

Children Changing in Context

Child Temperament and Personality Development as
Interrelated with Parenting in the Etiology of Adjustment
Problems

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Children Changing in Context: Child Temperament and Personality Development as Interrelated with Parenting in the Etiology of Adjustment Problems

Kinderen Veranderend in Context:
Ontwikkeling van Temperament en Persoonlijkheid in Relatie tot Opvoeding als
Determinanten van Probleemgedrag

(met een samenvatting in het Nederlands)

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To my grandfathers, who each in their own way taught me, long before I read it in a textbook, that deviation from social norms and expectations can never be enough to define mental illness. It is from their stories that I first understood it to be necessary for compassion in the most difficult circumstances, and for happiness in many others.

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|Chapter 1 - General Introduction|

Children differ from one another in the way they behave, think, and feel. Some children are distressed when day-to-day routines are broken, whereas others enjoy the excitement of unexpected events; Some children keep their rooms tidy, and hand in their homework on time, whereas others come home from school and enthusiastically take out all their toys, getting so caught up in their play that homework assignments are hastily completed right before bedtime; Some children enjoy playing sports, asking everybody to join in, whereas others prefer to spend their time daydreaming with a single best-friend. Theories on individual differences in children posit that children start out with mostly biologically based differences in style of approach and response to the environment, or *temperament*, which become elaborated into consistent ways of behaving, thinking, and feeling, or *personality*, across development (Shiner & Caspi, 2003).

The overall aim of this dissertation was to examine how child temperament and personality change, what the role of parenting is in explaining these changes, and how child temperament/personality and parenting together predict child internalizing and externalizing problems. Four notions guided the investigation: (1) Person-, and variable centered approaches to child temperament and personality are complementary in nature and may each provide unique information; (2) Although stable by definition, child temperament and personality are subject to maturation and experience, and can thus be considered as developing; (3) The parenting children experience is an important context for their developing temperament and personality, and may drive individual differences in temperament/personality change; (4) Child temperament/personality and parenting are interrelated risk factors in the etiology of child adjustment problems.

Temperament and personality description: Variable- and person-centered approaches

In an effort to capture the most important differences between children, several temperament taxonomies have been proposed, describing temperament along different dimensions or traits. Chess and Thomas (1985) first described nine dimensions to represent the most important individual differences in behavioural styles: activity level, rhythmicity, approach, adaptability, responsiveness, intensity of reaction, quality of mood, distractibility and persistence. Rothbart (1981) defined temperament as heritable differences in reactivity and regulation, and although she had initially proposed more dimensions, Gartstein and Rothbart (2003) later came to a three dimensional taxonomy based on factor-analytic results, including surgency, negative affectivity and effortful control. Buss and Plomin (1984) theorized that for a dimension to be

considered as central to temperament, it should be heritable, relatively stable across development (i.e., identifiable in adults), and serve an evolutionary adaptive purpose. They identified emotionality, activity, and sociability as fulfilling these criteria. In this dissertation we focus on the three dimensions proposed by Goldsmith (1996): anger proneness, social fear and activity level. The dimensions are similar to the Buss and Plomin model, but have the advantage of distinguishing fear and anger as separate dimensions of negative emotionality. Distinct biological bases for the three temperament dimensions assessed in this dissertation can be found in Gray's formulation (1991) of neural substrates for a behavioural inhibition system (social fear), behavioural activation system (activity), and a fight-flight system (anger proneness).

In contrast to temperament research, research on personality has reached more consensus on the basic framework for describing the most important traits. Five dimensions have repeatedly emerged as independent factors from investigations of all the adjectives that could be used to describe an individual in a given language (Costa & McCrae, 1988; Goldberg, 1990). The basic premise of this 'lexical approach' was that important differences between individuals would have become represented in language. The same five factors have emerged from different languages and cultures across the globe, indicating that they may represent a universal taxonomy (McCrae & Costa, 1997). The five basic dimensions of personality, or the 'Big Five', are extraversion, agreeableness, conscientiousness, emotional stability and openness to experience. The *extraversion* dimension contrasts emotional, social, and verbal expressiveness with shyness, inhibition, self-isolation, withdrawal, and non-assertiveness. *Agreeableness* determines the degree to which individuals are equipped to maintain close and reciprocal relationships, or the broad area of prosocial versus antisocial interactions. The *conscientiousness* dimension refers to a concentrated, reliable, and achievement oriented attitude in work-like situations with high levels of involvement and perseverance. *Emotional stability* (the inverse of *neuroticism*) refers to self-reliance, emotional balance, and being easy-going as opposed to being fearful, anxious, and emotionally disorganized under stress, and having low self-esteem. *Openness to experience* represents an openness to new ideas, experiences or the general richness and complexity of a person's mental life. Mervielde and De Fruyt (1999) came to a similar model based on investigations of parents free descriptions of their children. The most important differences for children are that the factor most related to the agreeableness domain in adults, encompasses irritability (a facet of neuroticism in adults), dominance (a facet of extraversion in adults), and compliance (specific to children). The factor most related to the openness to experience domain covers creativity, fantasy, curiosity, imagination, humor, and resourcefulness in initiating activities in children. To make these differences clear, the factor representing the agreeableness domain was labelled *benevolence*, and the factor associated with openness to experience was labelled *imagination*.

Most research on temperament and personality thus specifies dimensions or traits, representing a variable-centered approach. However, although temperament and personality can be described by relatively independent dimensions derived from factor analysis, not all

combinations may be equally likely to occur. A person-centered approach investigates the configuration of dimensions within individuals.

A person-centered approach was taken by Thomas and Chess (1985) in their temperament theory by, in addition to describing several temperament dimensions, proposing three temperament types: 'easy', 'slow to warm up', and 'difficult'. However, even though temperament theory has thus defined types from early on, not many studies have investigated temperament configurations in young children, and results so far have been inconsistent with regards to the number and nature of the types (Aksan et al., 1999; Caspi & Silva, 1995; Janson & Mathiesen, 2008; Komsí et al., 2006; Stifter, Putnam, & Jahromi, 2008).

Following Block's work (1971) on personality configurations, which were based on the concepts of ego-control (i.e., general tendency to constrain impulses) and ego-resiliency (i.e., ability to flexibly adjust the degree of ego-control to changing environmental demands), several studies have established that Big Five personality configurations tend to cluster into the following three types: the resilient, undercontrolled, and overcontrolled personality types (Caspi & Shiner, 2006; Zentner & Shiner, 2012). Resilient children are usually found to be relatively extraverted, agreeable, conscientious, emotionally stable, and open to experience. Undercontrollers are moderately extraverted, moderate to low on emotional stability, and low on agreeableness and conscientiousness. Overcontrollers are relatively introverted and emotionally unstable, while at the same time highly agreeable, and moderate to high on conscientiousness (Asendorpf & Van Aken, 1999; Hart, Hofmann, Edelstein, & Keller, 1997; Robins, John, Caspi, Moffit, & Stouthamer-Loeber, 1996).

Most studies delineating temperament/personality types have used techniques such as cluster analysis. More recently, analysis techniques such as latent class analysis (Muthén & Muthén, 2000), have become available that provide more objective means of determining whether different subgroups are indeed present, for instance by indicating the statistical significance of specifying additional subgroups. Additionally, these techniques are based on a latent variable framework, taking into account measurement error. Finally, most studies have determined the types based on single-informant reports. A drawback of a single-informant approach is the possibility that coherence into types is due to the 'halo effect,' i.e., a tendency of general perceptions of an individual to influence perceptions of specific traits (Thorndike, 1920).

Studies on temperament and personality types thus take a person-centered approach by investigating relative levels of dimensions within individuals. Other person-centered approaches may be taken, however. O'Connor and Dyce (2001) investigated the extremity of adults' five dimensional personality configuration. They noted that personality extremity, regardless of which dimension is especially extreme, or what the configuration looks like within the individual, may be seen as an indication of behavioral rigidity, and likely to be associated with symptoms of personality pathology. By modeling the five personality dimensions as representing orthogonal dimensions in a five-dimensional space, each individual's personality configuration could be represented by a single point. A vector was computed, representing the distance of this point from an average midpoint, with a longer vector thus indicating a more

extreme personality configuration. In their cross-sectional study, O'Connor and Dyce (2001) showed that vector length as a representation of personality extremity was indeed associated with personality pathology in adults. In a recent review, Shiner reports that estimated prevalence rates of personality disorder among adolescents have ranged from 6% to 17% (Shiner, 2009). If personality extremity is a marker for personality pathology, we would expect a small subgroup of adolescents to be characterized by relatively long vectors, indicating an extreme personality configuration. If this subgroup is already characterized by extreme personality configurations in childhood, these children could be identified early on, indicating the importance of investigating the development of personality extremity across childhood and adolescence.

In this dissertation we take both a person-, and a variable-centered approach. With regard to the person-centered approach, we investigate both temperament and personality types, as well as personality extremity. The first aim of this dissertation was to investigate, using latent class (growth) analysis, which subgroups can be identified based on (a) configurations of temperament in toddlers, (b) multiple informants' reports of personality in childhood, and (c) trajectories of personality extremity across childhood and adolescence.

Temperament and personality: Stable and changing

Central to definitions of both temperament and personality is stability across time and situations. This should however not be taken to imply that changes cannot occur. Although temperament is thought to be based in mostly biological differences, as all biologically based dispositions it is also likely to be subject to maturation and experience over time, and can thus be considered as developing (Rothbart & Bates, 2006). If we think of personality as developing through a process of elaboration of temperament, we can expect even more change to take place.

Indeed, investigations of mean-levels of personality across the lifespan have indicated that they indeed change, even into old age (Roberts et al., 2006). Generally speaking, adults tend to become more agreeable, conscientious, emotionally stable, and open to experience as they age (Roberts et al., 2006; Shiner, Masten, & Tellegen, 2002). These developments have been summarized in the 'maturity principle', i.e. individuals increase on those traits that make them better able to perform tasks associated with the responsibilities of adult life (Roberts, Caspi, & Moffitt, 2001). Social Investment Theory posits that taking on new social roles is in fact what drives these changes in personality (Roberts, Wood, & Smith, 2005). For instance, taking on the responsibility of a paid job requires individuals to become more punctual and organized, and entering a romantic relationship requires less egocentrism and more altruism. By placing these social roles as the driving force behind personality change, this theory predicts that most personality change would occur in young adulthood, when these types of social roles are taken on. Indeed, a meta-analysis of personality development across the lifespan indicated that personality change was greater in early adulthood than in adolescence (Roberts et al., 2006).

However, there is not much longitudinal evidence available on mean-level personality development in childhood and adolescence. The evidence so far has been mixed with regards to whether development is aimed at increasing maturity. Of course, maturation does not start in emerging adulthood. Children's self-regulatory capacities continue to increase across childhood and adolescence (Kochanska & Knaack, 2003; Murphy, Eisenberg, Fabes, Shepard, & Guthrie, 1999; Reed, Pien, & Rothbart, 1984), as do their cognitive capacities for perspective taking (Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991). These developments may be reflected in increases in conscientiousness, benevolence, and emotional stability for instance. Additionally, children start increasing autonomy, developing an identity and establishing important friendships well before emerging adulthood (Galambos & Costigan, 2003). For instance, with the transition to secondary school children are expected to be much more responsible for their own schoolwork, and need to establish a new social circle. Overall, we could thus expect most change to occur during childhood and adolescence.

Even when mean levels of traits change for the population as a whole, relative differences between individuals may be highly stable (Santor, Bagby, & Joffe, 1997). Early temperament traits indeed predict later childhood temperament (Komsis et al., 2006; Putnam, Rothbart, & Gartstein, 2008), and even adult personality (Caspi et al., 2003), but relative stability of traits has been found to be only moderate in childhood, increasing with age (Roberts & DelVecchio, 2000). However, stability of temperament profile classifications has not been investigated much (for an exception see, Aksan et al., 1999; Janson & Mathiesen, 2008). Even though traits may be moderately stable, relative levels of the dimensions within individuals may be much more stable.

In this dissertation we examine how temperament and personality change during two important developmental transitions: toddlerhood and the transition from childhood to adolescence. Again, different approaches were taken. The second aim of this dissertation was to investigate stability of temperament types in toddlers (person-centered), and mean-level changes of the personality dimensions across childhood and adolescence (variable-centered).

Explaining temperament and personality change: The role of parenting

Mean-level development of temperament and personality may be due to general maturation, or to experiences that similarly affect a population of children (e.g., transition to secondary school, developmental task of increasing autonomy). In addition to mean-level changes, individual differences in development may occur due to contextual factors that are more specific to the individual. Indeed, behavioral genetic studies find, next to significant heritability, a substantial contribution of environmental factors to both temperament (Goldsmith et al., 1999), and personality (Spengler, Gottschling, & Spinath, 2012).

For children, the parenting context is likely an important environment for their developing temperament and personality (Shiner & Caspi, 2003). Parenting is a multi-dimensional construct (Darling & Steinberg, 1993). Differences between parents can be described in terms of behaviors that are aimed at promoting the child's emotional well-being,

such as providing warmth and support, and behaviors that are aimed at teaching the child to comply with societal norms, or disciplining behaviors. Among the strategies that parents may employ to discipline their child, we can further distinguish those that are aimed at clearly and consistently conveying what is (and what is not) considered acceptable behavior (e.g., setting rules that the child can understand and consistently reinforcing them), and those that, whilst also aimed at reducing unacceptable behavior, may harm a child's sense of safety and security, such as when parents react excessively angry and hostile to child misbehavior (i.e., are overreactive).

Theories on parenting generally posit that parents exert influence on their developing child by providing working models of behavior that children internalize and bring with them to other contexts (for an overview see, Belsky & Jaffee, 2006). In terms of temperament and personality development, children who experience warm, supportive, and consistent parenting may learn to trust others, decreasing in social fear, and may learn to display similar behavior, and act more warmly to others, resulting in increases in benevolence. Children who experience harsh, overreactive parenting may become fearful of others, as well as imitate hostile behavior, increasing in anger proneness, or becoming less benevolent. The development of their regulatory capacities may be impeded, leading to increases in activity level, or decreases in conscientious and emotional instability. Parenting behavior may thus shape temperament and personality development.

Although earlier theories on parenting focused solely on how parents shape their children across development, the possibility that individual differences in children may elicit different parenting behavior later came to be acknowledged also (Bell, 1968; Belsky, 1984). For instance, children who are anger prone or low on benevolence and conscientiousness may elicit more hostility and overreactivity, because they are more frustrating to deal with. Conversely, highly agreeable and conscientious children may be easier to interact with, and may elicit more warmth and support from their parents. Rather than that parents influence their developing child, parents may thus be faced with individual differences in their children and respond to them differently (Shiner & Caspi, 2003).

Research on personality and relationship quality in adults has led to the conclusion that an individual's personality is more influential in determining relationship quality than that relationship quality is in influencing an individual's personality (Neyer & Asendorpf, 2001; Neyer & Lehnart, 2007; Robins, Caspi, & Moffitt, 2002). This finding was explained by noting that more stable characteristics (personality traits) are generally more likely to influence less stable characteristics (relationship quality), than the other way around. However, this conclusion cannot be readily extended to the parent-child relationship. First, child traits are not (yet) as stable as those of adults. Second, the parent-child relationship is different from a romantic relationship for instance, in that parents and children are not equal interaction partners. Especially when children are younger, parents are more powerful interaction partners, and their behavior may be more influential in shaping traits in their children, than a romantic partner's behavior is in shaping traits in his/her significant other.

Although shaping and elicitation are separate processes that posit different causal mechanisms as responsible for associations between parenting behavior and child temperament/personality, both processes may be at work simultaneously. In fact, change in children's personality and parental behaviors may be so interrelated, that the direction of effects cannot be easily separated. The parallel continuities hypothesis states that individual behavior is stable when the environment is stable, but when either the individual or the environment changes, the other changes in order to adjust (Caspi, 1993). For instance, regardless of how agreeable children are initially, decreases in benevolence may instantaneously lead to increases in overreactive parenting and decreases in warmth, or decreases in warmth and increases in overreactivity may lead to decreases in benevolence.

The third aim of this dissertation was to investigate how temperament and personality are associated with parenting behavior across development. We examine (a) how parenting shapes child temperament and personality (parent-effects), (b) how child temperament and personality elicit parenting behavior (child-effects), and (c) how changes in parenting and child traits are associated (parallel processes).

Child temperament/personality and parenting: Interrelated factors in the etiology of adjustment problems

Child temperament and personality: Individual-level factors in the etiology of adjustment problems

Individual differences in terms of temperament and personality have been hypothesized to represent a vulnerability for both internalizing adjustment problems, such as anxiety and depression, and externalizing problems, such as aggression and rule-breaking behavior (Shiner & Caspi, 2003). Children who are anger prone or low on conscientiousness may be less sensitive to punishment (Lytton, 1990), failing to learn to inhibit aggressive impulses or to refrain from breaking rules. Additionally, anger prone or disagreeable children may be especially likely to attribute hostile intent (Coie & Dodge, 1998), leading them to aggress, or justify delinquent behavior by 'blaming-the-victim' (Koolen, Poorthuis, & Van Aken, 2012). In contrast, fearful, emotionally unstable children may be overly sensitive to punishment (Grusec & Hastings, 2008), withdrawing from interaction in an effort to avoid it. Withdrawal from social interaction may induce feelings of loneliness, and reduce chances of exposure to fearful stimuli, further aggravating anxiety. Because they do not attempt to exert control over their environment, they may develop a sense of helplessness. They may have fewer opportunities for developing their social skills, exhibiting socially awkward behavior, leading to rejection by peers. Additionally, their perception may be biased, interpreting neutral peer behaviors as rejecting or threatening.

Indeed, studies on temperament as well as those on personality traits indicate that they are important determinants of both internalizing problems and externalizing problems. Anger proneness, activity level, and low conscientiousness and agreeableness are associated with the development of externalizing problems, whereas social fearfulness, introversion, and emotional instability are determinants of internalizing problems (De Pauw, Mervielde, & Van

Leeuwen, 2009; Ozer & Benet-Martinez, 2006). In terms of personality types, overcontrolled children may be especially at risk of developing internalizing problems due to their inhibited nature, whereas undercontrollers' impulsivity may leave them vulnerable to the development of externalizing problems. Previous studies have indeed shown that resilient children are generally well-adjusted, whereas overcontrollers are vulnerable to internalizing symptoms, and undercontrollers exhibit the most externalizing symptoms (Asendorpf & van Aken, 1999; Hart et al., 1997; Robins et al., 1996; Van Leeuwen et al., 2004).

Two developmental periods appear to be especially important when investigating adjustment problems, as they are characterized by important changes within individuals, accompanied by major changes in the context. The first period is toddlerhood, where rapid development in multiple domains takes place. As toddlers develop a sense of who they are, and what they want, they wish to exert some control over their lives. Frustration when they feel blocked in attaining their goals, may be expressed by externalizing behavior (e.g., hitting, biting, kicking, screaming). As children increase in self-regulation, and develop their language capacities and reasoning skills, these behaviors decrease for most children (Miner & Clarke-Stewart, 2008). However, for some children they remain stable from this very early age (Fanti & Henrich, 2010). The same is true for internalizing symptoms: although most children are relatively symptom free, for some children symptoms are heightened and relatively stable from age two already (Feng, Shaw, & Silk, 2008; Keenan & Shaw, 1997).

Although studies on personality types in older age groups have proven useful in identifying children who are at risk for internalizing problems, versus children who are at risk for externalizing problems, the association between temperament profiles and adjustment problems has not been investigated as much. Studies so far indicate that temperament profiles are not as clearly distinguishable in terms of risk for internalizing versus externalizing problems (Aksan et al., 1999; Janson & Mathiesen, 2008; Rettew et al., 2008; Stifter et al., 2008).

Like toddlerhood, the transition into adolescence is another important period to study adjustment problems. Children need to adjust to the physical and hormonal changes that accompany the onset of puberty (e.g., Paikoff & Brooks-Gunn, 1991) as they transition to secondary school and face the developmental task of increasing autonomy (Galambos & Costigan, 2003). Parents need to facilitate this increasing autonomy by learning to relax some control and remain supportive. Rates of parent-child conflict increase during this transition, indicating that the parent-child relationship is under pressure during this period (Laursen, Coy, & Collins, 1998). How children and parents handle these changes might be important for subsequent adolescent adjustment (Graber & Brooks-Gunn, 1996). The transition to adolescence is also a period characterized by an increase in problem behaviors. Rates of internalizing problems are quite low in childhood, but much more prevalent in adolescence (Petersen, 1993). Externalizing behavior problems, such as delinquency and status violations, have also been reported to increase across adolescence (Bongers, Koot, van der Ende, & Verhulst, 2004; Lahey et al., 2000).

Although *levels* of the child personality dimensions have previously been found to be potent predictors of adjustment problems, the relative risk associated with intra-individual

changes in personality across the transition from childhood to adolescence have not been investigated. This may be important however, as an individual can be at relatively low risk of experiencing problems relative to other individuals (i.e., relatively high mean levels), but may decrease in for instance emotional stability over time, with this decrease resulting in heightened adjustment problems. Indicating the importance of taking into account intra-individual changes in addition to mean levels, lower levels of emotional stability have been found to be related to increases in mortality in adult men, but only if they were accompanied by decreases in emotional stability over time (Mroczek & Spiro, 2007).

If we think of personality types as representing a vulnerability for adjustment problems, we would expect that not all children with a vulnerable personality type necessarily exhibit problematic development. Children with a vulnerable personality type may experience protective factors (e.g., supportive parenting, low levels of stress), preventing them from experiencing adjustment problems. Similarly, children without a vulnerable personality type may also exhibit adjustment problems, due to other risk-factors they may experience (e.g., harsh parenting, high levels of stress). Overall, children with an initially vulnerable personality type may be more likely to experience adjustment problems, relative to children without such a personality type, while at the same time most children with a vulnerable personality type can still be expected to be well-adjusted. Modeling mean level development for all children with a given personality type may obscure this fact. More generally, distinct subgroups of children are likely to follow different developmental trajectories of internalizing and externalizing problems. Indeed, heterogeneity in the development of adjustment problems has been well established, both for externalizing (Broidy et al., 2003; Nagin & Tremblay, 1999), and internalizing problems (Brendgen, Wanner, Morin, & Vitaro, 2005; Feng, Shaw, & Silk, 2008; Sterba, Prinstein, & Cox, 2007). Thus, it is important to identify children with an especially problematic developmental trajectory, and examine whether certain personality types are predictive of belonging to this problematic group.

In addition to the personality types, the extremity of a personality configuration, as assessed by a person's vector length in five-dimensional space (O'Connor & Dyce, 2001), may also be associated with adjustment problems in children. Personality extremity may indicate behavioral rigidity (O'Connor & Dyce, 2001), implying a reduced ability to adjust to changing environmental demands. Additionally, having an extreme personality configuration may be associated to a subjective sense of strangeness. Individuals who judge their own personalities as more 'normal' have been shown to experience less depression and higher self-esteem (Wood, Gosling, & Potter, 2001). Relatedly, the behavior of children with an extreme personality may be perceived by others as being different from the norm, resulting in problems in interaction, ultimately leading to adjustment problems.

Although the resilient, under-, and overcontrolled types have been associated with adjustment problems, they are usually not found to add much predictive value of adjustment problems above and beyond the dimensions themselves (Asendorpf, 2003; Asendorpf & Denissen, 2006; Costa, Herbst, McCrae, Samuels, & Ozer, 2002; Huey & Weisz, 1997; Rovik et al., 2007; Van Leeuwen, De Fruyt, & Mervielde, 2004). However, it is not unlikely that certain

configurations could provide additional risk, indicating that the level of risk that one dimension conveys is partly dependent on the level of risk on another dimension, or more generally, that personality extremity as a structural aspect of personality is associated to adjustment above and beyond the content.

Although by far most studies on associations between personality and adjustment are based on the notion that personality may be a vulnerability for adjustment problems, implying a causal relationship between the two (Tackett, 2006), an alternative explanation has been proposed in the spectrum hypothesis (Widiger & Clark, 2000), which states that adjustment problems lie at a more extreme end on a continuum with personality. For instance, externalizing problems may be located at a more extreme low end of an underlying dimension with benevolence and/or conscientiousness, whereas internalizing problems may be located at the extreme low end of an underlying dimension with extraversion and emotional stability. Thus, rather than that personality and adjustment problems are causal factors in each other's etiology, they may be different manifestations of the same underlying construct. The spectrum hypothesis would predict that associations between personality dimensions and adjustment problems are non-linear. That is, the strength of the association between for instance benevolence and externalizing problems should become stronger towards the low end of the dimension, as more of the variance in externalizing problems would be captured there. However, most studies have been restricted to investigations of linear associations between personality and adjustment problems. If associations are non-linear, these linear effects may have underestimated the strength of the association between personality and adjustment problems, which can be expected to increase towards the low end of the personality dimensions.

Parenting: A contextual factor in the etiology of child adjustment problems

Whereas personality changes and configurations may represent a risk-factor for adjustment problems within the child, ecological transactional models of the etiology of child adjustment problems explicitly propose that these individual level risk-factors continuously interact with factors in the proximal environment, such as parenting, to produce child adjustment problems (Bronfenbrenner & Morris, 1998; Cicchetti & Toth, 1998).

Overreactive parenting is a parenting behavior that is closely related to harsh or coercive parenting which is thought to be central to the development of externalizing problems in children (Patterson, 1982). It includes behaviors such as insulting and hitting the child. Overreactive parenting may reinforce oppositional behavior (Patterson, 1982), and provide a model of hostile interaction styles, resulting in heightened risk for externalizing problems (Pettit & Dodge, 1993). At the same time, children may withdraw from parents in an attempt to avoid unpleasant interactions (Bender et al., 2007; Prinzie et al., 2003), and develop low self-esteem, increasing risk for internalizing problems (MacPhee & Andrews, 2006). This hostile style of disciplining may thus be an additional risk factor for adjustment problems.

Overreactive parenting may be especially problematic for children transitioning to adolescence, as children need support from parents while they are striving for increasing

autonomy. Overreactive parenting is power-assertive behavior and not likely to be supportive of autonomy in the child, resulting in a poor fit between the adolescent's developmental stage and the parenting context (Eccles et al., 1993). In addition to mean-levels, increases in overreactive parenting during this developmental stage may thus be problematic for children.

Although overreactive parenting may be associated with both internalizing and externalizing problems, whether children indeed experience adjustment problems, and if so, which type of adjustment problems, may be dependent on their personality type. In line with the definition of 'resiliency', i.e. positive adaptation despite adverse circumstances, resilient children may be expected to be well-adjusted even when they experience overreactive parenting. Undercontrollers, due to their lack of impulse control, may exhibit more oppositional behavior. They may attribute hostile intent, leading them to aggress (Shiner & Caspi, 2003). Conversely, overcontrolled children may be more likely to withdraw from overreactive parents to avoid negative interactions (Bender et al., 2007). The experience of overreactive parenting may lead them to develop low self-esteem (MacPhee & Andrews, 2006) or symptoms of anxiety (Feng et al., 2008).

Longitudinal investigations of developing child temperament/personality, and parenting behaviors as additive and/or interactive risk-factors, may inform us about which child characteristics and parenting behaviors are meaningfully associated with adjustment problems. However, they do not inform us about the processes underlying these associations. Interactions between parent and child take place in real-time, and influence processes should occur through these real-time interactions (Bronfenbrenner & Morris, 1998). Micro-level interaction processes have been proposed to be the 'proximal engines of development'. Affective expressions can be seen as building blocks of personality, which can be assessed in real-time (Lewis, 2000). Additionally, affective processes have been proposed to be central in determining parenting behavior (Dix, 1991).

Although toddlers' self-regulation is rapidly developing, emotion regulation in toddlers is still in large part a dyadic process in which emotions are thought to be co-regulated in interaction with parents (Calkins, Smith, Gill, & Johnson, 2001; Cicchetti et al., 1991; Eisenberg et al., 2001; Kochanska & Murray, 2000). The real-time process of exchanging emotional expressions between parents and children provides the basis for emotional co-regulation, and is deemed important for many socialization outcomes in children, as it places demands on self-regulation, and helps them understand emotions in others and appraise the appropriateness of their own behavior (Laible & Thompson, 2007).

When dyadic affective expressions are highly variable, this may be an indication of affective dysregulation, a process that has been indicated as underlying both internalizing and externalizing problems (Dodge & Garber, 1991). Affective dysregulation may be especially problematic for toddlers because it may interfere with their developing self-regulation. Additionally, developing a theory of mind is a key developmental task in this period (Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991), and heightened affective variability may impede toddlers' developing understanding of emotions in others. Although most research on parent-child interaction investigates how mean levels of parenting behaviors are associated

with child outcomes, dyadic characteristics of mother-child interaction may be the real-time 'proximal engines' that are important in determining the development of children's adjustment problems across developmental time (Bronfenbrenner & Morris, 1998).

The fourth aim of this dissertation was to investigate how child temperament and personality are interrelated with parenting in the etiology of internalizing and externalizing adjustment problems. We examine how (configurations of) child traits and parenting may be additive risk-factors. Additionally, we investigate how child traits and parenting interact to produce adjustment problems. Finally, we investigate how affective variability, as a characteristic of parent-child interaction, may be a dyadic risk-factor.

Project design

In order to study two important developmental periods (i.e., toddlerhood and the transition to adolescence), we used data from two longitudinal studies: The *toddler sample* comprised 165 toddlers and their mothers, who were assessed four times across one year (between 2002 and 2004). The *Flemish Study on Parenting, Personality and Development sample* (FSPPD) (Prinz et al., 2003), provided information on the constructs of interest to this dissertation at five assessments carried out across eleven years, covering an age range of six through twenty years.

Toddler sample

Mothers for the toddler sample were recruited through Infant Health Care centres. Two hundred and twenty seven mothers provided contact information, but due to the time-consuming nature of the study a random subgroup of 150 mothers was selected to be contacted, and recruitment stopped when 99 mothers had agreed to participate. To obtain a larger range of problem behavior, 66 families were recruited through coordinators of the Home-Start program. Home-Start is a volunteer-based parenting support program for mothers who experience difficulties in childrearing. Volunteers visit mothers once a week for half a day and offer emotional, instrumental, and informational support. After parents gave informed consent, the research staff made four home visits over the course of one year, to videotape the mothers and children in a standardized play situation. The children were on average 2 years 6 months old at Time 1 (range = 1 year 2 months – 3 years 8 months, SD = 6.7 months), including 45% girls, and 55% boys.

FSPPD sample

For the FSPPD, a proportional stratified sample of elementary school-aged children attending regular schools in Belgium was randomly selected in 1999. The second child and the before-last child were selected from an alphabetically arranged list of all children who had their birthday before March 31st of that year. Strata were constructed according to geographical location (province), sex and age. When parents agreed to be contacted, the researcher called the parents, explained the study, and obtained written permission. Out of 800 invited families, 682

families responded to the mailed questionnaires. At the first assessment, the total sample consisted of 674 families.

This dissertation focuses on the third through seventh waves, as these contained the measures of interest (T1 = 2001; T2 = 2004; T3 = 2007; T4 = 2009; T5 = 2012). At T1, 596 families participated. Data were collected according to a cohort-sequential design, including four cohorts, 6, 7, 8, and 9 years old at T1. See Table 1.1 for an overview of the ages at which the different cohorts were assessed. ($M = 7.5$, $SD = 1$ year 1 month; 49.8% boys; 50.2% girls).

Table 1.

Ages at which the Cohorts were Assessed

	6y	7y	8y	9y	10y	11y	12y	13y	14y	15y	16y	17y	18y	19y	20y
Cohort 1	T1			T2			T3		T4			T5			
Cohort 2		T1			T2			T3		T4			T5		
Cohort 3			T1			T2			T3		T4			T5	
Cohort 4				T1			T2			T3		T4			T5

Note. T1 = 2001; T2 = 2004; T3 = 2007; T4 = 2009; T5 = 2012.

Measures

In both the toddler sample and the FSPPD, a multi-informant approach was taken. In the toddler sample mothers filled out questionnaires and mother-child interaction was observed in a twelve-minute, standardized play interaction. Mother and child were given a box of lego blocks and carried out four tasks: free play (two minutes), building a tower (four minutes), building a bridge (three minutes), cleaning up (three minutes). Mothers were instructed to touch the blocks a maximum of three times during each task. In the FSPPD, mothers, fathers, teachers and child reports were available.

Child temperament/personality. For the toddler sample, mothers rated the activity level, anger proneness, and social fearfulness scales of the short version of the Toddler Behavior Assessment Questionnaire (TBAQ) (Goldsmith et al., 1991). For the FSPPD, children, mothers, fathers, and teachers rated the extraversion, benevolence, conscientiousness, emotional stability, and imagination scales of the Hierarchical Personality Inventory for Children (HiPIC) (Mervielde & De Fruyt, 1999).

Parenting. For the toddler sample, observational and maternal reports of parenting were available. Observers coded the harshness and support scales from the Coder Impressions Inventory (CII) (Webster-Stratton, 1998), and the hostility and sensitivity scales of the Erickson rating scales (Erickson, Sroufe, & Egeland, 1985). Mothers reported on their negative control and consistent disciplining practices by filling out the Parenting Dimensions Inventory (PDI) (Slater & Power, 1987), and their responsiveness by filling out the Nijmegen Parenting Questionnaire (NPQ) (Gerris et al., 1993). For the FSPPD, mothers and fathers reported on the overreactivity subscale of the Parenting Scale (PS) (Arnold et al., 1993; Prinzie et al., 2007), and the warm parenting subscale of the Parenting Practices Questionnaire (PPQ) (Robinson, Mandleco, Olsen, & Hart, 1995).

Dyadic Affective Variability. Affective displays of children and mothers were coded in real-time with the Specific Affect Coding System (SPAFF) (Gottman, McCoy, Coan, & Collier, 1995; Granic lab, 2006). The ten codes are mutually exclusive and include both negative (whine, fear, sad, anger, contempt), and positive codes (interest, enthusiasm, humor, affection) as well as a neutral code to indicate the absence of any other codable affect. To obtain measures of dyadic affective variability, trajectories of dyadic affective states were modelled in State Space Grids (Lewis, Lamey, & Douglas, 1999), using the GridWare program (Lamey, Hollenstein, Lewis, & Granic, 2004). Three indices of dyadic variability were modelled to load on a latent variable, for each subtask: number of transitions between dyadic affective states (transitions), range of affective states visited by the dyad (range), and a measure of the evenness of the distribution of behavior across all the dyadic affective states (duration entropy).

Adjustment problems. Internalizing and externalizing adjustment problems were assessed with the Child Behavior Checklist (CBCL) (1991a). For the toddler sample, mothers filled out the age-appropriate CBCL/2-3 (Achenbach, 1992; Verhulst, Van der Ende, & Koot, 1996). FSPPD, mothers and fathers reported on the CBCL (1991a), children filled out the youth-self report (YSR) (Achenbach 1991b), and teachers filled out the teacher report form (TRF) (Achenbach, 1991c).

Table 2. Overview of Measures per Assessment

Construct	Instrument	Sample	Informant	Assessment Time
Temperament	TBAQ	Toddler	mother	T1-T4
Personality	H/PIC	FSPPD	teacher mother, father child	T1-T3 T1-T4 T2-T5
Parenting negative control	PDI	Toddler	mother	T1-T4
harshness	CII	Toddler	observer	T1-T4
hostility	Erickson	Toddler	observer	T1-T4
overreactivity	PS	FSPPD	father mother	T1-T3 T1-T4
consistent discipline	PDI	Toddler	mother	T1-T4
responsiveness	NPQ	Toddler	mother	T1-T4
sensitivity	Erickson	Toddler	observer	T1-T4
support	CII	Toddler	observer	T1-T4
warmth	MPQ	FSPPD	mother	T2-T4
Dyadic affective variability	SPAFF	Toddler	observer	T1
Adjustment problems internalizing problems	CBCL/2-3 CBCL	Toddler FSPPD	mother mother father	T1-T4 T1-T4
externalizing problems	TRF	FSPPD	teacher	T1-T4
	YSR	FSPPD	child	T3
	CBCL/2-3	Toddler	mother	T1-T4
	CBCL	FSPPD	mother father	T1-T4 T1-T4
	TRF	FSPPD	teacher	T1-T4
	YSR	FSPPD	child	T3

Outline of this dissertation

In the chapters that follow, seven empirical studies are presented that address the aims of this dissertation: Which subgroups can be identified based on configurations of temperament in toddlers, (multiple informants' reports of) personality in childhood, and trajectories of personality extremity across childhood and adolescence? (*aim 1*); How stable are temperament types in toddlers, and how do mean-levels of the personality dimensions change across childhood and adolescence? (*aim 2*); How are temperament and personality associated with parenting behavior across development? (*aim 3*); How are child temperament and personality interrelated with parenting in the etiology of internalizing and externalizing adjustment problems? (*aim 4*).

In *Chapter 2*, we report an investigation of the number and type of temperament configuration in toddlers (*aim 1*), and their stability across months (*aim 2*), in relation to both negative and positive parenting (*aim 3*), and internalizing and externalizing adjustment problems (*aim 4*). In *Chapter 3* we investigate personality types in children (*aim 1*), and how their prediction of developmental trajectories of internalizing and externalizing problems is dependent on maternal overreactive parenting (*aim 4*).

Chapter 4 presents a study on mean-level development of the personality dimensions across childhood and adolescence (*aim 2*). Additionally, reciprocal relations between changes in the personality dimensions and maternal warm and overreactive parenting are investigated (*aim 3*). *Chapter 5* details a study on how changes in children's Big Five personality dimensions and overreactive parenting across the transition to adolescence are predictive of adolescent adjustment problems (*aim 4*).

Chapter 6 examines how personality extremity develops from childhood into late adolescence (*aim 1*), and how different developmental trajectories of personality extremity are predictive of internalizing and externalizing adjustment problems above and beyond the personality dimensions themselves (*aim 4*). In *Chapter 7*, we present a study on non-linear associations between Big Five personality dimensions and adjustment problems in children and adolescents (*aim 4*), and in *Chapter 8* we present an investigation of how mother-child dyadic affective variability, a structural aspect of affective displays, across minutes, relates to toddlers' internalizing and externalizing behavior problems (*aim 4*).

|Chapter 2|

Toddlers' Temperament Profiles: Stability and Relations to Negative and Positive Parenting

Abstract

This study investigated the type and stability of temperament profiles in toddlers, and relations of profile probability to negative and positive parenting trajectories. Mothers ($N=96$) rated their child's (41 girls and 54 boys) Sociability, Anger Proneness, and Activity Level four times during one year. The assessment of parenting included both maternal self-reports and observational measures. Latent profile analysis indicated three temperament profiles: a well-adjusted 'typical' profile, an 'expressive' profile with heightened externalizing problems, and a 'fearful' profile with heightened internalizing problems. Although toddlers' profile classifications were highly stable across one year, individual differences in (changes in) toddlers' temperament profile probability occurred. We identified negative and positive parenting as environmental mechanisms that were related to the development of temperament profiles over time. These results support the notion that, in addition to having a genetic base, temperament is subject to maturation and experience over time.

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Introduction

Temperament can be defined as the biologically based core of individual differences in style of approach and response to the environment that is stable across time and situations. This core is then thought to become more differentiated into later personality through interaction with the environment (Shiner & Caspi, 2003). Most research on child temperament has investigated temperament traits, representing a variable-centered approach. Several different temperament taxonomies co-exist, describing temperament along different dimensions or traits. Early on, Chess and Thomas (1985) described nine dimensions: activity level, rhythmicity, approach, adaptability, responsiveness, intensity of reaction, quality of mood, distractibility and persistence. Other theorists have mostly employed a three dimensional framework. Buss and Plomin (1984) identified emotionality, activity, and sociability, and Goldsmith (1996) used the dimensions of anger proneness, social fear and activity level to describe temperament. Although Rothbart (1981) had initially proposed more dimensions, Gartstein and Rothbart (2003) also came to a three dimensional taxonomy based on factor-analytic results, including surgency, negative affectivity and a regulatory component of temperament, effortful control.

Although temperament may be described by relatively independent dimensions derived from factor analysis, not all possible combinations of these dimensions may occur in actual persons. Even if they all occur, certain combinations could be much more likely in that they characterize more individual children. In a person-centred approach the configuration of temperament traits within individuals is investigated. Temperament theory has advocated a person-centred approach from its beginning. Thomas and Chess's temperament theory (1985), in addition to describing several temperament dimensions, classified children as belonging to either of three types: 'easy', 'slow to warm up', or 'difficult'. The person-centred approach is also in line with contemporary 'systems' approaches to development, which indicate that through interaction of the separate temperament dimensions, or lower order elements, the whole personality organization emerges within the individual (Lewis, 2000).

