by continuously challenging the parent to be more active and responsive. This process between the parent and the child could, over time, facilitate a change for the better in the parent’s neuroticism-related characteristics and feelings.

One explanation for the lack of effect of infant negative affectivity in increasing parental neuroticism could be that the negative affectivity factor comprises the separate components of distress to novelty (fear) and distress to limitations. These characteristics, which at the age of six months are not differentiated enough to show any independent effects, may still differ somewhat in their overt expression, resulting in a somewhat less consistent effect on feelings and behaviors related to parental neuroticism (see e.g., Rubin et al., 1999). The existing literature does not report entirely
consistent associations between infant’s negative temperamental characteristics and parenting experience either (Boivin, Pérusse, & Dionne, 2005; Rohtbart, 1986).

The current results further suggest that extraversion and neuroticism in adulthood may differ in terms of their susceptibility to environmental influence (see Fleeson, 2007). In other words, experiences may differentially influence an individual’s development, because the impact of the environment is mediated by individual differences in the organism; even though Belsky’s differential susceptibility hypothesis originally refers to differences in the susceptibility of individuals high or low in specific temperament- or personality characteristics (Belsky, 1997), it could also be suggested that temperament and personality characteristics per se, for example positive or negative affectivity, activity, neuroticism or extraversion, are differentially susceptible to environmental influence. Parental extraversion and neuroticism may thus differ in terms of the degree to which parenting experiences in general may affect, i.e. increase or decrease, the level of that trait. Or, developmental changes in these parental traits may also differ according to specific environmental characteristics, like the child’s unique temperament.

In terms of social investment theory, the parenting role comes with its own set of expectations and contingencies that calls for behaving in a certain fashion (Roberts et al., 2006a). In this study, the roles that the parents were committed to may have differed according to their perceptions of temperamental differences in their children (see e.g., Paris & Helson, 2002; Sameroff & Fiese, 2000; Sirignano & Lachman, 1985), and these roles may have also differently contributed to the patterns of continuity and change in extraversion and neuroticism. It can also be suggested that parents may change simply through learning generalization: while in the middle of the everyday interaction with the child, parents observe themselves acting in a certain way, and gradually come to a different opinion about themselves that eventually generalizes across domains (Roberts et al., 2006a).

In Costa and McCrae’s personality model (McCrae et al., 2000), an individual’s self-concept is considered largely as a function of basic temperamental tendencies. The dynamic interaction of basic tendencies with the environment produces characteristic adaptations that comprise, for example, social relationships, skills, and habits. Successful coping with parenting situations with temperamentally unique children can
be assumed to require a permanent reorganization of one’s priorities and characteristic adaptations to the environment: one could thus ask whether these characteristic adaptations can, over time, moderate parents’ own feelings and behaviors, and thereby also gradually modify their more ‘stable’ or basic self-concept, reflected in measures of extraversion and neuroticism. Or, in other words, characteristics of extraversion and neuroticism may shift over time along a continuous dimension extending from the trait’s core to its surface, and the core trait may become more unstable due to significant relationship experiences (Asendorpf & Van Aken, 2003).

In addition to showing evidence of change in parental personality, our findings suggest that parents’ personality traits may change their views of their child’s temperament over time. We found that parent’s own higher-rated extraversion promoted higher ratings in the child’s effortful control, while higher parental neuroticism promoted ratings of the child’s higher negative affectivity. These predictive associations are well in line with the voluminous literature showing that the more positive parental characteristics contribute positively to the child’s development, while the less favorable parental characteristics may increase the risk for adverse development of the child (e.g., Gartstein & Bateman, 2008; Propper & Moore, 2006; Spinrad et al., 2007; Stright et al., 2008). For example, parents’ extraversion-related positive affect during play may stimulate children’s interest in a task or refocus waning attention, as well as create a positive environment that increases enjoyment of such efforts (Gaertner et al., 2008).

In this transactional setting, parents’ ratings of positive and negative affectivity in infants also showed theoretically relevant heterotypic continuity over five years (see also Putnam et al., 2008). The predictive paths between temperament sumscores, i.e., the paths from higher positive affectivity in infancy to higher effortful control in middle childhood, and the paths from higher negative affectivity to lower effortful control and higher negative affectivity in middle childhood were as hypothesized, and similar to those shown between latent temperament sumscores in Studies I and II. In addition, in the multilevel analysis, the infant’s higher negative affectivity sumscore also predicted lower extraversion in middle childhood.