A handful of studies have taken a person-centred approach to temperament in preschool-aged children. Aksan and colleagues (1999) found two temperament types: one high in control and low in both approach and negative affectivity, and one low in control and high in approach and negative affectivity. There was also a large 'other' group, but classification of all individuals into types was not attempted. Komsis and colleagues (2006) found that temperament clustered into three types: a 'resilient' type, characterized by high activity, positive affectivity and control and low negative affectivity, an 'undercontrolled' type, characterized by high activity and negative affectivity, and low control and positive affectivity, and an 'overcontrolled' type, characterized by low activity and positive affectivity, average negative affectivity and high control. Stifter, Putnam and Jahromi (2008) also revealed three clusters: an 'inhibited' cluster, high in negative affect and low in approach, an 'exuberant' cluster, high in positive affect and high on approach, and a 'low reactive' cluster, moderate on approach and low on positive and negative affect.

Although the aforementioned studies converged on a three profile solution, two studies investigating temperament found a five-type solution to be the best fitting one. Caspi and Silva (1995) found an 'undercontrolled' type, characterized by a lack of control and difficulty sustaining attention, an 'inhibited' type, that also had difficulty sustaining attention but was also socially inhibited, a 'reserved' type, that was also inhibited but not as much and had no difficulty sustaining attention, a 'confident' type that was mainly characterized by high scores on approach, and finally, a 'well-adjusted' type that was average on all measures. More recently, Janson and Mathiesen (2008) also converged on a five type solution. The undercontrolled, confident and inhibited types were replicated, but they found an 'unremarkable' type rather than a 'well-adjusted' type that was characterized by average to moderately low scores on all temperament dimensions, and an 'uneasy' type that was shy and high on emotionality.

The discrepancies in the number and content of temperament types may be due to the analysis techniques used in previous studies, such as cluster analysis and configural frequency analysis. In the present study, we performed latent profile analysis (LPA) (Muthén & Muthén, 2000). Unlike cluster analysis, LPA allows for varying parameters across the profiles, and provides statistics that help the researcher make a more objective choice for a final model. Furthermore, whereas in traditional clustering techniques individuals are assigned to clusters on an all-or-none basis, LPA provides a probability score for each profile, thereby taking uncertainty of membership, or error, into account. Individuals can be assigned to the profile for which they have the highest probability, and additionally, the probabilities themselves can be investigated. Although we are unaware of any studies employing LPA for preschool aged children's temperament, we know of one study that used it to investigate older children. Rettew, Althoff, Dumenci, Ayer and Hudziak (2008) found that eleven year old children were best categorized into three profiles: a 'disengaged' profile, characterized by high novelty seeking, low persistence and reward dependence, a 'steady' profile, which was non-impulsive, orderly and characterized by a strong ability to persevere despite obstacles or frustration, and a 'moderate' profile, characterized by moderate scores on all temperament dimensions.

Temperament is implicated in adjustment problems. Certain temperament characteristics may make children vulnerable to developing internalizing or externalizing problems. Recently, high negative emotionality and activity as assessed by different temperament measures have all been shown to be related to externalizing problems, whereas low sociability was related to internalizing problems (De Pauw, Mervielde, & Van Leeuwen, 2009). A few studies have related temperament clusters in preschool aged children to adjustment problems, and found that one or two clusters had both elevated levels of internalizing and externalizing problems (Aksan et al., 1999; Janson & Mathiesen, 2008; Rettew et al., 2008; Stifter et al., 2008). Relating temperament profiles to adjustment problems may help validate the profiles by showing that they are meaningfully related to other aspects of development. Furthermore, some children may be especially prone to internalizing problems, whereas others are prone to externalizing problems, due to their configuration of temperament traits. The first aim of the present study was to investigate, using LPA, whether

toddlers' temperaments are best described by a three- or a five profile solution, and whether these profiles can be distinguished by their levels of adjustment problems.

Temperament profile stability

The second aim of the present study was to investigate temperament profile stability. Temperament is (theoretically) regarded as a heritable, biologically based core that is highly stable across time and situations. Early temperament traits indeed predict later childhood temperament (Komsis et al., 2006; Putnam, Rothbart, & Gartstein, 2008), and even adult personality (Blatny, Jelinek, & Osecka, 2007), providing evidence for the stability of temperament traits. However, temperament is thought to be influenced not only by heredity, but also by maturation and experience, and is thus regarded as developing (Rothbart & Bates, 2006). For instance, the earlier children develop fearful inhibition, the earlier they are motivated to avoid potentially threatening situations and the fewer experiences of these situations they will have. This difference in experience may in turn impact the development of fearful inhibition itself. Indeed, behavioral genetic studies find, next to significant heritability, a significant contribution of environmental factors (Goldsmith, Lemery, Buss, & Campos, 1999).

Supporting the idea of temperament as developing, a meta-analysis of temperament and personality development has indicated that stability is only moderate overall, with test-retest correlations ranging from .35 in the 0-3 year age range, to .52 in the 3-6 year age range (Roberts & DelVecchio, 2000). To our knowledge only two studies investigated stability in temperamental profiles during the childhood years. Aksan and colleagues (1999) found a fair to moderate degree of stability for their two types from 3.5 to 4.5 years of age, with fewer than 50% of children remaining in the same category. Janson and Mathiesen (2008) report similar stability coefficients, with 46% of children remaining in the same temperament profile over a 2-year timespan, from 2.5 to 4.5 years. In general, toddlerhood is characterized by rapid development of emotion regulatory capacity, patterns of relating to others, and internal representations of relationships. When development is rapid, shorter spaced assessments are needed to pick up on developmental changes which may be lost over longer timescales. Generally, it is important to supplement investigations on larger timescales with investigations on smaller timescales to get a fuller picture of the nature of temperament development across the lifespan. In contrast to previous studies on the stability of temperament profile membership, the present study takes a more fine-grained look by investigating toddlers over a one year period, across 4 time points.

Even when stability is high, individual differences in this stability may occur, with environmental mechanisms contributing to these differences. One such mechanism is parenting. Negative parenting behaviors, such as hostility, harshness and negative control, can be distinguished from positive parenting behaviors, such as support, consistency and sensitivity. Children with an 'easy' temperament may elicit more positive parenting than children with a 'difficult' temperament, whereas children with a difficult temperament may be challenging to handle and elicit more negative parenting than their easy counterparts. Child negative emotionality is indeed associated with less supportive parenting and more restrictive

control (Paulussen-Hoogeboom, Stams, Hermanns, & Peetsma, 2007), and mothers of irritable and fearful toddlers have been shown to be more disapproving (Gauvain & Fagot, 1995). Increases in negative emotionality between 4 and 12 months have been related to more negative parenting when toddlers were 18 months (Bridgett et al., 2009).

Experiences of parenting may in turn promote stability in these temperament profiles. For instance, toddler inhibition is related to later social reticence, only when mothers use intrusive control (Rubin, Burgess, & Hastings, 2002). In the present study we included multiple measurements of temperament as well as parenting, allowing us to investigate the stability of profile membership and relations of profile membership probability to trajectories of negative and positive parenting.

Present study

In the present study, we employed LPA to investigate the number and types of profiles that best describe the present sample. Based on previous research, we hypothesized that either a three-profile (Aksan et al., 1999; Komsı et al., 2006; Stifter et al., 2008) or a five-profile solution (Caspi & Silva, 1995; Janson & Mathiesen, 2008) would emerge. We expected that a well-adjusted profile would emerge, as well as one or more profiles with heightened levels of internalizing or externalizing problems. We further expected that profile membership would be moderately stable, and that well-adjusted temperament profiles would be longitudinally related to trajectories of more positive and less negative parenting, whereas less adaptive temperament profiles would be related to trajectories of less positive and more negative parenting. A multi-informant approach, including observer and mother reports allowed for the reduction of reporter bias in the assessment of parenting.

Method

Participants and Procedures

The sample consisted of 96 mothers and their children (41 girls and 54 boys). The children's mean age was 30 months at T1 ($SD = 6.5$, range = 18-43), 36 months at T2 ($SD = 6.5$, range = 26-49), 39 months at T3 ($SD = 6.5$, range = 27-51), and 42 months at T4 ($SD = 6.5$, range = 40-55 months). The mothers' mean age was 34.7 years at T1 ($SD = 4.9$, range = 23-46). 98% had Dutch nationality, 90% were two-parent families, and 10% were single mothers. Percentages of mothers' educational levels were for elementary school 4%, for secondary school 11%, for non-university higher education 79%, and for university or higher 6%. Ten % of the families were of low Socio-Economic Status (SES) (<€1,400 per month), 47% of intermediate SES (€1,400 - €2,800 per month), and 43% of high SES (>€2,800 per month).

Approximately 1000 mothers, recruited through Infant Health Care centres, were asked to provide contact information if they wished to be informed about our study. 227 mothers provided contact information. Because of the time-consuming nature of the study a random subgroup of 150 mothers was selected to be contacted, and recruitment stopped when 99 mothers had agreed to participate. Three mothers did not fill out the questionnaires, leaving a

total of 96 participants. Three mothers dropped out of the study between the first and the second time point, and one more mother dropped out between the third and the fourth time point. Participants and non-participants did not differ on demographic variables or on the variables under study. As Little's MCAR test indicated that data was missing completely at random, $\chi^2(33) = 40.94$, $p = .16$, it could be imputed using Expectation Maximization (Schafer & Graham, 2002).

After parents gave informed consent, the research staff made four home visits over the course of one year, each lasting about 45 min. The home visits included a 12-min., standardized and video-taped observation of mother-child play interactions. A box of Lego blocks with two little cars were offered on a carpet of approximately one m². The mother-child dyads performed four subtasks: free play (2 min.), building a tower (4 min.), building a bridge (3 min.) and cleaning up (3 min.). Mothers were asked to play with their child as they usually would. Immediately after the home visit, the research staff coded the Coder Impressions Inventory (CII) (Webster-Stratton, 1998). The video tapes were later coded by trained research assistants. At each time, questionnaires were sent to the mothers.

Measures

Temperament. Mothers rated the activity level, anger proneness, and social fearfulness scales of the short version of the Toddler Behavior Assessment Questionnaire (TBAQ) (Goldsmith, Rieser-Danner, & Briggs, 1991), which was specifically devised for the present age range. Items are rated on scales ranging from 1 (*never*) to 7 (*always*). The social fearfulness scale consists of eleven items measuring inhibition, distress, or signs of shyness in novel or uncertainty-provoking situations of a social nature (e.g., 'When at the doctor's office, how often did your child cry or struggle when the doctor tried to touch him/her?'). The anger proneness scale consists of nine items measuring crying, protesting, or other signs of anger in situations involving conflict with another child or the caregiver (e.g., 'When it was time for bed or a nap and your child did not want to go, how often did s/he physically resist or struggle?'). However, as missing data for one of the items ('When you were going out and your child did not want to stay with the regular sitter, how often did s/he show no signs of anger?') ranged from $n = 51$ (T4) to $n = 63$ (T2) and this item had a strong negative influence on the scale reliability, it was excluded from subsequent analyses. The activity level subscale consists of seven items measuring limb, trunk or locomotor movement during a variety of daily situations (e.g., 'When being dressed, how often did your child squirm or try to get away?'). Cronbach's *alphas* ranged from .59 to .70, with two exceptions: Cronbach's *alphas* for activity level at T1 and 2 were .42 and .56 respectively. These reliabilities are comparable to those of other studies on temperament in this age range (Janson & Mathiesen, 2008).

Adjustment problems. Mothers rated the internalizing and externalizing problem behavior subscales of the Dutch version of the Child Behavior Check List (CBCL/ 2-3) (Achenbach, 1992). The internalizing subscale consists of 25 items (e.g., 'My child cries a lot'), whereas the externalizing subscale consists of 26 items (e.g., 'My child disobeys'). Each item is rated: 0(*not true*), 1(*sometimes/somewhat true*), or 2(*often/very true*). The CBCL is a well validated, reliable

instrument to measure child behavior (Vignoe, Bérubé, & Achenbach, 2000). Cronbach's *alphas* ranged from .72 to .90.

Parenting. The negative parenting measure comprised the *harshness* scale from the Coder Impressions Inventory (Webster-Stratton, 1998), the *hostility* scale from the Erickson rating scales (Erickson, Sroufe, & Egeland, 1985), and the *negative control* dimension from the Parenting Dimensions Inventory (PDI) (Slater & Power, 1987). The harshness scale of the CII consists of twelve items (e.g., 'The parent used sarcasm in a demeaning or hurtful way'). The CII was originally designed for treatment effectiveness studies. Coders rate how often the observed parenting behaviors occurred, 1 (*did not occur*), 2 (*occurred once*), or 3 (*occurred more than once*). Coders achieved agreement of > 80 % after 30 h. of training with videotapes before home visits. Cronbach's *alphas* ranged from .67 to .80. Three different observers rated the Erickson scales on the videotapes of the home observations, after 25 hours of practice. These 7-point rating scales are regularly used to code parents' interactions with children in the present age range (e.g., Alink et al., 2009; Van Bakel & Riksen-Walraven, 2002). The hostility scale measures mothers' expressions of anger and rejection of the child. For this scale, the Intra-class correlations between raters in a sub-sample of 25 tapes was ICC = 0.70. In addition to these observational measures, mothers rated their negative control on six hypothetical situations from the PDI, describing child misbehavior (i.e., "Your child hits his/her friend after an argument"), each followed by several parental reactions. Mothers indicated how probable it was that they would use each reaction (0 = *very improbable* to 3 = *very probable*). A mean score across situations was calculated for: ignoring, love withdrawal, physical punishment, and exercise of power. Cronbach's *alphas* ranged from .83 to .89. Results of confirmatory factor analysis (CFA) for the measures of negative parenting affirmed the feasibility of combining reports. When a single component was extracted, it had an eigenvalue of 1.54, explaining 51% of the variance, and all factor loadings were greater than 0.61. Scores on the indicators were averaged to form composite scores (scores were standardized across rather than within time points, thereby preserving the relative differences in variability across time, and allowing for the investigation of change across time).

The positive parenting measure included the *support* scale from the CII, the Erickson *sensitivity* scale, the *consistency* scale of the PDI, and the *responsiveness* scale of the Nijmegen Parenting Questionnaire (NPQ) (Gerris et al., 1993). The support scale of the CII consists of thirteen items (e.g., 'mother was patient with the child'), coded as 1 (*did not occur*), 2 (*occurred once*), or 3 (*occurred more than once*). Cronbach's *alphas* ranged from .71 to .86. Additionally, the Erickson sensitivity scale was coded on a 7-point scale, reflecting the extent to which the mother remains engaged, responds to her child's needs, and paces her efforts to her child's tempo. The intra-class correlation between raters in a subsample of 25 tapes was ICC = 0.88. Finally, mothers rated their responsiveness and consistency. The consistency scale of the PDI consists of eight items (e.g., 'My child often gets me to change my mind after I have denied his/her request'), rated on a six point scale (1 = *completely disagree* to 6 = *completely agree*). Cronbach's *alphas* ranged from .71 to .77. The responsiveness scale of the NPQ consists of 8 items (e.g., 'I know what's wrong when my child is having problems'), rated on

a 6-point scale (1=*totally disagree* to 6=*totally agree*). Cronbach's *alphas* ranged from .79 to .91. Results of CFA for the measures of positive parenting affirmed the feasibility of combining reports into a composite score. When a single component was extracted, it had an eigenvalue of 1.44, explaining 36% of the variance, and all factor loadings were greater than 0.45. Scores on the indicators were averaged to form composite scores (scores were first standardized across time points, preserving the relative differences in variability across time).

Statistical analysis

To ensure that the four variables weighed equally in the profile analysis, while preserving level differences across time points, scores for each of the temperament traits were standardized across time points. In LPA in Mplus version 4.2 (Muthén & Muthén, 2007) these standardized scores were regressed on a latent categorical variable representing the profiles ($N = 384$). Three-variable temperament measurements were thus regarded as profiles, disregarding whether profiles describe different people at the same time point or the same people at different time points. We assessed model fit with the Lo-Mendell-Rubin (LMR) test, which compares models with a model with $k-1$ profiles (Lo, Mendell, & Rubin, 2001), the sample size adjusted Bayesian Information Criterion (adjBIC), with lower values indicating better fit, and entropy as a measure of classification quality. Most importantly, the profiles were inspected for their substantive interpretation. In addition to a categorical profile classification, continuous probability indicators were obtained for each profile. MANOVAS were performed to investigate the statistical significance of the mean difference between profiles for each temperament trait, as well as differences in levels of adjustment problems. Next, we performed General Loglinear Modeling to investigate profile stability. Finally, we performed Latent Growth Curve Modeling to investigate the relations between temperament profile probability and positive and negative parenting. Multivariate growth models were fitted in LISREL 8.54 (Jöreskog & Sörbom, 2003) to the observed mean vector and covariance structure using Maximum Likelihood estimation. Each model included covariances between the intercept and slope of the probability for one of the temperament profiles and the intercept and slope of either positive or negative parenting. Slope loadings of the first and final time point were fixed to one, whereas loadings of the second and third time point were freely estimated to allow for nonlinearity of change. We assessed model fit with the comparative fit index (CFI), with CFI $>.90$ indicating a good fit; and the root mean square error of approximation (RMSEA), with RMSEA $<.08$ indicating an acceptable fit (for an overview of model fit statistics, see Hu & Bentler, 1995).

Results

Profile Analysis

Three-, four-, and five-profile models were fitted to the data. The three-profile model was chosen as providing the best fit to the data (three-profile model: Loglikelihood (20) = -1552.05, LMR = 58.84, $p < .01$, AIC = 3144.10, BIC = 3223.11, entropy = .71). Although the four- and five-profile models had lower AIC and BIC indexes, they did not provide statistically significant incremental fit over the k-1 models, whereas the three-profile model did (four-profile model: Loglikelihood (18) = -1550.28, LMR = 20.28, $p < .35$, AIC = 3136.55, BIC = 3207.67, entropy = .74; five-profile model: Loglikelihood (22) = -1539.65, LMR = 20.41, $p < .06$, AIC = 3123.29, BIC = 3210.21, entropy = .72). Furthermore, the three-profile model provided a sufficient classification of individuals: the average probabilities for the most likely profile were large enough ($> .81$), and the probabilities for the other two profiles were small enough ($< .13$). Finally, each profile was sufficiently large to allow for the expectation that the results might replicate across samples and are not due to the specific characteristics of a certain individual (profile 1 = 60.9%, profile 2 = 26.6%, profile 3 = 12.5%). For a graphical representation of the estimated profile means, see Figure 1.

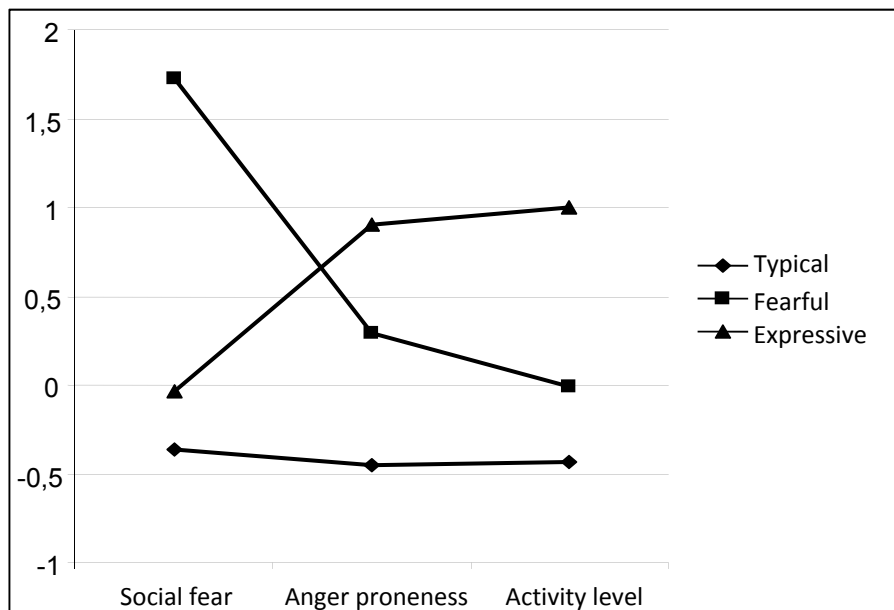


Figure 1. Standardized means for the three temperament traits for each of the profiles in the three-profile solution.

A MANOVA was performed to investigate the statistical significance of the mean difference between profiles for each temperament trait. Descriptives of the study variables are provided in Table 1.

Table 1.
Descriptives of the Study Variables for the Three Profiles

	N	Social fear		Anger proneness		Activity level		Internalizing problems		Externalizing problems		Negative parenting		Positive parenting	
		M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
All Times															
Profile 1	224	2.36	.66	2.65	.60	3.53	.62	4.29	3.84	8.33	6.00	-.03	.66	.06	.65
Profile 2	120	2.72	.71	3.93	.69	4.88	.59	6.57	4.12	15.42	6.88	.06	.74	-.13	.76
Profile 3	40	4.43	.69	3.35	.78	3.83	.70	8.42	4.43	11.99	5.35	.02	1.01	-.22	.70
T1															
Profile 1	45	2.39	.63	2.75	.60	3.37	.69	4.43	4.10	9.07	6.68	-.18	.54	.06	.58
Profile 2	37	2.60	.72	3.99	.67	4.83	.51	6.93	4.11	17.82	7.04	.10	.90	-.20	.66
Profile 3	14	4.34	.62	3.40	1.01	3.78	.76	6.59	4.54	12.00	6.42	-.17	.76	-.38	.74
T2															
Profile 1	57	2.38	.59	2.64	.56	3.57	.50	4.10	3.86	8.30	6.75	.04	.86	-.04	.76
Profile 2	26	2.89	.71	3.88	.71	4.99	.50	6.91	4.50	15.77	7.12	.07	.64	-.18	.71
Profile 3	13	4.45	.53	3.35	.58	3.95	.86	8.27	4.12	11.81	5.14	-.01	.41	-.24	.62
T3															
Profile 1	63	2.38	.70	2.63	.65	3.56	.65	4.13	3.86	8.22	5.64	-.01	.58	.05	.70
Profile 2	28	2.61	.58	3.88	.60	4.94	.64	6.05	3.11	13.36	6.22	.12	.84	-.24	1.00
Profile 3	5	4.56	.99	3.54	.52	4.11	.79	11.60	3.29	14.20	4.03	.33	1.18	-.05	.50
T4															
Profile 1	59	2.31	.70	2.60	.58	3.58	.64	4.42	3.66	7.92	5.07	-.01	.62	.15	.52
Profile 2	29	2.80	.80	3.97	.83	4.78	.75	6.32	4.75	14.01	6.37	-.06	.48	.12	.63
Profile 3	8	4.48	.84	3.09	.76	3.51	.55	9.89	4.41	10.87	4.85	.20	1.85	.03	.89

The multivariate test revealed a significant main effect for temperament profile, $F(6,760)=145.64$, $p<.01$. The effect size was large, partial $\eta^2 = .54$ (Cohen, 1988). Univariate tests indicated that there were significant differences or a large effect size between the profiles for each of the temperament traits, $F_{\text{social fear}}(2,381) = 177.92$, $p < .01$, partial $\eta^2 = .48$, $F_{\text{anger proneness}}(2,381) = 125.18$, $p < .01$, partial $\eta^2 = .40$, $F_{\text{activity level}}(2,381) = 156.18$, $p < .01$, partial $\eta^2 = .45$. Post-hoc Bonferroni tests indicated that all differences between profiles were significant (profile 1 vs 2: $\Delta_{\text{social fear}} = .28$, $p < .01$, $\Delta_{\text{anger proneness}} = 1.15$, $p < .01$, $\Delta_{\text{activity level}} = 1.27$, $p < .01$; profile 1 vs 3: $\Delta_{\text{social fear}} = 2.18$, $p < .01$, $\Delta_{\text{anger proneness}} = .65$, $p < .01$, $\Delta_{\text{activity level}} = .42$, $p < .01$; profile 2 vs 3: $\Delta_{\text{social fear}} = 1.90$, $p < .01$, $\Delta_{\text{anger proneness}} = .51$, $p < .01$, $\Delta_{\text{activity level}} = .85$, $p < .01$). The majority of the sample was classified as belonging to a profile that was lower than the other two profiles on all three temperament traits. Profiles that are similar to this one have sometimes been labeled well-adjusted. However, as the temperament traits themselves were not a measure of adjustment, we did not follow this tradition, but called this profile 'typical'. Profile 2 was characterized by the highest levels of anger proneness and activity level, and intermediate levels of social fear. We called this profile 'expressive', as it was both anger prone and active. The third profile was characterized by the highest levels of social fear, and intermediate levels of anger proneness and activity level, and we called it 'fearful'. Although studies often use the term 'inhibited' to describe profiles that are fearful, we did not choose this label as this type was more anger prone and active than the typical group, whereas an 'inhibited' type is generally below average on anger proneness. At each time point, each individual was classified into the profile for which s/he had the highest probability.

We performed a MANOVA to investigate differences between profiles in levels of adjustment problems. The multivariate test revealed a significant and large main effect of temperament profile, $F(4,762) = 33.95$, $p < .01$, partial $\eta^2 = .15$. Tests of between-subjects effects revealed a significant, medium effect for internalizing problems ($F(2,381) = 25.37$, $p < .01$, partial $\eta^2 = .12$), and a significant and large effect for externalizing problems ($F(2,381) = 51.29$, $p < .01$, partial $\eta^2 = .21$). Post-Hoc Bonferroni tests indicated that the typical profile was lower on internalizing and externalizing problems than both the expressive profile ($\Delta_{\text{internalizing}} = 2.29$, $p < .01$; $\Delta_{\text{externalizing}} = 7.09$, $p < .01$), and the fearful profile ($\Delta_{\text{internalizing}} = 4.14$, $p < .01$; $\Delta_{\text{externalizing}} = 3.66$, $p < .01$). The fearful profile had higher levels of internalizing problems than the expressive profile, whereas the expressive profile had higher levels of externalizing problems than the fearful profile ($\Delta_{\text{internalizing}} = 1.85$, $p = .01$; $\Delta_{\text{externalizing}} = 3.43$, $p < .01$).

Profile Stability

General loglinear modelling was performed in SPSS, to investigate the stability of temperament classifications across time points. At each interval, staying in any of the temperament profiles was identified as a statistically significant type (a sequence that occurred more often than expected by chance). Profile stability was high: 71% of the children retained their profile membership from the first to the second time point, 68% retained their profile membership from the second to the third time point, and 75% retained their membership from the third to the fourth time point. Finally, 72% of the preschoolers were classified into the same profile at the fourth as at the first time point. Certain changes were also statistical types: 4% of the children changed from 'fearful' to 'expressive' from the first to the second, and from the second to the third time point. All other changes were statistical antitypes, indicating that they occurred less often than expected by chance. For a graphical presentation of the changes, see Figure 2.

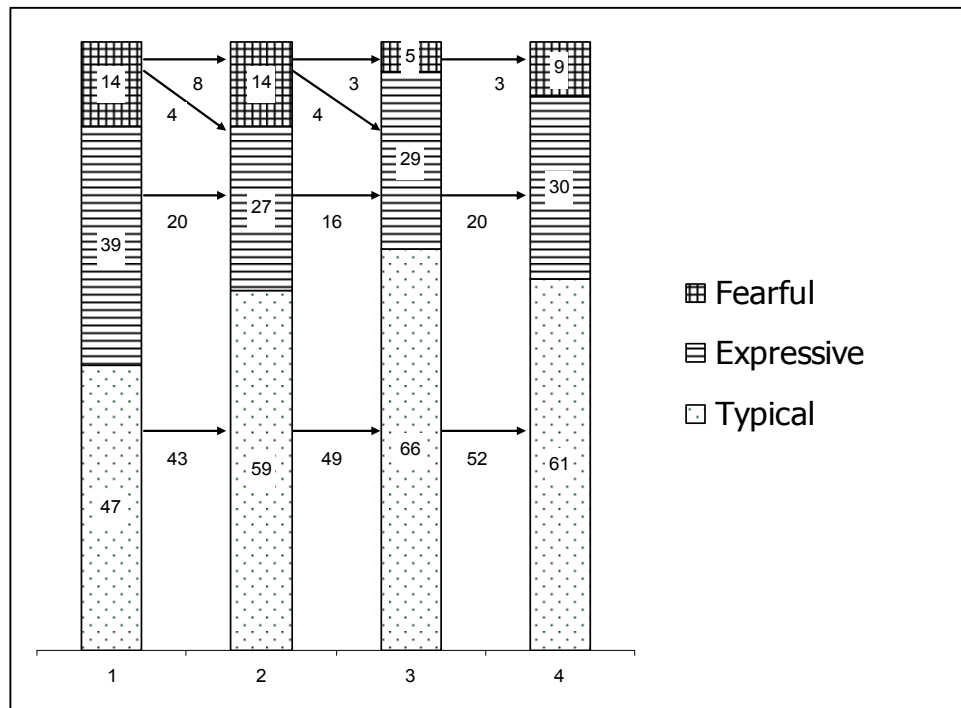


Figure 2. Percentage of participants classified into each temperament profile at each time point. Arrows indicate pathways between time points identified as statistical types. Numbers at arrows indicate percentage of participants out of the total number in each cross-tabulation. Statistical antitypes are not shown.

Temperament profile probability and parenting

To investigate relations between the temperament profiles and parenting, multivariate latent growth models were fitted, including the probability for a temperament profile and negative or positive parenting. The models provided an acceptable fit to the data (typical-positive: $\chi^2 (24) = 36.85, p = .05, CFI = .98, GFI = .92, RMSEA = .08$; typical-negative: $\chi^2 (24) = 28.92, p = .22, CFI = .99, GFI = .95, RMSEA = .05$; expressive-positive: $\chi^2 (19) = 28.14, p = .08, CFI = .97, GFI = .94, RMSEA = .07$; expressive-negative: $\chi^2 (19) = 29.97, p = .05, CFI = .96, GFI = .95, RMSEA = .08$; fearful-positive: $\chi^2 (19) = 18.78, p = .47, CFI = 1.00, GFI = .96, RMSEA = .00$; fearful-negative: $\chi^2 (24) = 31.36, p = .17, CFI = .98, GFI = .94, RMSEA = .05$).

Children who were more likely to be classified as typical initially, had parents who displayed more positive parenting ($\sigma^2 = .05 (.03), p < .01$), whereas children who were more expressive or fearful had parents who displayed less positive parenting ($\sigma^2 = -.04 (.02), p < .001$; $\sigma^2 = -.04 (.02), p < .01$, respectively). Parents of children who were more fearful also displayed more negative parenting ($\sigma^2 = .06 (.03), p < .001$), whereas the typical and expressive profiles were not related to negative parenting. Initial profile probability was related to changes in parenting over time: children who were more typical had parents who displayed a less strong increase in positive parenting over time ($\sigma^2 = -.06 (.02), p < .001$), and children who were more expressive or fearful had parents who displayed a stronger increase in positive parenting over time ($\sigma^2 = .04 (.01), p < .001$; $\sigma^2 = .05 (.02), p < .001$, respectively). Initial levels of temperament profile probability were not related to changes in negative parenting over time, and initial levels of parenting were not related to changes in temperament probability over time. Finally, associated change occurred: when children became more typical, parents increased more in positive parenting ($\sigma^2 = .03 (.02), p < .001$) and decreased in negative parenting over time ($\sigma^2 = -.04 (.02), p < .01$). When children increased in expressiveness or fearfulness, parents displayed a less strong increase in positive parenting ($\sigma^2 = -.02 (.01), p < .001$; $\sigma^2 = -.03 (.01), p < .001$, respectively). Change in probability for expressiveness or fearfulness was not related to change in negative parenting.

Discussion

This study investigated temperament profiles in children aged two to four years. We found a three-profile solution: a typical profile, characterized by low levels of social fear, anger proneness and activity level, an expressive profile, characterized by low levels of social fear, and high levels of anger proneness and activity level, and a fearful profile characterized by high levels of social fear, and intermediate levels of anger proneness and activity level.

Like the present study, several other studies converged on a three-profile solution. Although they investigated different temperament traits, Komsis and colleagues (2006) and Stifter and colleagues (2008) reported an undercontrolled or exuberant type that was similar to our expressive type, as well as an overcontrolled or inhibited type that was similar to our fearful type, and finally a resilient or low reactive type that was similar to our typical type. The validity of the types found in the present study is supported by the differential relations of the

types to adjustment problems. Although previous studies found one or two types with elevated internalizing as well as externalizing problems (Aksan et al., 1999; Janson & Mathiesen, 2008; Rettew et al., 2008; Stifter et al., 2008), we found one type that was high on internalizing problems, the fearful type, and a different type that was high on externalizing problems, the expressive type, and finally one type that was generally well-adjusted.

Our results resemble findings in personality research, which has replicated three types across measurement, analysis method and culture: a resilient type that is well-adjusted, an overcontrolled type that is prone to internalizing problems and an undercontrolled type that is prone to externalizing problems (e.g., Asendorpf & van Aken, 1999; Hart, Hoffman, Edelstein, & Keller, 1997; Robins, John, Caspi, Moffitt, & Stouthamer-Loeber, 1996; Van Leeuwen, de Fruyt, & Mervielde, 2004). Some differences between the temperament profiles of the present study and these personality types can also be noted. The fearful and expressive types both have higher levels of fearfulness and anger proneness compared to the typical group, whereas the undercontrolled type is less fearful and the overcontrolled type is less anger prone than the resilient group. It appears that as temperament becomes differentiated into personality, the two less well-adjusted profiles become more distinct from each other. Perhaps the most salient feature of the profile becomes more strongly entrenched into the child's developing personality, magnifying differences between these profiles.

Constrasting our findings, two studies on temperament profiles found a five-profile solution (Caspi & Silva, 1995; Janson & Mathiesen, 2008). However, three of the five profiles were highly similar across these two studies (the undercontrolled, inhibited and confident types, which are again highly similar to our three types), whereas the remaining two types differed. Perhaps some sample specific variations became significant as subtypes due to the large sample sizes of both these studies ($N = 993/1037$). It is also true that the guidelines for interpreting these results are not clear-cut, and ultimately based on the priority given to certain considerations, such as interpretability of the profiles, statistical significance of the addition of profiles, and the choice of model fit statistics (Muthén & Muthén, 2000).

In addition to investigating which profiles best described the present sample, we investigated the longitudinal stability of these profiles. Although toddlerhood is a period of rapid development in several domains, temperament profile stability was high: between 68% and 75% of children retained their profile between consecutive timepoints, and 72% was classified in the same profile at the first and the fourth timepoint. Aksan and colleagues (1999) and Janson and Mathiesen (2008) found a lower stability of around 50%, even across a comparable timegap (1 year, as between the first and the fourth time point of the present study). Perhaps stability was lower in these other studies because they converged on a solution with more profiles, that were more similar to each other than the profiles in the present study. When profiles differ more, children are less likely to transition between them. Another interesting result was that it was a type to transition from fearful to expressive across the first three time points, but not from the third to the fourth time point. This pattern supports the idea that as children grow older their developmental trajectories become more crystallized, and change becomes less likely (Roberts & Delvecchio, 2000). Although test-retest correlations

indicate moderate stability for temperament traits at preschool age, results of the present study indicate that when three profiles are used to describe temperament, the configuration of these traits is much more stable.

Although profile stability was high, change did occur. As LPA produces probability scores for the profiles, we were able to investigate how (changes in) the probability that individuals were classified into a certain profile were related to parenting. Initial typicalness was related to more positive parenting, whereas initial expressiveness was related to less positive parenting. Initial fearfulness was related to less positive parenting and more negative parenting. Studies on temperament traits have also found negative emotionality (anger and fearfulness) to be related to more negative and less positive parenting (Bridgett et al., 2009; Paulussen-Hoogenboom et al., 2007). However, social fear or inhibition has also been found to be related to less negative parenting (Bryan & Dix, 2008; Rubin et al., 2002). Perhaps social fear as a trait is related to less negative parenting across all children, because parents see these children as vulnerable and react by being especially careful. However, children belonging to the fearful profile may be especially problematic, as they also have heightened levels of anger proneness and experience more negative parenting and less positive parenting. Future research could investigate the possibility of differential relations of social fearfulness to negative and positive parenting in different temperament types.

In addition to these concurrent relations, we found over-time relations between initial levels of temperament probability and changes in parenting, such that higher initial typicalness was related to less strong increases in positive parenting over time, whereas higher initial expressiveness and fearfulness were related to stronger increases in positive parenting over time. Although these relations may seem unexpected at first glance, they should be interpreted in concert with the other relations in the models. As for instance typicalness was related to higher levels of positive parenting initially, parents of more typical children possibly could not increase as much as parents of children that started out lower.

Although conclusions regarding directionality of effects can never be definitive from these types of correlational analyses, as relations could be due to third variables such as genetic parent-offspring similarity, it is interesting that there were several relations between initial levels of child temperament to changes in parenting, but no relations between initial levels of parenting and changes in child temperament. Several studies investigating temperament traits have also uncovered these child-driven processes. In children aged eight to eleven, child irritability has been shown to predict increases in inconsistent discipline, whereas child fearfulness and positive emotionality predict increases in maternal acceptance (Lengua & Kovacs, 2005). Higher initial fear has been related to decreases in rejection and consistency, whereas higher initial irritability has been related to increases in consistency over time (Lengua, 2006).

Finally, increases for typicalness were related to increases in positive parenting and decreases in negative parenting, and increases in expressiveness and fearfulness were related to decreases in positive parenting. These associated changes, that were independent of initial levels, show that when either children or parents changed, the other changed accordingly.

Parents and children may have experienced each other as changing and reacted to these changes, resulting in these parallel processes.

Strengths and limitations

The present study has several strengths. First, we performed latent profile analysis, rather than cluster analysis as most studies have previously done. Second, the longitudinal design incorporating four measurements allowed us to investigate stability in profiles over time. We performed latent growth modeling, investigating both negative and positive parenting in relation to profile probability trajectories. Furthermore, we incorporated multiple informants' perspectives in our predictor variables, reducing informant bias.

Despite these strengths, some limitations are also worth mentioning. First, the use of the TBAQ as the temperament measure may have limited generalizability of the results. Although the TBAQ is brief and was designed specifically for our age range, the internal consistency of the scales was moderate, and we lacked a measure of effortful control. Replication of the temperament profiles across other measures, including effortful control, is necessary. Second, research on temperament and adjustment problems has been criticized by stating that the associations between traits and problem behavior result from item overlap. However, an indication that item contamination is limited comes from studies that found that the pattern of relations between temperament and adjustment was not affected after removal of the possibly confounded items (Lemery, Essex, & Smider, 2002; Lengua, West, & Sandler, 1998). Third, although observational measures were available for parenting, mothers were the sole reporters on the child's temperament and behavior problems. Reliance on a single informant may produce relations that are biased by the informant. However, multiple studies have shown that temperament and behavior problems are also related when different informants are used (e.g., Booth-LaForce & Oxford, 2008; Smeekens, Riksen-Walraven, & van Bakel, 2007). Fourth, stability may have been inflated because mothers filled out the same questionnaire at each time point. Their memory of what they reported may influence subsequent reports. More generally, mothers may tend to retain a stable picture of their child, despite changes in the child's behavior. Although future research should include other informants, we would like to note that mothers are considered valuable informants for both temperament and behavior problems. Especially in the preschool period, mothers are usually the ones who spend most time with their children and experience their reactions in a wide range of situations. Finally, generalizability of the results may be limited as the sample consisted mainly of Dutch, middle class, two-parent families. Replication in lower income, culturally diverse samples is needed.

Conclusion

Similar to a few other studies investigating temperament profiles, and many investigations of personality profiles, toddlers' temperament trait configurations were best described by three profiles: a typical, well-adjusted profile, an expressive profile, prone to externalizing problems and a fearful profile, prone to internalizing problems. Although temperament profile stability

was high, changes in profile probability occurred. We identified negative and positive parenting as environmental mechanisms that were related to the development of temperament profiles over time.

| Chapter 3 |

Personality Types in Childhood: Relations to Latent Trajectory
Classes of Problem Behavior and Overreactive Parenting Across the
Transition into Adolescence

Abstract

This study investigated relations between children's personality types and trajectories of internalizing and externalizing problems, and overreactive parenting across six years. Latent Class Analysis of the Big Five personality dimensions (modeled as latent factors, based on mother-, father-, and teacher-reports) for 429 children (mean age eight years at T1) replicated the resilient, under-, and overcontroller types. Latent Class Growth Analysis of externalizing and internalizing problems (modeled as latent factors, based on mother- and father-reports), revealed that undercontrollers were at greater risk of belonging to a high/decreasing externalizing problem class and a high/stable co-occurring problem class than were resilient. Overcontrollers were more likely to be in a high/stable internalizing class, and less likely to be in the externalizing problem class, but only at low levels of parental overreactivity. Undercontrollers appeared at double risk, as they were at risk for high overreactive parenting, which was an independent risk-factor for the elevated problem trajectories. Because childhood personality types were a risk-factor for adjustment problems that persisted into adolescence, Under- and overcontrollers may be considered as a target for early intervention, with a focus on overreactive parenting for undercontrollers specifically.

Van den Akker, A. L., Deković, M., Asscher, J. J., Shiner, R. L., & Prinzie, P. (2012, December 31). Personality types in childhood: Relations to latent trajectory classes of problem behavior and overreactive parenting across the transition into adolescence. *Journal of Personality and Social Psychology*. Advance online publication. doi:10.1037/a0031184

Introduction

A growing body of evidence makes clear that children's personality traits are important predictors of their adjustment, including the development of internalizing and externalizing symptoms and disorders (Caspi & Shiner, 2006). Children who are low on agreeableness and conscientiousness are prone to externalizing problems (Lynam et al., 2005; Ozer & Benet-Martinez, 2006; Prinzie et al., 2003; Tackett, Marcel, & Kushner, 2012), whereas introverted and emotionally unstable children are at risk of developing internalizing problems (Klein, Dyson, Kujawa, & Kotov, 2012; Van Leeuwen, Mervielde, Braet, & Bosmans, 2004). These findings suggest that children's personality characteristics may leave them vulnerable to the development of adjustment problems. However, it has been emphasized that the environment plays a role in determining whether this initial vulnerability will, in fact, lead to adjustment problems (Shiner & Caspi, 2003). The parenting context is likely an especially important environmental factor in determining whether children with a vulnerable personality will eventually experience adjustment problems (Akse, Hale, Engels, Raaijmakers, & Meeus 2004; Van Leeuwen et al., 2004).

Although most of the research linking children's personalities with the development of adjustment problems has focused on the impact of children's traits, "person-centered" research on children's personality types provides a complementary perspective on the emergence of adjustment problems. These personality types represent particular configurations of multiple personality variables within people. It is important to examine such types in the development of adjustment problems because, as noted by Robins and Tracy (2003), ". . . it is unlikely that environmental events and contexts ever influence a single trait in isolation. Parents, teachers, and other socializing agents interact with the whole child, not with one trait at a time" (p. 114). Thus, by focusing on the life trajectories of youth with different personality types, it is possible to discern whether there are predictable patterns in which certain groups of youth are more likely to encounter risks to healthy development. The present study addressed the role of children's personality types in the development of adjustment problems across the years from childhood through adolescence, examining the potential moderating role of a negative parenting style termed "overreactive" parenting.

Findings on Personality Types in Childhood and Adolescence

Most research on personality traits adopts the Big Five approach, which distinguishes five personality dimensions: (1) extraversion, (2) agreeableness/benevolence, (3) conscientiousness, (4) emotional stability and (5) openness/imagination. This model is among the best established and most used in research on adult personality traits and has been shown to apply to younger children and adolescents as well (Shiner & Caspi, 2003; Shiner & DeYoung, in press). However, although the five dimensions may be relatively independent from each other in factor analytic models, not all configurations of these dimensions may be equally likely.

Following Block's work (1971) on personality configurations, which were based on the concepts of ego-resiliency and ego-control, several studies have established that Big Five personality configurations tend to cluster into the following three types: the resilient, undercontrolled, and overcontrolled personality types (Caspi & Shiner, 2006; Zentner & Shiner, 2012). Resilient children are usually found to be relatively extraverted, agreeable, conscientious, emotionally stable, and open to experience. Undercontrollers are moderately extraverted, moderate to low on emotional stability, and low on agreeableness and conscientiousness. Overcontrollers are relatively introverted and emotionally unstable, while at the same time highly agreeable, and moderate to high on conscientiousness (Akse, Hale, Engels, Raaijmakers, & Meeus, 2007; Asendorpf & Van Aken, 1999; Dubas, Gerris, Janssens, & Vermulst, 2002; Hart, Hofman, Edelstein, & Keller, 1997; Robins, John, Caspi, Moffitt, & Stouthamer-Loeber, 1996).

Although multiple studies have replicated these three types, these studies have mostly employed methods that are based on observed variables, such as cluster analysis. Latent class analysis (LCA) is a newer technique that has the advantage of removing measurement error from the construct of interest, and providing the researcher with more objective indices of fit that may determine whether the classes are distinguishable (Bauer & Curran, 2004). DeClercq, Rettew, Althoff, and De Bolle (2011) used LCA and found four rather than three personality types in children: a class with high levels of all personality dimensions (9%), a class with moderate levels of all personality dimensions (45%), a class with low levels of all dimensions (33%), and finally a class that resembled the undercontroller type (12%). However, LCA of the Big Five personality dimensions conducted in a sample of early-adolescents did reveal the resilient, undercontroller and overcontroller types (Meeus, Van de Schoot, Klimstra, & Branje, 2011). However, although previous studies had found that resilients constitute the largest part of the sample, in the study by Meeus and colleagues, overcontrollers were in the majority (49%) in early adolescence, followed by resilients (39%), and a small group of undercontrollers (12%).

So far, the studies that have used LCA to examine personality types in children, have thus revealed mixed results. Like these previous studies, the first aim of the present study was to replicate the resilient, under- and overcontrolled personality types in children, using LCA. In contrast to previous studies, we adopted a multi-informant approach. As personality traits can be defined as a core of individual differences that are relatively stable across time and contexts (McAdams & Pals, 2006), multiple informants' reports should provide a better picture of a child's personality than a single informant's viewpoint. In the present study, mother-, father-, and teacher-reports of children's Big Five personality dimensions were included as indicators of latent personality dimension factors. Mother and father reports of child personality have each been shown to provide incremental predictive value in the prediction of child adjustment problems, indicating the importance of including both informants (Tackett, 2011). As teachers are able to compare the child's personality to those of other children in their class, their unique view likely adds additional information to parental reports, and this incremental information may be important in predicting adjustment problems. Furthermore, including multiple

informants reduces the chance that the coherence of the dimensions into types is due to single informants' tendency to be guided by the 'halo effect,' i.e., a tendency of general perceptions of an individual to influence perceptions of specific traits (Thorndike, 1920).

Personality Types and Trajectories of Adjustment Problems

Particular personality types may leave some children vulnerable to the development of different types of adjustment problems (Shiner & Caspi, 2003). Overcontrolled children may be especially at risk of developing internalizing problems due to their inhibited nature, whereas undercontrollers' impulsivity may leave them vulnerable to the development of externalizing problems. Previous studies have indeed shown that resilient children are generally well-adjusted, whereas overcontrollers are vulnerable to internalizing symptoms, and undercontrollers exhibit the most externalizing symptoms (Asendorpf & van Aken, 1999; Hart et al., 1997; Robins et al., 1996; Van Leeuwen et al., 2004). That the personality types differ in terms of the kinds of adjustment problems they experience can be seen as an indication of the utility of conceptualizing youth's personalities in terms of types, for both research and clinical practice.

However, although the personality types consistently are found to be characterized by different concurrent levels of symptoms, much less is known about differences in the development of these symptoms. One study found that undercontrollers increased more in aggression than resilient children and overcontrollers across the transition to adolescence (Hart et al., 1997), whereas another study found a stronger increase in aggression for undercontrollers than for resilient children and overcontrollers between ages four and five, with a similar development of all three personality types until five years (Asendorpf & Van Aken, 1999). In terms of their levels of inhibition (Asendorpf & Van Aken, 1999), self-esteem, and social withdrawal (Hart et al., 1997), the personality types have been found to develop similarly across the transition to adolescence.

Although previous studies have not revealed many differences in the growth of problem behavior between the different personality types, the present study takes a different approach. Rather than estimating *mean* trajectories for the different personality types, we estimate trajectory *classes* of combinations of internalizing and externalizing problems, and then investigate whether the under- and overcontrollers are overrepresented in problematic trajectory groups. When investigating adjustment problems, heterogeneity in development is to be expected, with a minority of children exhibiting problematic development. Indeed, heterogeneity in the development of adjustment problems has been well established, both for externalizing (Broidy et al., 2003; Nagin & Tremblay, 1999), and internalizing problems (Brendgen, Wanner, Morin, & Vitaro, 2005; Feng, Shaw, & Silk, 2008; Sterba, Prinstein, & Cox, 2007). Even if personality types are thought of as representing a vulnerability for maladjustment, not all children with a vulnerable personality type necessarily exhibit problematic development. Children with a vulnerable personality type may experience protective factors (e.g., supportive parenting, low levels of stress), preventing them from experiencing adjustment problems. Similarly, children without a vulnerable personality type may also exhibit adjustment problems, due to other risk-factors they may experience (e.g.,

harsh parenting, high levels of stress). Thus, adjustment problems may be thought of as multiply determined, with multiple risk- and protective factors interacting to produce problematic development. Children with an initially vulnerable personality type can be expected to be more likely to experience adjustment problems, relative to children without such a personality type, while at the same time most children with a vulnerable personality type can still be expected to be well-adjusted, especially in a community sample such as that of the present study. Modelling mean level development for all children with a given personality type may obscure this fact. Thus, it is important to identify children with an especially problematic developmental trajectory, and examine whether certain personality types are predictive of belonging to this problematic group.

Two recent studies have demonstrated the value in examining classification groups based on the simultaneous consideration of both internalizing and externalizing disorders. A study of lifetime diagnoses of internalizing and externalizing disorders (from mid-adolescence through thirty years of age) found that most individuals experienced relatively few problems (63%). A smaller group of individuals had been diagnosed with internalizing problems (16%), a comparable group exhibited externalizing problems (17%), and a relatively small group had comorbid problems (4%) (Olino, Klein, Farmer, Seeley, & Lewinsohn, 2011). Another recent study of comorbidity of mental disorders in two large nationally representative samples converged on a similar solution, but with two internalizing classes rather than one: an anxiety-disorder class (11%) and a depression disorder class (6%) (Vaidyanathan, Patrick, & Iacono, 2011).

Similar to personality types, not all configurations of internalizing and externalizing symptoms may thus be equally likely. Most children will likely be well-adjusted, and when children experience problems they will most likely exhibit either externalizing or internalizing symptoms. However, a small but important group of children may experience both types of problems. Thus, similar to the notion that children are characterized by certain configurations of personality dimensions, they can also be thought of as characterized by certain configurations of adjustment problems. Thus, the second research question of the present study was this: Do the under- and overcontrolled personality types represent a vulnerability for belonging to elevated symptom trajectories? We again took a multi-informant approach to reduce reporter bias in measurement of psychological symptoms: For both internalizing and externalizing behavior problems, mother- and father-reports were included to load on a latent variable. Latent variables indicated by multiple informants have been shown to be a better predictor of later psychopathology than either single-informant scores, or scores that are aggregated by simply averaging the multiple informants' scores (Van Dulmen & Egeland, 2011).

Personality Types and Overreactive Parenting in the Development of Adjustment Problems

Although children's personality types may represent an initial vulnerability for adjustment problems, the environment is assumed to play an important role in determining whether this vulnerability will eventually lead children to experience psychopathology (Shiner & Caspi, 2003). For children, the parenting they receive likely shapes their adjustment in important

ways. General models of the etiology of adjustment problems hypothesize that environmental risk-factors interact with individual characteristics to produce psychopathology (Bronfenbrenner & Morris, 2006). Theoretical considerations of the relations between personality and psychopathology more specifically posit that children with different personalities differentially evoke, shape and respond to their environment (Shiner & Caspi, 2003).

Overreactive parenting is an environmental factor that is associated with adjustment problems in children (Arnold, O'Leary, Wolff, & Acker, 1993; Prinzie, Onghena, & Hellinckx, 2007). Overreactive parenting is a hostile style of disciplining which entails responding with anger, frustration, and meanness to children's problematic behavior by, for instance, hitting or insulting the child (Arnold et al., 1993). Due to their personality type, some children may be more difficult to handle for their parents and may therefore evoke more overreactive parenting. At the same time, children with a vulnerable personality type may have limited resources to deal with overreactive parenting (Bates, Schermerhorn, & Petersen, 2012).

When children with a vulnerable personality type are exposed to negative parenting practices, they may thus be especially likely to experience adjustment problems (O'Connor & Dvorak, 2001). Undercontrollers, due to their lack of impulse control, may exhibit more oppositional behavior. Overreactive parenting is closely related to coercive parenting which reinforces oppositional behavior in children (Patterson, 1982). Additionally, impulsive children may interpret similar environmental events differently from inhibited children. They may attribute hostile intent, leading them to aggress (Shiner & Caspi, 2003). Conversely, Overcontrolled children may be more likely to withdraw from overreactive parents to avoid negative interactions (Bender et al., 2007). The experience of overreactive parenting may lead them to develop low self-esteem (MacPhee & Andrews, 2006) or symptoms of anxiety (Feng et al., 2008).

To our knowledge, three studies have investigated interactions between parenting behaviors and personality type. Akse and colleagues (2004) found that perceived parental rejection was more predictive of depression in overcontrolling girls than in resilient girls and was less predictive of aggression in overcontrolling boys than in resilient boys. Dubas and colleagues (2002) found the largest difference in externalizing symptoms between children who experienced high and children who experienced low restrictive control among undercontrollers. Finally, Van Leeuwen and colleagues (2004) found that negative parental control was more strongly related to externalizing symptoms for undercontrollers than for resilients, whereas it was associated with heightened internalizing symptoms for overcontrollers. Results thus indicate that children with different personality types react differently to negative parenting. The third research question of the present study was: Are undercontrollers more likely to 'act out', and are overcontrollers more likely to withdraw in reaction to overreactive parenting? We made optimal use of the longitudinal assessments of maternal overreactivity, by modeling two latent trajectory classes of maternal overreactivity (high vs. low), and investigated whether maternal overreactivity class membership interacted with child personality type to predict adjustment problem trajectory membership.

The Present Study

In a community sample of children who were on average eight years old at the first assessment, we investigated the replicability of the resilient, under- and overcontrolled personality types, using a multi-informant approach. Additionally, we investigated whether the under- and overcontrolled personality types represented a risk-factor of belonging to trajectories of elevated adjustment problems across the transition into adolescence. Finally, we investigated whether the relation between children's personality types and adjustment problem trajectory was dependent on the level of maternal overreactive parenting they received. A graphical representation of the estimated model is provided in Figure 1.

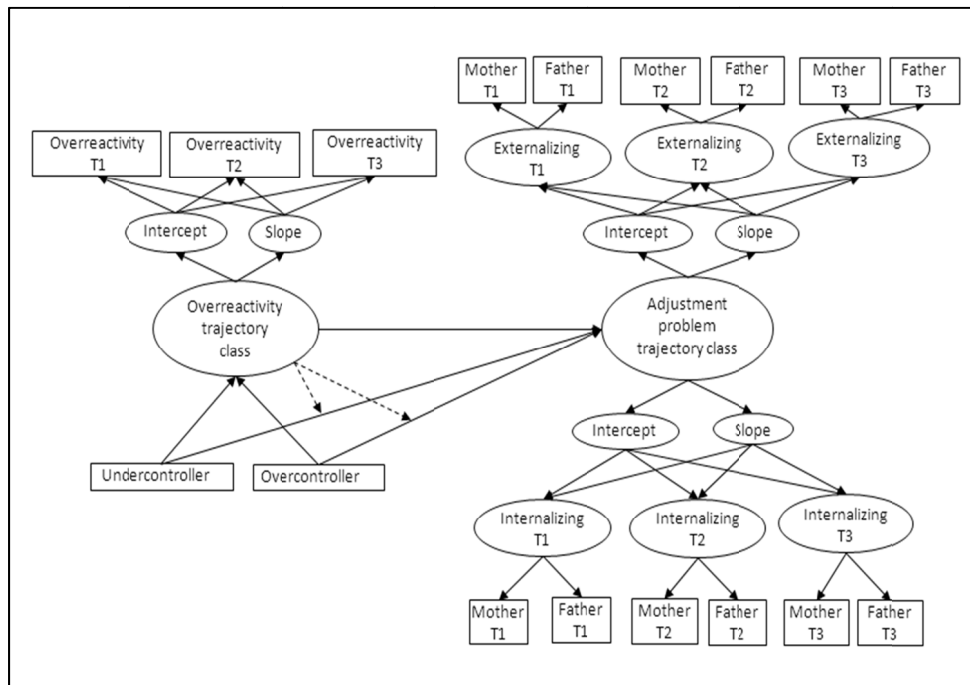


Figure 1. Graphical representation of the model predicting latent trajectory classes of internalizing and externalizing problems, by maternal overreactivity trajectories and personality type. Dashed lines indicate moderation of the pathways from the under-, and overcontroller dummy variables to the latent problem behavior trajectory class variable, by maternal overreactivity class.

Based on previous research on children's personality types, adjustment trajectories, and the role of parenting in the development of adjustment problems, we tested three predictions. First, we expected that three personality types would emerge, representing the resilient, undercontroller, and overcontroller personality types. Second, we hypothesized that four adjustment problem trajectory classes would be found (well-adjusted; internalizing;

externalizing; internalizing and externalizing problems), comparable to the classes obtained in recent studies with adult samples. Third, even though the under- and overcontroller personality types can be considered to be more vulnerable for adjustment problems, given the nature of our sample, and the fact that adjustment problems are multiply determined, we expected for each of the personality types that the well-adjusted trajectory would be most likely. However, we expected that the undercontrollers would be relatively more likely than the resilient to belong to a trajectory characterized mainly by heightened levels of externalizing problems, whereas the overcontrollers would be more likely than the resilient to belong to a trajectory characterized by mainly internalizing problems. Fourth, we predicted that undercontrollers in the high overreactive parenting class would be relatively more likely than the resilient to belong to a high-externalizing problem trajectory, whereas overcontrollers in the high overreactivity parenting class would be relatively more likely to belong to a high-internalizing problem trajectory. These findings would demonstrate that the two personality types are vulnerable to the development of different kinds of adjustment problems, in the context of similar negative parenting.

Method

Participants

This study is part of a larger project, “The Flemish Study on Parenting, Personality, and Development”. For detailed information on the sample, see Prinzie and colleagues (2004). We used data from the third (2001; Time 1), fourth (2004; Time 2), and fifth (2007; Time 3) waves, as these contained the measures of interest. The present sample consisted of children who were seven, eight, or nine years old at Time 1, resulting in a sample of 429 target children. Target children’s mean age was 8 years 4 months ($SD = 9.7$ months, range = 7 years 1 month – 9 years 11 months) at Time 1. There were 216 boys (50.3 %), and 213 girls (49.7 %). For these 429 children, 427 mothers, 405 fathers, and 365 teachers reported on the study variables at Time 1; 367/ 348 mothers and 349/327 fathers participated at Time 2/Time 3. The mothers’ mean age at Time 1 was 37 years ($SD = 3$ years, range = 27-52 years). The fathers’ mean age at Time 1 was 39 years ($SD = 4$ years, range = 30-62 years). Percentages of mothers’ and fathers’ educational levels were, respectively, as follows: elementary school 0.9% and 3.0%, secondary school 42.1% and 43.2%, non-university higher education 43.3% and 34.5%, and university or higher 13.6% and 19.3%. These percentages are representative of the Belgian population. All the parents were of Belgian nationality.

Measures

Adjustment problems. Mothers and fathers reported on the children’s adjustment problems at each measurement wave by completing the externalizing (33 items) and internalizing (31 items) problem behavior subscales of the Dutch translation of the Child Behavior Checklist (CBCL) (Achenbach, 1991; Verhulst, Van der Ende, & Koot, 1996). The

externalizing problem behavior scale consists of two subscales, measuring aggressive behavior (e.g., “My child screams or yells a lot”) and delinquent behavior (e.g., “My child steals”). The internalizing problem behavior scale consists of three subscales, measuring withdrawn behavior (e.g., “My child refuses to speak”), somatic complaints (e.g., “My child has nightmares”), and anxious/depressed behavior (e.g., “My child cries a lot”). Each item is rated: 0 (*not true*), 1 (*sometimes/somewhat true*), or 2 (*often/very true*). The CBCL is a well-validated, reliable instrument for measuring child symptoms (Vignoe, Bérubé, & Achenbach, 2000). Externalizing and internalizing symptom scores were obtained by summing the scores across the items for each subscale. Cronbach’s *alphas* ranged from .81 to .90.

Child personality. Mothers, fathers, and teachers completed the Hierarchical Personality Inventory for Children (HiPIC) at the first measurement wave (Mervielde & De Fruyt, 1999). The HiPIC is an empirically derived questionnaire, based on an extensive analysis of free parental descriptions of their children. This instrument includes 144 items, assessing 18 facets (8 items per facet) that are hierarchically structured under five higher order domains. The higher order domains are labelled as follows: (1) extraversion (32 items: e.g., “Bubbles with life”; 4 Facets: shyness, expressiveness, optimism, energy), (2) benevolence, which is a broader measure of the dimension termed ‘agreeableness’ in adults (40 items: e.g., “Defends the weak”; 5 facets: egocentrism, irritability, compliance, dominance, altruism), (3) conscientiousness (32 items: e.g., “Works with sustained attention”; 4 facets: achievement motivation, orderliness, concentration, perseverance), (4) emotional stability (16 items: e.g., “Has confidence in own abilities”; 2 facets: anxiety, self-esteem), and (5) imagination (24 items: e.g., “Asks many why questions”; 3 facets: creativity, curiosity, intellect). Items were rated on a 5-point Likert-type scale, ranging from 1 (*barely characteristic*) to 5 (*highly characteristic*). The HiPIC’s factor structure and high internal consistencies of domains have been established (Van Leeuwen et al., 2004). We obtained one score for each domain, by averaging the scores across the items. Cronbach’s *alphas* ranged from .72 to .91.

Overreactive parenting. At each wave, mothers reported on a Dutch translation of the overreactivity subscale of the Parenting Scale (Arnold et al., 1993; Prinzie et al., 2007). The overreactivity subscale contains nine items and measures parents’ tendency to respond with anger, frustration, and meanness to their child’s problematic behavior. Items represent discipline encounters (e.g., “When my child misbehaves...”), followed by two opposite anchor points for a 7-point Likert-type scale (e.g., *I speak to my child calmly* versus *I raise my voice or yell*). The parenting scale has adequate test-retest reliability, distinguishes clinical from nonclinical samples, and has been validated against behavioral observations (Arnold et al., 1993; Irvine, Biglan, Smolkowski, & Ary, 1999; Prinzie et al., 2007). Scores were averaged across all items. Cronbach’s *alphas* ranged from .78 to .79.

Statistical Analyses

To determine whether the personality dimensions could be represented by latent factors, we first performed a confirmatory factor analysis to examine whether all informants’ reports (mother, father, teacher) had significant loadings that were in the expected direction. To

answer the first research question regarding replicability of the resilient, under- and overcontrolled types, we performed an LCA on the latent factors representing the child personality dimensions.

To investigate whether personality type predicted trajectories of adjustment problems, we performed a multivariate LCGA of children's internalizing and externalizing adjustment problems to identify trajectories of adjustment problems across the transition to adolescence. In multivariate LCGA, growth curves are estimated for multiple constructs simultaneously (Bauer & Curran, 2004). For each construct, a latent intercept and slope growth factor are included, allowing for individual differences in both initial levels and changes across time. In the present study, we estimated two growth curves: one for internalizing and one for externalizing problems. The intercept and slope growth factors for each growth curve were estimated from latent variables of internalizing and externalizing problems. These latent factors were in turn indicated by mother-, and father-reports of internalizing and externalizing problems. A single latent class membership variable was estimated from the intercept and slope factors of internalizing and externalizing problems. Each class thus represented a particular configuration of initial levels and rates of change in internalizing and externalizing symptoms. Children's personality type classifications were included as predictors of adjustment problem trajectory class membership. As item overlap may be an issue when investigating relations between personality and adjustment problems, we investigated correlations between the personality dimensions and child adjustment problems, before and after removal of possibly confounded items. It was not possible to run the analyses with and without removal of possibly confounded items, as these items are important for the estimation both of the personality types, and of the adjustment problem trajectories. Using an expert procedure to determine which items were possibly confounded, De Bolle, Beyers, De Clercq, and De Fruyt (2012), identified five HiPIC (i.e., 'Is quick to argue', 'Bursts out in a rage at setbacks', 'Has a limited vocabulary', 'Goes to school against his/her will', 'Has trouble sitting still') and six CBCL items (i.e., 'easily jealous', 'bragging, boasting', 'secretive, keeps things to self', 'would rather be alone than with others', 'self-conscious or easily embarrassed', 'shy or timid') that were possibly confounded. Correlations before and after removal of item overlap are presented in Appendix 1. Results indicated that correlations decreased slightly after removal of possibly confounded items, but that the overall pattern of significant correlations remained intact.

To answer our final research question regarding dependence of the relation between personality type and adjustment problem trajectory on maternal overreactivity trajectory, we performed an LCGA of maternal overreactive parenting. Because we were interested in differences between children who experienced high, versus low overreactivity, we estimated two trajectories of overreactive parenting. We again included child personality type as a predictor of overreactive parenting class. In a next step, we estimated a model in which adjustment problem trajectory class membership was regressed on overreactive parenting trajectory class membership. The personality types were included as predictors of overreactive parenting trajectory class membership as well as adjustment problem trajectory class membership. By including these paths, we accounted for relations between child personality

type and overreactive parenting and estimated unique contributions of each risk factor to adjustment problem trajectory class membership. To answer our third research question, regarding differential relations between personality types and adjustment problems, we examined whether relations between personality type and adjustment problem trajectory class membership differed between children experiencing high versus low overreactivity. For a graphical representation of the final model, see Figure 1.

We performed all analyses in Mplus 6.11 (Muthén & Muthén, 2010) using robust maximum likelihood (mlr) estimation, which is the default estimation method for these types of analyses. Mplus uses full information maximum likelihood to handle missing data, making optimal use of available data. Models with an increasing number of profiles/trajectories were compared using the Bayesian information criterion, with lower values indicating better fit of the model to the data, taking into account increased model complexity (BIC). Further, a significant result of the Bootstrapped Likelihood Ratio-test (BLRT) test indicated that the model with more profiles/trajectories provides significantly better model fit than a model with one less profile/trajectory. The BLRT uses bootstrap samples to estimate the distribution of the loglikelihood difference test, rather than assuming it has a known distribution. In a simulation study, the BIC and BLRT have been shown to perform well in identifying the correct number of classes (Nylund, Asparouhov, & Muthén, 2007). Finally, although these fit indices may be used to help guide a decision on the number of classes, inspection of the solution for its substantive interpretation is ultimately deemed most important (Nylund, 2007). For instance, a class may provide significant incremental model fit, but may be too small to be considered meaningful or likely to replicate (Muthén & Muthén, 2000).

Results

Means and standard deviations of all measures are presented in Table 1.

Table 1.
Descriptive Statistics for the Study Variables

Measure	T1 Mother report		T1 Father report		T1 Teacher report	
	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>	<i>M</i>	<i>(SD)</i>
Extraversion	3.63	(.49)	3.61	(.47)	3.18	(.64)
Benevolence	3.50	(.50)	3.43	(.47)	3.64	(.59)
Conscientiousness	3.40	(.58)	3.35	(.55)	3.62	(.71)
Emotional Stability	3.47	(.64)	3.53	(.57)	3.46	(.67)
Imagination	3.84	(.55)	3.80	(.51)	3.45	(.73)
	T1		T2		T3	
Internalizing mother report	5.24	(5.26)	5.70	(5.42)	4.89	(5.18)
Internalizing father report	3.89	(4.36)	4.49	(4.66)	3.89	(4.36)
Externalizing mother report	7.09	(6.96)	6.23	(6.00)	5.95	(6.21)
Externalizing father report	6.32	(6.16)	5.43	(5.45)	5.12	(5.64)
Maternal overreactivity	3.19	(0.90)	3.16	(0.86)	3.15	(0.88)

Personality Types

Before estimating the personality types from latent classes of the Big Five dimensions, we determined the feasibility of modelling the multiple informants reports to load on latent variables. We performed a confirmatory factor analysis including five latent factors representing the child personality dimensions of extraversion, benevolence, conscientiousness, emotional stability and imagination, each indicated by mother-, father-, and teacher-report of the personality dimension. The model fit the data well ($\chi^2(64) = 169.74$, CFI = .96, RMSEA = .06). All indicators' factor loadings were significant and in the expected direction ($> .35$), indicating that the different informant reports could be represented by a latent variable. To investigate the number and nature of personality types, LCA was performed on these latent variables (indicated by the multiple informants' reports). Results pointed to a three-class solution (Loglikelihood = -3,525.86, BIC = 7,621.50, BLRT (8) = 29.34, $p = .02$), as the BIC for this solution was smaller than that of the two-class solution (Loglikelihood = -3,550.90, BIC = 7,568.53, BLRT (6) = 20.19, $p = .03$), and the four-class solution (Loglikelihood = -3,505.58, BIC = 7,623.37, BLRT (7) = 32.63, $p < .01$). Furthermore, the four-class solution estimated a class that was similar to a profile in the three-class solution (resilients with higher conscientiousness). The most likely class membership probabilities were large enough ($> .78$), and the alternative class probabilities were small enough ($< .18$). Entropy for the three-class solution was .61. A simulation study of

the performance of model fit statistics in factor mixture models has shown that entropy values of .60 generally indicate around 80% correct classification, whereas entropy values of above .80 indicate 90% correct classification (Lubke & Muthen, 2007). As entropy values of .72 have been reported as indicating good classification quality (Meeus et al., 2011), the classification of cases in the present study may be thought of as satisfactory. For a graphical representation of the resulting three classes' scores on the five estimated personality factors, see Figure 2.

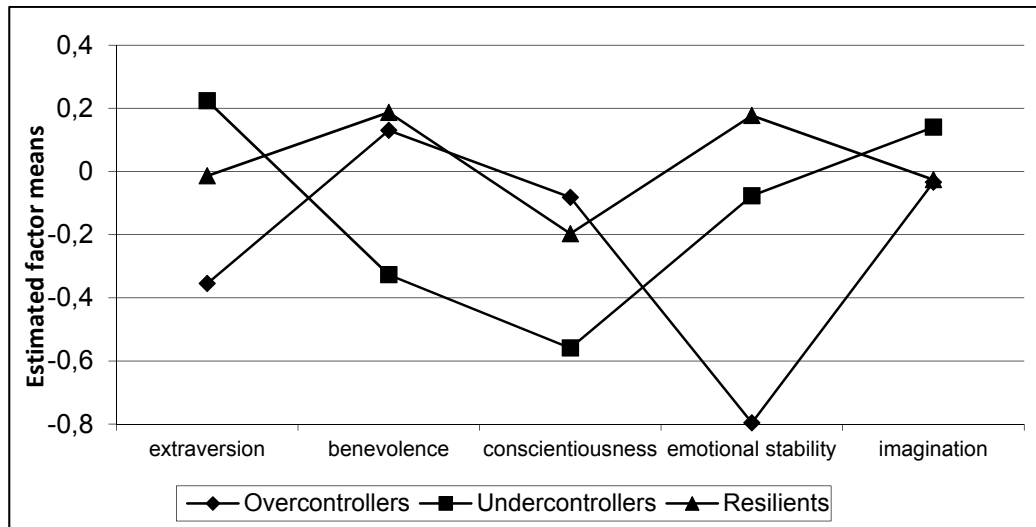


Figure 2. Estimated mean levels of the five personality dimension factors for the three personality types.

In the final three-class solution, the first profile comprised 62.0% of the sample ($n = 266$). This profile was benevolent and emotionally stable, with intermediate levels of extraversion, conscientiousness, and imagination. The second profile comprised 24.9% of the sample ($n = 107$). This profile was highly extraverted and imaginative, but low on benevolence and conscientiousness and moderately emotionally stable. The third profile comprised 13.1% of the sample ($n = 56$), and was introverted, and emotionally unstable, highly conscientious, and moderately imaginative. The three profiles resemble the resilient, undercontrolled and overcontrolled personality types respectively, and will further be referred to as such. A MANOVA on the saved factor scores was performed to inspect statistical significance of mean level difference between profiles. The multivariate test revealed a significant and large main effect of personality type, $F(10,846) = 116.62$, $p < .01$, partial $\eta^2 = .58$. Post-Hoc Bonferroni tests indicated that all differences between profiles were significant, except that the overcontrollers and resilients did not differ in levels of benevolence and imagination.

Trajectories of Adjustment Problems and Maternal Overreactivity

Similar to the latent personality dimensions, we modelled the internalizing and externalizing problem variables as latent factors, each indicated by mother- and father reports. From these latent variables the trajectories were estimated. To assess the feasibility of this latent variable approach, a confirmatory factor model of the internalizing and externalizing problem factors was fitted, with invariant loadings across the three time points. This model fit the data well ($\chi^2(24) = 97.32$, CFI = .98, RMSEA = .08), and all indicators' loadings were significant and in the expected direction ($> .67$). Freeing factor loadings across time points did not result in a significant improvement in model fit, indicating measurement invariance across time ($\chi^2(20) = 92.31$, CFI = .98, RMSEA = .09, $\Delta\chi^2(2) = 5.01$, $p = .082$).

To examine the number of classes for the problem behavior trajectories that described the configuration of internalizing and externalizing problems in the present study, we first performed an LCGA of the intercept and slope growth factors of internalizing and externalizing problems, with personality type membership as predictors. The results pointed to a four-class solution (two-class: Loglikelihood = -12,603.95, BIC = 25,492.79, BLRT (9) = 297.27, $p < .001$; three-class: Loglikelihood = -12,455.32, BIC = 25,250.07, BLRT (9) = 726.68, $p < .001$; four-class: Loglikelihood = -12,353.29, BIC = 25,100.57, BLRT (9) = 204.06, $p < .001$, five-class: Loglikelihood = -12,338.74, BIC = 25,053.28, BLRT (3) = 129.35, $p < .001$): Although a five-class solution provided lower BIC values and a significant blrt-test, it estimated a class that was smaller than 1%. This was considered too small to represent a replicable class, or to include in further analyses.

For maternal overreactivity, we estimated a two-class solution, as we were interested in investigating differences between children experiencing low and high overreactivity, in the relations between personality type and problem behavior trajectory¹.

To construct the final model, the latent class growth model of the four problem behavior trajectory classes and the latent class growth model of the two maternal overreactivity trajectories were combined. To answer our second research question, we included predictive paths from personality type to both maternal overreactivity class and adjustment problem trajectory class, as well as a path from maternal overreactivity path to adjustment problem trajectory class. The prediction of adjustment problem trajectory class by personality was thus controlled for relations between maternal overreactivity and child adjustment problems. To answer our third research question, regarding moderation of the

¹ LCGA of the intercept and slope growth factors of overreactive parenting, with personality type membership as predictors, pointed to a four-class solution (two-class: Loglikelihood = -1,318.50, BIC = 2,697.57, BLRT (5) = 303.90, $p < .001$; three-class: Loglikelihood = -1,280.61, BIC = 2,652.08, BLRT (5) = 75.78, $p < .001$; four-class: Loglikelihood = -1,259.78, BIC = 2,640.70, BLRT (5) = 41.66, $p < .001$, five-class: Loglikelihood = -1,248.92, BIC = 2,649.26, BLRT (5) = 21.73, $p < .001$). Classes in the four-class solution only differed in initial intercept and were all stable across time.

relation between personality type and adjustment problems by maternal overreactivity, a model in which the regression paths from the personality type dummies to the problem behavior trajectory classes were constrained to be equal for the high and low overreactive parenting classes (Loglikelihood (68) = -13,841.52, BIC = 28,095) was compared to a model in which these paths were allowed to differ (Loglikelihood (74) = -13,837.27, BIC = 15,012). Constraining the paths to be equal significantly decreased model fit (Δ loglikelihood (6) = 15.03, $p = .020$). The loglikelihood difference test was corrected for mlr estimation using the scaling correction factor (constrained model = 1.812; free model = 1.720) (Satorra & Bentler, 1999). To inspect which paths were different specifically, regression paths were constrained one at a time. Trajectory class means were fixed at the values from the unconstrained model, to retain the same order of classes.

In the final model, there was a small high-problem class (5.8%) that had high and stable levels of externalizing problems (Intercept: mean = 19.16, $SE = 1.95$, $p < .001$, Slope: mean = -1.10, $SE = 1.44$, $p = .445$) and high, stable levels of internalizing problems (Intercept mean = 10.79, $SE = 1.33$, $p < .001$, Slope mean = 1.20, $SE = .97$, $p = .217$). This group had the highest levels of both types of problems, with especially high levels of externalizing problems. The second class was an internalizing problem class (10.3%) that had heightened/decreasing levels of externalizing problems (Intercept mean = 6.55, $SE = .92$, $p < .001$, Slope mean = -2.75, $SE = .49$, $p < .001$), and high, stable internalizing problems (Intercept: mean = 10.11, $SE = 1.03$, $p < .001$, Slope: mean = 1.74, $SE = 1.24$, $p = .162$). The third class was an externalizing problem class (21.9%), exhibiting high and decreasing levels of externalizing problems, (Intercept: mean = 9.17, $SE = .69$, $p < .001$, Slope: mean = -2.44, $SE = .42$, $p < .001$), and low, increasing levels of internalizing problems (Intercept mean = 2.30, $SE = .49$, $p < .001$, Slope mean = 2.02, $SE = .33$, $p < .001$). The fourth class (62.0%) was a well-adjusted class that had low, decreasing levels of externalizing problems (Intercept: mean = 1.52, $SE = 0.00$, $p < .001$, Slope: mean = -2.01, $SE = .00$, $p < .001$) and low, increasing levels of internalizing problems (Intercept mean = -.31, $SE = 0.00$, $p < .001$, Slope mean = 1.71, $SE = 0.00$, $p < .001$). Although internalizing problems increased for this class, this class still had the lowest levels of both types of problems across all time points. For a graphical representation of the estimated trajectories for the four classes, see Figures 3 and 4. Finally, for the overreactivity analyses, there was a high, decreasing maternal overreactivity class (Intercept mean = 3.89, $SE = 0.08$, $p < .001$, Slope mean = -.09, $SE = 0.00$, $p < .001$), and a low, stable class (Intercept mean = 2.58, $SE = 0.06$, $p < .001$, Slope mean = .04, $SE = 0.06$, $p = .278$).

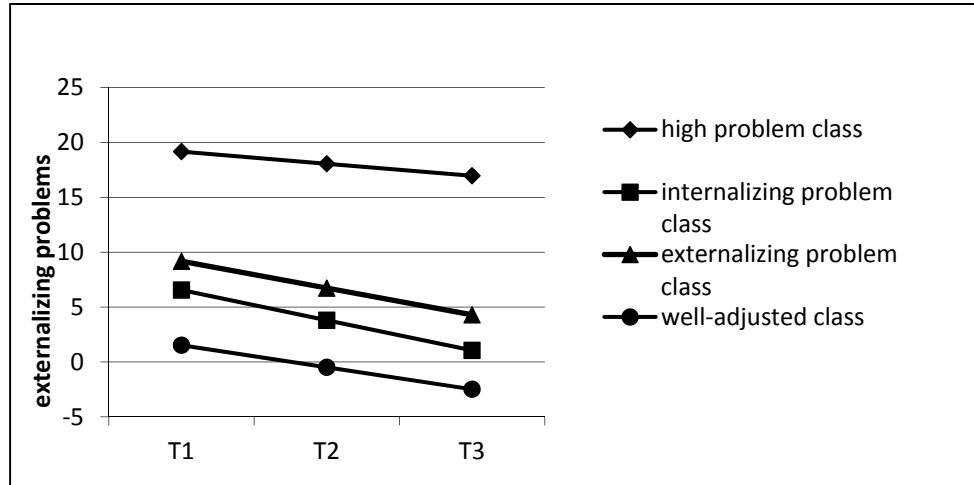


Figure 3. Estimated means of externalizing problems for the four-class solution.

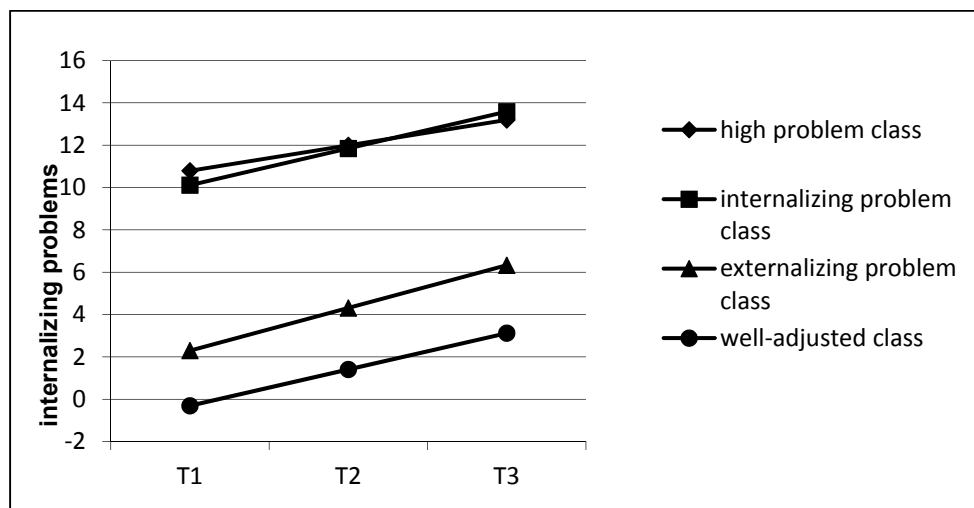


Figure 4. Estimated means of internalizing problems for the four-class solution.