In recent literature, the construct positive affectivity has been shown to be a heterogenic composite, associated concurrently and longitudinally with both extraversion- and effortful control-related characteristics (Kochanska, Aksan, Penney,
The infant’s own basic predisposition to positive affect, along with early signs of self-control, may explain the association between positive affect and effortful control especially in the parent–child interaction (see Kochanska et al., 2007); as suggested by Putnam and his colleagues (2008), early emerging tendencies to focus attention and benefit from parental soothing may contribute to later regulation of emotions, while positive affect (tendency to smile and laugh) may also lead the child to experiences that promote the development of willful control and attention, or elicit guidance from parents that facilitates the development of attentional skills underpinning effortful control.

The stability of parents’ views of the child’s negative affectivity over five years may reflect developmental continuity in the child’s negatively tuned reactions and behavior within the family context, due to the child’s own constitutional characteristics, as well as environmental characteristics (Scarr & McCartney, 1983). The path from the infant’s perceived higher negative affect sumscore to lower extraversion and effortful control in middle childhood may thus reflect initial difficulties in controlling fear and frustration within everyday situations, or a developmental process where negative emotion and attentional processes continually and mutually influence one another across time, leading to a somewhat compromised development of attentional and inhibitory mechanisms in the more negatively affective infant (Gaertner et al., 2008; Stifter & Spinrad, 2002). At least, the challenge to control him- or herself and to approach new situations may be harder for the easily frustrated or fearful infant.

In this transactional model, the child’s extraversion-sumscore did not contain aspects of anger-frustration or self-control which, in the other three studies, loaded significantly on the latent extraversion-superconstruct, presumably explaining the association between higher infant negative affect and higher child extraversion in those three studies. In this third study, the association between higher infant negative affectivity and lower child extraversion-sumscore may be explained by predictive associations between infant’s higher fearfulness and subsequent higher shyness and lack of extraverted characteristics like approach anticipation and high-intensity pleasure.

I also examined whether parental personality and their views of the child’s temperament showed parallel change over time (i.e., simultaneous change in parent and child that was not explained by the predictive associations between infant and parent...
characteristics at baseline and at follow-up). Obviously, I cannot determine which, that is the parent or the child, or some other environmental or individual aspect of the parent or the child promoted the change. However, I found that an increase in the ratings of the child’s negative affectivity and a decrease in positive-affectivity- and attention-related characteristics from infancy to middle childhood were associated with an increase in parental neuroticism, while parental extraversion and infant/child temperament did not show any parallel change. These associations are well in line with what is reported in the literature (e.g., Belsky et al., 1991; Kochanska et al., 2004; Propper & Moore, 2006), and complement the picture of transactional development between parental personality and infant/child temperament.

4.2.2 Transactional development of maternal stress and child temperament
In the fourth study, maternal perceived overall stress was considered as an important situational factor that may, besides the more constitutional personality characteristics, influence mothers’ behavior and feelings at home. Maternal overall stress also belongs to the likely significant contextual elements in the early development of temperament, even though the child’s temperamental characteristics may, in turn, also act as significant contributors of stability or change in the level of mothers’ perceived amount of stress. Therefore, the fourth study aimed to explore the longitudinal relations between maternal perceptions of stress and mother-rated temperamental development of the child from infancy to middle childhood.

Support for the hypotheses that mothers’ experience of overall stress would predict an increase in mothers’ ratings of temperamental maladjustment over time, and at the same time, mother-rated temperament traits in infancy would predict either an increase or a decrease in maternal stress was found. However, these effects were not shown in the same model, i.e., temperament did not influence and was not influenced by maternal stress in the same model. These results essentially complement prior, mainly cross-sectional, findings on the relations between parental stress and child behavior, by extending the period in question to cover the most important developmental phases in early childhood.
Maternal experience of stress proved to be a rather stable mental state from the infant’s age of six months to five and a half years. In terms of changes in maternal stress over time due to child temperament, we found only one significant path from infant activity level to decreased maternal stress in the childhood period, controlling for the level of initial maternal stress. This finding that a decrease in maternal stress was associated with the parents’ views of their infant as high in temperamental activity goes well in line with the finding that higher infant activity also reduced parental neuroticism over this five-years period, and justifies the suggestions of the potential significance and favorable effects of the infant’s activity for the parent–child relationship.

The more energetic and active the child is, the more likely he/she will also be to continue interaction-eliciting behavior with the mother, regardless of the mother’s level of stress. Thereby, as in the case of parental neuroticism, the effects that maternal overall stress might have on her behavior towards the child, for example a tendency to withdraw from interaction (Repetti & Wood, 1997), may not be able to reduce the infant’s lively and initiative behavior. For the mother, focusing on the active child may serve as an everyday means of forgetting the other stresses of life: these less stressed, frequently occurring and intensive moments between mother and child may thus eventually attenuate maternal perceptions of her overall stress. Further, the more active child may not raise as much worry in a parent as a child that seems more vulnerable, timid or fearful does.

It seemed that the changes in temperamental development from infancy to middle childhood originating in maternal stress during the infancy period were more prominent than changes in maternal stress. Changes in temperament included an increase in anger and a decrease in attentional focusing, as well as a decrease in soothability. At the level of latent temperament superconstructs of positive and negative affectivity, defined as in the first two studies, maternal stress in the infancy period predicted a higher level of child negative affectivity over time when infant negative affectivity was controlled for. These results are in line with prior knowledge of parent-effects on child development (Crnic et al., 2005). Maternal stress is thus likely to affect temperamental development in terms of both reactive (e.g., anger) and self-regulative functioning (attentional focusing and soothability). Similarly, the increase found in temperamental negative affectivity encompasses both internalizing aspects of child behavior (e.g., fearfulness,
shyness, sadness, and discomfort) as well as indicators of low self-regulation (low attentional focusing, low soothability, and low inhibitory control).

Earlier research has shown how parental stress experiences are related to parent–child interactions (Patterson, 1983; Snyder, 1991). Repetti and Wood’s (1997) notion of maternal withdrawal from the interaction due to stress is of particular interest with reference to the current findings. It could be hypothesized that parental stress-originated withdrawal reduces the moments of shared attention between the dyad, moments that are essential for the development of attention and self-regulation (Morales, Mundy, Crowson, Neal, & Delgado, 2005). In the current study, the predictive associations between higher maternal stress and the child’s reduced attentional and self-soothing capacities and ability to control anger/frustration complement these suggestions.

4.3 General conclusions

The current longitudinal study provided evidence for the theoretically relevant continuity of mother- and father-rated temperament from infancy to middle childhood, within the developmental psychobiological framework of Rothbart and her colleagues (Rothbart & Bates, 2006). It was also shown that the types characterizing childhood and adulthood personality may share common ground with temperament types from infancy onwards. Furthermore, the view that the development of children’s temperament is also sensitive and differentially susceptible to variability in contextual factors, represented in this study by parental personality traits and perceived overall stress (Belsky, 1997; Van den Boom, 1994; Wachs, 2006), was also supported.

For the adult personality traits extraversion and neuroticism, high stability over five years was shown. However, it was also shown that the unique environmental forces within a family that individually affect temperamental development in a child may not disappear in adulthood: the development of parents’ personality traits seemed to be susceptible to their perceptions of the child’s temperament. Similarly, parents’ experience of more situational factors, represented in this study by maternal perceptions of overall stress, also seemed to be susceptible to experiences with the child.

The continuities and associations between parents’ and infants’/children’s characteristics found in this study were independent of child gender. The cross-lagged paths between temperament and personality were also similar for mothers and fathers,
fitting with evidence showing that the rank-order stability of adult personality (Caspi et al., 2005), and the extent to which various environmental factors affect individual differences in men’s and women’s personalities and associated characteristics (e.g., Ansell & Pincus, 2004; Costa & McCrae, 1988; Neyer & Asendorpf, 2001) are unaffected by gender. In terms of stress, the associations between maternal stress and child temperament were, as in previous studies (Deater-Deckard & Scarr, 1996), also independent of child gender. While the current study investigated only maternal stress, similar indications and associations can be assumed for both parents’ stress (Deater-Deckard, & Scarr, 1996; Deater-Deckard et al., 1994).