Personality Type and Overreactive Parenting in the Prediction of Adjustment Problem Class

To answer our second and third research questions, we inspected relations between personality and adjustment problem trajectory (RQ1), as well as moderation of these relations by maternal overreactive parenting trajectory (RQ2). Personality type was a predictor of problem class: Compared to the resilient, the undercontrollers were relatively more likely to be in the externalizing and high-problem classes. High maternal overreactivity was an independent predictor of problem class: Children whose mothers were high on overreactivity were at heightened risk of belonging to all three elevated problem classes. Undercontrollers were at double risk because they were also more likely than the resilient to belong to this high overreactivity class. For the undercontrollers, there was no moderation: their personality type increased the risk of belonging to the externalizing and high-problem classes, independent of their overreactivity class.

As expected, the overcontrollers were relatively more likely to be in the high-internalizing class than in the well-adjusted class. Unexpectedly however, they were only more likely to belong to the internalizing problem class when they experienced low maternal overreactivity. At high levels of overreactivity, overcontrollers were equally likely as resilient to belong to the internalizing problem class. These results indicate that, at high overreactivity, resilient became as likely as overcontrollers to belong to the internalizing problem class. Additionally, overcontrollers were less likely than the resilient to belong to the externalizing class at low levels of overreactivity. At high levels of overreactivity, overcontrollers became equally likely as the resilient to belong to the externalizing problem trajectory. Finally, overcontrollers were not at heightened risk of belonging to the high overreactivity class. Estimated path coefficients and odds ratios are provided in Table 2. Predicted class probabilities of the four adjustment problem trajectory classes are provided in Table 3.

Table 2.

Logistic Regression Coefficients for the Problem Classes Compared to the Well-Adjusted Class

class	Internalizing class		Externalizing class		High problem class	
	<i>b</i> (<i>SE</i>)	<i>O.R.</i>	<i>b</i> (<i>SE</i>)	<i>O.R.</i>	<i>b</i> (<i>SE</i>)	<i>O.R.</i>
Overreactivity	1.54(.55)*	4.68	1.40 (.40)*	4.04	1.74 (0.67)*	5.70
High - overcontrollers	0.62(.74)	1.86	0.12 (.65)	1.13	0.34 (1.17)	1.40
Low - overcontrollers	2.51(.60)*	12.31	-18.41 (.00)*	0.00	0.34 (1.17)	1.40
High/low undercontrollers	0.74(.58)	2.09	2.14 (.38)*	8.53	3.60 (0.69)*	36.71

Note. Regression paths for undercontrollers did not differ significantly between the high and low overreactivity class, nor did the regression path from overcontroller to the high-problem class. These paths were thus constrained to be equal. *O.R.* = odds ratio. * $p < .05$.

Table 3.
Class Probabilities for the Four Adjustment Problem Trajectory Classes, for the Resilients, Under- and Overcontrollers in the High- versus the Low-Overreactivity Classes

class	Well-adjusted class	Internalizing class	Externalizing class	High problem class
High overreactivity - overcontrollers	.51	.23	.24	.02
Low overreactivity - overcontrollers	.60	.39	.00	.01
High overreactivity - undercontrollers	.15	.08	.54	.23
Low overreactivity - undercontrollers	.44	.05	.39	.12
High overreactivity - resilient	.59	.14	.24	.03
Low overreactivity - resilient	.86	.04	.09	.01

Discussion

Results indicated that children's personality types resembled the resilient, under- and overcontroller types. Undercontrollers were at greater risk of belonging to a high/decreasing externalizing problem class and a high/stable co-occurring problem class than were resilient. Overcontrollers were more likely to be in a high/stable internalizing class, and less likely to be in the externalizing problem class, but only at low levels of overreactivity. Below we first discuss the comparability of the personality types found in this study to those found in other studies. Next, we turn to the findings with regards to problem behavior trajectories and discuss implications for theory concerning the interplay of personality and parenting in the etiology of adjustment problems.

Personality Types

Configurations of the personality dimensions of the children in the present study replicated the resilient, undercontroller, and overcontroller personality types previously found in a study using LCA in adolescents (Meeus et al., 2011), and in studies using other statistical methods to delineate children's personality types (Asendorpf & Van Aken, 1999; De Fruyt, Mervielde & Van Leeuwen, 2002; Robins et al., 1996). Interestingly, the differences between profile types were somewhat more pronounced in the present study. Whereas undercontrollers have usually been found to be less extraverted than resilient, the undercontrollers in this study were more extraverted. Children who are less controlled and more impulsive can be expected to be highly outgoing when interacting with others. Supporting this idea, hyperactive/impulsive symptoms have been associated with higher levels of extraversion in children with attention-deficit/hyperactivity disorder (Martel, Roberts, Gremillion, Von Eye, & Nigg, 2011). Relatedly, the overcontrollers in the present study were more conscientious than the resilient. As

conscientiousness represents the ability to control impulses and delay gratification, we would expect overcontrollers to be especially high on conscientiousness. Finally, whereas undercontrollers are not always found to differ from resilient on emotional stability, the undercontrollers in the present sample were significantly less emotionally stable than the resilient, while at the same time significantly more emotionally stable than the overcontrollers.

The one study in children using LCA on mother reports of Big Five dimensions to investigate personality types converged on a solution of four types that differed from the types obtained in the present study (De Clercq et al., 2011). Personality traits are theoretically considered consistent patterns of how people respond to the environment; in other words, traits index those aspects of behavior, emotion, and cognition that are stable across situations. A multi-informant approach seems more likely to tap into this stability across situations. However, it is also true that the choice of a final solution is ultimately based on the priority given by the researcher to certain considerations, such as interpretability of the classes, statistical significance of addition of profiles, and the choice of model fit statistics (Muthén & Muthén, 2000). More studies investigating personality types in children using LCA are needed to see whether the three-type solution replicates across samples.

Although overcontrollers were in the majority in a previous study focused on early adolescence (Meeus et al., 2011), they constituted the smallest class in the present study. If the change from overcontroller to resilient is a developmental trend, such that more and more children mature into becoming resilient over time, we would expect there to be even more overcontrollers among the eight year old children of the present study than among the twelve year old children of the study by Meeus and colleagues. The overcontrollers in the present study were perhaps more extreme, which could explain why fewer children were categorized as such. It is also possible that an increase in the overcontroller personality type occurs across the transition to adolescence, with a decline thereafter. Previously, a longitudinal and a cross-sectional study have reported decreases in extraversion and conscientiousness across these years (Soto, John, Gosling, & Potter, 2011; Van den Akker, Deković, & Prinzie, 2010), and imagination has been found to decrease across this time period as well (Van den Akker et al., 2010). These mean-level trait changes seem to indicate some negative personality changes during the transition from late childhood through adolescence; this coincides with the onset of puberty and the stresses inherent in that set of biological changes. Perhaps these mean-level changes in traits during the transition to adolescence can account for why the overcontroller personality type increases across the transition to adolescence before it decreases across middle and late adolescence.

Adjustment Problem Trajectories

To investigate whether the personality types represented a vulnerability to the development of adjustment problems, we first identified classes of problem behavior trajectories. Similar to findings obtained in a previous cross-sectional study of children (Olino et al., 2011), we found four groups of children differentiated by their problem behaviors: a large well-adjusted group,

a smaller group with mainly externalizing problems, an even smaller group with mainly internalizing problems, and a very small group with high levels of both externalizing and internalizing problems.

Although the two moderate problem groups could be characterized by one type of problem that was most elevated, both these groups had heightened levels of both types of problems. High levels of co-occurrence of internalizing and externalizing symptoms are frequently found in youth (e.g., Garnefski & Diekstra, 1997; Youngstrom, Findling, & Calabrese, 2003). Individuals with co-morbid internalizing and externalizing symptoms experience higher levels of impairment over time and seek out treatment at much higher rates than individuals with single kinds of symptoms (Newman, Moffitt, Caspi, & Silva, 1998).

It is also important to note that, although the well-adjusted group was low on both internalizing and externalizing problems across all time points, their levels of internalizing problems did increase. The children in the present study transitioned from childhood to adolescence, which is a potentially difficult time as children enter secondary school and experience the onset of puberty (Eccles et al., 1993). Mean rates of internalizing symptoms have previously been found to increase during this period (Bongers, Koot, Van der Ende, & Verhulst, 2004; Hankin, 2009).

Personality Type and Overreactive Parenting in the Prediction of Adjustment Problem Class

Our second research question was: Are the under- and overcontroller personality types vulnerable to experiencing adjustment problems? When comparing the probabilities of each of the four adjustment problem trajectories at low levels of overreactivity, it becomes clear that the under- and overcontrollers were most likely to belong to the well-adjusted trajectory. Thus, supporting our expectation based on the notion that adjustment problems are multiply determined, children were most likely to be well-adjusted even if they had a vulnerable personality type. When comparing the probabilities of belonging to any of the three problem groups together, to the probability of belonging to the well-adjusted group, overcontrollers were still most likely to be well-adjusted (well-adjusted = .60, sum for the problem groups = .40), whereas the undercontrollers were more likely to belong to one of the problem groups (well-adjusted = .44, sum for the problem groups = .56).

Relative to the resilients, the under- and overcontroller personality types were more likely to belong to problematic trajectories. As expected, undercontrollers were more likely to belong to a group that experienced heightened and persistent externalizing problems. However, although the undercontrollers are usually seen as an externalizing group, they were also at heightened risk of belonging to a small but problematic group that had very high levels of both externalizing and internalizing problems. Furthermore, the externalizing group had increasing levels of internalizing problems. It thus appears that undercontrollers are especially at risk of experiencing co-occurrence of internalizing and externalizing problems. The 'failure model' has proposed that when children exhibit externalizing problems, their negative interactions with the environment induce feelings of failure, which ultimately cause internalizing symptoms (Capaldi, 1992; Gilliom & Shaw, 2004). Perhaps undercontrollers in

these problem groups are initially prone to externalizing symptoms due to their personality configuration, and these symptoms lead to increasing internalizing problems for them.

As expected, children with an overcontrolling personality type were vulnerable to belonging to a trajectory with heightened internalizing problems. However, unexpectedly, they were only more likely to be in the internalizing trajectory class at low, rather than high levels of maternal overreactivity. The fact that the overcontroller personality type is a vulnerability for internalizing problems at low levels of overreactivity may indicate either that the vulnerability is so strong that it is not as dependent on the environment, or that it is dependent on other environmental factors than overreactive parenting. Fearful children have previously been shown to experience more protective parenting, which predicted their later levels of internalizing problems (Bayer, Sanson, & Hemphill, 2006; Kiel & Buss, 2010; Kiel & Buss, 2011). It has been suggested that inhibited children elicit unduly gentle parenting which limits their exposure to challenging contexts, thereby increasing their fearfulness and anxiety (Bayer, Sanson, & Hemphill, 2006; Kiel & Buss, 2010). Future research may investigate whether overcontrollers who experience low levels of overreactivity indeed experience more overprotective parenting.

Although it may appear that overcontrollers were worse off at low levels of overreactive parenting, they were *less* likely than the resilient to belong to the externalizing class at low levels of overreactive parenting. At high levels of overreactivity, differences between overcontrollers and resilient disappeared. When comparing the overall probability of belonging to any of the problematic groups in contrast to the well-adjusted group, for high and low maternal overreactivity, it becomes clear that overcontrollers were not worse off when maternal overreactivity was low (probability of belonging to any problem group at low overreactivity = .40, at high overreactivity = .49). Rather, the nature of their problems was different depending on the level of maternal overreactivity they experienced. At high levels of overreactivity, fewer children belonged to the internalizing trajectory and more children belonged to the externalizing trajectory. Our expectation that overcontrollers would be especially likely to withdraw when mothers were overreactive was thus not supported. Rather, high maternal overreactive parenting appears to be a so-called 'strong' environment (Shiner & Caspi, 2003) that is associated with the development of externalizing problems in children, regardless of their personality type.

Although we found no moderation by maternal overreactive parenting for undercontrollers, the undercontrollers were more likely to belong to the high maternal overreactivity trajectory. High maternal overreactivity was an independent risk-factor for all three elevated symptom trajectories. It thus appears that undercontrollers are at double risk: both due to their personality configuration, and due to the heightened levels of maternal overreactive parenting they receive. Perhaps undercontrollers elicit more overreactive parenting because their low levels of agreeableness and conscientiousness make them harder to manage. Patterson's coercion theory postulates that irritable youth evoke negative parenting, which reinforces rather than reduces their problematic behavior, eventually leading to conduct problems in children (Patterson, 1982). Evocative effects of child traits have been

demonstrated for instance for irritable temperament, which predicted increases in inconsistent discipline across time, as well as effortful control, which predicted decreases in maternal rejection (Lengua, 2006). Undercontrollers have previously been found to experience more restrictive control than resilients or overcontrollers (Dubas et al., 2002). For undercontrollers, negative parenting could thus be a mechanism that partly explains why they experience adjustment problems. However, not all types of negative parenting appear to be elevated just for undercontrollers, as parental rejection has been found to be equally elevated for under- and overcontrollers (Akse et al., 2004).

In contrast to our findings, a previous study by Van Leeuwen, Mervielde, and colleagues (2004) found that overcontrollers experiencing high levels of negative control exhibited the highest levels of internalizing problems, whereas undercontrollers exhibited the most externalizing problems (Van Leeuwen, Mervielde et al., 2004). However, unlike the present study, this previous study did not investigate the interaction between the overcontroller type and negative control on externalizing problems. Another study found that undercontrollers had the highest levels of internalizing problems, but not externalizing problems, at high levels of restrictive control, with no interaction for overcontrollers (Dubas et al., 2002). As of yet, results regarding differential effects of negative parenting practices for children with different personality types appear to indicate that under- and overcontrollers do respond differently to negative parenting than resilients do, but do not point clearly yet to a specific link between personality type and internalizing or externalizing problem behavior.

In summary, the results of the present study show that under- and overcontrollers were not at risk of more strongly increasing problems relative to the resilients, but rather of experiencing heightened problems that were persistent across a considerable time span.

We did not find support for the hypothesis that overcontrollers are more likely to react to overreactive parenting by developing internalizing symptoms, whereas undercontrollers react by developing externalizing symptoms. Rather, differences between overcontrollers and resilients were most pronounced at low levels of overreactivity, with overcontrollers more likely to belong to the internalizing problem trajectory class, but less likely to belong to the externalizing trajectory class. Although undercontrollers' risk of belonging to the externalizing and co-occurring problem trajectories was not dependent on overreactive parenting, undercontrollers do appear to be at double risk: their personality type represents a risk-factor for the elevated problem classes, and they were more likely to experience overreactive parenting, which was an independent risk-factor for elevated symptom level trajectories. Indeed, undercontrollers who experienced high overreactive parenting had a very low probability of belonging to the well-adjusted group (probability = .15).

Strengths and Limitations of the Present Study

The present study has several strengths. First, the three waves of measurement covered a considerable time span of six years, allowing the investigation of the development of overreactive parenting and adjustment symptoms over the transition to adolescence. Second, we investigated risk-factors for adjustment problems from multiple levels of the child's

ecology, while taking into account their possible interactive effects. Third, LCA/LCGA modelling has the advantage of removing measurement error from the construct under investigation. Finally, the multi-informant approach of the present study likely reduced reporter bias.

In addition to these strengths, some limitations are also worth mentioning. First, although we took care to investigate whether relations between personality and adjustment problems may have been due to item overlap, we cannot rule out that item overlap partially explains the relations found in the present study. It was not possible to estimate the model with possibly confounded items removed, as these were essential both in the estimation of the personality types, and in the estimation of adjustment problem trajectories. Second, although creating latent classes based on information from multiple informants can be considered a strength, it is also true that different informants may provide unique perspectives that may be lost in aggregation. Different informants have different experiences with the target individual, interact with the child in different contexts and as a consequence may have different, but equally useful information on the target child. Additionally, informants may differ in how close they are to the target child, and as a result may have different degrees of access to relevant information. Some informants may thus generally be considered 'better informants'. In the present study, teacher reports were included in the latent personality constructs. At the time when children's personality was assessed, they were in elementary school, and the assessment was done near the end of the school year. Teachers had thus had the children in their class for an entire school year, so we expect they knew the children quite well. However, in high school, where teachers may spend as little as one hour a week interacting with a child, teachers may not be equally good informants, especially with regards to internalizing problems for instance, which may not be readily visible. Third, although we investigated different personality types, we did not investigate the child's gender as a possible moderator, as the groups would have become too small to include in the present analyses. Previous studies have shown that relations between internalizing and externalizing behavior may vary according to gender (Akse et al., 2004; Mesman, Bongers, & Koot, 2001), and future studies should investigate whether interactions between overreactive parenting and personality type in the prediction of problem behavior trajectory differ between girls and boys. Relatedly, we investigated two overreactivity classes, whereas the model comparisons pointed to a four-class solution. We could not add all four classes to the model, as resulting classes would have become too small to investigate further. It should be noted that even in the present study, there was already a very small class: The low overreactivity-high problem class represented only 1% of the sample. Although this is a very small class, it is important to note that this is an informative finding: Youth who experienced low levels of overreactive parenting were highly unlikely to belong to a class with high levels of both externalizing and internalizing symptoms.

Conclusion

The present study demonstrated that resilient, undercontroller, and overcontroller types may be robustly obtained when using multi-informant reports of children's personality traits. Undercontrollers were at heightened risk of belonging to a class with high externalizing problems, as well as a class with high internalizing and externalizing problems. Further, this undercontroller group appeared to be at double risk as they were also more likely than resilients to experience high maternal overreactivity, which was an independent risk-factor for all elevated symptom trajectories. The overcontrollers were at greater risk of belonging to a high internalizing trajectory class, but only at low levels of overreactivity. As childhood personality types are a risk-factor for elevated problems that appear quite persistent, under- and overcontrollers may be considered as an important groups of youth to target for early intervention, with a focus on negative parenting practices for undercontrollers specifically.

|Appendix 1|

Table 1 .Correlations between the Five Personality Dimensions and Internalizing and Externalizing problems at Time 1, with and without Possibly Confounded Items

	Internalizing Mother report	Externalizing Mother report	Internalizing Father report	Externalizing Father report
Mother report				
Extraversion	-.30**	.03	-.28**	.06
<i>Extraversion</i>	-.23**	-.01	-.22**	.02
Benevolence	-.35**	-.66**	-.23**	-.56**
<i>Benevolence</i>	-.31**	-.62**	-.20**	-.53**
Conscientiousness	-.16**	-.33**	-.09	-.23**
<i>Conscientiousness</i>	-.11**	-.30**	-.05	-.21**
Emotional Stability	-.55**	-.18**	-.39**	-.13**
<i>Emotional Stability</i>	-.53**	-.19**	-.36**	-.13**
Imagination	-.07	-.03	-.16**	-.03
<i>Imagination</i>	-.04	-.02	-.13**	-.04
Father report				
Extraversion	-.28**	.06	-.28**	.07
<i>Extraversion</i>	-.23**	.02	-.21**	.02
Benevolence	-.30**	-.55**	-.32**	-.63**
<i>Benevolence</i>	-.31**	-.53**	-.30**	-.60**
Conscientiousness	-.13*	-.28**	-.11*	-.26**
<i>Conscientiousness</i>	-.12**	-.26**	-.09**	-.25**
Emotional Stability	-.40**	-.05	-.49**	-.13**
<i>Emotional Stability</i>	-.38**	-.05	-.46**	-.13**
Imagination	-.15**	-.04	-.13*	-.01
<i>Imagination</i>	-.14**	-.06	-.09	-.02
Teacher report				
Extraversion	-.12*	.09	-.08	.16**
<i>Extraversion</i>	-.10	.03	-.03	.11*
Benevolence	-.14**	-.38**	-.08	-.35**
<i>Benevolence</i>	-.16**	-.36**	-.10	-.34**
Conscientiousness	-.08	-.21**	-.02	-.19**
<i>Conscientiousness</i>	-.08	-.20**	-.01	-.18**
Emotional Stability	-.11*	.06	-.13*	.04
<i>Emotional Stability</i>	-.10	.05	-.12*	.01
Imagination	-.08	-.08	-.01	.00
<i>Imagination</i>	-.08	-.08	.02	-.01

Note. Italics indicate that possibly confounded items were removed. * p < .05, ** p < .01.

| Chapter 4 |

Mean-Level Personality Development across Childhood and Adolescence: A Temporary Defiance of the Maturity Principle and Bidirectional Associations with Parenting

Abstract

This study investigates mean-level personality development in children from age six to age twenty years. Additionally, we investigated longitudinal, bidirectional associations between child personality and maternal overreactive and warm parenting. In this five wave study, mothers reported on their child's personality from T1 through T4, and children provided self-reports from T2 through T5. Mothers reported on their levels of overreactive and warm parenting from T2 through T4. Using cohort-sequential latent growth curve modeling, we investigated mother reported child personality from age six to age seventeen, and child reported personality from age nine to age twenty. Extraversion decreased linearly across the entire study. Benevolence and conscientiousness increased from middle to late childhood, temporarily declined from late childhood to mid-adolescence, and increased again thereafter. Imagination decreased from middle childhood to mid-adolescence, and also increased thereafter. Mothers reported a temporary decline in emotional stability with an increase thereafter, whereas children did not. Boys and girls differed in mean-levels of the personality dimensions, and to a lesser extent in the degree and direction of changes. Latent difference score modeling showed that child personality predicted changes in parenting, and that, to a lesser extent, parenting predicted changes in child traits. Additionally, changes in child personality were associated with changes in maternal parenting. Results of the present study show that personality change is not directed at increasing maturity from childhood to mid-adolescence, and that it elicits and is shaped by both positive and negative parenting.

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Introduction

Although personality is by definition stable across time and contexts, a growing body of evidence shows that mean-level personality development occurs across the life-span, well into old age, and is mostly aimed at increasing ‘maturity’ (Roberts, Walton, & Viechtbauer, 2006). However, much less is known about mean-level personality development across childhood and adolescence. The scarce evidence is mixed with regards to whether personality development at this age is aimed at increasing maturity (De Fruyt et al., 2006; Klimstra, Hale, Raaijmakers, Branje, & Meeus, 2009; Soto, John, Gosling, & Potter, 2011; Van den Akker, Deković, & Prinzie, 2010). Additionally, it is becoming clear that individual differences in personality development are influenced by contextual factors, such as for instance: taking on roles of work (Roberts, Caspi, & Moffitt, 2003), involvement in a romantic relationship (Scollon & Diener, 2006), or even entering the military (Jackson, Thoemmes, Jonkmann, Lütke, & Trautwein, 2012). For children an important contextual factor that may be associated with their personality development is the parenting they experience (Shiner & Caspi, 2003). The present study longitudinally investigates mean-level personality development from age six to age twenty years, as well as how individual differences in personality development influence, or are influenced by maternal overreactive and warm parenting.

Personality development

Development of the Big Five dimensions has been investigated across the lifespan. Adults tend to become more agreeable, conscientious, and emotionally stable as they age (Roberts et al., 2006; Shiner, Masten, & Tellegen, 2002). These developments have been summarized in the ‘maturity principle’, i.e. individuals increase on those traits that make them better able to perform tasks associated with the responsibilities of adult life (Roberts, Caspi, & Moffitt, 2001). Social Investment Theory posits that taking on new social roles is in fact what drives these changes in personality (Roberts, Wood, & Smith, 2005). For instance, taking on the responsibility of a paid job requires individuals to become more punctual and organized, and entering a romantic relationship requires less egocentrism and more altruism. By placing these social roles as the driving force behind personality change, this theory predicts that most personality change would occur in young adulthood, when these types of social roles are taken on. Indeed, a meta-analysis of personality development across the lifespan indicated that personality change was greater in early adulthood than in adolescence (Roberts et al., 2006).

However, theories on personality development in childhood and adolescence state that individuals may start out with mostly biologically based individual differences in reactivity and regulation of emotions and behavior, which become elaborated into personality across development (Shiner & Caspi, 2003). More generally, children move from being entirely dependent on their parents in early childhood, to autonomous individuals with a sense of their own identity in adulthood (Galambos & Costigan, 2003). We could thus expect most change to occur during this period. However, there is not much longitudinal evidence available on mean-level development in childhood and adolescence. The meta-analysis on mean-level personality

development summarized changes between age ten and eighteen into a single category (Roberts et al., 2006). When investigating development it is vital that the chosen time-interval is appropriate to capture change. As development may be faster paced in children and adolescents, shorter time-intervals may be necessary to capture changes, than would be necessary for adults.

The transition to adolescence may be especially interesting in terms of personality change. Children experience the biological and hormonal changes of puberty. Additionally, whereas most children have spent their entire childhood in a school class with the same children, they transition to a new school, where they need to adjust to new routines, an increased workload, and establish a new social circle. Simultaneously, they start to face the developmental task of increasing autonomy, and establishing a stable sense of identity (Galambos & Costigan, 2003). That the multiple changes associated with the transition to adolescence may be stressful for children, is shown by increased rates of depression and anxiety in this period (Petersen et al., 1993), and increases in parent-child conflict (Laursen, Coy, & Collins, 1998). The many changes children experience may well be reflected in mean-level personality change.

Results of one cross-sectional study of over a million individuals, ranging in age from 10 to 65 years old (Soto et al., 2011), indicate that the transition to adolescence may indeed be different in terms of personality development from later life periods, in that personality development is not aimed at becoming more mature. Rather, levels of extraversion, agreeableness, conscientiousness, and openness decreased across early adolescence for both boys and girls, whereas neuroticism (the inverse of emotional stability), increased for girls. Thus, during early adolescence, there appeared to be a temporary change towards immaturity. From mid-adolescence onwards, development was in line with the maturity principle, with levels of agreeableness, conscientiousness, and openness increasing, and neuroticism decreasing. Results of this study indicate that when a broad time-interval is chosen to assess personality change from late childhood to emerging adulthood, it would appear that not much change has occurred. However, taking a closer look at the changes between ages ten and twenty results in an entirely different conclusion. Children first decrease on several dimensions and then increase again.

There are several longitudinal findings that also indicate that mean-level development of the personality dimensions defies the maturity principle in adolescence. Decreases in conscientiousness and imagination (De Fruyt, et al., 2006), as well as extraversion (Branje, Van Lieshout, & Gerris, 2007; Loehlin, Horn, & Willerman, 1990), have been reported for adolescents. A study of the present sample that was limited to the age range of nine to fifteen years, also found decreases in extraversion, conscientiousness and imagination (Van den Akker et al., 2010). However, there are also some findings which indicate that personality development does follow the maturity principle in adolescence: Openness to experience has been found to increase in adolescence (Branje et al., 2007; Branje, Van Lieshout, & Van Aken, 2004; Klimstra et al., 2009; McCrae et al., 2002;) as have agreeableness and emotional stability (Klimstra et al., 2009).

If personality change in this age range is non-linear (i.e., decrease followed by increase), mixed findings may be due to differences in the age ranges and intervals between assessments (Soto et al., 2011). To determine whether personality change across childhood and adolescence is indeed non-linear, a sufficient number of assessments and a large enough sample size are vital. Additionally, to assess whether a tendency to change toward immaturity is specific to the transition to adolescence, it is important to investigate children from well before this transition. Finally, incongruence in the longitudinal findings to date may also be due to differences in informants. In investigations of personality in younger age groups the use of other-reports to assess children's personalities (usually parents) is relatively common (e.g., De Fruyt et al., 2006; Loehlin et al., 1990). However, especially in older adolescents, self-reports are often used (e.g., Klimstra et al., 2009; Roberts et al., 2003). With regards to agreeableness for instance, parents may perceive their children as becoming less agreeable due to the increased conflict in the relationship. Children may have an entirely different view, basing their judgments on how agreeable they are in interaction with their peers, which become an increasingly more important social context than the family during this time. In the present study we investigate both mother- and self-reported mean-level personality development from middle childhood into emerging adulthood, covering ages six through twenty.

When investigating personality development across this period, it is important to take into account the possibility of gender differences. Girls have been found to be more conscientious, agreeable and open to experience in late childhood (Soto et al., 2011), as well as in adolescence (Klimstra et al., 2009). These findings have been taken to indicate that for girls personality matures earlier, possibly due to their earlier pubertal timing (Branje et al., 2007). It has also been proposed that the difference between boys and girls is due to gender-specific socialization, in that girls may be socialized to be 'better behaved' and more other-oriented (Bussey & Bandura, 1999). If boys and girls exhibit equal levels of conscientiousness, agreeableness and openness to experience in middle childhood, but girls start changing earlier than boys on these dimensions, this would provide support for the earlier maturing of girls being responsible for the gender differences. However, if gender differences are already present in middle childhood, well before the onset of puberty, it is more likely that they are due to gender-specific socialization.

Personality development in context

In addition to contextual factors that may affect an entire population of children simultaneously, such as the transition to adolescence or adulthood, there are contextual factors that are more specific to the individual which may be responsible for individual differences in personality development. For instance, in adults, increased work and relationship satisfaction have been associated with increases in extraversion and emotional stability (Scollon & Diener, 2006), and entering the military has been associated with decreases in agreeableness (Jackson et al., 2012).

For children, the parenting context is likely an important environment for their developing personality (Shiner & Caspi, 2003). Parenting can broadly be divided into relatively

independent dimensions of positive parenting, such as parental warmth, and negative parenting, such as overreactive parenting. Warmth comprises behaviors such as expressing affection, and showing interest in the child's activities (Robinson, Mandleco, Olsen, & Hart, 1995), whereas overreactivity is a tendency to respond with anger, frustration, and meanness to children's problematic behavior (Arnold, O'Leary, Wolff, & Acker, 1993).

Shiner and Caspi (2003) posit several processes that could explain how relations between personality and the parenting context may arise. A first process describes how child personality shapes the child's developing personality. Theories on parenting generally posit that parents exert influence on their developing child by providing working models of behavior that children internalize and bring with them to other contexts (for an overview, see Belsky & Jaffee, 2006). Children who experience warm parenting may for instance learn to act more warmly to others, resulting in increases in benevolence for them. Warm parenting may foster the development of behavioral and emotional regulation in children, leading to increases in conscientiousness and emotional stability. Through a similar process, children who experience overreactive parenting may model hostile behavior and become less benevolent. The development of their regulatory capacities may be impeded, leading them to become less conscientious and emotionally stable.

Several investigations of parenting and child temperament/personality indicate that parenting behavior may indeed shape child traits. For instance, maternal responsiveness has been shown to longitudinally predict higher levels of effortful control in toddlers (Kochanska, Murray, & Harlan, 2000), and parental punitive reactions, a form of negative parenting, predict higher levels of negative emotionality in children (Eisenberg et al., 1999). Maternal rejection has been found to predict increases in fear and irritability, whereas inconsistent discipline predicted decreases in fear (Lengua, 2006). However, there is very little prospective longitudinal evidence on the bidirectional relations between parenting and child personality, especially in adolescence (Bates, 2012; Kiff & Lengua, 2011).

A second process that may explain associations between child personality and parenting behavior, is environmental elicitation, i.e. relations between child personality and the parenting context may arise because child characteristics elicit certain maternal parenting behavior (Shiner & Caspi, 2003). For instance, children who are low on benevolence or conscientiousness may be frustrating to deal with for parents, leading them to display more overreactive parenting. Conversely, highly agreeable and conscientious children may be easier to interact with, and parents may be more likely to express warmth. Conscientiousness at age twelve has for instance been shown to predict levels of support perceived from fathers, but not mothers, at age seventeen, controlling for previous levels of support (Asendorpf & Van Aken, 2003). Rather than that parents influence their developing child, parents may thus be faced with individual differences in their children and respond to them differently (Prinz et al., 2012). Controlling for previous levels of temperament and parenting, child positive emotionality has been shown to longitudinally predict more maternal acceptance (Lengua & Kovacs, 2005). Child irritability has been shown to predict increases in rejection whereas higher effortful control and higher child fearfulness predicted decreases in rejection (Lengua, 2006).

Although shaping and environmental elicitation are separate processes that posit different causal mechanisms as responsible for person-context associations, both processes may be at work simultaneously. In fact, change in children's personality and their mothers' parenting behaviors may be so interrelated, that the direction of effects cannot be easily separated. For instance, regardless of how agreeable children are initially, decreases in agreeableness may instantaneously lead to increases in overreactive parenting and decreases in warmth, or decreases in warmth and increases in overreactivity may lead to decreases in agreeableness. Increases in adolescents' perceptions of the support they perceived from their mothers have been shown to be associated with increases in their levels of agreeableness, conscientiousness and openness to experience, regardless of initial levels (Branje et al., 2004). An investigation of the present sample has previously indicated that decreases in benevolence and emotional stability were associated with increases in overreactivity (Van den Akker et al., 2010). Whereas this previous study investigated a composite of parent- and teacher reported personality, in the present study we focus on self-reports of children's personality and maternal reports of her own parenting behaviors, including warmth in addition to overreactivity. It is important to investigate associations to self-reported child personality, as this would indicate that parenting affects children's personality development as they themselves experience it.

The present study

In this five-wave, multi-informant longitudinal study, we investigated children's Big Five development from age six to age twenty, making optimal use of available data. Specifically, we modeled mother reported child personality development from age six to age seventeen (mother reports were available from wave 1 through 4), and child self-reported personality from age nine to age twenty (self-reports were available from wave 2 through 5), using cohort-sequential latent growth curve modeling. We expected that personality development would follow the maturity principle such that children would have higher levels of benevolence, conscientiousness, emotional stability and openness, and lower levels of extraversion in emerging adulthood compared to middle childhood. However, based on cross-sectional findings of Soto and colleagues (2011), we expected that benevolence, conscientiousness, emotional stability, and imagination would show a temporary decrease across the transition to adolescence. We expected that girls would be higher on benevolence and conscientiousness than boys, but lower on emotional stability. Additionally, we investigated interrelations between child self-reported personality and mother reported overreactive and warm parenting (wave 2 through 4). We expected that children who are low on benevolence, conscientiousness, and emotional stability would elicit more overreactive parenting, while at the same time benevolence, conscientiousness and emotional stability would decrease when children experienced higher levels of overreactive parenting. We expected that lower levels of extraversion, benevolence, and conscientiousness would be associated with decreases in maternal warmth, while at the same time these dimensions would decrease when children experienced lower levels of maternal warmth. Finally, we expected that decreases in child

benevolence, conscientiousness and emotional stability would be related to increases in maternal overreactivity, whereas decreases in benevolence, conscientiousness and imagination would be related to decreases in maternal warmth.

In sum, this study longitudinally investigates mean-level development of personality from age six to age twenty years, as well as bidirectional relations between child self-reported personality and maternal reports of her warm and overreactive parenting behavior.

Method

Participants

For this study, we used data from the third through seventh (T1: 2001; T2: 2004; T3: 2007; T4: 2009; T5: 2012) waves of the Flemish Study on Parenting, Personality and Development (FSPPD; Prinzie et al., 2003). At T1 through T4 mothers reported on their child's personality. From T2 to T5, children provided self-reports. The cohort-sequential design included four cohorts of children who were respectively six, seven, eight, and nine years old at the first measurement. The total sample consisted of 596 children (49.8% boys; 50.2% girls), whose mean age at T1 was 7.5 ($SD = 1y 1$ month). At T1 576 mothers reported on their child's personality, at T2 492 mothers and 510 children participated, at T3 462 mothers and 433 children participated, at T4 424 mothers and 409 children participated, and at T5 423 children participated. Children who participated at all times differed from those who did not on 4 out of 26 study variables: they reported slightly lower levels of extraversion at T2 ($T(490) = -2.14, p = .033, d = .19$), slightly higher levels of benevolence at T2 ($T(490) = 2.30, p = .022, d = .21$), and conscientiousness at T4 ($T(421) = -3.13, p = .002, d = .31$), and for these children mothers reported slightly higher levels of warmth at T4 ($T(430) = -2.18, p = .030, d = .21$). Mothers who participated at all times differed from those who did not on 3 out of 26 study variables: they reported slightly lower levels of extraversion at T3 ($T(107.35) = -2.09, p = .039, d = .40$), moderately higher levels of benevolence at T4 ($T(39.55) = 2.17, p = .036, d = .69$), and slightly higher levels of emotional stability at T4 ($T(422) = 2.19, p = .029, d = .21$).

Measures

Child personality. Mothers and children reported on the child's Big Five personality dimensions by filling out the Hierarchical Personality Inventory for Children (HiPIC) (Mervielde & De Fruyt, 1999). The HiPIC is an empirically derived questionnaire in the lexical tradition, based on an extensive analysis of free parental descriptions of their children. This instrument includes 144 items, 8 items per facet, assessing 18 facets that are hierarchically structured under five higher order domains. The higher order domains are labelled as follows: (1) extraversion (32 items; e.g., "Bubbles with life"), (2) benevolence (40 items; e.g., "Defends the weak"), (3) conscientiousness (32 items; e.g., "Works with sustained attention"), (4) emotional Stability (16 items; e.g., "Has confidence in own abilities"), and (5) imagination (24 items; e.g., "Asks many why questions"). Items were rated on a 5-point Likert-type scale, ranging from 1 (*barely characteristic*) to 5 (*highly characteristic*). The HiPIC's factor structure and high internal

consistencies of domains have been established Mervielde & De Fruyt, 1999). We obtained one score for each domain, by averaging the scores across the items. Cronbach's *alphas* ranged from .88 to .96 in the mother reports, and from .83 to .93 in the child self-reports.

Maternal overreactivity. Mothers reported on their levels of overreactivity at T2 through T4 by filling out the Dutch translation of the overreactivity subscale of the Parenting Scale (Arnold et al., 1993; Prinzie et al., 2007). The overreactivity subscale contains nine items and measures parents' tendency to respond with anger, frustration, and meanness to their child's problematic behavior. Items represent discipline encounters (e.g., "When my child misbehaves..."), followed by two opposite anchor points for a 7-point Likert-type scale (e.g., *I speak to my child calmly* versus *I raise my voice or yell*). The parenting scale has adequate test-retest reliability, distinguishes clinical from nonclinical samples, and has been validated against behavioral observations (Arnold et al., 1993; Irvine, Biglan, Smolkowski, & Ary, 1999). Scores were averaged across all items. Cronbach's *alphas* ranged from .77 to .80.

Maternal Warmth. Mothers filled out the Parenting Practices Questionnaire (Robinson et al., 1995) at T2 through T4. The warm parenting scale consists of eleven items measuring the degree to which parents are affectionate to their children and are involved in their lives (e.g., "I express affection by hugging, kissing, and holding my child"). Items are rated on a 5-point scale ranging from 1 (*never*) to 5 (*always*). Scores were averaged across items. Cronbach's *alphas* ranged from .84 to .86.

Statistical Analyses

For both mother and child reports, we estimated cohort-sequential latent growth curves for each of the Big Five personality dimensions, in Mplus 7 (Muthén & Muthén, 1998-2012), using maximum likelihood estimation. Mplus uses full information maximum likelihood to handle missing data, making optimal use of available data. Because of the cohort-sequential design, we could model development from age six to age twenty years. For each dimension, we fitted a model including an intercept and a linear slope factor and a covariance between these factors (linear growth model). Next, we investigated whether adding a quadratic growth factor provided a significant improvement in model fit, and finally we investigated whether adding a cubic growth factor provided a significant improvement in model fit. When model estimation resulted in negative values for the factor variances, these were constrained to zero.

Next, we investigated the final growth model for gender differences. We compared a fully constrained model to model with all parameters freed across gender. If freeing the parameters resulted in a significant improvement in model fit, we constrained parameters that did not result in a significant decrease in model fit one at a time. Incremental fit of models was investigated using the chi-square difference test. We assessed model fit with the comparative fit index (CFI), with CFI > .90 indicating a good fit, and the Root Mean Square Error of Approximation (RMSEA), with RMSEA < .05 indicating a good fit, and RMSEA < .10 indicating an acceptable fit (for an overview of model fit statistics, see Hu & Bentler, 1995).

To investigate relations between maternal overreactivity and child personality we fitted Latent Difference Score (LDS) models (Selig & Preacher, 2009). We fitted ten models: one

for each personality dimension (5) and parenting behavior (2) combination. Observed variables were modeled as a single indicator of the latent difference score variable. Initial levels predicted change over time, change was allowed to correlate, and cross paths between child personality and parenting were included, such that levels of child personality at each time predicted changes in parenting from that time to the next, and levels of parenting at each time predicted changes in child personality over time. We assessed model fit with the CFI and Standardized Root Mean Square Residual (SRMR) statistics.

Results

Descriptives and intercorrelations of the study variables are provided in Tables 1 and 2. Relative stability of both the child self-reported and mother reported personality dimensions was large between consecutive measurements ($r = .51 - .81$). In the mother reports, relative stability from T1 to T4 was moderate to large ($r = .47 - .62$), and in the child reports relative stability from T2 to T5 was moderate ($r = .33 - .44$). Maternal overreactivity was related to lower levels of child reported benevolence and conscientiousness at T2, T3, and T4, and to lower levels of imagination at T2 and T3. Maternal warmth was related to higher levels of child reported extraversion, conscientiousness, and imagination at T2, T3, and T3, and to higher levels of benevolence at T2 and T4.

Table 1.

Descriptives for the Study Variables

Measure	T1 <i>M (SD)</i>	T2 <i>M (SD)</i>	T3 <i>M (SD)</i>	T4 <i>M (SD)</i>	T5 <i>M (SD)</i>
Mother report					
EXT	3.65 (.51)	3.55 (.52)	3.47 (.53)	3.38 (.55)	--
BEN	3.44 (.44)	3.49 (.42)	3.43 (.43)	3.42 (.43)	--
CONS	3.36 (.51)	3.32 (.54)	3.25 (.55)	3.20 (.58)	--
ES	3.48 (.63)	3.44 (.64)	3.45 (.64)	3.52 (.61)	--
IMAG	3.86 (.56)	3.77 (.57)	3.64 (.58)	3.54(.60)	--
Overreactivity	--	3.13(.83)	3.12(.86)	3.03(.86)	--
Warmth	--	4.23(.43)	4.02(.50)	4.00(.52)	--
Child report					
EXT	--	3.55 (.46)	3.47 (.48)	3.46 (.53)	3.39 (.54)
BEN	--	3.50 (.40)	3.45 (.38)	3.43 (.37)	3.62 (.40)
CONS	--	3.32 (.45)	3.21 (.47)	3.20 (.47)	3.40 (.56)
ES	--	3.52 (.61)	3.47 (.65)	3.41 (.67)	3.29 (.73)
IMAG	--	3.65 (.53)	3.48 (.51)	3.46(.49)	3.57(.49)

Table 2.

Correlations Between the Study Variables

Measure	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.	11.	12.	13.
1. EXT T1	--	.19**	.21**	.34**	.48**	.54**	.04	.11*	.17**	.28**	.46**	-.01	.07
2. BEN T1	.16**	--	.53**	.24**	.25**	.09	.51**	.34**	.08	.13**	.12*	.37**	.28**
3. CONS T1	.12**	.36**	--	.29**	.48**	.20**	.26**	.55**	.19**	.32**	.11*	.16**	.44**
4. ES T1	.44**	.25**	.20**	--	.38**	.20**	.17**	.16**	.55**	.23**	.20*	.08	.07
5. IMAG T1	.45**	.16**	.52**	.31**	--	.31**	.09	.32**	.21**	.62**	.20**	.04	.25**
6. EXT T2	.74**	.16**	.17**	.31**	.33**	--	.11*	.23**	.35**	.41**	.65**	.02	.18**
7. BEN T2	.06	.71**	.29**	.20**	.12**	.16**	--	.44**	.24**	.12*	.16**	.60**	.30**
8. CONS T2	.08	.30**	.73**	.19**	.39**	.16**	.41**	--	.13**	.47**	.12*	.18**	.66**
9. ES T2	.26**	.24**	.23**	.62**	.30**	.43**	.30**	.25**	--	.23**	.29**	.15**	.08
10. IMAG T2	.30**	.14**	.44**	.30**	.74**	.42**	.21**	.53**	.38**	--	.23**	.06	.32**
11. EXT T3	.62**	.20**	.18**	.32**	.27**	.75**	.19**	.18**	.34**	.28**	--	.11*	.14**
12. BEN T3	.04	.55**	.25**	.13**	.08	.11*	.68**	.29**	.19**	.12*	.24**	--	.35**
13. CONS T3	.06	.24**	.60**	.10*	.31**	.14**	.25**	.76**	.14**	.38**	.21**	.40**	--
14. ES T3	.15**	.18**	.20**	.52**	.22**	.27**	.20**	.21**	.68**	.29**	.40**	.30**	.13**
15. IMAG T3	.32**	.12**	.42**	.32**	.70**	.37**	.16**	.49**	.32**	.80**	.44**	.22**	.52**
16. EXT T4	.49**	.21**	.16**	.25**	.28**	.66**	.19**	.20**	.32**	.32**	.79**	.24**	.18**
17. BEN T4	.02	.47**	.29**	.12*	.13**	.11*	.63**	.36**	.18**	.22**	.14**	.74**	.37**
18. CONS T4	.03	.21**	.52**	.05	.27**	.09	.23**	.67**	.12*	.39**	.11*	.33**	.81**
19. ES T4	.14**	.12*	.15**	.50**	.23**	.25**	.16**	.19**	.60**	.27**	.34**	.19**	.07
20. IMAG T4	.25**	.12*	.40**	.27**	.62**	.28**	.18**	.47**	.27**	.74**	.31**	.21**	.46**
21. OverreactivityT2	-.03	-.34**	-.17**	-.15**	-.13**	-.08	-.38**	-.18**	-.20**	-.15**	-.08	-.26**	-.11*
22. OverreactivityT3	.05	-.26**	-.22**	-.09	-.10*	-.02	-.30**	-.23**	-.11*	-.15**	-.09	-.39**	-.26**
23. OverreactivityT4	.05	-.20**	-.22**	-.07	-.10*	.01	-.23**	-.20**	-.06	-.14**	-.00	-.27**	-.19**
24. Warmth T2	.19**	.26**	.17**	.05	.28**	.31**	.29**	.21**	.15**	.29**	.22**	.18**	.17**
25. Warmth T3	.26**	.23**	.23**	.10*	.27**	.30**	.23**	.24**	.09	.28**	.36**	.31**	.28**
26. Warmth T4	.23**	.25**	.25**	.09	.29**	.29**	.25**	.22**	.10*	.28**	.28**	.24**	.24**

Note. Correlations from mother reported variables (T1-T4) are presented below the diagonal, correlations from child reported variables (Time2-Time5) are presented above the diagonal. * $p < .05$, ** $p < .01$.

Table 2.
Continued

Measure	14.	15.	16.	17.	18.	19.	20.	21.	22.	23.	24.	25.	26.
1.EXT T1	.12*	.23**	.39**	.03	.14**	.13*	.23**	-.02	.04	.11*	.20**	.20**	.19**
2.BEN T1	-.02	.08	.07	.33**	.27**	-.07	.07	-.26**	-.26**	-.20**	.19**	.19**	.15**
3.CONST T1	.07	.25**	.09	.13*	.36**	.04	.12*	-.12*	-.14**	-.14**	.13**	.16**	.12*
4. ES T1	.39**	.17**	.16**	-.02	.01	.38**	.13**	-.03	-.08	-.01	.07	.02	.03
5.IMAG T1	.14**	.47**	.18**	.03	.24**	.10*	.44**	-.10*	-.08	-.09	.22**	.23**	.21**
6. EXT T2	.17**	.31**	.54**	-.07	.14**	.18**	.26**	-.06	-.04	.03	.15**	.15**	.18**
7. BEN T2	.12*	.07	.14**	.41**	.25**	.05	.01	-.15**	-.27**	-.20**	.04	.09	.13**
8. CONST T2	.02	.29**	.14**	.12**	.55**	-.01	.19**	-.10*	-.19**	-.10*	.09	.15**	.15**
9. ES T2	.64**	.24**	.20**	.00	.02	.54**	.18**	-.02	-.08	-.04	-.06	-.05	.01
10. IMAG T2	.15**	.67**	.20**	-.04	.21**	.10	.57**	-.14**	-.10*	-.13*	.12*	.18**	.18**
11. EXT T3	.39**	.43**	.75**	-.05	.09	.30**	.27**	-.06	.02	.06	.13**	.15**	.18**
12. BEN T3	.19**	.19**	.09	.56**	.22**	.06	.03	-.17**	-.25**	-.24**	.04	.06	.14**
13. CONST T3	.03	.42**	.09	.21**	.64**	-.02	.18**	-.12*	-.21**	-.18**	.04	.13*	.16*
14. ES T3	--	.28**	.28**	.03	-.01	.70**	.19**	-.06	-.01	.03	-.06	-.04	-.03
15. IMAG T3	.35**	--	.31**	.01	.27**	.16**	.64**	-.10	-.04	-.08	.11*	.15**	.20**
16. EXT T4	.38**	.38**	--	.02	.14**	.41**	.43**	-.07	-.02	.03	.09	.12*	.09
17. BEN T4	.17**	.23**	.24**	--	.33**	.09	.05	-.10*	-.16**	-.17**	.06	.10	.13*
18. CONST T4	.07	.41**	.20**	.52**	--	.03	.31**	-.09	-.11*	-.11*	.05	.09	.10*
19. ES T4	.77**	.30**	.47**	.17**	.08	--	.21**	-.01	.01	.04	-.07	-.04	-.06
20. IMAG T4	.28**	.81**	.48**	.36**	.56**	.35**	--	-.14**	-.08	-.12*	.08	.08	.08
21.OverreactivityT2	-.09	-.13**	-.13*	-.23**	-.18**	-.12*	-.21**	--	.63**	.59**	-.25**	-.26**	-.25**
22.OverreactivityT3	-.13**	-.19**	-.10*	-.34**	-.32**	-.08	-.25**	.63**	--	.73**	-.20**	-.28**	-.25**
23.OverreactivityT4	-.02	-.15**	-.09	-.40**	-.33**	-.05	-.28**	.59**	.73**	--	-.21**	-.25**	-.31**
24. Warmth T2	.04	.25**	.28**	.21**	.17**	.07	.25**	-.25**	-.20**	-.21**	--	.55**	.59**
25. Warmth T3	.05	.33**	.31**	.23**	.21**	.05	.32**	-.26**	-.28**	-.25**	.55**	--	.70**
26. Warmth T4	.04	.29**	.37**	.32**	.25**	.07	.38**	-.25**	-.25**	-.31**	.59**	.70**	--

Personality Development across Childhood and Adolescence

For mother and child reports, we fitted cohort-sequential growth models for each of the Big Five dimensions. For both mother and child reports, we investigated the shape of growth by comparing linear-, quadratic-, and cubic growth models. Results of these model comparisons are shown in Table 3. For *mother reported* extraversion, benevolence, conscientiousness, and emotional stability, a quadratic model provided incremental fit over a linear model, whereas for imagination it did not. However, as for extraversion none of the parameters including the quadratic slope were significant, the linear model was chosen as the final model for both extraversion and imagination. For conscientiousness and emotional stability, a cubic growth model provided incremental model fit over the quadratic growth model, whereas for benevolence it did not. For the *child reported* personality dimensions, quadratic models provided incremental fit over linear models in all instances. However, for extraversion none of the parameters including the quadratic slope were significant. We thus chose the linear model as our final model. Finally, for conscientiousness, a cubic growth model provided incremental model fit over the quadratic model, whereas for benevolence, emotional stability and imagination it did not.

Next, we inspected these models for gender differences. In all instances, a model with all growth parameters freed across gender provided a significant improvement in model fit over a model with all parameters constrained (mother report: $\Delta\chi^2_{\text{extraversion}}(5) = 13.14, p = .02$; $\Delta\chi^2_{\text{benevolence}}(9) = 21.98, p < .01$; $\Delta\chi^2_{\text{conscientiousness}}(10) = 50.75, p < .01$; $\Delta\chi^2_{\text{emotional stability}}(7) = 14.78, p = .04$; $\Delta\chi^2_{\text{imagination}}(5) = 14.25, p = .01$; child report: $\Delta\chi^2_{\text{extraversion}}(5) = 14.59, p = .01$; $\Delta\chi^2_{\text{benevolence}}(6) = 13.34, p = .04$; $\Delta\chi^2_{\text{conscientiousness}}(7) = 16.95, p = .02$; $\Delta\chi^2_{\text{emotional stability}}(9) = 61.19, p < .01$), except for child-reported imagination ($\Delta\chi^2(6) = 2.25, p = .895$). Constraining the parameters one at a time, revealed that there were no gender differences in the growth factor (co)variances. Model fit indices of the final models are provided in Table 4. Estimated growth factor means for boys and girls are presented in Table 5, and growth factor (co)variances, which did not differ between boys and girls, are provided in Table 6.

Table 3.

Model Fit Indices of the Linear, Quadratic, and Cubic Growth Models

	Linear growth (L.)			Quadratic growth (Q.)			L. vs. Q.	Cubic growth (C.)			Q. vs. C.
	$\chi^2(df)$	RMSEA	CFI	$\chi^2(df)$	RMSEA	CFI	$\Delta\chi^2(df)$	$\chi^2(df)$	RMSEA	CFI	$\Delta\chi^2(df)$
Mother											
EXT	101.57(100)	.02	.999	91.89(96)	.00	1.000	9.68(4)*	90.27(95)	.00	1.000	1.72(1)
BEN	172.71(103)**	.10	.930	151.11(97)**	.09	.945	12.76(4)*	150.08(96)**	.09	.945	1.03(1)
CONS	175.11(96)**	.11	.934	153.53(92)**	.10	.949	21.85(4)**	145.78(91)**	.09	.954	7.75(1)**
ES	203.67(102)**	.12	.892	166.16(98)**	.10	.928	37.51(4)**	159.35(97)**	.10	.934	5.81(1)*
IMAG	137.61(102)**	.07	.974	130.64(98)**	.07	.976	6.99(4)	--	--	--	--
Child											
EXT	128.16(101)*	.06	.961	115.75(97)	.05	.973	12.41(4)*	114.60(96)	.05	.973	1.15(1)
BEN	252.49(98)**	.15	.668	163.78(97)**	.10	.856	88.71(1)**	161.51(96)**	.10	.859	2.27(1)
CONS	274.79(95)**	.17	.712	173.63(94)**	.11	.873	101.16(1)**	165.86(93)**	.11	.883	7.77(1)**
ES	197.34(96)**	.13	.842	169.07(92)**	.11	.880	28.27(4)**	162.41(87)**	.11	.882	6.66(5)
IMAG	239.98(99)**	.15	.802	151.37(95)	.09	.921	88.61(4)**	151.24(94)	.10	.919	0.13(1)

Note. * $p < .05$, ** $p < .01$.

Table 4.
Model Fit Indices of the Final Growth Models

	$\chi^2(df)$	RMSEA	CFI
Mother			
EXT	92.93(99)	.00	1.000
BEN	142.37(96)**	.08	.953
CONS	110.04(89)	.06	.983
ES	162.11(98)**	.10	.932
IMAG	130.68(101)*	.06	.978
Child			
EXT	121.77(100)	.06	.969
BEN	136.90(96)**	.08	.912
CONS	153.27(92)**	.10	.902
ES	108.79(90)	.06	.971
IMAG	151.37(95)	.09	.921

Note. * $p < .05$, ** $p < .01$.

Table 5.
Intercept and Slope Factor Means for the Final Growth Models

	Intercept (<i>SE</i>)		Linear Slope (<i>SE</i>)		Quadratic Slope (<i>SE</i>)		Cubic Slope (<i>SE</i>)	
	Boys	girls	boys	girls	boys	girls	boys	girls
Mother								
EXT	3.69(.02)**	3.69(.02)**	-0.40(.04)**	-0.25(.04)**	--	--	--	--
BEN	3.37(.03)**	3.46(.03)**	0.22(.07)*	0.22(.07)*	-0.23(.06)**	-0.23(.06)**	--	--
CONS	3.29(.04)**	3.39(.03)**	0.18(.18)	0.39(.18)*	-0.96(.35)**	-0.96(.35)**	0.54(0.21)**	0.54(0.21)**
ES	3.57(.04)**	3.57(.04)**	-1.14(.24)**	-0.81(.25)**	1.89(.48)**	1.47(.49)**	-0.73(.28)*	-0.73(.28)*
IMAG	3.93(.03)**	3.93(.03)**	-0.47(.04)**	-0.34(.04)**	--	--	--	--
Child								
EXT	3.53(.03)**	3.62(.03)**	-0.17(.03)**	-0.17(.03)**	--	--	--	--
BEN	3.52(.03)**	3.66(.03)**	-0.67(.08)**	-0.67(.08)**	0.69(.07)**	0.69(.07)**	--	--
CONS	3.34(.04)**	3.46(.04)**	-0.43(.21)*	-0.43(.21)*	-0.28(.43)	-0.28(.43)	0.71(.25)**	0.71(.25)**
ES	3.54(.05)**	3.52(.05)**	0.24(.14)	-0.26(.15)	-0.24(.12)*	-0.24(.12)*	--	--
IMAG	3.76(.03)**	3.76(.03)**	-0.94(.10)**	-0.94(.10)**	0.74(.09)**	0.74(.09)**	--	--

Note. Parameters that differ significantly between boys and girls are indicated in italics. * $p < .05$, ** $p < .01$.

Table 6.
Growth Factor (Co)Variances for the Final Growth Models

	Variances			Covariances		
	Intercept (SE)	Linear Slope (SE)	Quadratic Slope (SE)	Intercept – L. Slope (SE)	Intercept – Q. Slope (SE)	L. Slope –Q. Slope (SE)
Mother						
EXT	0.24(.02)**	0.27(.03)**	--	-0.11(.02)**	--	--
BEN	0.15(.02)**	0.31(.22)	0.21(.16)	-0.04(.06)	-0.03(.05)	-0.19(.18)
CONS	0.24(.04)**	1.13(.31)**	0.62(.24)*	-0.18(.09)*	0.06(.07)	-0.73(.27)**
ES	0.30(.03)**	0.27(.05)**	--	-0.12(.03)	--	--
IMAG	0.25(.02)**	0.16(.03)**	--	-0.06(.02)**	--	--
Child						
EXT	0.14(.02)**	0.26(.04)**	--	-0.07(.02)**	--	--
BEN	0.09(.01)**	0.12(.03)**	--	-0.05(.02)**	--	--
CONS	0.11(.02)**	0.18(.04)**	--	-0.03(.02)	--	--
ES	0.33(.07)**	2.81(.72)**	1.54(.50)**	-0.53(.20)**	0.31(.15)*	-1.95(.58)**
IMAG	0.17(.04)**	0.72(.44)	0.25(.30)	-0.11(.12)	0.02(.09)	-0.40(.35)

Note. Dashes indicate the parameters were not estimated in these models. * $p < .05$, ** $p < .01$

Mothers reported that boys and girls did not differ in their levels of extraversion at age six. Both boys and girls decreased linearly in extraversion across time, with a stronger decrease for boys than for girls. Children reported that girls were more extraverted than boys initially (age nine), but that boys and girls decreased equally. Both mothers and children reported that girls were also more benevolent than boys initially. Mothers reported an increase in benevolence from age six to age eleven, with a decrease thereafter, whereas children reported a decrease specifically across the transition to adolescence (from age nine to age fourteen), with an increase thereafter. Boys and girls did not differ in their development of benevolence across time. In addition to being more extraverted and benevolent initially, girls were also rated more conscientious initially, both according to mothers and children's self-reports. The development of conscientiousness provided the strongest evidence for a temporary decrease across the transition to adolescence: According to mothers, boys increased in conscientiousness from age six to age nine, and then decreased up to age seventeen, but less and less strongly so as they got older. Girls increased from age six to age ten, decreased until age fifteen, and then increased again. According to children, boys and girls did not differ in their development of conscientiousness across time: boys and girls decreased from age nine to age fifteen, and then increased up to age twenty, with this increase accelerating as children grew older. Mothers also reported a temporary dip in emotional stability across the transition to adolescence: boys and girls were equally emotionally stable at age six, but boys decreased more up to age eleven, and increased more afterwards, such that boys eventually ended up more emotionally stable than girls at age seventeen. Mothers reported that girls decreased again from age sixteen to age seventeen. Children reported that girls were less emotionally stable at age nine and that they decreased more up to age seventeen. Finally, both mothers and children reported that boys and girls were equally imaginative. Mothers reported that children decreased in imagination over time, with a stronger decrease for boys than for girls. Children reported a similar development for boys and girls with imagination decreasing from age nine to age fifteen and then increasing up to age twenty, again indicating a temporary dip across the transition to adolescence. For a graphical presentation of the estimated growth trajectories of the mother and child reported Big Five dimensions, see Figure 1.

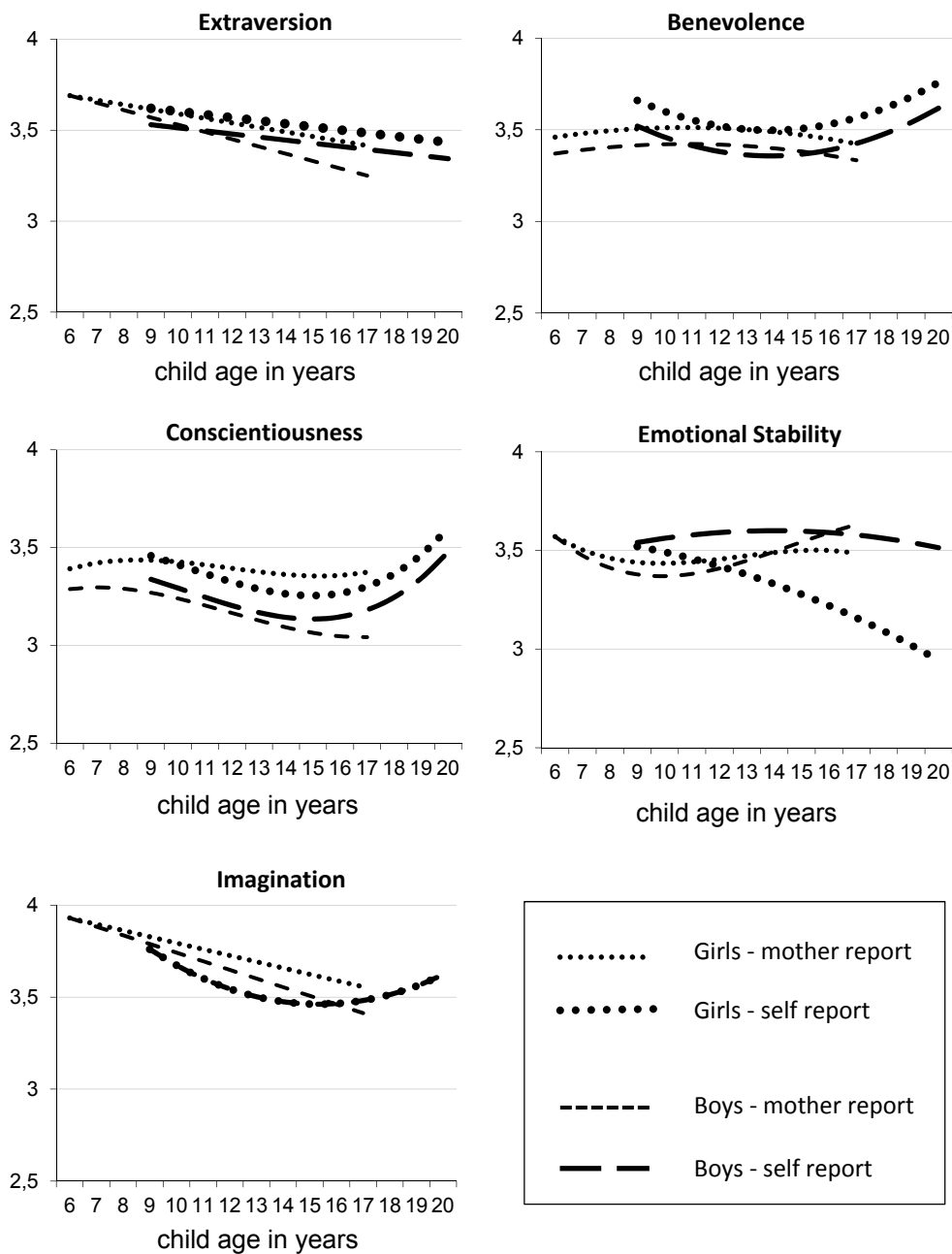


Figure 1. Estimated growth trajectories for the personality dimensions.

Child Personality and Maternal Parenting

To investigate relations between the (child reported) personality dimensions and (mother reported) overreactive parenting, we investigated five latent difference score models, one for each personality dimension. In none of these models did freeing the cross paths and covariances across gender result in a significant improvement in model fit, so we fitted the models to boys and girls simultaneously. Results of these model comparisons, and model fit indices and parameter estimates for the final models are provided in Table 7.

Lower initial levels of benevolence, conscientiousness, and imagination were related to higher initial levels of overreactivity. Additionally, decreases in benevolence and conscientiousness from T2 to T3, and from T3 to T4 were related to increases in overreactivity. Two effects supported the notion that differences in child personality elicit overreactive parenting behavior: Higher levels of benevolence at T2 predicted decreases in overreactivity from T2 to T3, whereas higher levels of extraversion at T3 predicted increases in overreactivity between T3 and T4. Additionally, we found a shaping effect of overreactive parenting on child personality: higher overreactivity at T3 predicted decreases in conscientiousness from T3 to T4.

To investigate relations between the (child reported) personality dimensions and (mother reported) parental warmth, we again investigated five latent difference score models, one for each personality dimension. Mothers who reported more warmth had children who reported that they were more extraverted, benevolent, conscientious and imaginative initially. Increases in warmth from T2 to T3 were associated with increases in conscientiousness and imagination, and increases in warmth from T3 to T4 were associated with increases in benevolence, conscientiousness and imagination. We found three eliciting effects of child personality on maternal warmth: children who were more benevolent and imaginative initially, had mothers who increased in warmth from T2 to T3, and children who were more extraverted at T3 had mothers who increased in warmth from T3 to T4. There were three associations that were only marginally significant: extraversion and conscientiousness at T2, and benevolence at T3, were marginally related to subsequent increases in warmth. Finally, there was one shaping effect: mothers who reported more warmth at T2, had children who decreased more in emotional stability from T2 to T3.

Table 7. Model Fit Indices and Standardized Parameter Estimates for the LDS Models

	Gender Difs.	Fit Statistics			Correlated (change)			Elicitation		Shaping	
	$\Delta\chi^2(df)$	$\chi^2(df)$	SRMR	CFI	CP _{T2} ⁻	CP _{Δ23} ⁻	CP _{Δ34} ⁻	CP _{T2} →	CP _{T3} →	MB _{T2} →	MB _{T3} →
					MB _{T2}	MB _{Δ23}	MB _{Δ34}	MB _{Δ23}	MB _{Δ34}	CP _{Δ23}	CP _{Δ34}
Overreactivity											
EXT	2.29(7)	48.27(4)**	.04	.953	-.02	-.07	-.01	.08†	.10*	-.04	.08
BEN	3.23(7)	32.38(4)**	.03	.968	-.26**	-.18**	-.14**	-.13**	.03	-.03	-.08†
CONS	4.67(7)	36.86(4)**	.03	.965	-.11*	-.14**	-.11*	-.07†	.07	-.04	-.10*
ES	11.27(7)	39.29(4)**	.03	.962	-.03	-.05	.04	-.07	.03	-.00	.06
IMAG	6.14(7)	33.18(4)**	.03	.971	-.09*	-.03	-.06	.00	-.04	-.06	.06
Warmth											
EXT	7.14(7)	52.94(4)**	.04	.944	.20**	.06	.05	.08†	.10*	.02	.06
BEN	8.25(7)	48.60(4)**	.04	.945	.20**	.03	.10*	.11*	.08†	-.06	.02
CONS	6.34(7)	52.90(4)**	.04	.944	.12**	.10*	.12*	.08†	.04	.00	.02
ES	9.40(7)	50.76(4)**	.04	.946	.07	-.00	-.07	-.03	.06	-.10*	-.00
IMAG	6.22(7)	46.56(4)**	.04	.955	.22**	.10*	.11*	.10*	.05	-.04	.03

Note. CP = child personality dimension, MB = maternal parenting behavior. † $p < .10$, * $p < .05$, ** $p < .01$.

Discussion

This study investigated the development of the Big Five personality dimensions across childhood and adolescence. Results indicate that mean level change occurred for all five dimensions. Mother- and self-reported extraversion and mother-reported imagination changed in a linear fashion, steadily decreasing from childhood to emerging adulthood. All other dimensions changed in a non-linear fashion, showing both increases and decreases over time. Thus, although mean-level differences are not large when comparing levels in childhood to those in emerging adulthood, the amount of change that occurs during this time-span cannot be inferred from these net changes. In addition to mean-level changes, we found that individual differences in personality change were related to the parenting context. Environmental elicitation occurred such that levels of child benevolence, conscientiousness, and emotional stability predicted subsequent changes in maternal overreactivity, whereas extraversion, benevolence and imagination predicted subsequent changes in maternal warmth. There was also some evidence that parenting behaviors shape child personality: maternal overreactivity predicted change in conscientiousness and maternal warmth predicted change in emotional stability. Finally, change in benevolence and conscientiousness was associated with change in overreactive parenting and warmth, and change in imagination was associated with change in warmth.

Dimension development

Middle to late childhood. In the present study we investigated mean-level personality change from age six to age twenty, allowing us to model personality development from middle childhood up to emerging adulthood. From middle to late childhood (six to nine years), mothers reported increases in benevolence and conscientiousness. Increasing self-regulatory capacities due to general maturation (Eisenberg, Duckworth, Spinrad, & Valiente, 2012), may lead children to become more planful and orderly, and increasing perspective taking skills (Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991), may result in children's increasing tendency to take into account the needs of others. Extraversion decreased across this period. Increasing self-regulation may lead to lower activity levels (Soto et al., 2011), which is a component of extraversion. Additionally, imagination decreased. Perhaps this is due to children's increasing tendency to conform to the peer group, which has been found to increase across childhood, with a peak in early adolescence (Berndt, 1979). They may be less prone to try new things, but rather be most interested in mastering social norms to fit in. Finally, emotional stability also decreased. As children enter elementary school, they leave the relatively protected home environment, and need to live up to all kinds of expectations. Children's view of how competent they are in several domains, has been found to decrease from when children first enter elementary school (Jacobs, Lanza, Osgood, Eccles, & Wigfield, 2002).

Late childhood to middle adolescence. From late childhood to middle adolescence (nine to thirteen years), children in the present study continued to decrease in extraversion

and imagination. Mothers reported that children continued to increase in benevolence up to age eleven, at which point they started decreasing, whereas children reported a decrease from age nine already. Children also started to decline in conscientiousness from age nine, both according to mother- and self-reports. According to mothers, emotional stability slightly increased. Boys also reported an increase in emotional stability, whereas girls reported a decrease. Overall, it thus appears that personality development during this period is not aimed at becoming more, but rather at becoming less mature.

One could argue that the development of benevolence and conscientiousness could be expected to be more in line with the maturity principle during this period. As children transition to secondary school, they gain responsibility over their own school work, need to make new friends, etc. However, at this age, children have not established a stable sense of identity nor are they autonomous in their decision making (Galambos & Costigan, 2003). They likely do not feel that they are choosing to take on these new roles, and as a result are not motivated to change their behavior. Although they may be getting a taste of the adjustments they will need to make when transitioning to adulthood, the sense of investment that is of course central to Social Investment Theory (Roberts et al., 2005), is lacking. Perhaps the fact that they face all these changes, but are not intrinsically motivated is especially stressful, leading them to become less rather than more mature. Further research is necessary to elucidate the processes that lead to these mean-level decreases in early adolescence.

Middle adolescence to emerging adulthood. In line with the cross-sectional study by Soto and colleagues (2011), extraversion continued to decrease across late adolescence, whereas the decreases in benevolence, conscientiousness and imagination were temporary. Levels increased again from middle adolescence into emerging adulthood, at least according to children themselves. Social Investment Theory predicts increases in benevolence and conscientiousness occur across the transition to adulthood because adolescents take on adult social roles that require them to behave responsibly. These behavioral changes then lead to personality change in a bottom-up fashion (Roberts et al., 2005). Increases in conscientiousness around this time have been linked to investment in schoolwork, and taking exams (Bleidorn, 2012). Theories on identity formation have placed openness to experience/imagination as central to the process of identity exploration (Ozer & Benet-Martinez, 2006), and empirical evidence shows that openness longitudinally predicts higher levels of identity exploration (Luyckx, Soenens, & Goossens, 2006). The normative increases in processes of identity exploration in this age period may be associated with these increase in imagination from mid-adolescence onwards (Klimstra, Hale, Raaijmakers, Branje, & Meeus, 2010).

In contrast to the child self-reports, mother-reports of benevolence, conscientiousness and imagination did not show an increase around this time, except for conscientiousness in girls, which increased from age fifteen up to age seventeen, although they did report that the decrease in benevolence leveled off. More generally, it appears that the largest differences between mothers and children's reports occurred at age seventeen. Perhaps due to children's increasing autonomy and separation from the family context, parents have less access to the relevant information needed to judge the child's personality and become less good informants.

It is also important to note that because no mother reports were available for the final measurement moment, we cannot rule out that mothers would report increases again at the final moment.

Emotional stability differed most between mother- and self-reports, and between boys and girls. Mothers and children both reported that boys and girls started out similarly, but that girls ended up less emotionally stable than boys in emerging adulthood. However, for children's self-reports a decrease started at age nine and continued up to late adolescence, but for mothers, girls were only less emotionally stable from age fourteen onwards. Additionally, for girls it appears that the transition to adulthood may also be a transitional period that is stressful, as their levels of emotional stability declined at a stronger rate across this period, than across earlier adolescence. Importantly, this decrease did not show up in the mothers' reports of their daughters' emotional stability. This may indicate that the decrease in emotional stability may be difficult to notice for caretakers. Declines in emotional stability in adolescence have been associated to higher levels of adjustment problems (Van den Akker et al., 2010), and girls may not easily get help for the possible problems associated with it. In contrast to our findings, increases in emotional stability/decreases in neuroticism have been reported across this period (Klimstra et al., 2009; Soto et al., 2011).

In addition to these gender differences for emotional stability, we found that girls were more benevolent and conscientious than boys. These differences were present in both mothers' and children's own reports, and they were apparent at age six already. Thus, it appears unlikely that the differences found in the present study were due to differences in pubertal timing. Results of the present study are more in line with the notion that these gender differences are due to either initial biological differences, or due to gender-specific socialization in childhood (Bussey, & Bandura, 1999). Unlike for benevolence and conscientiousness, mothers reported that boys were equally extraverted and imaginative as girls at age six, but decreased more on these dimensions, making them less extraverted and imaginative by late adolescence. In line with the mother-reports, self-reports also indicated that girls were more extraverted than boys from age nine onwards. According to children this difference remained stable. However, in contrast to mothers' reports, boys and girls reported similar levels of imagination at every age.

Personality development and the parenting context

Shaping of child personality by maternal parenting. Although mean-level development of personality dimensions has been suggested to be due to intrinsic maturation, the dimensions are only partially heritable in childhood, and genetic effects mostly account for stability, whereas environmental factors mostly account for change (Spengler, Gottschling, & Spinath, 2012). Results of the present study supported the notion that maternal parenting behavior is such an environmental factor that is associated to personality change in children and adolescents. Two effects supported the notion that maternal parenting behavior shapes child personality. Higher levels of maternal overreactivity predicted decreases in conscientiousness, for one out of two intervals. Relatedly, parents' punitive behaviors have

been shown to predict poorer behavioral regulation in children, controlling for previous levels of behavioral regulation (Eisenberg et al., 1999). Another shaping effect was found such that higher levels of maternal warmth predicted subsequent decreases in emotional stability for one out of two intervals. Although we might expect that when mothers are affectionate and supportive, children would become more rather than less emotionally stable, studies relating fearful temperament to positive, supportive parenting have uncovered similar effects (for a review see, Kiff & Lengua, 2006). It has been suggested that unduly gentle parenting limits exposure to experiences that may boost children's confidence and help them overcome fears (Bayer, Sanson, & Hemphill, 2006; Kiel & Buss, 2010). However, more research is necessary to discern how warm parenting may result in decreases in emotional stability.

Elicitation of maternal parenting by child personality. We found somewhat more support for the elicitation process than for the shaping process: children who were more benevolent initially had parents who decreased in overreactivity and increased in warmth over time, whereas children who were more extraverted had parents who increased in overreactivity and warmth, and finally, children who were more imaginative initially, had parents who increased in warmth. Although it may seem counterintuitive that higher levels of extraversion would predict both increases in overreactivity as well as warmth, extraverted children are optimistic and sociable, which may elicit warmth. At the same time they are energetic and expressive, which may also lead to more heated arguments with parents. Future research may investigate whether the different facets of extraversion are differentially related to positive vs. negative parenting.

Traditionally, theories on parenting have emphasized influence processes from parents on children, because parents are more powerful interaction partners (for an overview see, Belsky & Jaffee, 2006). In his parenting process model, Belsky (1984) acknowledged the possibility of child effects and placed child personality as a central factor that may influence parenting. Evidence on relations between personality and intimate partner relationship quality have led to the conclusion that personality is more important for determining relationship quality than vice versa (Neyer & Asendorpf, 2001; Neyer & Lehnart, 2007; Robins, Caspi, & Moffitt, 2002). Results of the present study overall indicate that child personality is also more important for determining maternal parenting behavior, than vice versa.

Child personality and maternal parenting: parallel processes. In research on parenting it is always important to consider the possibility that associations are due to genetic similarity between parents and children. When harsh parenting and externalizing problems are for instance found to be associated concurrently, it is possible that a genetic similarity related to impulsivity and negative affectivity underlies this association, rather than that they are causally related. Although the direction of effects cannot be inferred from associated changes nor can third variables be ruled out, these associations do speak against the idea that parenting behavior and child personality were associated merely because parents and children resembled each other due to genetic similarity. In the present study, changes in several of the personality dimensions were associated with changes in parenting: increases in benevolence and conscientiousness were associated with decreases in overreactivity and increases in warmth,

whereas increases in imagination were associated with increases in warmth. Although we found gender differences in levels of the personality dimensions, we found no gender differences in associations between parenting and child personality. Individual differences in child personality thus appear to equally elicit, be shaped by, and associated with maternal parenting behavior in boys and girls.

Maternal overreactivity was related to benevolence and conscientiousness, the dimensions that most determine a child's manageability. Benevolence and conscientiousness have been found to cohere as a meta-trait with emotional stability, because they all reflect the outcome of the socialization process (Digman, 1997). However, overreactivity was not related to emotional stability in this study. In a previous study, we did find that overreactivity was related to other-reported emotional stability, in addition to benevolence and conscientiousness (Van den Akker et al., 2010). In this study we showed that mother- and child-reports diverged most for emotional stability. Thus, there may be a discrepancy between mothers and children's own perceptions of their levels of emotional stability, with maternal parenting more likely to be associated with how emotionally stable she perceives her child to be. These results indicate the importance of focusing on self-reported child personality in addition to other-reports.

Overall, there were more relations between child personality and maternal warmth, than overreactivity. Interestingly, maternal warmth showed most significant associations to imagination relative to the other dimensions: initial levels as well as changes were associated, and there was an over-time relation. Change in imagination has previously been associated with change in adolescents' perceived support from mothers (Branje et al., 2004). Imagination thus appears to be a child characteristic that is especially important with regards to positive aspects of the parent child relationship, as it was not related to maternal overreactive parenting, neither concurrently nor prospectively.

Strengths and Limitations

This study has several strengths. First, the longitudinal, cohort-sequential design allowed us to investigate the development of personality in children across a considerable age-span: from six to twenty years of age. Second, the HiPIC is a comprehensive measure of child personality. Third, including multiple informants allowed us to investigate where mothers' perceptions of their child's personality and children's self-perceptions converged, and where they diverged. Relatedly, because we included maternal reports of warmth and overreactivity, and child reports of personality, the associations we found between personality and parenting could not have been due to informant bias. In contrast, most studies only use one informant to investigate associations between constructs (Van Leeuwen et al., 2004).

In addition to these strengths, some limitations are also worth mentioning. First, no child reports were available for the first measurement. As the children were only six at this time, they were just learning how to read and write and could not fill out the HiPIC. In contrast, for the final measurement only child self-reports were available. As a result, because of our multi-informant approach, we could only investigate relations between parenting and child

personality for three out of five waves. It would be interesting to investigate reciprocal relations between parenting and personality at earlier ages. Especially the process of shaping may be more prominent early on in a child's development, when parents have relatively more power in the relationship. As children enter adolescence and become more autonomous, their relative power in the relationship increases and elicitation may start to play a more prominent role. Second, in addition to the processes investigated in the present study, there may be other processes through which parenting and child personality are related. Environmental construal for instance, is a process similar to shaping, in which the environment also influences the child's personality development, but not necessarily due to characteristics of the environment per se (Shiner & Caspi, 2003). Rather, children's personality may lead them to interpret the environment differently. For instance, children who are low on benevolence may interpret a parent's comment on not cleaning their room, as overly hostile because they have a tendency to attribute hostile intent. Relations between child-reported maternal overreactivity and subsequent child personality, which are not corroborated by maternal reports of overreactivity, may provide evidence for a process of environmental construal. As we only had child reports of maternal overreactivity for the T3 and T4 measurements, we did not investigate this possibility in the present study.