4.4 Weaknesses and strengths of the study

There are limitations to this study that should be borne in mind in the interpretation of the findings. First, there were no intermediate assessments of temperament between infancy and five-and-a-half years of age available: intermediate assessments certainly would have specified more exactly the developmental paths of temperament. For the third and fourth study, examining the developmental transaction between parental personality and stress and the child’s temperament, one limitation is related to the lack of micro-level interactional patterns between parent–child dyads that would illuminate the paths between the predictor and outcome variables in a more detailed fashion.

In temperament research, the question of objectivity in measuring child behavior according to parental reports is also still open to debate (Kagan, 1994, 1998; Seifer et al., 2004). Kagan (1998), for example, noted that parents may be prone to form an unintended but consistent disposition towards the child, although the prior experiences of the child may not have been that consistent. However, sources of observational error exist also in artificial laboratory settings, for example errors related to the characteristics of the rater, or effects of the situation or measure on child behaviors, or interactions between rater characteristics and child behavior (Rothbart & Goldsmith, 1985). Further, in the more objective assessment settings, only a limited set of behaviors can be evoked. Especially in the case of positive affectivity, some children could be less likely to express positive affect in the laboratory, relative to other more familiar settings where the parents are able to see this behavior (Gartstein & Marmion, 2008; Rothbart & Goldsmith, 1985). The unfamiliar laboratory setting may also make the child exhibit
more fearful reactions than what is representative of his/her general level of fearfulness in everyday life (Rothbart & Goldsmith, 1985). Accordingly, recent evidence points to greater predictive validity and greater situational consistency of parent-ratings in comparison to these more objective perceptions (Majdandzic & van den Boom, 2007; Pauli-Pott et al., 2003). Because temperament exerts its effect on the child’s everyday life, Rothbart’s measures also allow the empirical investigation of temperament in various situations and social contexts. The possibility of parental inaccuracy and bias is further minimized by asking for frequencies of recent, specific, and concrete behaviors in response to common everyday stimuli (Rothbart, 1981; Rothbart et al., 2001). The items in the infant and child behavior questionnaires are also worded in a simple and straightforward manner, in order to minimize misinterpretation (Putnam et al., 2001).

The relatively small sample sizes and response rates in this study also restrict the external validity of the findings. Especially, due to the inclusion criteria for family units in Study II and III, i.e., both parents had to provide complete data on all of the study variables at the baseline and at the follow-up, the drop-out rate was relatively high. Even though the study sample was representative of the initial population, generalizations should still be drawn with caution.

Further, using the same informant for parents’ as well as infant’s/child’s characteristics evokes the question of shared method variance. However, the important advantage of path analysis and the analysis of correlated change is that it reduces shared method variance: because the path coefficients control for the indirect paths, which contain the full bias, the error is, at least partly eliminated (Neyer & Asendorpf, 2001). Beyond that, it should also be acknowledged that the causality between parent and child cannot be considered straightforward enough to enable the isolation of any single factor as the sole origin of a developmental outcome. In other words, the analyses of cross-paths and correlated change in the present study are unable to provide conclusive evidence of causal effects, because the study designs did not allow us to rule out alternative explanations, such as the coaction of other, for example genetic- or community-level -factors, that push the development forward.
4.5 Theoretical and clinical implications

Characteristics of personality and temperament are theoretically and empirically related (Caspi et al., 2005; Rothbart et al., 2000a), and closely associated with individuals’ well being and psychosocial adjustment (e.g., Auerbach et al., 2008; Costa & McCrae, 1980; Eisenberg, et al., 2007; Hampson, 2008; Löckenhoff, Sutin, Ferrucci, & Costa, 2008; Nigg, 2006; Ramos, Guerin, Gottfried, Bathurst, & Oliver, 2005; Roberts et al., 2007; Steel, Schmidt, & Shultz, 2008). While no clear consensus yet exists concerning the exact nature of temperament or personality, an integrated understanding of the constructs, their development and associations with environmental influences and various clinically relevant outcomes is of increasing interest for both researchers and clinicians. Therefore, evidence of continuity, as well as every association between changes in the child’s temperament and parental personality is both theoretically and clinically meaningful.