Conclusion

Mean-levels of all Big Five personality dimensions changed across childhood and adolescence. Mean-level personality change across the transition into adolescence appears especially interesting, as the development of benevolence, conscientiousness and imagination temporarily defies the maturity principle. In addition to mean-level changes, we found individual differences in personality change that were associated with changes in maternal parenting behavior, with more associations for maternal warmth than for maternal overreactivity. Evidence indicated that maternal parenting shapes child personality over time, as well as that child personality elicits changes in maternal parenting behavior, with child personality more important in determining parenting behavior than vice versa.

|Chapter 5|

Transitioning to Adolescence: How Changes in Child Personality and Overreactive Parenting Predict Adolescent Adjustment Problems

Abstract

The present study examined how changes in child Big Five personality characteristics and overreactive parenting during the transition from childhood to adolescence, predict adolescent adjustment problems. The sample included 290 children, aged eight to nine years. At three moments, with two year intervals, mothers, fathers and a teacher reported on the child's personality, and mothers and fathers reported on their parenting behavior. At the third measurement moment, mothers, fathers, and children reported on the child's adjustment problems. Rank-order stability of the personality dimensions and overreactive parenting were high. Univariate latent growth models revealed mean-level decreases for extraversion, conscientiousness and imagination. Mean levels of benevolence, emotional stability, and overreactive parenting were stable. Multivariate latent growth models revealed that decreases in extraversion and emotional stability predicted internalizing problems, whereas decreases in benevolence, conscientiousness, and emotional stability predicted externalizing problems. Increases in overreactive parenting predicted externalizing, but not internalizing problems. The associations were similar for boys and girls. The results indicate that changes in child personality and overreactive parenting during the transition to adolescence are associated with adolescent adjustment problems. Overall, child personality was more important than overreactive parenting, and children were more likely to 'act out' than to 'withdraw' in reaction to overreactive parenting.

Van den Akker, A. L., Deković, M., & Prinzie, P. (2010). Transitioning to adolescence: How changes in child personality and overreactive parenting predict adolescent adjustment problems. *Development and Psychopathology*, 22, 151-163. doi:10.1017/S0954579409990320

Introduction

Evidence is accumulating in support of the notion that child personality and negative parenting practices are related to adolescent adjustment problems (McLeod, Weisz, & Wood, 2007; Rothbaum & Weisz, 1994). Although it is important to identify factors related to adjustment problems, it should also be acknowledged that these factors are neither perfectly stable (Roberts & DelVecchio, 2000; Roberts, Walton, & Viechtbauer, 2006), nor independent from each other (De Clercq, Van Leeuwen, De Fruyt, Van Hiel, & Mervielde, 2008; Prinzie et al., 2004). Ecological transactional models of the etiology of adjustment problems suggest that individual risk factors (child personality) and contextual risk factors (negative parenting) shape each other over time (Cicchetti & Toth, 1998). However, few studies have examined how interrelated changes in child characteristics and negative parenting are related to adjustment problems (Lengua, 2006). This is especially true for the transition to adolescence.

The transition to adolescence is an important developmental period for both children and parents. Children need to adjust to the physical and hormonal changes that accompany the onset of puberty (e.g., Paikoff & Brooks-Gunn, 1991) as they transition to secondary school and face the developmental task of increasing autonomy (Galambos & Costigan, 2003). Parents need to facilitate this increasing autonomy by learning to relax some control and remain supportive. Rates of parent-child conflict increase during this transition, indicating that the parent-child relationship is under pressure during this period (Laursen, Coy, & Collins, 1998). How children and parents handle these changes might be important for subsequent adolescent adjustment (Graber & Brooks-Gunn, 1996). The transition to adolescence is also a period characterized by an increase in problem behaviors. Rates of internalizing problems are quite low in childhood, but highly prevalent in adolescence (Petersen, 1993). Externalizing behavior problems, such as delinquency and status violations, have also been reported to increase across adolescence (Bongers, Koot, van der Ende, & Verhulst, 2004; Lahey et al, 2000). As the transition to adolescence brings challenges to children and parents, and adjustment problems are heightened after it, this period is especially important to investigate in this regard. The present study contributes to the literature on adjustment problems by investigating how intraindividual changes in child personality and overreactive parenting during this transition, are related to adolescent adjustment problems. Including both child personality and overreactive parenting, as well as both internalizing and externalizing problems, allows us to identify the relative contribution of each risk factor to each type of adjustment problems.

Child personality and overreactive parenting as risk factors for adjustment problems

We adopt the Big Five approach to child personality. This cross-culturally replicated model is among the best established and most used in research on adult personality and applies to adolescent personality as well (Shiner & Caspi, 2003). A major advantage of investigating the Big Five in younger populations is the possibility to integrate findings with literature regarding adults. The Big Five are classically labeled as follows: (1) extraversion, (2) agreeableness/benevolence, (3) conscientiousness, (4) neuroticism vs. emotional stability, and (5)

openness/imagination. Low agreeableness and conscientiousness are associated with externalizing problems (Lynam et al., 2005; Ozer & Benet-Martinez, 2006), whereas low extraversion and emotional stability are most related to internalizing problems (Muris, Meesters, & Blijlevens, 2007; Van Leeuwen, Mervielde, Braet, & Bosmans, 2004).

Although child personality has been identified as a risk factor for adjustment problems, the relation between changes in Big Five characteristics and adjustment problems has not been examined. Personality is theoretically viewed as stable across time and situations (Shiner & Caspi, 2003), but empirical evidence shows that personality changes substantially over time. Mostly mean-level change has been investigated during the transition to adulthood. Individuals tend to become more extraverted, agreeable/benevolent, conscientious, and imaginative/open to experience, suggesting that personality tends to become more mature (Roberts & Delvecchio, 2000; Roberts et al., 2006; Shiner, Masten, & Tellegen, 2002). Findings regarding personality development in adolescence are more scarce and reveal a somewhat different picture. In line with the maturity principle Openness to experience has been found to increase across early adolescence (Branje, Van Lieshout, & Gerris, 2007; Branje, Van Lieshout, & Van Aken, 2004; McCrae et al., 2002; Klimstra, Hale, Raaijmakers, Branje, & Meeus, 2009). Girls' personality development across adolescence, assessed with another measure than the Big Five, is for a large part also directed at maturity (Johnson, Hicks, McGue, & Iacono, 2007). However, there are also findings that do not support the maturity principle: decreases in conscientiousness and imagination (De Fruyt, et al., 2006), as well as decreases in extraversion have been reported across adolescence (Branje et al., 2007).

Another type of stability is differential or rank-order stability. It is assessed by test-retest correlations, which convey information on individuals' relative standing on a personality dimension. A meta-analysis revealed that, in general, differential stability increases with increasing age. The estimated population correlation controlling for the time interval of the longitudinal study was .43 for ages ten to nineteen (Roberts & Delvecchio, 2000). De Fruyt and colleagues (2006) report a higher degree of differential stability across a three year time interval for children aged eight to eleven: Test-retest correlations ranged from .63 for emotional stability to .82 for conscientiousness. This higher degree of stability is likely due to the fact that the parents reported on the child's personality at each time. Parents might show a tendency to retain a stable picture of their children. Prinzie and Deković (2008), who had teachers report on the child's personality (a different teacher every measurement wave), report much lower rank-order stabilities in six - nine year old children across a three year interval, ranging from .38 for emotional stability to .59 for imagination.

Even if both mean level stability and differential stability are substantial, individual differences in the degree of stability may occur. Studying intra-individual changes in risk factors for adjustment problems may reveal unique information. Individuals might be at low risk relative to others, but still experience adjustment problems because they have experienced an increase in risk across the transition to adolescence. The stress of facing the biological, psychological and social changes that accompany the transition to adolescence potentially increases children's risk for adjustment problems during this period (Cicchetti & Rogosch,

2002). This increase in risk may include decreases in extraversion, benevolence, conscientiousness, emotional stability, and imagination.

In addition to the individual level risk factor of child personality, we examined overreactive parenting as a contextual risk factor (Arnold, O'Leary, Wolff, & Acker, 1993). Overreactive parenting is a tendency to respond with anger, frustration, and meanness to children's problematic behavior. It is a parenting behavior that is closely related to harsh or coercive parenting (Patterson, 1982) and includes behaviors such as insulting and hitting the child. This hostile style of disciplining may reinforce oppositional behavior (Patterson, 1982), and provide a model of hostile interaction styles, resulting in heightened risk for externalizing problems (Pettit & Dodge, 1993). At the same time, children may withdraw from parents in an attempt to avoid unpleasant interactions (Bender et al., 2007), and develop low self-esteem, both increasing risk for internalizing problems (MacPhee & Andrews, 2006). Overreactive parenting may be especially problematic for children transitioning to adolescence, as children need support from parents while they are striving for increasing autonomy. Overreactive parenting is power-assertive behavior and not likely to be supportive of autonomy in the child, resulting in a poor fit between the adolescent's developmental stage and the parenting context (Eccles et al., 1993). Increases in overreactive parenting during this developmental stage may thus put children at increased risk for adjustment problems.

When investigating the relative contribution of child personality and overreactive parenting to adjustment problems, it is important to realize that the two may be interrelated in several ways. These interrelations, when not specifically investigated, might obscure the true predictive value of either factor. First, child personality characteristics may elicit changes in overreactive parenting (Belsky, 1993). Second, overreactive parenting may elicit changes in child personality. We know of only one study investigating transactional relations between initial levels and changes in the Big Five and parenting behavior in adolescents, which found no such relations (Branje et al., 2004). However, no study has investigated these relations during the transition to adolescence, and no study has investigated transactional relations between Big Five child personality dimensions and overreactive parenting. Studies on the relation between temperament and other aspects of negative parenting have documented these types of transactions. For instance, higher levels of child irritability predict increases in inconsistent discipline, lower levels of self-regulation predict increases in harsh parenting, and lower levels of effortful control predict increases in rejection by parents. At the same time, higher parental inconsistency has been shown to increase irritability and fearfulness in children (Brody & Ge, 2001; Lengua, 2006; Lengua & Kovacs, 2005). In addition to these transactional relations between initial levels and changes, changes in child personality and overreactive parenting may be correlated, independent of initial levels. The parallel continuities hypothesis states that individual behavior is stable when the environment is stable, but when either the individual or the environment changes, the other changes in order to adjust (Caspi, 1993). For instance, increases in adolescent Agreeableness, conscientiousness and emotional stability are related to increases in parental support (Branje et al, 2004). Thus, when investigating the relative contribution of child personality and overreactive parenting to adjustment problems, possible

transactional relations as well as correlated change between these two predictors, should be taken into account.

Present study's aims and hypotheses

We investigated the relative contribution of changes in Big Five child personality and overreactive parenting during the transition to adolescence, to adjustment problems. Multivariate latent growth curve modeling was performed, containing information on individual- as well as population-level change (Curran & Willoughby, 2003). A longitudinal design allowed us to model development from eight to fourteen years of age. Reports of multiple informants were combined to reduce reporter bias. For a graphical representation of the hypothesized model, see Figure 1.

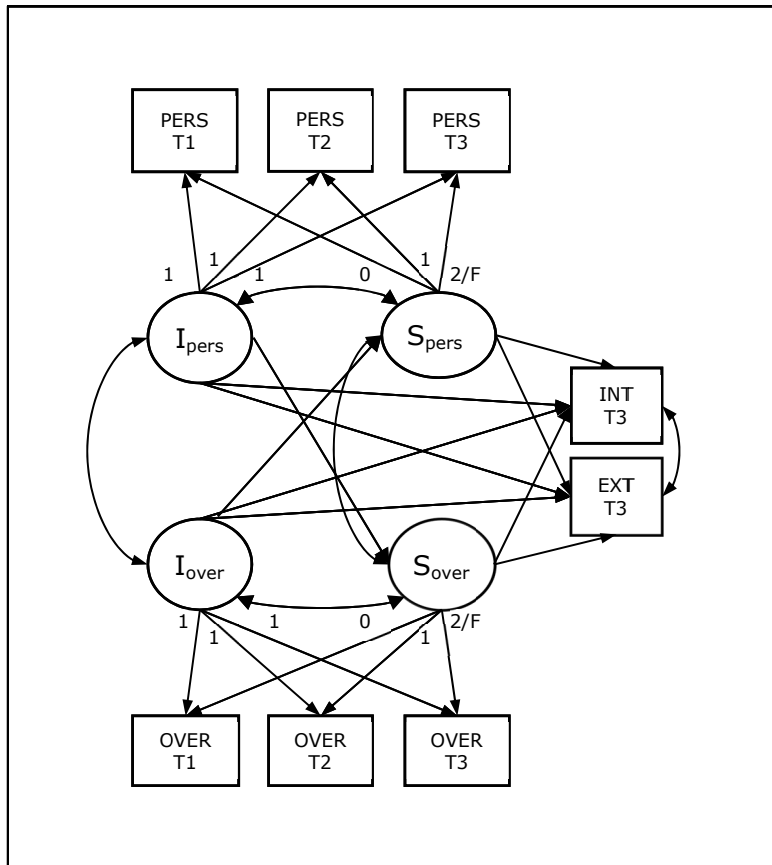


Figure 1. Multivariate latent growth model of the interrelations between child personality (PERS), overreactive parenting (OVER), internalizing problems (INT), and externalizing problems (EXT). I = intercept; S = slope; T = time. Numbers along the arrows represent intercept and slope loadings. F = freely estimated.

We hypothesized that child personality and overreactive parenting would be interrelated. Although we know of no studies investigating over-time relations between child personality and overreactive parenting, we base our expectations on findings relating child temperament to various other aspects of negative parenting. Temperament is viewed as the genetically determined base which, under environmental influences, becomes differentiated into later personality (Shiner & Caspi, 2003). Higher levels of temperamental trait fear predict decreases in rejection and inconsistent discipline, higher levels of child irritability predict increases in inconsistent discipline, and lower levels of effortful control predict increases in parental rejection. At the same time, higher levels of parental rejection predict increases in temperamental trait fear in the child (Lengua, 2006). Based on these findings, we hypothesized that lower levels of benevolence and emotional stability in late childhood are related to increases in overreactive parenting over time, whereas higher levels of overreactive parenting in late childhood are related to decreases in emotional stability and benevolence. The investigation of the other personality dimensions was exploratory, due to a lack of previous empirical studies. We further expected changes in overreactive parenting to be associated to changes in child personality dimensions. Based on findings regarding parental support (Branje et al., 2004), we hypothesized that decreases in benevolence, conscientiousness and emotional stability are related to increases in overreactive parenting. Generally, we expected that benevolence, conscientiousness and emotional stability would show stronger relations to overreactive parenting than extraversion and imagination, as these are characteristics that are more visible to parents and determine how easy the child is to handle.

Although, as far as we know, there are no studies relating changes in Big Five personality to adjustment problems, we based our expectations on findings regarding absolute levels (Lynam et al., 2005; Muris et al., 2007; Ozer & Benet-Martinez, 2006; Van Leeuwen et al., 2004). We hypothesized that decreases in emotional stability and extraversion are most strongly related to internalizing problems, whereas decreases in conscientiousness and benevolence are related to externalizing problems.

Regarding overreactive parenting, we expected that when parents increase their overreactive parenting, children experience more adjustment problems. With regards to the relative strength of the prediction of internalizing versus externalizing problems, two meta-analyses indicate that harsh parenting explains more of the variance in externalizing than internalizing problems, indicating that children could be more likely to 'act out' than withdraw in response to overreactive parenting (McLeod et al., 2007; Rothbaum & Weisz, 1994). We hypothesized that overreactive parenting is more predictive of externalizing than of internalizing problems. Changes in two other aspects of negative parenting have been related to adjustment problems: increases in inconsistent discipline predict higher levels of externalizing problems, and increases in parental rejection predict higher levels of externalizing and internalizing problems (Lengua, 2006).

Regarding the relative contribution of child personality versus overreactive parenting, child personality is likely most important as it is most proximal to the child's problem behaviour

(Cicchetti & Toth, 1998). We hypothesized that adjustment problems are more strongly predicted by changes in child personality than by changes in overreactive parenting.

Finally, as girls are more socialized toward relationship-oriented strategies of emotion-regulation (Morris, Silk, Steinberg, Myers, & Robinson, 2007), and may thus be more susceptible to negative parenting practices, we hypothesized that overreactive parenting would be more strongly related to adjustment problems in girls than in boys. For instance, maladaptive parental coping has been found to predict depressive symptoms, alcohol problems, and delinquency in girls but not in boys (Davies & Windle, 1997).

Method

Participants

This study is part of a larger project: 'The Flemish Study on Parenting, Personality, and Development'. For detailed information on the sample, see Prinzie and colleagues (2004). We used data from the third (2001; Time 1), fourth (2004; Time 2), and fifth (2007; Time 3) wave, as these contained the measures of interest. To obtain a sample of children who transitioned from childhood to adolescence, we selected data for children who were eight or nine years old at Time 1, resulting in a sample of 290 target children. Target children's mean age was 8 years 10 months ($SD = 7$ months, range = 8 years – 9 years 11 months) at Time 1, 11 years 9 months ($SD = 6$ months, range = 11 years – 12 years 11 months) at Time 2, and 14 years 9 months ($SD = 6$ months, range = 14 years – 15 years 11 months) at Time 3. There were 141 boys (48.6%), and 149 girls (51.4%). Girls and boys did not differ in age, $T(288) = 0.70$, $p = .49$. For these 290 children, 289 mothers, 277 fathers and 247 teachers participated at Time 1, 244 mothers, 232 fathers and 217 teachers participated at Time 2, and 235 mothers, 215 fathers and 150 teachers participated at Time 3. Target children gave self-reports at Time 3, $n = 233$. The mothers' mean age at Time 1 was 42 years 7 months ($SD = 3$ years, range = 36-49 years). The fathers' mean age at Time 1 was 45 years 2 months ($SD = 3$ years 9 months, range = 36-61 years). Percentages of mothers' and fathers' educational levels were for elementary school 1.0% and 3.0%, for secondary school 40.5% and 42.2%, for non-university higher education 37.0% and 23.3%, and for university or higher 21.4% and 31.5%, respectively. These percentages are representative of the Belgian population. All the parents had the Belgian nationality.

Missing data points across the study mounted to 11.7% for the mother data, 12.3% for the father data, and 10.7% for the teacher data. Little's MCAR test indicated that data were missing completely at random, $\chi^2/df = 1.10$. Missing data were imputed using Expectation Maximization, a maximum likelihood procedure that uses iterations to impute missing values based on all available data. This procedure is a highly efficient way to use available data under the assumption that data are missing at random (Schafer & Graham, 2002).

Measures

Adjustment problems. Mothers, fathers, and target children reported on the child's internalizing and externalizing problems at Time 3. Mothers and fathers completed the Dutch translation of the Child Behavior Checklist (CBCL) (Achenbach, 1991a; Verhulst, van der Ende, & Koot, 1996). Target children rated the Dutch translation of the Youth Self Report (YSR) (Achenbach, 1991b; Verhulst, van der Ende, & Koot, 1997). Both questionnaires consist of an internalizing and an externalizing problem behavior scale. The internalizing problem behavior scale consists of three subscales, measuring withdrawn behavior, somatic complaints, and anxious/depressed behavior (e.g., 'My child cries a lot'). The externalizing problem behavior scale consists of two subscales, measuring aggressive and delinquent behavior (e.g. 'My child steals'). Each item is rated: 0 (*not true*), 1 (*sometimes/somewhat true*), or 2 (*often/very true*). The CBCL is a well validated, reliable instrument to measure child behaviour (Vignoe, Bérubé, & Achenbach, 2000). An internalizing and an externalizing problem behavior score was obtained for each respondent by summing the scores across the items for each subscale. Cronbach's *alphas* ranged from .81 to .89. The average intercorrelations between reporters were: .61 between mothers and fathers, .39 between mothers and adolescents, and .36 between fathers and adolescents. We performed Confirmatory Factor Analysis (CFA) to assess the feasibility of combining reports. A multitrait, multimethod model with correlated uniqueness (i.e., estimated error covariances) within method (mother report, father report, adolescent report) was used (Marsh, Byrne, & Craven, 1992). The CFA based on the covariance matrix and using maximum likelihood estimation, demonstrated an adequate fit to the data, $\chi^2/df = 1.18$, RMSEA = .03. All item loadings were significant and in the expected direction (average = .67). These results supported the feasibility of aggregating scores across respondents. Composite scores were created by averaging the scores of the available respondents. These were used for all further analysis.

Child personality. Fathers, mothers, and teachers completed the Hierarchical Personality Inventory for Children (HiPIC) (Mervielde & De Fruyt, 1999). The HiPIC is an empirically derived questionnaire, based on an extensive analysis of free parental descriptions of their children. This instrument includes 144 items, 8 items per facet, assessing 18 facets that are hierarchically structured under five higher-order domains. The domains are labeled as follows: (1) extraversion (32 items; e.g., 'Bubbles with life'). This scale contrasts emotional, social, and verbal expressiveness with shyness, inhibition, self-isolation, withdrawal, and non-assertiveness. (2) benevolence (40 items; e.g., 'Defends the weak'). This scale covers the broad area of prosocial- versus antisocial interactions. The scale contrasts a warm, empathic consideration of other people's needs, emotions, and interests, and open, trustful, interpersonal orientations with dominance, egocentrism, and irritation. To distinguish the broader content from the adult agreeableness factor, this factor was labeled as benevolence. This scale includes typical adult agreeableness facets such as compliance, egocentrism, and altruism but also facets that are primarily related to other Big Five factors in adults, such as dominance and irritability. Dominance primarily loads on the extraversion domain in adults, whereas irritability is more related to neuroticism. (3) conscientiousness (32 items; e.g., 'Works

with sustained attention'). This scale refers to conscientiousness in worklike situations and combines a concentrated, reliable, and achievement oriented attitude in work situations with high levels of involvement and perseverance. (4) emotional stability (16 items; e.g., 'Has confidence in own abilities'). In this scale, self-reliance, emotional balance, and being easygoing are opposed to being fearful, anxious, and emotionally disorganized under stress, and having low self-esteem. (5) imagination (24 items; e.g., 'Asks many why questions'). This scale is composed of the three facets creativity, curiosity, and intellect. The items of this scale emphasize openness to new ideas and experiences in terms of creativity, fantasy, curiosity, imagination, humor, and resourcefulness in initiating activities. Items were rated on a 5-point Likert-type scale, ranging from 1 (*barely characteristic*) to 5 (*highly characteristic*). The HiPIC's factor structure and high internal consistencies of domains have been established (Van Leeuwen et al., 2004). We obtained one score per respondent for each domain, by averaging the scores across the items. Cronbach's *alphas* ranged from .87 to .98. The average intercorrelations between reporters were: .70 between mothers and fathers, .38 between mothers and teachers, and .38 between fathers and teachers. Multitrait, Multimethod CFA's with correlated uniqueness were conducted for each of the time points to assess the feasibility of aggregating scores. A good fit to the data was demonstrated for Time 1: $\chi^2/df = 1.89$, RMSEA = .06; Time 2: $\chi^2/df = 16.82$, RMSEA = .05; and Time 3: $\chi^2/df = 1.53$, RMSEA = .04. All factor loadings were significant and in the expected direction (average = .38). Composite scores were created by averaging the scores of the available respondents. These were used for all further analysis.

Overreactive parenting. Fathers and mothers reported on a Dutch translation of the overreactivity subscale of the Parenting Scale (Arnold et al., 1993; Prinzie, Onghena, & Hellinckx, 2007). The subscale contains nine items and measures parents' tendency to respond with anger, frustration, and meanness to their child's problematic behavior. Items represent discipline encounters (e.g. 'When my child misbehaves...'), followed by two opposite anchor points for a 7-point Likert-type scale (e.g., *I speak to my child calmly* versus *I raise my voice or yell*). The overreactivity subscale has adequate test-retest reliability, distinguishes clinical from nonclinical samples, and has been validated against behavioral observations (Arnold et al., 1993; Irvine, Biglan, Smolkowski, & Ary, 1999; Prinzie et al., 2007). We obtained one score for each respondent by averaging the scores across all items. Cronbach's *alphas* ranged from .74 to .81. The average intercorrelation between mothers' and fathers' reports was .22. A Multitrait, Multimethod CFA with correlated uniqueness showed an acceptable fit to the data: $\chi^2/df = 3.60$, RMSEA = .10. All factor loadings were significant and in the expected direction (average = .49). Composite scores were created by averaging the scores of the available respondents. These were used for all further analysis.

Statistical Analyses

We performed statistical analyses in three steps. First, we fitted univariate growth curves to the child personality dimensions and overreactive parenting to determine the type of change (linear or non-linear). We also examined whether there was variability in change over time, as

indicated by either a significant slope variance, or a significant intercept-slope covariance, as this is a necessary condition for including change as a predictor (Duncan, Duncan, & Strycker, 2006). Second, we examined the interrelations between child personality and overreactive parenting, and their contribution to adjustment problems. We tested five multivariate models, including the intercept and slope of a personality dimension and overreactive parenting, and Time 3 internalizing and externalizing problems. Third, we performed multigroup analyses to investigate gender differences in the strength of the associations.

We used the LISREL 8.54 software (Jöreskog & Sörbom, 2003) to fit the models to the observed mean vector and covariance structure using Maximum Likelihood estimation. We assessed model fit with the comparative fit index (CFI), with CFI > .90 indicating a good fit; and the root mean square error of approximation (RMSEA), with RMSEA < .05 indicating a good fit, and RMSEA < .08 indicating an acceptable fit (for an overview of model fit statistics, see Hu & Bentler, 1995). MacCallum, Browne, and Sugawara (1996) have elaborated on these cut points and noted that RMSEA < .10 indicates mediocre fit. We used the chi-square difference test to assess significance of incremental fit in nested model comparison.

Results

Descriptive Statistics

Descriptives of the measures and their intercorrelations are presented in Table 1. For a graphical representation of the mean level estimates of the five personality factors across the three timepoints, see Figure 2. Rank-order stabilities from Time 1 to Time 2 were .77 for extraversion, .72 for benevolence, .79 for conscientiousness, .70 for emotional stability, .80 for imagination, and .67 for overreactive parenting. Rank-order stabilities from Time 2 to Time 3 were .79 for extraversion, .70 for benevolence, .75 for conscientiousness, .66 for emotional stability, .79 for imagination, and .66 for overreactive parenting. Rank-order stability was lower from Time 1 to Time 3: .31 for extraversion, .58 for benevolence, .64 for conscientiousness, .58 for emotional stability, .58 for imagination, and .60 for overreactive parenting. Most of the associations between the personality dimensions and overreactive parenting on the one hand, and internalizing and externalizing problems on the other, were significant.

Table 1. Intercorrelations and Descriptive Statistics for the Study Variables ($N = 290$)

Variable	Time 1						Time 2						Time 3							
	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20
Time 1																				
1. EXT	--																			
2. BEN	-.05	--																		
3. CONS	-.00	.40	--																	
4. ES	.46	.12	.14	--																
5. IMAG	.46	.12	.55	.39	--															
6. Overreactive	.03	-.12	-.23	-.12	-.12	--														
Time 2																				
7. EXT	.77	-.02	.06	.31	.36	-.03	--													
8. BEN	-.15	.72	.28	.02	.01	-.32	-.03	--												
9. CONS	-.07	.33	.79	.07	.43	-.20	.03	.41	--											
10. ES	.32	.10	.20	.70	.40	-.15	.43	.12	.19	--										
11. IMAG	.26	.09	.48	.29	.80	-.11	.39	.13	.57	.45	--									
12. Overreactive	-.01	-.32	-.14	-.15	-.07	.67	-.11	-.35	-.16	-.20	-.12	--								
Time 3																				
13. EXT	.31	.00	.11	.29	.29	-.09	.79	-.01	.07	.33	.24	-.07	--							
14. BEN	-.05	.58	.25	-.04	-.01	-.13	-.04	.70	.33	.01	.08	-.07	.07	--						
15. CONS	.05	.25	.64	-.01	.29	-.05	.07	.31	.75	.06	.41	-.12	.16	.51	--					
16. ES	.27	.07	.24	.58	-.04	-.24	.32	.05	.20	.66	.38	-.24	.44	.13	.14	--				
17. IMAG	.31	.09	.45	.29	.58	-.04	.34	.14	.51	.39	.79	-.11	.43	.22	.55	.49	--			
18. Overreactive	.06	-.29	-.26	-.09	-.09	.60	-.06	-.34	-.25	-.13	-.16	.66	-.11	-.40	-.26	-.15	-.20	--		
19. Internalizing	-.25	-.17	-.22	-.33	-.33	.10	-.30	-.14	-.13	-.36	-.12	.08	-.37	-.27	-.19	-.53	-.23	.14	--	
20. Externalizing	-.10	-.44	-.36	-.02	-.02	.28	.09	-.47	-.34	-.13	-.12	.22	-.00	-.65	-.43	-.21	-.22	.39	.55	--
<i>M</i>	3.49	3.50	3.43	3.48	3.69	3.16	3.40	3.56	3.41	3.52	3.63	3.15	3.32	3.52	3.26	3.52	3.47	3.13	5.63	7.06
<i>SD</i>	0.43	0.43	0.53	0.51	0.49	0.69	0.44	0.39	0.55	0.48	0.50	0.64	0.43	0.38	0.54	0.42	0.48	0.66	3.98	4.41

Note. Correlations greater than |.111| are significant at $p < .05$. Correlations greater than |.141| are significant at $p < .01$.

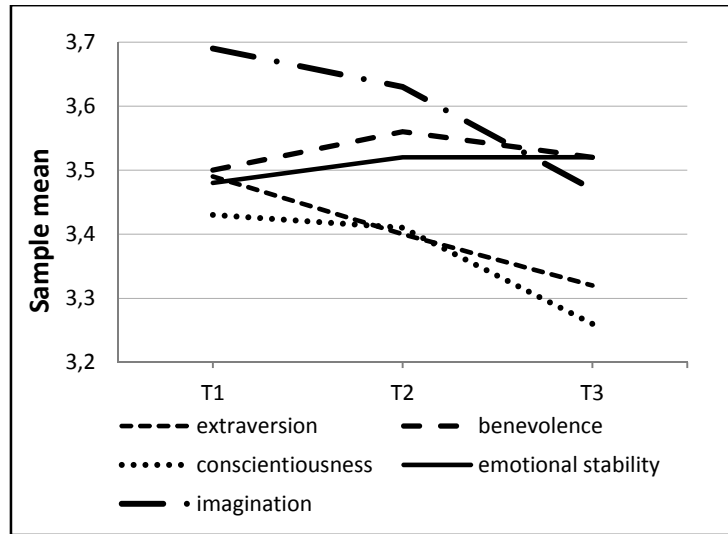


Figure 2. Mean levels of the five personality dimensions across the three timepoints.

Univariate Latent Growth Models

Univariate linear and nonlinear growth models were fitted to determine the type of change. When the nonlinear model did not provide significant incremental fit, the more parsimonious, linear model was selected. Linear growth models were preferred for extraversion (linear model: $\chi^2(3) = 3.59$, CFI = .999, RMSEA = .03; compared to nonlinear model: $\Delta\chi^2(1) = 0.27$, $p = .60$), benevolence (linear model: $\chi^2(3) = 14.52$, CFI = .969, RMSEA = .12; compared to nonlinear model: $\Delta\chi^2(1) = 0.45$, $p = .50$), emotional stability (linear model: $\chi^2(3) = 5.51$, CFI = .993, RMSEA = .05; compared to nonlinear model: $\Delta\chi^2(1) = 0.06$, $p = .81$), and overreactive parenting (linear model: $\chi^2(3) = 0.55$, CFI = 1.000, RMSEA = .00; compared to nonlinear model: $\Delta\chi^2(1) = 0.12$, $p = .73$). Nonlinear growth models were selected for imagination (nonlinear model: $\chi^2(2) = 5.27$, CFI = .993, RMSEA = .08; compared to linear model: $\Delta\chi^2(1) = 11.31$, $p < .01$) and conscientiousness (nonlinear model: $\chi^2(2) = 10.37$, CFI = .981, RMSEA = .12; compared to linear model: $\Delta\chi^2(1) = 12.76$, $p < .01$).

Parameter estimates of the final univariate models are shown in Table 2. The significant mean slopes of extraversion, conscientiousness and imagination were negative, indicating that, on average, children became less imaginative, conscientious and extraverted from late childhood to mid-adolescence. Extraversion decreased linearly, whereas conscientiousness and imagination decreased more from early to mid-adolescence, than from late childhood to early adolescence. The mean slopes of benevolence, emotional stability and overreactive parenting were not significant, indicating that, on average, children retained their levels of benevolence and emotional stability over time, and parents retained their levels of overreactive parenting. For all measures except imagination, either the slope variance or the intercept-slope covariance was significantly different from zero. As either of these must be

significant to include the slope as a predictor in the multivariate models, the slope of imagination was excluded from subsequent analyses (Duncan et al., 2006).

Table 2.
Parameter Estimates of the Univariate Latent Growth Models (N = 290)

Model	Intercept		Slope		Intercept↔Slope	
	<i>M</i>	σ^2	<i>M</i>	σ^2	σ^2	<i>r</i>
Extraversion	3.49**	.15**	-.08**	.01**	-.01*	-.23
Benevolence	3.52**	.15**	.01	.02**	-.03**	-.52
Conscientiousness	3.44**	.24**	-.05**	.01	-.01*	-.30
Emotional Stability	3.48**	.20**	.02	.01**	-.03**	-.64
Imagination	3.69**	.20**	-.06**	.00	-.01	-.28
Overreactivity	3.16**	.34**	-.02	.03**	-.04*	-.39

Note. * $p < .05$, ** $p < .01$.

Multivariate Latent Growth Models

To investigate the relations between child personality, overreactive parenting and internalizing and externalizing problems, multivariate models were fitted for each of the personality dimensions separately. The models showed an acceptable fit (extraversion: $\chi^2(11) = 19.37$, CFI = .992, RMSEA = .05; benevolence: $\chi^2(11) = 44.99$, CFI = .977, RMSEA = .10; conscientiousness: $\chi^2(10) = 25.60$, CFI = .987, RMSEA = .07; emotional stability: $\chi^2(11) = 20.72$, CFI = .990, RMSEA = .06; imagination: $\chi^2(16) = 48.63$, CFI = .970, RMSEA = .08).

Parameter estimates of the relations between child personality and overreactive parenting, and the regression paths from child personality and overreactive parenting to adjustment problems are shown in Table 3. Regarding the interrelations between child personality and overreactive parenting, the intercept correlations showed that children who were initially less benevolent, conscientious, and emotionally stable, had parents who exhibited more overreactive parenting. The over-time intercept-slope correlations indicated that children who were more benevolent initially, had parents who increased their overreactive parenting over time, whereas parents who exhibited more overreactive parenting initially, had children who became more benevolent and emotionally stable over time. Decreases in benevolence and emotional stability in the child were related to increases in overreactive parenting.

Regarding the prediction of adjustment problems, internalizing problems were negatively predicted by the intercepts of all five personality dimensions, indicating that children who were initially less extraverted, benevolent, conscientious, emotionally stable, and imaginative, experienced more internalizing problems. As expected, the relations were strongest for extraversion and emotional stability. For these dimensions, the changes over time were also predictive of internalizing problems, indicating that children who became less

extraverted and emotionally stable over time also experienced more internalizing problems. Overreactive parenting was not related to internalizing problems in any of the models.

As expected, externalizing problems were negatively predicted by the intercepts of benevolence and conscientiousness, indicating that children who were less benevolent and conscientious initially, showed more externalizing problems six years later. Regression paths from the intercept of overreactive parenting to externalizing problems were significant and positive in all multivariate models, indicating that when parents exhibited more overreactive parenting initially, children showed more externalizing problems. In addition to these initial levels, the slopes of benevolence, conscientiousness, and emotional stability predicted externalizing problems, indicating that when children became less benevolent, conscientious and emotionally stable over time, they showed more externalizing problems. When extraversion, conscientiousness and imagination were taken into account regression paths from the slope of overreactive parenting were significant, indicating that children of parents who increased their overreactive parenting, exhibited more externalizing problems.

Multigroup Models

Finally, the multivariate models were fitted for boys and girls simultaneously. A model with all parameters freely estimated, was compared to a model with the between-variable covariances and the regression paths from the intercepts and slopes of personality and overreactive parenting to internalizing and externalizing problems, constrained to be equal across boys and girls. The constrained model did not fit the data significantly worse for any of the personality variables (extraversion: $\Delta\chi^2(12) = 14.06, p = .30$; benevolence: $\Delta\chi^2(12) = 3.69, p = .99$; conscientiousness: $\Delta\chi^2(12) = 11.34, p = .50$; emotional stability: $\Delta\chi^2(12) = 14.11, p = .29$; imagination: $\Delta\chi^2(8) = 12.55, p = .13$), indicating that the strength of the associations did not differ significantly between boys and girls.

Table 3. *Parameter Estimates for the Multivariate Latent Growth Models (N = 290)*

Parameters	Extraversion		Benevolence		Conscientiousness		Emotional Stability		Imagination	
	σ^2/b (SE)	r/β	σ^2/b (SE)	r/β	σ^2/b (SE)	r/β	σ^2/b (SE)	r/β	σ^2/b (SE)	r/β
$I_{\text{personality}} \leftrightarrow I_{\text{parenting}}$	0.00 (0.02)	.01	-0.12 (0.02)	-.54**	-0.07 (0.02)	-.25**	-0.05 (0.02)	-.19**	-0.03 (0.02)	-.13
$I_{\text{personality}} \leftrightarrow S_{\text{parenting}}$	0.00 (0.01)	.05	0.02 (0.01)	.33**	-0.01 (0.01)	-.06	0.01 (0.01)	.09	-0.01 (0.01)	-.08
$I_{\text{parenting}} \leftrightarrow S_{\text{personality}}$	-0.01 (0.01)	-.15	0.04 (0.01)	.39*	0.01 (0.00)	.10	0.02 (0.01)	.16*	--	--
$S_{\text{personality}} \leftrightarrow S_{\text{parenting}}$	-0.01 (0.00)	-.26	-0.02 (0.00)	-.79**	-0.00 (0.00)	-.15	-0.01 (0.00)	-.33**	--	--
$I_{\text{personality}} \rightarrow \text{internalizing}$	-3.54 (0.60)	-.35**	-2.85 (0.89)	-.28**	-1.56 (0.54)	-.19**	-5.60 (0.70)	-.66**	-1.54 (0.58)	-.17**
$S_{\text{personality}} \rightarrow \text{internalizing}$	-8.51 (3.15)	-.28*	-8.35 (7.39)	-.32	-2.24 (2.02)	-.04	12.54 (2.88)	-.57**	--	--
$I_{\text{parenting}} \rightarrow \text{internalizing}$	1.08 (0.68)	.08	0.31 (0.54)	.05	0.60 (0.48)	.09	0.39 (0.41)	.06	0.79 (0.46)	.12
$S_{\text{parenting}} \rightarrow \text{internalizing}$	0.39 (3.27)	.06	-1.37 (6.31)	-.06	2.07 (2.35)	.10	-0.62 (2.57)	-.03	2.30 (2.31)	.11
$I_{\text{personality}} \rightarrow \text{externalizing}$	0.56 (0.48)	.10	-7.92 (0.95)	-.70**	-2.78 (0.56)	-.31**	-1.16 (0.74)	-.12	-0.93 (0.63)	-.09
$S_{\text{personality}} \rightarrow \text{externalizing}$	1.38 (2.60)	.01	-19.72(9.31)	-.68*	-7.11 (2.60)	-.13**	-6.03 (2.80)	-.25*	--	--
$I_{\text{parenting}} \rightarrow \text{externalizing}$	3.13 (0.59)	.41*	1.10 (0.49)	.15*	2.41 (0.50)	.32**	3.06 (0.51)	.40**	2.98 (0.52)	.40**
$S_{\text{parenting}} \rightarrow \text{externalizing}$	8.80 (4.44)	.35*	-1.46 (7.26)	-.06	6.55 (3.11)	.27*	7.07 (3.90)	.28	7.92 (3.38)	.33*

Note. Dashes indicate the parameter was not estimated. $I_{\text{personality}}$ = Intercept personality, $S_{\text{personality}}$ = Slope personality, $I_{\text{parenting}}$ = Intercept overreactive parenting, $S_{\text{parenting}}$ = Slope overreactive parenting. * $p < .05$, ** $p < .01$.

Discussion

This study examined how interrelated changes in Big Five child personality dimensions and overreactive parenting during the transition from middle childhood to adolescence, predict adolescent adjustment problems. Changes in child personality dimensions predicted both internalizing and externalizing problems, whereas changes in overreactive parenting predicted only externalizing problems. Additionally, child personality and overreactive parenting predicted changes in each other, and changes in child personality and overreactive parenting were associated. Finally, the strength of the associations between child personality, overreactive parenting and adolescent adjustment problems did not differ between boys and girls.

In general, rank-order stabilities of the personality dimensions revealed that individuals kept their relative standing on the personality dimensions to a large degree. The magnitude of rank-order stability found in the present study was highly comparable to that reported in the study by De Fruyt and colleagues (2006), and higher than reported in the meta-analysis by Roberts and Delvecchio (2000). This is likely due to the fact that we used the same instrument to measure child personality as De Fruyt and colleagues, whereas the instruments included in the meta-analysis were different. Second, we also included parent reports in our study, as did De Fruyt and colleagues. Parents likely show a tendency to retain a stable picture of their children.

Although rank-order stability was high, the group as a whole did show personality changes. Indeed, the present findings regarding mean level personality changes add to the picture of the transition to adolescence as a potentially difficult time for children (e.g., Galambos & Costigan, 2003). On average, children became less extraverted, conscientious and imaginative. In contrast, findings on Big Five personality development of adolescents transitioning to young adulthood consistently reveal increases in extraversion, agreeableness, conscientiousness, emotional stability, and imagination (Roberts, Caspi, & Moffit, 2001; Roberts et al., 2006). These findings have led researchers to formulate the maturity principle: personality development tends to be aimed at becoming more mature. The findings of the present study indicate that the transition to adolescence is different from the transition to adulthood in terms of personality development, as this is a time in which personality does not appear to change towards becoming more mature. Possibly, this reflects temporary difficulties that children face when confronting the challenges of this developmental transition. Several studies investigating parent-reported personality change during adolescence, report findings that are more in line with the maturity principle. Openness has been reported to increase during adolescence (Branje et al., 2004), as well as Agreeableness and emotional stability (Klimstra et al., 2009). However, an investigation of a sample more similar in age to ours, also reported decreases in imagination and conscientiousness (De Fruyt et al., 2006). It thus appears that the transition to adolescence is not only different from the transition to adulthood but also from changes during adolescence in terms of personality development.

In contrast to these mean level changes for several child personality dimensions, mean levels of overreactive parenting were stable. The rank-order stability of overreactive parenting was also high. Patterson's coercion theory (1982) posits that overreactive or coercive parenting reinforces rather than reduces problematic behavior in the child, which in turn reinforces coercive parenting. These coercive cycles may lead to an early stabilization of negative parent-child interactions. More recently however, Granic and Patterson (2006) have stressed that this stability may be broken during periods of transition, such as the transition to adolescence. Indeed, the mean level stability in this study should not be interpreted as strict stability. As we performed latent growth curve modeling, we revealed individual differences in changes in overreactive parenting as well as child personality.

Interrelations between child personality and overreactive parenting

In contrast to many studies investigating risk factors for adjustment problems, the present study is sensitive to the notion that children and parents engage in a reciprocal process of interaction (Magnusson, 1999). The longitudinal investigation allowed us to study how changes in risk factors were interrelated over a period of six years. As expected, children who were initially less benevolent, conscientious and emotionally stable had parents who exhibited more overreactive parenting. However, contrary to expectation, children of parents who were more overreactive initially, became more benevolent and emotionally stable over time. At first glance, overreactivity appears to positively influence personality development. Perhaps children of parents who were more overreactive became more benevolent and emotionally stable (at least in appearance to their parents) in an effort to avoid future overreactive behavior from their parents. Also contrary to expectation, we found that children who were more benevolent in late childhood, had parents who increased their overreactive parenting. This relation seems even more difficult to explain. However, here it is important to note that all the relations in the model should be taken into account simultaneously, when interpreting these transactional relations. An alternative explanation of these findings then becomes evident: higher initial overreactive parenting was related to decreases in overreactive parenting over time. The same was true for benevolence and emotional stability: higher initial levels were related to decreases over time. Parents who were high on overreactive parenting decreased their overreactive parenting over time, and children who were high on benevolence or emotional stability became less benevolent and emotionally stable over time. Although the parents might still be relatively high on overreactive parenting, their children may have become more benevolent and emotionally stable in response to these decreases. Similarly, parents may have perceived the increases in benevolence in their children and become less overreactive in response. That decreases in overreactive parenting were related to increases in benevolence and emotional stability, supports this view. These correlated changes also support the parallel continuities hypothesis: individual behavior is stable when the environment is stable, but if either of the two changes, the other adjusts to the changing environment (Caspi, 1993).

In contrast to the aforementioned personality characteristics, extraversion and imagination were not related to overreactive parenting concurrently or prospectively. Similarly, extraversion and imagination are not related to changes in parental support (Branje et al., 2004). Benevolence, conscientiousness and emotional stability are dimensions that determine the child's manageability for teachers and parents. Children who are benevolent are compliant, children who are conscientious do what they are supposed to and emotionally stable children are easy to handle. These characteristics are likely to be related to how much the child is disciplined and the degree of frustration the parent will feel when interacting with the child. Indeed, benevolence, conscientiousness and emotional stability have been found to cohere as a meta-trait, and it has been suggested that this is because they all somehow reflect the outcome of the socialization process (Digman, 1997). These domains are thus more likely to be related to overreactive parenting than extraversion and imagination, which are dimensions that are much less related to this 'manageability'. Especially imagination is a characteristic that is mostly internal to the child, and not likely to elicit overreactive parenting.

Child personality and overreactive parenting as risk factors for adjustment problems

Extraversion and emotional stability are frequently found to be potent predictors of internalizing problems (Muris et al., 2007; Van Leeuwen et al., 2004). The present study extends these findings by revealing that, in addition to initial levels, decreases in these dimensions are predictive of internalizing problems. These findings indicate that adolescents might be relatively high on extraversion and emotional stability (decreases were related to higher initial levels), and still experience internalizing problems, if they decrease in these dimensions during the transition to adolescence. For externalizing problems too, we found that not only the initial level, but also the changes in personality (decreases in benevolence, conscientiousness and emotional stability) were significant predictors. These findings indicate that studying changes in risk factors over time can reveal information that studying absolute levels cannot. Although an adolescent might have been at low risk for adjustment problems during childhood, facing the stressors associated with the transition to adolescence may have initiated personality change, leaving him/her at increased risk in adolescence. Although not many studies have investigated the risk associated with changes in personality dimensions, one study found that low levels of emotional stability are related to higher levels of mortality in adult men, but only when combined with decreases in emotional stability over time (Mroczek & Spiro, 2007).

Initial overreactive parenting contributed to externalizing problems, and when extraversion, conscientiousness and imagination were taken into account, increases in overreactive parenting also contributed to externalizing problems. Overreactive parenting was not related to internalizing problems. Apparently, adolescents were more likely to act out than withdraw in reaction to overreactive parenting. This pattern of findings may be specific for the present concept of overreactive parenting, as more harsh physical discipline has for instance been shown to be related to internalizing problems (Bender et al., 2007). Overall, these findings support our expectations regarding the relative contributions of child personality and

overreactive parenting: overreactive parenting contributes more to externalizing than to internalizing problems, and child personality is the more important predictor overall.

Finally, the processes by which child personality and overreactive parenting affected adjustment problems were the same for boys and girls. Although girls may be socialized to be more concerned with interpersonal concerns (Morris et al., 2007), they did not experience more adjustment problems in response to overreactive parenting than boys did. Similarly, changes in parental rejection and inconsistency during the transition to adolescence are equally related to adjustment problems in boys and girls (Lengua, 2006).

Limitations

There are several limitations to the present study. First, due to the immense complexity of a model including all five personality dimensions, interrelations among the five personality dimensions could not be modeled with the present sample size. Interrelations among the personality dimensions could however influence the results, such that certain dimensions could be partially related to adjustment problems through their relation to the other personality dimensions. Additionally, we did not distinguish between separate informants who provide unique views which are lost when aggregating their scores. However, our strategy of combining reports of multiple informants reduces reporter bias, resulting in more objective assessments. Third, as information on adjustment problems from the adolescents themselves was available only for the final measurement moment, we could not include adjustment problems at previous times in the analyses. In other words, we examined how changes in child personality and overreactive parenting were associated with *levels of* adjustment problems, rather than *changes in* adjustment problems. Future research, including multiple measurements of adjustment problems could investigate this possibility, as well as tell us more about the direction of effects between child personality and overreactive parenting on the hand and adjustment problems on the other. It is quite possible that child personality and overreactive parenting drive changes in adjustment problems, as well as that adjustment problems drive changes in child personality and overreactive parenting. Fourth, although we included transactional relations between personality and parenting, other types of relations are imaginable and should be investigated in future studies. For instance, interactions between personality and parenting are also found to occur, such that certain personality characteristics could for instance increase vulnerability to overreactive parenting (Manders, Scholte, Janssens, & de Bruyn, 2006; Prinzie et al., 2003). Fifth, although we investigated gender differences in the relations between personality, overreactive parenting, and adjustment problems, we did not investigate gender differences in mean initial levels and changes of personality and parenting. As previous studies have found gender differences in personality development across adolescence (Branje et al., 2007; Klimstra et al., 2009; McCrae et al., 2002), future studies could investigate whether there are also gender differences in personality development across the transition to adolescence. Sixth, research on the relation between personality and problem behavior has been criticized by stating that the associations between traits and problem behavior result primarily from item overlap. However, a strong indication that personality and

adjustment problems are conceptually and empirically distinct comes from a study by Prinzie, Onghena, and Hellinckx (2005), who demonstrated that removal of the possibly confounded items in the measures used in the present study did not affect the pattern of relations between dimensions and indicators of adjustment. Similar results have been reported in studies investigating temperament and adjustment problems (Eisenberg et al., 2004; Lemery, Essex, & Smider, 2002; Lengua, West, & Sandler, 1998), demonstrating that item contamination in trait and problem behaviour measures is rather limited. Finally, it could be argued that the effect sizes for the present study were quite small. For instance the mean changes in the personality dimensions were $.72 SD$ for extraversion, $.45 SD$ for conscientiousness and $.56 SD$ for imagination over a period of six years. However, although these may seem small effects, such changes may have substantial impact. For instance, every half a standard deviation decrease in emotional stability per decade, has for adults been associated to a 40% increase in mortality (Mroczek & Spiro, 2007), indicating that small effects in personality research are certainly not negligible.

Implications for psychopathology and intervention

Taken together, the present study showed that changes in Big Five personality dimensions predict adolescent internalizing as well as externalizing problems. Overreactive parenting predicted externalizing problems only, implying that interventions aimed at overreactive parenting may be more successful in reducing children's externalizing than internalizing problems. Intervening on overreactive parenting may be equally important for boys and girls, as this parenting behavior was equally related to externalizing problems in boys and girls. Furthermore, early intervention aimed at reducing overreactive parenting may have a positive effect on the child's personality development. As the child's personality was the more important predictor of adolescent adjustment problems overall, intervention efforts should also be aimed at positively influencing personality development. Finally, the present study shows that a person's absolute level on a risk factor does not convey all information on that person's risk, indicating that a person's history, in terms of possible changes in risk factors, should also be taken into account. Even though personality has been viewed as largely stable across time, the present study shows that changes do occur, both at the group and at the individual level. Furthermore, these changes are meaningful in that they may put a person at increased risk for internalizing as well as externalizing problems.

| Chapter 6 |

The Development of Personality Extremity from Childhood to Adolescence: Relations to Internalizing and Externalizing Problems

Abstract

This study investigated the development of personality extremity (deviation of an average midpoint of all five personality dimensions together) across childhood and adolescence, and relations between personality extremity and adjustment problems. For 598 children (mean age T1 = 7.5 years), mothers and fathers reported the Big Five personality dimensions four times across eight years. A child's vector length in a five dimensional configuration of the Big Five dimensions, represented personality extremity. Mothers, fathers, and teachers reported the child's internalizing and externalizing problems at the first and final measurement. In a cohort-sequential design, we modeled personality extremity from six to seventeen years. Growth Mixture Modeling revealed a similar solution for both mother and father reports: a large group with relatively short vectors that were stable over time (mother reports: 80.3%; father reports: 84.7%), and two smaller groups with relatively long vectors (i.e., extreme personality configuration). One group started out relatively extreme and decreased over time (13.2%; 10.4%), whereas the other group started out only slightly higher than the short vector group, but increased across time (6.5%; 4.9%). Children who belonged to the increasingly extreme class experienced more internalizing and externalizing problems in late adolescence, controlling for previous levels of adjustment problems and the Big Five personality dimensions. Personality extremity may be important to consider when identifying children at risk for adjustment problems.

Van den Akker, A. L., Prinzie, P., Deković, M., Asscher, J. J., De Haan, A. D., & Widiger, T. (2013). The development of personality extremity from childhood to adolescence: Relations to internalizing and externalizing problems. Accepted pending minor revisions by *Journal of Personality and Social Psychology*.

Introduction

The validity of the Big Five approach for describing child and adolescent personality has been well established (Mervielde, De Clercq, De Fruyt, & Van Leeuwen, 2005; Shiner & Caspi, 2003; Tackett, 2006). Results indicate that the Big Five framework applies to children and adolescents in much the same way as it does to adults, making it possible to study the development of personality across the lifespan with a single framework. Furthermore, the Big Five approach has proven useful in predicting many child outcomes, including child adjustment problems. Children who are low on agreeableness and conscientiousness are prone to externalizing problems (Lynam et al., 2005; Ozer & Benet-Martinez, 2006; Prinzie, Van der Sluis, De Haan, & Deković, 2010; Van den Akker, Deković, & Prinzie, 2010), whereas introverted and emotionally unstable children are at risk of developing internalizing problems (De Pauw & Mervielde, 2010; Van Leeuwen, Mervielde, Braet, & Bosmans, 2004).

While the five factor model was originally developed to describe normal personality, the potential utility of the dimensional approach for understanding problematic personality in adults (Samuel & Widiger, 2008; Trull & Durrett, 2005; Widiger, 2011), as well as in children and adolescents (De Clercq, De Fruyt, Van Leeuwen, & Mervielde, 2006; Mervielde et al., 2005), is becoming apparent. Indeed, for DSM-5, a dimensional approach to personality pathology has been advocated as an integrative framework that may be included as an alternative to the diagnostic criteria for different personality disorders that often result in a high comorbidity among personality disorders, and a high incidence of a diagnosis of personality disorder 'not otherwise specified.' This proposed dimensional trait model represents "an extension of the five factor model" (APA, 2012), although there is some disagreement over whether the DSM-5 dimension of psychoticism aligns with five-factor openness (Krueger et al., 2011; Widiger, 2011).

Within the dimensional framework, problematic personality can be thought of as an extreme variant of the same dimensions underlying normal personality. The five factors, which are often labeled (1) extraversion, (2) agreeableness (or the broader dimension of benevolence in children), (3) conscientiousness, (4) neuroticism (the opposite of the dimension that is labeled emotional stability), and (5) openness to experience (imagination in children) would indicate personality pathology at both extremely high levels and extremely low levels. For instance, an individual characterized by maladaptively high levels of extraversion is dominant, reckless, and attention-seeking, whereas someone with maladaptively low extraversion is distant, and isolated. Maladaptively high agreeableness indicates a docile, meek personality, whereas maladaptively low agreeableness indicates manipulative, and exploitative traits. In a related vein, someone who is maladaptively high on conscientiousness can be thought of as perfectionistic, and preoccupied with organization, whereas someone who is maladaptively low on conscientiousness is irresponsible, negligent, and undependable. An individual can be emotionally unstable, or too high on emotional stability, indicating callous unemotionality. With regards to openness, maladaptively high openness would indicate someone lives in

fantasy and has lost touch with reality, whereas someone who is maladaptively low on openness would be dogmatic, closed-minded, and stuck in routine (Widiger, 2011).

Personality extremity

Based on the notion that both extremely high and low variants of normal personality may be maladaptive, a measure of the extremity of a person's personality configuration has previously been shown to predict personality pathology in adults (O'Connor & Dyce, 2001). Personality extremity was operationalized as the length of a person's vector in five-(personality)dimensional space, thus representing the deviation from an average midpoint of all dimensions together. Although it is impossible to visualize a five dimensional space, a person's vector length can be easily computed by an extension of the Pythagorean theorem for two dimensional space. Given that a person's vector in two dimensional space is $(a^2 + b^2)^{1/2}$, where a and b represent two personality dimensions (standardized, with a mean of zero), the length of a vector in five dimensional space is as follows $(a^2 + b^2 + c^2 + d^2 + e^2)^{1/2}$ (O'Connor & Dyce, 2001). As both high levels and low levels of the personality dimensions contribute equally to a longer vector length (as deviations from the standardized mean of zero are squared), associations between vector length and the personality dimensions themselves should thus be weak (O'Connor & Dyce, 2001). In other words, vector length represents the extremity of a person's personality configuration, rather than an additive effect of high levels on the personality dimensions. This is in line with the idea that both high and low levels of the personality dimensions are maladaptive (Widiger, 2011).

Although personality extremity has been associated with personality pathology in adults cross-sectionally (O'Connor & Dyce, 2001), we know of no study that has previously investigated the development of personality extremity across childhood and adolescence. When investigating development in children, it is important to take into account the possibility that different children may develop along different developmental trajectories. In a recent review, Shiner reports that prevalence rates of personality disorder among adolescents have ranged from 6% to 17% (Shiner, 2009). If personality extremity in childhood is a marker for personality pathology in adulthood, we would expect a small subgroup of children to be characterized by relatively long vectors, indicating an extreme personality configuration. It is interesting to know whether this subgroup is already characterized by extreme personality configurations in childhood, and can thus be identified early on, or whether they do not develop an extreme personality configuration until later on in adolescence. Thus, our first research question was: can a small subgroup with a trajectory of relatively extreme personality configurations be identified in the development of personality extremity across childhood and adolescence?

Although personality extremity has been related to personality pathology in adults, we know of no investigations of relations of vector length to internalizing and externalizing adjustment problems. Personality extremity may be associated with adjustment problems because it indicates behavioral rigidity (O'Connor & Dyce, 2001), implying a reduced ability to adjust to changing environmental demands. Additionally, having an extreme personality may

be associated to a subjective sense of strangeness. Individuals who judge their own personalities as more 'normal' have been shown to experience less depression and higher self-esteem (Wood, Gosling, & Potter, 2001). Relatedly, the behavior of children with an extreme personality may be perceived by others as being different from the norm, resulting in problems in interaction. Our second research question was: Are children with a relatively extreme personality configuration, or long vectors, at increased risk of adjustment problems in late adolescence?

Although the extremity of personality configuration has not been investigated in the prediction of adjustment problems, previous studies of configurations of Big Five personality dimensions have focused on the resilient, undercontrolled, and overcontrolled personality types, originally identified by Block (1971). Resilients are generally well-adjusted, whereas overcontrollers are vulnerable to internalizing symptoms, and undercontrollers exhibit the most externalizing symptoms (Asendorpf & van Aken, 1999; Hart, Hofmann, Edelstein, & Keller, 1997; Robins, John, Caspi, Moffitt, & Stouthamer-Loeber; Van Leeuwen et al., 2004). Although informative in the sense that certain configurations are more likely than others, these personality configurations are not usually found to be predictive of outcomes over and above the personality dimensions (Asendorpf, 2003; Asendorpf & Denissen, 2006; Costa, Herbst, McCrae, Samuels, & Ozer, 2002; Huey & Weisz, 1997; Rovik et al., 2007; Van Leeuwen, De Fruyt, & Mervielde, 2004). In one exception, personality types assessed at age four to six explained additional variance over and above the dimensions in predicting aggressiveness at age 22 (Asendorpf & Denissen, 2006).

Although empirical findings have not (yet) demonstrated much additive predictive value of (other types of) personality configurations over the personality dimensions, it is not unlikely that a certain personality configuration could produce risk for adjustment problems that is not directly deducible from the dimensional scores. The whole personality configuration could be more than the sum of its parts when the implication of a certain personality dimension's level is dependent on scores on the other dimensions. For instance, being highly emotionally unstable or extremely introverted may be problematic in its own right, but a combination of high emotional instability and extreme introversion may produce heightened risk for adjustment problems at levels above the additive effect of the two dimensions separately. Thus, in the present study, we examined whether personality extremity was predictive of adjustment problems above and beyond the effects of the personality dimensions.

The present study

The present study investigates the development of personality extremity, as indicated by vector length (in five dimensional space), from six to seventeen years, using a cohort-sequential design including four time points. Using latent growth mixture modeling (LGMM) (Bauer & Curran, 2004), we investigate whether a small relatively extreme subgroup in the development of personality extremity can be identified. Based on findings regarding the prevalence of personality pathology in youths, we hypothesize that a small subgroup will have

relatively extreme personality configurations that are either stable or increasingly extreme across time. Additionally, we investigate whether children with a relatively extreme personality configuration experience more adjustment problems in late adolescence than those with a less extreme personality configuration, controlling for their levels of adjustment problems in childhood. To investigate whether personality extremity provides incremental predictive value above and beyond the personality dimensions, we control for their levels of the Big Five dimensions. To investigate the replicability of our findings, we investigate both mother- and father-reported extremity, as well as mother-, father-, and teacher-reported adjustment problems.

Method

Participants

This study is part of a larger project: 'The Flemish Study on Parenting, Personality, and Development'. For more detailed information on the sample, see Prinzie and colleagues (2004). We used data from the third (2001; Time 1), fourth (2004; Time 2), fifth (2007; Time 3), and sixth (2009; Time 4) wave, as these contained the measures of interest. The cohort-sequential design included four cohorts of children who were respectively six, seven, eight and nine years old at the first measurement. We included children for whom either mother- or father-reports of personality were available at one of the four measurement occasions, resulting in a sample of 598 children (49.9% boys ; 50.1% girls). Target children's mean age was 7 years 6 months ($SD = 1.10$ years, range = 6 years – 9 years 11 months) at Time 1. At Time 1, 576 mothers, 539 fathers, and 510 teachers participated; At Time 2, 507 mothers and 477 fathers participated; At Time 3, 469 mothers and 435 fathers participated; At Time 4, 432 mothers, 399 fathers, 271 teachers participated. Children of parents who participated at all times differed from those who did not for 6 out of 42 study variables: they were lower on externalizing problems as reported by teachers at Time 1 and Time 2, and by fathers at Time 4, and lower on internalizing problems as reported by teachers at Time 2 and fathers at Time 4. Finally, fathers reported lower levels of vector length for these children at Time 2.

The mothers' mean age at Time 1 was 36.78 years ($SD = 3.73$ years, range = 23-52 years). The fathers' mean age at Time 1 was 38.19 years ($SD = 4.30$ years, range = 28-61 years). Percentages of mothers' and fathers' educational levels were for elementary school 1.3% and 3.0%, for secondary school 41.7% and 39.6%, for non-university higher education 43.2% and 33.4%, and for university or higher 12.2% and 24.1%, respectively. These percentages are representative of the Belgian population. All the parents had the Belgian nationality.

Measures

Adjustment problems. Mothers, fathers, and teachers reported on the child's internalizing and externalizing problems at Time 1 and Time 4. Mothers and fathers completed the Dutch translation of the Child Behavior Checklist (CBCL) (Achenbach, 1991a; Verhulst, van der Ende, & Koot, 1996). Teachers rated the Dutch translation of the Teacher Report Form

(TRF) (Achenbach, 1991b; Verhulst, van der Ende, & Koot, 1996). Both questionnaires consist of an internalizing (number of items 31 for the CBCL and 35 for the TRF) and an externalizing problem behavior scale (number of items 33 for the CBCL and 34 for the TRF). The internalizing problem behavior scale consists of three subscales, measuring withdrawn behavior, somatic complaints, and anxious/depressed behavior (e.g., 'My child cries a lot'). The externalizing problem behavior scale consists of two subscales, measuring aggressive and delinquent behavior (e.g. 'My child steals'). Each item is rated: 0 (*not true*), 1 (*sometimes/somewhat true*), or 2 (*often/very true*). The CBCL is a well validated, reliable instrument to measure child behavior (Vignoe, Bérubé, & Achenbach, 2000). An internalizing and an externalizing problem behavior score was obtained for each respondent by summing the scores across the items for each subscale. Cronbach's *alphas* ranged from .81 to .94. The average intercorrelations between reporters were: .62 between mothers and fathers, .35 between mothers and teachers, and .27 between fathers and teachers.

Child personality. Mothers and fathers completed the Hierarchical Personality Inventory for Children (HiPIC) (Mervielde & De Fruyt, 1999) at all four times. The HiPIC is an empirically derived questionnaire in the lexical tradition, based on an extensive analysis of free parental descriptions of their children. This instrument includes 144 items, 8 items per facet, assessing 18 facets that are hierarchically structured under five higher order domains. The higher order domains are labelled as follows: (1) extraversion (32 items; e.g., "Bubbles with life"), (2) benevolence (40 items; e.g., "Defends the weak"), (3) conscientiousness (32 items; e.g., "Works with sustained attention"), (4) emotional Stability (16 items; e.g., "Has confidence in own abilities"), and (5) imagination (24 items; e.g., "Asks many why questions"). Items were rated on a 5-point Likert-type scale, ranging from 1 (*barely characteristic*) to 5 (*highly characteristic*). The HiPIC's factor structure and high internal consistencies of domains have been established (Van Leeuwen et al., 2004). We obtained one score for each domain, by averaging the scores across the items. Cronbach's *alphas* ranged from .88 to .93.

Vector length. For both the mother- and the father-reports, we first obtained orthogonal factor scores for each dimension, using varimax rotation. The five dimensions were thus uncorrelated, and had a mean of zero. For each individual, the five personality dimensions were modelled in a five-dimensional space. Each person's vector length in this five-dimensional space was computed using the following extension of the Pythagorean theorem: $([\text{extraversion}]^2 + [\text{benevolence}]^2 + [\text{conscientiousness}]^2 + [\text{emotional stability}]^2 + [\text{imagination}]^2)^{1/2}$ (O'Connor & Dyce, 2001). A longer vector indicated that a personality configuration was farther removed from the midpoint, and thus considered more extreme.

Statistical Analyses

First, we investigated the development of vector length. Growth mixture modeling of the vector length scores was performed in Mplus 6.11 (Muthén & Muthén, 2010), using robust maximum likelihood (mlr) estimation, which is the default estimation method for these types of analyses. Mplus uses full information maximum likelihood to handle missing data, making optimal use of available data. Models with an increasing number of profiles/classes were

compared using the sample size adjusted Bayesian information criterion, with lower values indicating better fit (SSABIC). Further, a significant result of the Bootstrapped Likelihood Ratio-test (BLRT) test, comparing the model with a model with k-1 profiles, indicated that the model with more profiles provides significantly better model fit (Nylund, Asparouhov, & Muthen, 2007). Entropy was inspected as a measure of classification quality, with higher values indicating better classification quality. Finally, and most importantly in these types of analyses, the classes were inspected for their substantive interpretation. Continuous probability indicators for class membership were obtained. We again performed these analyses for both the mother and the father reported personality extremity.

Next, we investigated whether probability of belonging to the extreme groups was predictive of internalizing and externalizing problems at Time 4, controlling for adjustment problems and the personality dimensions at Time 1. Interactions between vector length class and gender were also inspected. We ran twelve stepwise regressions, one for each informant report (mother/father/teacher) of each type of adjustment problems (internalizing/externalizing).

Results

Descriptive statistics

Descriptive statistics and intercorrelations between the study variables are presented in Tables 1 and 2. The personality dimensions were robustly related to both internalizing and externalizing problems across informant reports. All informants' reports of internalizing problems in childhood were related to lower levels of both mother- and father-reported extraversion, conscientiousness, emotional stability, and imagination. Benevolence was associated with lower levels of mother- and father-, but not teacher-reported internalizing problems. Additionally, all informants' reports of externalizing problems were associated with both mother- and father-reported benevolence and conscientiousness. Mother-reports of extraversion were associated to higher levels of teacher-reported externalizing problems, whereas father-reports of imagination were associated with lower levels of teacher-reported internalizing problems. Finally, maternal reports of emotional stability were associated with lower levels of both mother- and father-reported externalizing problems, whereas father-reported emotional stability was associated to father-reports of externalizing problems only.

Vector length showed considerable rank-order stability across time. Stability was moderate across the eight years of the study ($r_{\text{mother}} = .36$; $r_{\text{father}} = .40$), and large between consecutive measurements ($r_{\text{mother}} = .55 - .63$; $r_{\text{father}} = .56 - .57$). Relations between vector length and the five personality dimensions were not strong ($r_{\text{mother}} = -.20 - .10$; $r_{\text{father}} = -.17 - -.18$), supporting the idea that a vector can be long (and personality configuration extreme) due to both high or low levels on the individual dimensions, as well as that vector length adds information to the levels of the personality dimensions individually. Vector length as reported by mothers was positively related to all informants' concurrent ratings of both internalizing and externalizing problems, except for teacher-reported internalizing problems at T1. Vector length

as reported by mothers was positively related to all informants' concurrent ratings of both internalizing and externalizing problems, except for teacher-reported internalizing problems at T1 and externalizing problems at T4. These associations replicated across the father data.

Table 1.
Descriptives of the Study Variables

Study Variable	Mother-report <i>M(SD)</i>	Father-report <i>M(SD)</i>	Teacher-report <i>M(SD)</i>
1. Internalizing T1	4.41(6.68)	3.40(3.95)	3.70(4.41)
2. Externalizing T1	7.43(6.68)	6.58(6.08)	4.78(6.79)
3. Internalizing T4	4.09(4.86)	3.37(4.12)	4.67(5.49)
4. Externalizing T4	5.54(6.39)	5.04(5.93)	4.22(5.67)
5. Extraversion T1	3.65(0.51)	3.63(0.48)	--
6. Benevolence T1	3.44(0.44)	3.39(0.41)	--
7. Conscientiousness T1	3.36(0.51)	3.33(0.49)	--
8. Emotional stability T1	3.48(0.63)	3.53(0.57)	--
9. Imagination T1	3.68(0.56)	3.82(0.53)	--
10.Vector T1	2.11(0.75)	2.09(0.79)	--
11.Vector T2	2.10(0.76)	2.09(0.78)	--
12.Vector T3	2.10(0.76)	2.11(0.74)	--
13.Vector T4	2.08(0.81)	2.09(0.78)	--

Table 2.
Descriptives and Correlations between the Study Variables

Measures	1.	2.	3.	4.	5.	6.	7.	8.	9.	10.
1. int M T1	--	.59**	.19**	.55**	.39**	.12*	.37**	.31**	-.06	.31**
2. int F T1	.59**	--	.15**	.33**	.56**	.11*	.29**	.46**	-.04	.19**
3. int T T1	.20**	.15**	--	.19**	.15**	.29**	.17**	.18**	.18**	.01
4. ext M T1	.56**	.33**	.04	--	.66**	.34**	.33**	.25**	-.05	.52**
5. ext F T1	.38**	.56**	.03	.66**	--	.35**	.23**	.37**	-.06	.42**
6. ext T T1	.14**	.10*	.31**	.36**	.35**	--	.11*	.07	-.06	.27**
7. int M T4	.38**	.29**	.17**	.33**	.23**	.12*	--	.55**	.40**	.42**
8. int F T4	.31**	.46**	.15**	.25**	.37**	.10	.55**	--	.25**	.27**
9. int T T4	-.06	-.04	.18**	-.05	-.07	-.06	.40**	.25**	--	.00
10. ext M T4	.31**	.19**	.01	.52**	.42**	.27**	.46**	.27**	.01	--
11. ext F T4	.23**	.29**	.08	.46**	.56**	.30**	.25**	.53**	.03	.68**
12. ext T T4	-.05	-.07	-.05	.05	.07	.21**	.04	-.02	.21**	.29**
13. EXT T1	-.33**	-.27**	-.22**	.07	.07	.13**	-.10*	-.13**	-.12	.14*
14. BEN T1	-.32**	-.22**	-.06	-.64**	-.53**	-.29**	-.19**	-.14**	.00	-.32**
15. CONS T1	-.15**	-.11*	-.09*	-.32**	-.24**	-.23**	-.09	-.16**	-.07	-.29**
16. ES T1	-.57**	-.43**	-.24**	-.17**	-.14**	-.03	-.32**	-.26**	-.06	-.13**
17. IMAG T1	-.09*	-.15**	-.13**	-.01	-.01	.02	-.03	-.11*	-.05	-.03
18. vectorT1	.29**	.18**	.06	.28**	.21**	.11*	.11*	.09	.05	.14**
19. vectorT2	.18**	.08	.08	.21**	.14**	.11*	.15**	.12*	.10	.15**
20. vectorT3	.17**	.12*	.18**	.22**	.17**	.21**	.25**	.19**	.16*	.24**
21. vectorT4	.15**	.13**	.07	.23**	.24**	.21**	.30**	.26**	.18*	.36**

Note. Coefficients for the mother data are presented below the diagonal, and coefficients for the father data are presented above the diagonal. M = mother-report, F = father-report, T = teacher-report. * $p < .05$. ** $p < .01$.

Table 2.
Continued

11.	12.	13.	14	15.	16.	17.	18.	19.	20.	.21
.23**	-.07	-.30**	-.30**	-.14**	-.44**	-.15**	.11**	.05	.09	.06
.29**	-.07	-.31**	-.31**	-.12**	-.53**	-.14**	.22**	.16**	.15**	.14**
.08	-.05	-.17**	-.08	-.12**	-.23**	-.14**	.04	-.00	.11*	.08
.46**	.06	.07	-.52**	-.27**	-.07	-.02	.16**	.14**	.19**	.21**
.56**	.07	.06	-.61**	-.27**	-.16**	-.01	.21**	.17**	.19**	.23**
.30**	.18**	.09	-.24**	-.26**	.04	-.11*	.09	.05	.15**	.14**
.25**	.05	-.13**	-.15**	-.08	-.24**	-.07	.05	.10*	.22**	.17**
.53**	-.02	-.13**	-.23**	-.18**	-.34**	-.10*	.11*	.12*	.21**	.28**
-.03	.22**	-.09	-.00	-.07	-.03	-.08	-.01	.06	.12	.20**
.68**	.29**	.05	-.28**	-.26**	-.12*	-.10	.06	.06	.15**	.23**
--	.22**	.02	-.37**	-.21**	-.13*	-.08	.06	.09	.25**	.33**
.22**	--	.07	-.05	-.02	.10	-.01	-.13*	-.06	-.04	.05
.09	.10	--	.14**	.12**	.45**	.47**	-.04	.03	.00	.02
-.33**	-.06	.15**	--	.36**	.24**	.16**	-.11	-.12	-.17**	-.18**
-.21**	-.02	.12**	.36**	--	.19**	.52**	-.06	-.07	-.09	-.07
-.10	.10	.44**	.25**	.20**	--	.32**	-.08	-.07	-.11*	-.07
-.04	-.01	.45**	.16**	.52**	.31**	--	-.09	-.00	-.04	-.02
.10	-.01	-.07	-.17**	-.08*	-.20**	-.01	--	.56**	.45**	.40**
.11*	.06	.02	-.11*	-.09*	-.10*	-.04	.55**	--	.56**	.49**
.23**	.06	-.05	-.17**	-.13**	-.16**	-.00	.41**	.55**	--	.57**
.31**	.12	.05	-.13**	.05	-.07	.10*	.36**	.47**	.63**	--

Vector length development

In both the mother- and father data, all indices of the growth mixture models including an increasing number of trajectory classes, indicated that a two-class solution provided incremental fit over a one-class solution, and that a three-class solution provided incremental fit over a two-class solution. In the mother data, BLRT was significant for the four-class solution, but SSABIC increased, whereas entropy did not. In the father data SSABIC slightly decreased for the four-class solution, but entropy also decreased and the BLRT was not significant. Results thus pointed to a three-class solution in both the mother and the father data. Model fit indices are provided in Table 3.

Table 3.
Model Fit Indices of the GMM Models

	Loglikelihood(df)	SSABIC	entropy	BLRT(df)
Mother reports				
2-class solution	-2,437.20(20)	4,938.69	.71	36.59(3)*
3-class solution	-2,421.20(23)	4,916.32	.75	32.01(3)*
4-class solution	-2,416.86(26)	4,917.28	.75	8.69(3)*
Father reports				
2-class solution	-1,874.97(20)	3,813.29	.80	52.00(3)*
3-class solution	-1,865.35(23)	3,803.56	.80	19.23(3)*
4-class solution	-1,858.93(26)	3,800.23	.75	32.07(6)

Note. * $p < .01$.

Average probabilities for the most likely class were $> .75$ for the mother data, and $> .83$ for the father data. Most importantly, the three-class solution was in line with the expectations based on theoretical considerations: The majority of children belonged to a group that had relatively short vectors, and remained stable over time (mother: 80.3%; father: 84.7%). There were two much smaller groups that had relatively long vectors, indicating a more extreme personality profile. One extreme group started out highest, and decreased over time (mother: 13.2%; father: 10.4%), whereas the other extreme group started out slightly higher than the short vector group, but increased over time (mother: 6.5%; father: 4.9%). Growth factor means and (co)variances for the subgroups are provided in Table 4. For a graphical representation of the estimated mean level development for the subgroups, see Figure 1.

Table 4.

Growth Factor Parameters for the Classes in the Final GMM Solution

Trajectory classes	μ Intercept	μ Slope	σ Intercept	σ Slope	σ Intercept ↔ Slope
Mother reports					
Short vector/stable	1.87(.07)*	.07(.08)	.16(.06)*	.25(.10)*	-.09(.07)
Extreme/decreasing	3.40(.23)*	-1.16(.26)*	.16(.06)*	.25(.10)*	-.09(.07)
Extreme/increasing	2.36(.18)*	1.55(.26)*	.16(.06)*	.25(.10)*	-.09(.07)
Father reports					
Short vector/stable	1.89(.06)*	.08(.08)	.16(.05)*	.16(.10)	-.05(.06)
Extreme/decreasing	3.65(.21)*	-1.05(.15)*	.16(.05)*	.16(.10)	-.05(.06)
Extreme/increasing	2.07(.28)*	1.67(.24)*	.16(.05)*	.16(.10)	-.05(.06)

Note. * $p < .01$.

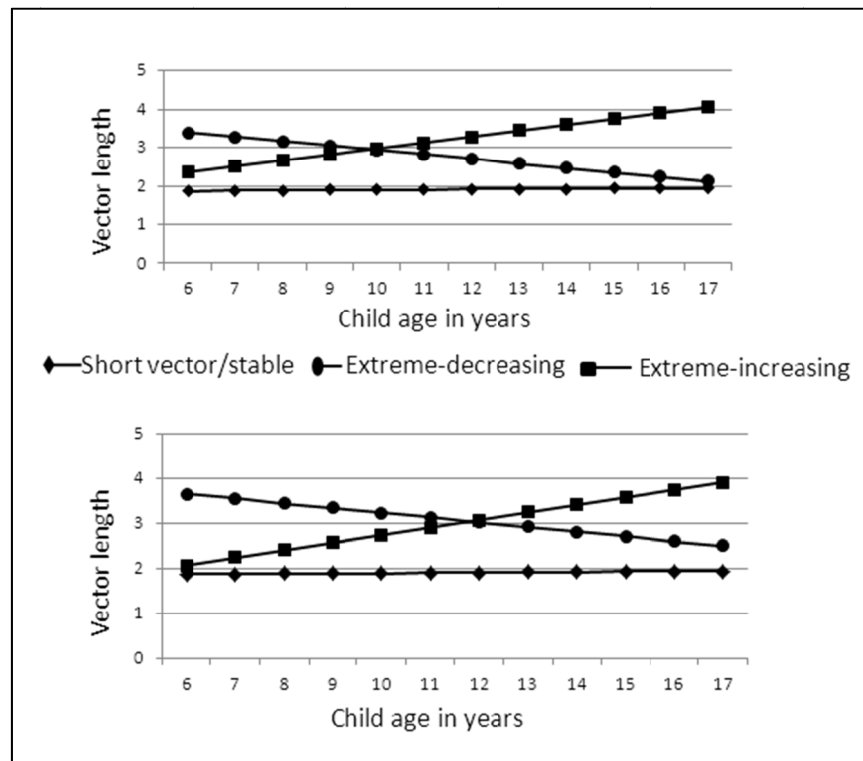


Figure 1. Estimated mean levels of vector length for the subgroups as estimated from the mother-date (top-panel) and the father data (bottom-panel).

Vector length development and adjustment problems

Next, we investigated whether probability of belonging to the extreme groups was predictive of internalizing and externalizing problems at Time 4, controlling for adjustment problems and the personality dimensions at Time 1. We ran twelve stepwise regressions, one for each informant report (mother/ father/ teacher) of each type of adjustment problems (internalizing/externalizing). Results of these analyses are presented in Tables 5 and 6. Adjustment problems and the personality dimensions at T1, and gender were added in a first step. The probabilities of belonging to the extreme/increasing and extreme/decreasing classes were added in a second step, and interactions between these two classes and gender were added in a third step.

Adjustment at T1 was predictive of adjustment at T4 in all instances, except that teacher-reported externalizing problems at T1 were not predictive of teacher-reported externalizing problems at T4. Several personality dimensions at T1 also predicted adjustment eight years later: mother-reported externalizing problems were predicted by both mother- and father-reports of extraversion at T1, and mother-reported emotional stability. Father-reported externalizing problems were predicted by maternal reports of the child's extraversion only. Mother-reports of internalizing problems at T4 were predicted by her own reports of her child's emotional stability at T1. Father-reports of internalizing problems were predicted by both informants' reports of the child's levels of conscientiousness at T1. Two associations for teacher-reported adjustment problems occurred: maternal reports of imagination at T1 were associated with lower levels of teacher reported externalizing behavior at T4, and gender was a significant predictor for teacher reported externalizing problems, such that girls exhibited lower levels of externalizing problems according to teachers.