In the current study, temperament and personality were seen as broadly overlapping domains, with temperament providing the primarily biological basis for the developing personality (Caspi et al., 2005; Costa & McCrae, 2000; Goldsmith et al., 1987; Rothbart et al., 2000a). Besides the genetic association between temperament and personality (e.g., Goldsmith et al., 1987), it was also acknowledged that temperament develops and includes also later appearing elements, which further relates temperament to the construct of personality. Temperament and personality were also considered most meaningful in social contexts.

Thereby, the results of the current study were in line with the definition of temperament as early appearing individual differences that; first, are relatively stable across situations; second, are not all visible at birth, but become visible during time; and third, are shaped by both hereditary and environmental factors. Interaction between different temperament dimensions during development was also acknowledged. Further, it was acknowledged that the same environment may have a unique influence on the level of more than one dimension of temperament or personality at the same time.

For temperament, the results of the current study were in line with Rothbart’s theoretical framework, highlighting especially the developmental coherence of positive and negative affectivity, as well as the interplay between reactivity and self-regulation in growth from infancy to middle childhood (Rothbart & Bates, 2006), from the
perspectives of both of the child’s parents. The predictive validity of both parents’
ratings was also supplemented, which further emphasizes the importance of both
parents in developmental research. The confirmatory factor solution, shown to fit the
data well among six to seven years olds in Rothbart et al. (2001), was also replicated in
this Finnish sample. Thereby, as an additional contribution, the current study further
validated the measures and constructs of Rothbart and her colleagues (Rothbart et al.,
2001).

The individual level temperament profiles further illustrated how the common basis
of temperament and personality can be profiled in terms of infant/child temperament
dimensions. In a more practical or clinical sense, the resilient, under- and overcontrolled
temperament types showed how the early temperament variables may assume their
actual meaning in relation to other variables in an individual’s profile (Janson &
Mathiesen, 2008).

The current study also highlighted the relevance of temperament as a relational and
interactional construct (e.g., Rothbart & Bates, 2006), in which individual differences in
ways of regulating experiences are particularly susceptible to social influences. Instead
of conceptualizing temperament only as a set of traits inherent in the child, temperament
was, thus, also seen as a set of individual differences in the way children regulate
experience (Rothbart & Bates, 2006). In terms of theory-based change or lawful
discontinuity (Caspi & Roberts, 1999), the results of the present study were in line with
literature suggesting that the development of infant temperament, and especially the
characteristics related to the development of negative affectivity and attentional and
self-regulative capacities may be affected, besides genetic influence, by the unique
environment of the infant (Belsky, 1997; Belsky, Goldsmith et al., 1999; Hsieh, &
Crnic, 1998; Gilissen, Bakermans-Kranenburg, van IJzendoorn, & van der Veer, 2008;
Kochanska, 1995, 1997), here conceptualized as parental personality and experienced
overall stress.

For adult personality traits extraversion and neuroticism, theory-based high rank-
order stability over five years was shown (Roberts & DelVecchio, 2000; Terracciano et
al., 2006). However, despite high consistency, evidence of the possibility of
theoretically relevant non-normative change in these temperament-based personality
traits, due to important and enduring interpersonal relations (Neyer & Asendorpf, 2001;
Robins et al., 2002) was also gained. More specifically, the current study suggests that individuals seem to be able to maintain their level of extraversion, perhaps even in less favorable environments, and be able to utilize a chance, at least in the form of the child’s positive affectivity, to become more extraverted. In the case of neuroticism, and also in the more situational experience of life as stressful, this study suggests that individuals may be prone to detect reasons for decreasing the levels of these less favorable behaviors and feelings (see Neyer & Asendorpf, 2001), while also the risk for cumulative effects of the more negative parent and child characteristics seem to be true for higher parental neuroticism and negatively tuned situational experiences like higher parental overall stress.

The similarities found in the temperament-associations for neuroticism and stress are understandable, as individuals who score high on neuroticism are also known to be easily overwhelmed by stressful experiences (e.g., Costa & McCrae, 1992). However, whereas self-ratings of neuroticism rise from a range of individual temperament-based characteristics, parents’ perceptions of stress may also result from situational factors, like objectively higher amounts of stressful phenomena in their life. Parental experience of life as stressful, caused by either environmental or individual-level causes, may still have a detrimental effect on the proximal processes between parent and child, evidenced here as increases in negative aspects of child temperament.

In a transactional sense, the predictive associations and simultaneous change between parent and child characteristics detected in this study may have involved both evocative and reactive person–environment transactions that, within a family, may be suggested to lead to discontinuities as well as continuities in temperament and personality, causing simultaneous change (Scarr & McCartney, 1983). Or it may have been that parents and children proactively created environments that fitted and strengthened their characteristics, and these environments further promoted their genetically concordant characteristics (Scarr & McCartney, 1983). The current study also provided evidence of how these within-family experiences may differentially influence an individual’s development, in terms of temperament- or personality-related differences in susceptibility of unique environments in childhood as in adulthood. In terms of Belsky’s (1984) ecological model, the idea of intertwined developmental influence between the
three main classes of factors within a family, namely the parents’ own personality traits, perceived overall stress and the child’s temperamental characteristics, was supported.

Considering the developmental relevance of parental views, it may be suggested that the over-time continuity of parental views of the child’s temperament, and the bidirectional influences between parent’s views of their own personality and the child’s temperament may be those that matter the most, because this is the intimate and enduring environment that is probably the most influential for both parent and child. Whether parents’ individual characteristics shape their subjective interpretations of their child or not, these interpretations are those that come to life between parent and child. Similarly, parental perceptions of situational characteristics like overall stress can be viewed as a combination of objective stressful events, coping processes and personality factors that together form the outcome variable of perceived stress, which may then put a strain on the everyday interaction of the parent and the child.

Further, considering the clinical relevance of early temperament, a child’s temperament as it interacts with the environment, here conceptualized as the interaction between parent and child characteristics may be a better predictor of developmental outcomes than temperament alone (Rothbart & Putnam, 2002). Given the increasing evidence of the influence of contextual characteristics upon central nervous system development (e.g., Nelson & Bloom, 1997; Schore, 2001), it can be assumed that the proximal processes between parent and child could also have an influence on the constitutional underpinnings of temperamental characteristics. Within personality trait theory, it is also acknowledged that an increased understanding of the mechanisms or correlates of rank-order change in the temperament-based personality traits may further allow the development of effective therapeutic interventions even during adulthood (McCrae, 2001).

Furthermore, the predictive associations, along with the parallel changes in parents’ self-rated neuroticism and overall stress and the child’s temperament highlight the importance of paying attention to the cumulative effects of parents’ self-representations and the child’s temperament, at least when evaluating the developmental risks or planning any therapeutic endeavors for a specific family (see e.g. Gartstein & Sheeber, 2004; Martorell & Bugental, 2006). Additional clinical relevance for recognizing the negative cumulative effects of parent and child characteristics comes from the existing
research showing that especially the more negative or challenging temperamental characteristics in a young child are more susceptible to the harmful influence of less optimal parental characteristics (Belsky, 1997).

However, the present study also suggests that, if offered a strong and enduring enough environmental chance for change, parents’ and children’s reasonably stable psychological characteristics may also be changed for the better. It may be proposed that extraversion and individual temperament-dimensions linked with that trait can be considered as buffering or protective factors in the child’s as well as in the adult’s life, especially within their intertwined development during the child’s early years.

In sum, the current study showed that parent-rated temperament shows moderate to high levels of continuity from infancy to middle childhood, and that the continuity of mother- and father-rated temperament is quantitatively and qualitatively similar. Theoretically relevant links between childhood temperament and personality types were also shown. Furthermore, this study offered evidence of concurrent and predictive bidirectional associations between child temperament and parental personality and perceived stress. Thereby, this study also emphasizes the importance of paying attention to the transactional effects of parents’ personality- and stress-related characteristics and views of the child’s temperament, especially when evaluating the risks and protective factors for a specific family.
REFERENCES