Above and beyond the associations with T1 adjustment, gender and the personality dimensions, belonging to the mother reported extreme/increasing class predicted higher levels of internalizing problems as reported by all three informants, as well as mother-, and father-, but not teacher-reported externalizing problems. Results for the father data replicated these findings, except there was no prediction for the teacher-reported internalizing problems. The probability of belonging to the extreme/decreasing vector class was not associated with adjustment problems at T4 in either the mother- or the father data. Finally, three interactions with gender were significant: In the mother data, the probability of belonging to the extreme/increasing class was more strongly associated with mother-, and teacher-, reported internalizing problems for girls than for boys. The interaction with the mother-, but not with the teacher-reported internalizing problems was replicated in the father data. In sum, the extreme/increasing class experienced more internalizing and externalizing problems as reported by both mothers and fathers. These associations were replicated both within- and between informants, whereas associations with teacher-reported adjustment problems were not as consistent.

Table 5. Results of the Regression Analyses Predicting T4 Internalizing Problems

	Mother <i>b</i> (<i>SE</i>)	β	Father <i>b</i> (<i>SE</i>)	β	Teacher <i>b</i> (<i>SE</i>)	β
Mother reported personality						
constant	7.23(2.86)*		4.15(2.31)		3.13(4.18)	
AdjustmentT1	0.33(0.06)**	.29	0.46(0.05)**	.43	0.23(0.09)*	.16
Gender	-0.09(0.51)	-.01	0.44(0.38)	.05	0.99(0.83)	.09
EXT T1	0.70(0.52)	.07	-0.14(0.46)	-.02	-1.32(0.84)	-.12
BEN T1	-0.95(0.55)	-.08	0.20(0.49)	.02	1.03(0.95)	.08
CONS T1	0.30(0.55)	.03	-1.18(0.48)*	-.14	0.11(0.99)	.01
ES T1	-1.26(0.45)**	-.16	-0.35(0.36)	-.05	0.30(0.65)	.03
IMAG T1	-0.15(0.53)	-.02	0.44(0.38)	.05	-0.41(0.93)	-.04
extreme/increasing	14.88(3.17)**	.62	3.14(0.93)**	.16	21.85(5.75)**	.73
extreme/decreasing	-3.37(2.88)	-.17	-0.45(0.81)	-.03	3.64(5.29)	.15
Gender X extreme/increasing	-6.73(2.21)**	-.40	--	--	-9.16(3.89)*	-.45
Gender X extreme/decreasing	1.60(1.76)	.13	--	--	-2.55(3.14)	-.18
Father reported personality						
constant	5.90(2.92)*		5.30(2.35)		5.99(4.61)	
AdjustmentT1	0.35(0.06)**	.31	0.41(0.06)**	.39	0.28(0.10)**	.20
Gender	-0.35(0.51)	-.04	0.53(0.37)	.07	-0.02(0.78)	-.00
EXT T1	0.05(0.63)	.01	0.20(0.50)	.02	-0.58(1.13)	-.05
BEN T1	-0.25(0.63)	-.02	-0.36(0.51)	-.03	0.23(1.05)	.02
CONS T1	-0.15(0.62)	-.02	-1.23(0.49)*	-.15	-0.35(1.07)	-.03
ES T1	-0.82(0.48)	-.10	-0.79(0.41)	-.11	0.69(0.80)	.07
IMAG T1	0.22(0.65)	.02	0.75(0.52)	.10	-0.62(1.08)	-.06
extreme/increasing	15.90(4.15)**	.53	6.25(1.13)**	.25	4.72(2.46)	.13
extreme/decreasing	-1.19(3.11)	-.06	0.37(0.78)	.02	-0.29(1.59)	-.01
Gender X extreme/increasing	-6.60(2.99)*	-.30	--	--	--	--
Gender X extreme/decreasing	1.39(1.90)	.11	--	--	--	--

Note. For the analyses where the third step (adding the interactions) was significant, we present results from the third step, when the third step was not significant, we present results from the second step.

* $p < .05$. ** $p < .01$.

Table 6. Results of the Regression Analyses Predicting T4 Externalizing Problems

	Mother <i>b</i> (<i>SE</i>)	β	Father <i>b</i> (<i>SE</i>)	β	Teacher <i>b</i> (<i>SE</i>)	β
Mother reported personality						
Constant	4.03(3.57)		5.60(3.62)		4.42(4.17)	
AdjustmentT1	0.45(0.06)**	.45	0.35(0.06)**	.38	0.13(0.07)	.14
Gender	-0.59(0.53)	-.05	-0.27(0.54)	-.02	-2.39(0.73)**	-.21
EXT T1	2.06(0.64)**	.16	1.84(0.68)**	.15	1.05(0.87)	.10
BEN T1	0.49(0.83)	.03	-1.23(0.87)	-.09	-0.36(1.00)	-.03
CONS T1	-1.28(0.69)	-.10	-0.01(0.71)	-.00	1.47(1.01)	.13
ES T1	-1.15(0.49)*	-.11	-0.54(0.50)	-.06	0.78(0.66)	.09
IMAG T1	-0.51(0.64)	-.04	-0.96(0.67)	-.09	-1.96(0.93)*	-.20
extreme/increasing	5.25(1.33)**	-.17	3.15(1.37)*	.11	2.68(2.00)	.09
extreme/decreasing	-1.22(1.11)	-.05	-1.23(1.19)	-.05	-1.31(1.59)	-.06
Gender X extreme/increasing	-	--	--	--	--	--
Gender X extreme/decreasing	--	--	--	--	--	--
Father reported personality						
Constant	6.35(3.47)		4.86(3.35)		5.10(4.41)	
AdjustmentT1	0.47(0.05)**	.48	0.52(0.06)**	.51	0.15(0.07)*	.15
Gender	-0.88(0.56)	-.07	0.13(0.51)	.01	-2.53(0.75)**	-.23
EXT T1	1.63(0.76)*	.12	0.71(0.70)	.06	0.66(1.08)	.06
BEN T1	0.73(0.85)	.05	-0.55(0.85)	-.04	-0.49(1.02)	-.04
CONS T1	-1.26(0.76)	-.10	-0.31(0.69)	-.03	0.47(1.03)	.04
ES T1	-0.97(0.55)	-.09	-0.09(0.51)	-.01	0.68(0.76)	.07
IMAG T1	-1.01(0.79)	-.08	-0.79(0.72)	-.07	-0.62(1.03)	-.06
extreme/increasing	4.45(1.70)**	.11	6.57(1.58)**	.18	-1.57(2.34)	-.05
extreme/decreasing	0.92(1.13)	.04	0.37(1.08)	.02	-1.28(1.51)	-.06
Gender X extreme/increasing	--	--	--	--	--	--
Gender X extreme/decreasing	--	--	--	--	--	--

Discussion

This study investigated the development of personality extremity from middle childhood to late adolescence. LGMM revealed that there were three distinct subgroups of children: most children belonged to a group that had relatively short vectors, whereas two small subgroups of children had relatively long vectors, indicating an extreme personality configuration. One of these groups started out relatively extreme, but decreased in extremity across time, whereas the other group started out only slightly more extreme, but increased in extremity across time. Children with an increasingly extreme personality configuration experienced more internalizing and externalizing problems in late adolescence, controlling for their levels of the personality dimensions and previous levels of adjustment problems.

Development of personality extremity

Our first research question was whether a small subgroup of relatively extreme children could be identified in the development of personality extremity across childhood and adolescence. As expected, the majority of children had relatively short vectors that were stable across development. A minority of children was thus classified as relatively extreme. Interestingly, the size of this group (mother data: 19.7%; father data: 15.3%) is in line with prevalence estimates of personality disorders in adolescents (Shiner, 2009). We found two distinct subgroups of children within the relatively extreme group. One group was relatively extreme in childhood, but decreased in extremity across childhood and adolescence (mother data: 13.2%; father data: 10.4%). These children thus appear to mature into a less extreme personality configuration across childhood and adolescence. Developmental trajectories of transient problems in early childhood are more often found. With regards to externalizing problems for instance, there is a substantial group of children who exhibit relatively high levels of externalizing problems in early childhood, that decrease over time (Nagin & Tremblay, 1999). The second group of children started out at levels comparable to those of the majority of children, but increased to levels of extremity well beyond those at which the other extreme group started out (mother data: 6.5%/ father data: 4.9%). From between age ten and twelve onwards they have the highest levels of extremity. This is a small, but likely important group of children in terms of developmental outcomes. It thus appears that children's initial levels of personality extremity are less important than their development over time, in determining the extremity of their personality configuration in late adolescence. These findings underscore the importance of taking a developmental approach when investigating the development of children and adolescents.

Personality extremity and adjustment problems

Personality extremity, or vector length was associated concurrently with both internalizing and externalizing problems. Highly similar associations were found in the mother and the father data. Additionally, and as expected, personality extremity was not strongly related to the

personality dimensions themselves (O'Connor & Dyce, 2001). Although the relations were not strong, they indicated that children with a more extreme personality configuration were somewhat more likely to be low on benevolence, conscientiousness, and emotional stability. Although vector length was slightly related to the personality dimensions, the probability of belong to the extreme/increasing class was predictive of adjustment problems above and beyond the personality dimensions. This class experienced higher levels of internalizing and externalizing problems, as reported by mothers and fathers. Most studies on relations between personality and adjustment problems only include a single informant. That the associations of the present study were significant both within- and across informants, indicates that results were not due to informant bias.

In addition to both fathers and mothers, we included teachers as informants of adjustment problems. Prediction of teacher-reported adjustment problems was not as consistent. Although mother-reported personality extremity was associated with higher teacher reported internalizing problems, this association did not replicate across the father data. Additionally, neither mother- nor father-reported vector length was associated with teacher-reported externalizing problems in adolescence. Discrepancies between parents and teachers are often found in research on adjustment problems (Van Dulmen & Egeland, 2011). Although teachers may be considered valuable informants of adjustment problems, as they are able to compare the children to other children, in late adolescence teachers only interact with the children for a few hours a week. Thus, the teachers likely did not know the children that well. We did find that personality extremity based on mother reported child personality was associated with higher levels of teacher reported internalizing problems, indicating that the problems these children experience may even be noticeable to teachers.

In addition to these main effects of extremity trajectory class, we found an interaction with gender and the extreme/increasing class in the prediction of teacher reported internalizing problems, such that the association was stronger for boys than for girls. A similar interaction was found with regards to mother-reported internalizing problems, both in the mother- and father-reported data. Although these interactions were in the same direction, they only occurred with regards to internalizing problems, and did not replicate consistently across informants, indicating that this may not be a replicable finding.

Overall, the results thus appear to indicate that vector length as a conceptualization of the extremity of the personality configuration adds information that is not held in the levels of the dimensions separately. Previous investigations of other types of configurations of personality dimensions have not found much evidence for the added predictive value of personality configurations over the dimensions (Asendorpf, 2003; Asendorpf & Denissen, 2006; Costa et al., 2002; Huey & Weisz, 1997; Rovik et al., 2007; Van Leeuwen, De Fruyt, & Mervielde, 2004). However, several studies investigating personality pathology, have found that including maladaptive traits added to the prediction of personality pathology symptoms, above the predictive value of normal traits (Tromp & Koot, 2010). We did not study maladaptive personality specifically, but rather whether extreme versions of normal personality are maladaptive in a community sample. Based on the notion that the same personality

dimensions underlie both normal and abnormal personality, this approach should be useful in gaining an understanding of both normal and abnormal personality. Additionally, childhood Axis I disorders are predictive of the development of Axis II disorders in adulthood, indicating continuity of psychopathology from childhood to adulthood (Ramklint, Von Knorring, Von Knorring, & Ekselius, 2003). However, relating personality extremity of normal personality dimensions to personality pathology symptoms would provide further support for personality extremity in childhood as an indication of maladaptive personality.

Personality extremity was related to both internalizing and externalizing adjustment problems. Although previous investigations of normal personality in children usually indicate that low levels of extraversion and emotional stability are related to internalizing problems, whereas low levels of benevolence and conscientiousness are related to externalizing problems (Klein, Dyson, Kujawa, & Kotov, 2012; Tackett, Marcel, & Kushner, 2012), the present study shows that the picture may be more complex. If only low levels of for instance emotional stability were problematic, we would expect there to be no relation between personality extremity and adjustment problems, as equally high and low levels receive the same score on personality extremity, resulting in a net value of zero. Perhaps studies have found that lower levels of the personality dimensions are problematic because they have focused on linear relations. When the low end of the personality dimensions is more strongly related to maladjustment overall, small effects of high levels being problematic as well (as indicated by non-linear relations), may be obscured in linear relations. Future studies of relations between personality and adjustment problems may investigate whether non-linear relations between personality and adjustment indeed occur.

Results of the present study indicate that even with just information on normal personality dimensions, predictive value may increase when personality extremity is taken into account. Future research may investigate whether children who are characterized by extreme personality configurations are in fact at increased risk for personality pathology, as well as whether abnormal personality dimensions still add predictive value when the extremity of a person's normal personality configuration is taken into account.

Strengths and limitations

The present study has several strengths. The longitudinal cohort-sequential design allowed us to investigate the development of personality extremity across a considerable time span, from when children were six to when they were seventeen years old. Additionally, latent growth mixture modeling is an approach to identifying subgroups of children that produces continuous probability indicators of class membership, thereby taking error into account (Bauer & Curran, 2004). Finally, we included multiple informants, allowing us to investigate the replicability of our findings.

In addition to these strengths, some limitations are also worth mentioning. First, we only included other-reports of personality and problem behavior. As children were assessed at as young as six years, when they were just learning to read and write, they did not provide self-reports. However, self-reports may provide unique information, and should be included in

further investigations of personality extremity. It should also be noted that evidence indicates that other-reports of personality are very valuable, especially when they are provided by someone who is close to the target individual, as they provide predictive value incremental to self-reports (Connelly & Ones, 2010). Second, research on relations between personality dimensions and problem behavior has been criticized by stating that relations are due to item-overlap. However, investigations of the measures used in the present study have shown that item-contamination is rather limited (Prinzle, Onghena, & Hellinckx, 2005). Third, we investigated relations of vector length and adjustment problems in a community sample. Community samples may differ in important ways from clinical samples, and future studies may investigate whether the same relations between personality extremity and adjustment problems apply to clinical youth. Fourth, as the vector length class probability was computed from information at all four time points, it should be noted that the results do not provide evidence for purely prospective prediction. Finally, the five-dimensional vector length as an indicator of personality extremity as introduced by O'Connor and Dyce (2001) has not been investigated much to date. Further investigation is necessary to determine its validity in representing a structural aspect of personality that is important for child and adolescent, as well as adult outcomes.

Conclusion

Results of the present study indicate that there is a small but important subgroup of children whose personality configuration becomes increasingly extreme across childhood and adolescence. This group is at risk of experiencing both internalizing and externalizing adjustment problems in late adolescence. Furthermore, the extremity of their personality configuration was predictive of adjustment problems above and beyond their levels of the personality dimensions and previous levels of adjustment problems. Vector length, as a measure of the extremity of personality configuration thus adds information to the personality dimensions when examining risk for adjustment problems. Personality extremity appears important to be taken into account in addition to children's levels of the Big Five personality dimensions, when investigating their risk for adjustment problems.

|Chapter 7|

Non-linear Associations between Personality and Adjustment Problems in Childhood and Adolescence

Abstract

The spectrum hypothesis posits that adjustment problems and personality dimensions are partially overlapping manifestations of an underlying continuum, and predicts that associations between the personality and adjustment problems are non-linear, increasing in strength towards the low end of the personality dimensions. We investigated linear and non-linear associations between the Big Five personality dimensions, and four subtypes of adjustment problems: anxiety, depressive symptoms, rule-breaking behavior, and aggression, in childhood and adolescence. For 574 children, mothers reported the Big Five dimensions, and adjustment problems when children were on average 7.5 years old, and again eight years later. For each type of adjustment problems, multivariate regression analyses showed significant non-linear effects, which were responsible for between 8 and 27% of the explained variance. In terms of the spectrum hypothesis, findings of the present study indicate that anxiety may be a more extreme manifestation of emotional instability, whereas depression may be a more extreme manifestation of introversion. Benevolence had the strongest non-linear association with both rule-breaking behavior and aggression, indicating that the externalizing problems may be an extreme manifestation more of *disagreeableness*, than of *disinhibition*. Non-linear associations are important to take into account when investigating risk for adjustment problems, as neglecting these associations may lead to an underestimation of the strength of the association with personality.

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Introduction

The Big Five approach to describing child and adolescent personality characteristics has proven useful in predicting many child outcomes, including adjustment problems (Shiner & Caspi, 2003). Studies have consistently shown that low extraversion and emotional stability are predictors of internalizing symptoms (De Pauw & Mervielde, 2010; Van den Akker, Deković, & Prinzie, 2010; Van Leeuwen, Mervielde, Braet, & Bosmans, 2004), whereas low agreeableness and conscientiousness are associated with higher levels of externalizing symptoms (Lynam et al., 2005; Jones, Miller & Lynam, 2011; Prinzie, Van der Sluis, De Haan, & Deković, 2010; Van den Akker et al., 2010).

Personality and adjustment problems: The spectrum model

Findings on associations between personality dimensions and adjustment problems have mostly been interpreted as indicating that personality is an important causal factor, or a vulnerability, in the etiology of adjustment problems (Klein, Dyson, Kujawa, & Kotov, 2012; Tackett, 2006). For instance, children who are low on conscientiousness may be less sensitive to punishment (Lytton, 1990), failing to learn to inhibit aggressive impulses or to refrain from breaking rules. Disagreeable children may be especially likely to attribute hostile intent (Coie & Dodge, 1998), ultimately leading them to aggress. In contrast, emotionally unstable children may be overly sensitive to punishment (Rothbart & Bates, 2006), withdrawing from interaction in an effort to avoid it. Withdrawal from social interaction may induce feelings of loneliness, and reduce chances of exposure to fearful stimuli, further aggravating anxiety.

An alternative model, which has received much less empirical attention than the *vulnerability model*, is the *spectrum model*. The *spectrum hypothesis* proposes that adjustment problems and personality are different manifestations of more general underlying dimensions (Widiger & Clark, 2000). For instance, a dimension of *disinhibition* has been proposed to underlie externalizing symptoms (located at the extremely low and maladaptive end) and conscientiousness (located toward a higher and more adaptive end). Similarly, internalizing symptoms may be located at the extremely low end of an *emotional lability* dimension, with emotional stability located at the high end. Thus, personality and adjustment problems may be more or less extreme manifestations of a broader, dimensional construct. Whereas the vulnerability model predicts that personality causes adjustment problems, the spectrum model predicts that they share common etiological factors. Evidence for the spectrum hypothesis is found by studies indicating that adjustment problems and personality dimensions share genetic variance (Gjone & Stevenson, 1997; Krueger et al., 2002), and have the same biological correlates (Nigg, 2000).

Following from the notion that the same processes underlie a range of behavior, from full-blown psychopathology, to more moderate levels of symptoms, to normal personality functioning, the spectrum hypothesis implies that it is useful to study adjustment problems in population samples to gain an understanding of the entire range functioning (Widiger & Clark, 2000). A problem that is often encountered when investigating adjustment problems in a

population-, rather than in a clinical-sample, is that a large proportion of individuals are generally symptom free. The distribution of adjustment problems is thus usually highly skewed. Studies focusing on adjustment problems in non-clinical samples often employ linear regression to investigate associations with personality dimensions (Dougherty, Klein, Durbin, Hayden, & Ollino, 2010; Kushner, Tackett, & Bagby, 2012), where the skewed distribution may violate assumptions of normality (Tabachnik & Fidell, 1996). The problem of skewness in adjustment problems as an outcome variable is often solved by changing its distributional properties, by means of a mathematical transformation, such as a log transformation (e.g., Dougherty et al., 2010). However, even more often than not, the problem is simply ignored, likely because these transformations make it difficult to interpret the estimated coefficients, as they change the scale of the dependent variable.

It is important to note that, in population samples, we actually expect adjustment problems to be highly skewed. Adjustment problems represent deviance from the norm, and most individuals should be symptom free. Thus, rather than that the skewness is a 'problem', it is a confirmation of an expectation based on the nature of our construct. Something that is often overlooked, is that a skewed outcome variable may be an indication that the association with the predictor variables is non-linear. In fact, a log-transformation 'solves' the 'problem' of skewness in the outcome variable, by implying that there is an exponential relationship with the predictor variable. However, whether non-linear effects are actually present, is usually not tested.

Failing to account for the possibility of non-linear association may lead to an underestimation of the strength of the relationship between personality and adjustment problems. Additionally, the underestimation may, in the case of multiple regression lead to overestimation of the association of other personality dimension with adjustment problems, if they share variance with the personality dimension that shows a non-linear relationship.

Why would we expect associations between personality and adjustment problems to be non-linear? The spectrum hypothesis specifically predicts that personality and adjustment problems have partially overlapping distributions with a different mean. Moderately to extremely low conscientiousness and/or benevolence would for instance overlap with low to moderate externalizing symptoms (Klein et al., 2012). Thus, the association between these personality dimensions and externalizing problems would be expected to increase towards the low end of the personality dimensions, where the constructs come to overlap. The same reasoning applies to the relation of emotional stability and extraversion, with internalizing problems. Thus, it is important to investigate whether associations are non-linear, not only because they may result in under-, or over-estimation of associations, but also because we can theoretically expect them to be so. However, studies on associations between personality and adjustment problems have mostly neglected the possibility of non-linear associations (De Pauw & Mervielde, 2010; Lynam et al., 2005; Jones et al., 2011; Prinzie et al., 2010; Van den Akker et al., 2010; Van Leeuwen et al., 2004).

Internalizing and Externalizing Adjustment Problem Subtypes

Although it has consistently been found that emotional stability and extraversion are associated with broadband internalizing problems, whereas benevolence and conscientiousness are associated with broadband externalizing symptoms, we know much less about whether the dimensions are differentially related to subtypes of adjustment problems. Among the internalizing symptoms two types can be differentiated: anxious and depressive symptoms (Chorpita, Plummer, & Moffitt, 2000). The tripartite model (Clark & Watson, 1991) was proposed to explain why these two types of symptoms are distinct, but also co-occur at levels well above those expected by chance (Cannon & Weems, 2006). This model posits that negative affectivity, as a temperament trait, is a shared underlying component for both types of symptoms, which may result in high co-occurrence (Clark & Watson, 1991). Support for this notion is found by behavioral genetic studies which indicate that anxiety, depression, and negative affectivity share genetic variance (Mineka et al., 1998). In addition to a shared component of negative affectivity, the two types of symptoms each have a unique correlate, resulting in differentiation. Low positive affectivity is hypothesized to be implicated for depression only, whereas anxiety is proposed to be characterized by physiological hyper-arousal.

The tripartite model has received some support in children. Anxiety has been found to be related to high negative affectivity (low emotional stability), but unrelated to positive affectivity (extraversion) (Anthony, Lonigan, Hooe, & Philips, 2002; Phillips et al., 2002), whereas depressive symptoms have been found to be associated with both low positive emotionality, and high negative affectivity (Dougherty et al., 2010). A study of personality dimensions in children confirmed that emotional stability was related to both depression and anxiety, but indicated that extraversion did not differentiate between the two (Kushner et al., 2012). Two studies comparing the associations for children and adolescents found that low positive affectivity differentiated depression from anxiety in adolescents, but not in younger children (Cannon & Weems, 2006; Lonigan, Hooe, David, & Kistner, 1999), indicating that these differential associations may be dependent on the developmental period under study. In this study, we investigate whether emotional stability is associated with both anxiety and depressive symptoms, and whether extraversion differentiates between these two types of symptoms. We investigate the associations both in childhood and adolescence, to ascertain whether the differentiating effect is dependent on the developmental period under study.

Similar to internalizing problems, distinct types of externalizing problems can be distinguished: aggression, or 'overt' externalizing symptoms, and rule-breaking behavior (delinquency), or more 'covert' externalizing symptoms (Tackett, Krueger, Sawyer, & Graetz, 2003). A meta-analysis (Jones et al., 2011) indicated that agreeableness (benevolence in children) was the most important personality dimension for aggression and delinquency, and equally related to both. The next most important factor was conscientiousness, which was more strongly related to delinquency than to aggression. Interestingly, the effect of conscientiousness was stronger for younger age groups. Thus, like for internalizing problems, the associations may be dependent on the developmental period under study. However, the

studies included in the meta-analysis were mostly of adolescents and adults, and investigations of younger children are needed.

The present study

In a community sample of 574 children, the present study investigates whether associations between personality and adjustment problems are non-linear. We investigate two types of internalizing problems, i.e. anxiety and depressive symptoms, and two types of externalizing problems, i.e. rule-breaking behavior and aggression. We investigated these associations both in childhood and adolescence, to inspect whether the associations replicate across these developmental periods, or whether they vary depending on the age of the child. To investigate whether non-linear relations exist between personality dimensions and adjustment problems, we included quadratic effects of the personality dimensions in addition to their linear effects, and examined whether these provided significant incremental predictive value. Based on the reviewed literature, we expected (1) that emotional stability would be related to both anxiety and depression, whereas extraversion would be related to depressive symptoms only, in adolescence more strongly so than in childhood; (2) that benevolence and conscientiousness would be most important for rule-breaking behavior and aggression, with benevolence relatively more important, especially in adolescence; (3) that these associations would show significant non-linear effects, such that the strength of the association would increase towards the low end of the personality dimensions, in line with the spectrum hypothesis.

Method

Participants

This study is part of a larger project: 'The Flemish Study on Parenting, Personality, and Development'. For detailed information on the sample, see Prinzie and colleagues (2004). We used data from the third (2001; Time 1), and sixth (2009; Time 2) wave, when children were on average 7 years 6 months ($SD = 1.10$ years, range = 6 years – 9 years 11 months), and 15 years and 6 months ($SD = 1.10$ years, range = 6 years – 9 years 11 months), respectively. Data for both personality and adjustment problems were available for 574 children at T1, and for 424 children at T2. The sample included 50% boys and 50% girls. Reports of mothers who participated at both times did not differ significantly from those who did not for any of the study variables. The mothers' mean age at Time 1 was 36.78 years ($SD = 3.73$ years, range = 23–52 years). Percentages of mothers' educational levels were for elementary school 1.3% , for secondary school 41.7%, for non-university higher education 43.2%, and for university or higher 12.2%, respectively. These percentages are representative of the Belgian population. All mothers had the Belgian nationality.

Measures

Adjustment problems. Mothers reported on the child's adjustment problems at T1 and T2, by completing the anxious, depressed, rule-breaking and aggressive behavior subscales of the Dutch translation of the Child Behavior Checklist (CBCL) (Achenbach, 1991a; Verhulst, van der Ende, & Koot, 1996). The anxious behavior subscale consists of fourteen items (e.g., 'My child cries a lot', $\alpha = .81-.84$), the depressed behavior subscale consists of nine items (e.g., 'My child refuses to talk', $\alpha = .62-.76$), the aggressive behavior subscale consists of twenty items (e.g., 'My child fights a lot', $\alpha = .88-.89$), and the rule-breaking behavior subscale consists of thirteen items (e.g., 'My child steals', $\alpha = .58-.70$). Each item is rated: 0 (*not true*), 1 (*sometimes/somewhat true*), or 2 (*often/very true*). The CBCL is a well validated, reliable instrument to measure child behavior (Vignoe, Bérubé, & Achenbach, 2000). Scale scores were obtained for each respondent by summing the scores across the items for each subscale.

Child personality. Mothers completed the Hierarchical Personality Inventory for Children (HiPIC) (Mervielde & De Fruyt, 1999) at T1 and T2. The HiPIC is an empirically derived questionnaire in the lexical tradition, based on an extensive analysis of free parental descriptions of their children. This instrument includes 144 items, 8 items per facet, assessing 18 facets that are hierarchically structured under five higher order domains. The higher order domains are labelled as follows: (1) extraversion (32 items; e.g., "Bubbles with life"), (2) benevolence (40 items; e.g., "Defends the weak"), (3) conscientiousness (32 items; e.g., "Works with sustained attention"), (4) emotional stability (16 items; e.g., "Has confidence in own abilities"), and (5) imagination (24 items; e.g., "Asks many why questions"). Items were rated on a 5-point Likert-type scale, ranging from 1 (*barely characteristic*) to 5 (*highly characteristic*). The HiPIC's factor structure and high internal consistencies of domains have been established (Mervielde & De Fruyt, 1999). We obtained one score for each domain, by averaging the scores across the items. Cronbach's *alphas* ranged from .88 to .96.

Statistical Analyses

For each type of adjustment problems, we performed a stepwise multivariate regression analysis with the personality dimensions entered in a first step (linear effects), and the same personality dimensions, but now squared, in a second step (non-linear effects). To avoid problems with multicollinearity, the dimension scores were centered prior to squaring. All analyses were performed in SPSS version 20.0.

Results

Descriptive statistics

Descriptive statistics and correlations between the study variables are presented in Table 1. Both anxiety and depressive symptoms were negatively associated with all five personality dimensions in childhood and in adolescence ($r = -.10 - .62$), except that anxiety was not significantly associated with childhood imagination. In childhood, both rule-breaking and aggressive behavior were negatively associated with benevolence, conscientiousness, and emotional stability ($r = -.10 - .65$). In adolescence, rule-breaking behavior was negatively associated with benevolence, conscientiousness and imagination ($r = -.23 - .55$), whereas aggressive behavior was associated with all dimensions ($r = -.14 - .69$), except extraversion.

All the adjustment problem variables were skewed, with most children symptom free, and the number of children steadily decreasing as adjustment problems increased (skewness: 1.25 – 2.92; kurtosis: 2.10 – 12.63), the distribution of all the personality dimensions, at T1 and T2, was normal (skewness: -.63 – -.11; kurtosis: -.32 – .65).

Non-linear associations between personality and adjustment problems

For each type of adjustment problems, the squared terms provided significant incremental predictive value over the linear terms. Estimated coefficients for the regression analyses at T1 and T2 are provided in Tables 2 and 3, and predicted values for the models including only the linear dimensions, and those including both the linear and quadratic terms, are provided in Figures 1 through 4.

Table 1.
Descriptives and Correlations between the Study Variables

Measures	T1 <i>M(SD)</i>	1.	2.	3.	4.	5.	6.	7.	8.	9.	T2 <i>M(SD)</i>
1. Anxiety	2.88(3.31)	--	.66**	.29**	.45**	-.30**	-.25**	-.10*	-.62**	-.15**	2.66(3.27)
2. Depressive	1.53(1.70)	.56**	--	.19**	.34**	-.55**	-.25**	-.22**	-.48**	-.24**	1.42(2.03)
3. Rule-breaking	1.09(1.48)	.42**	.36**	--	.73**	-.01	-.55**	-.44**	-.06	-.23**	1.21(1.87)
4. Aggression	6.32(5.56)	.51**	.45**	.70**	--	.03	-.69**	-.46**	-.14**	-.19**	4.32(4.90)
5. EXT	3.65(0.51)	-.20**	-.47**	.05	.07	--	.25**	.20**	.47**	.48**	3.37(0.55)
6. BEN	3.44(0.44)	-.28**	-.30**	-.46**	-.65**	.16**	--	.52**	.18**	.35**	3.42(0.43)
7. CONS	3.36(0.51)	-.11**	-.20**	-.26**	-.32**	.12**	.36**	--	.08	.56**	3.21(0.58)
8. ES	3.48(0.63)	-.58**	-.39**	-.10*	-.18**	.44**	.25**	.20**	--	.35**	3.52(0.61)
9. IMAG	3.86(0.56)	-.03	.18**	-.02	.00	.45**	.16**	.52**	.31**	--	3.54(0.60)

Note. T1 correlations are presented below the diagonal, T2 correlations are presented above the diagonal.

* $p < .05$. ** $p < .01$.

Table 2.

Results of the Regression Analyses Predicting Adjustment Problems at T1 from the Personality Dimensions and Squared Terms

	Anxiety symptoms		Depressive symptoms		Rule-breaking behavior		Aggression	
	<i>b</i> (<i>SE</i>)	β	<i>b</i> (<i>SE</i>)	β	<i>b</i> (<i>SE</i>)	β	<i>b</i> (<i>SE</i>)	β
Step 1								
Constant	13.84(1.18)**		10.27(.63)**		5.82(.58)**		30.23(1.81)**	
EXT	-0.04(.26)	-.01	-1.43(.14)**	-.43	0.32(.13)*	.11	1.83(.41)**	.17
BEN	-1.07(.27)**	-.14	-0.62(.15)**	-.16	-1.44(.13)**	-.43	-7.67(.42)**	-.61
CONS	-0.30(.27)	-.05	-0.48(.15)**	-.14	-0.47(.14)**	-.16	-1.92(.42)**	-.18
ES	-3.13(.20)**	-.59	-0.53(.11)**	-.19	-0.08(.10)	-.04	-0.99(.31)**	-.11
IMAG	1.22(.26)**	.21	0.53(.14)**	.18	0.24(.13)	.10	1.47(.40)**	.15
Step 2								
Constant	12.64(1.21)**		9.02(.64)**		5.12(.59)**		27.47(1.84)**	
EXT	0.01(.26)	.00	-1.35(.14)**	-.40	0.31(.13)*	.11	1.90(.40)**	.17
BEN	-1.03(.28)**	-.14	-0.49(.15)**	-.13	-1.34(.14)**	-.40	-7.25(.42)**	-.57
CONS	-0.24(.27)	-.04	-0.45(.14)**	-.13	-0.43(.13)**	-.15	-1.76(.41)**	-.16
ES	-2.81(.21)**	-.53	-0.55(.11)**	-.20	-0.02(.10)	-.01	-0.79(.32)*	-.09
IMAG	0.96(.27)**	.16	0.54(.14)**	.18	0.16(.13)	.06	1.08(.41)**	.11
EXT ²	0.63(.34)	.06	0.95(.18)**	.19	0.05(.17)	.01	1.16(.51)*	.07
BEN ²	0.33(.40)	.03	0.15(.21)	.03	0.84(.20)**	.16	2.47(.61)**	.12
CONS ²	0.55(.34)	.06	0.20(.18)	.04	0.22(.17)	.05	1.31(.52)*	.08
ES ²	0.90(.20)**	.16	-0.02(.11)	-.01	0.20(.10)*	.08	0.54(.31)	.06
IMAG ²	-0.22(.29)	-.03	0.35(.15)*	.09	0.09(.14)	.03	-0.08(.44)	-.01

Note. * $p < .05$. ** $p < .01$.

Table 3.

Results of the Regression Analyses Predicting Adjustment Problems at T2 from the Personality Dimensions and Squared Terms

	Anxiety symptoms		Depressive symptoms		Rule-breaking behavior		Aggression	
	<i>b</i> (<i>SE</i>)	β	<i>b</i> (<i>SE</i>)	β	<i>b</i> (<i>SE</i>)	β	<i>b</i> (<i>SE</i>)	β
Step 1								
Constant	17.26(1.18)**		11.18(.75)**		9.01(.71)**		29.71(1.55)**	
EXT	-0.16(.27)	-.03	-1.68(.17)**	-.46	0.61(.17)**	.18	2.42(.36)**	.27
BEN	-1.25(.34)**	-.16	-0.24(.21)	-.05	-2.02(.21)**	-.46	-7.37(.45)**	-.64
CONS	-0.30(.28)	-.05	-0.69(.18)**	-.20	-0.72(.17)**	-.22	-1.79(.37)**	-.21
ES	-3.43(.23)**	-.63	-1.04(.15)**	-.31	-0.14(.14)	-.04	-1.33(.31)**	-.16
IMAG	0.92(.28)**	.17	0.74(.18)**	.22	-0.04(.17)	-.01	0.59(.37)	.07
Step 2								
Constant	14.88(1.18)**		9.42(.73)**		7.17(.69)**		25.40(1.57)**	
EXT	0.06(.26)	.01	-1.42(.16)**	-.39	0.37(.15)*	.11	2.42(.35)**	.27
BEN	-0.99(.34)**	-.13	-0.07(.21)	-.02	-1.39(.20)**	-.32	-6.13(.45)**	-.55
CONS	-0.28(.26)	-.05	-0.61(.16)**	-.18	-0.73(.15)**	-.23	-1.74(.35)**	-.21
ES	-2.95(.23)**	-.55	-0.90(.14)**	-.27	-0.25(.14)	-.08	-1.24(.31)**	-.15
IMAG	0.47(.28)	.09	0.46(.17)**	.14	0.09(.16)	.03	0.31(.37)	.04
EXT ²	0.24(.31)	.03	1.50(.19)**	.31	-0.32(.18)	-.07	1.01(.41)*	.09
BEN ²	0.85(.47)	.08	-0.31(.29)	.05	2.07(.27)**	.33	3.06(.62)**	.19
CONS ²	-0.49(.32)	-.07	-0.11(.20)	-.02	0.33(.19)	.08	0.48(.42)	.04
ES ²	1.66(.24)**	.28	0.20(.15)	.06	0.03(.14)	.01	0.65(.31)*	.07
IMAG ²	-0.23(.28)	-.03	0.01(.17)	.00	0.28(.16)	.07	-0.18(.37)	-.02

Note. * $p < .05$. ** $p < .01$.

Anxiety symptoms

For *childhood* anxiety symptoms, in the model including only the linear terms ($F(5;568) = 70.07, p < .001, R^2 = .38$), benevolence and emotional stability were negatively associated with anxiety symptoms, whereas imagination was positively associated. Including the squared terms resulted in a significant increment in model fit ($\Delta F(5;563) = 6.83, p < .001, \Delta R^2 = .04$). Only the quadratic term for emotional stability was significant. Emotional stability was now more strongly associated with anxiety symptoms with the strength of the association increasing towards the low end of the personality dimension.

In *adolescence*, relations in the model including only the linear terms were highly similar to those in childhood ($F(5;418) = 61.42, p < .001, R^2 = .42$): benevolence and emotional stability were negatively associated with anxiety symptoms, whereas imagination was positively associated. Again, including the squared terms resulted in a significant increment in model fit ($\Delta F(5;413) = 13.13, p < .001, \Delta R^2 = .08$), and the quadratic term for emotional stability was significant. However, imagination was no longer a significant predictor of anxiety symptoms, indicating that the association was overestimated in the linear model due to the quadratic effect of emotional stability. Overall, these results indicate that emotional stability shows a non-linear association to anxiety symptoms, both in childhood and adolescence, and that its relative importance is underestimated in linear models.

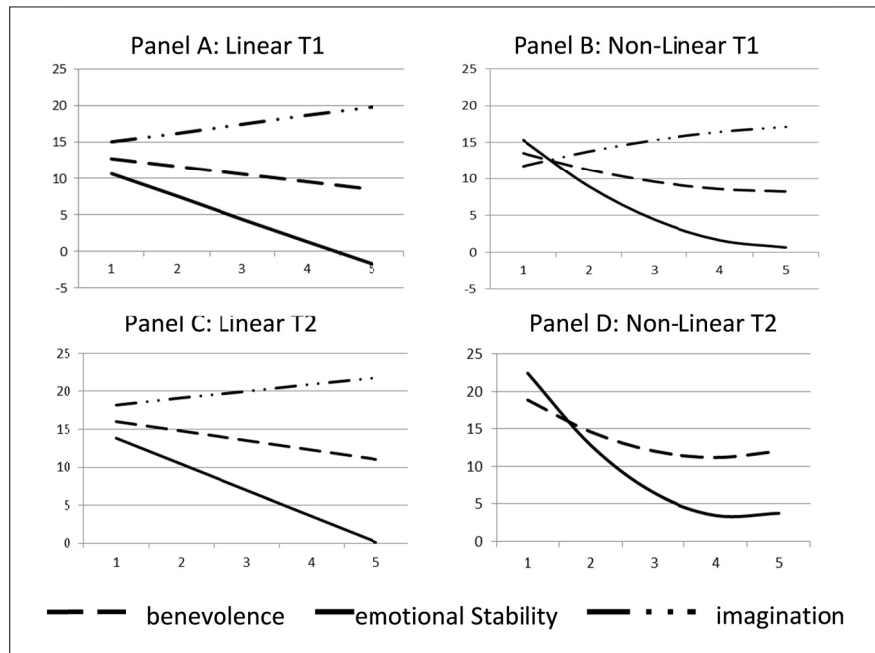


Figure 1. Predicted values of anxiety symptoms.

Depressive symptoms

For *childhood* depressive symptoms, in the model including only the linear terms ($F(5;568) = 54.27, p < .001, R^2 = .32$), extraversion, benevolence, conscientiousness, and emotional stability were negatively associated with depressive symptoms, whereas imagination was positively associated. Including the squared terms resulted in a significant increment in model fit ($\Delta F(5;563) = 9.53, p < .001, \Delta R^2 = .05$). The quadratic terms for extraversion and imagination were significant. Although extraversion was already relatively more strongly associated with depressive symptoms than emotional stability, this difference was now much more pronounced. Additionally, the association with imagination was u-shaped rather than positive, indicating that both low and high levels were associated with depressive symptoms.

In *adolescence*, in the model including only the linear terms ($F(5;418) = 56.61, p < .001, R^2 = .40$), extraversion, benevolence, conscientiousness, and emotional stability were negatively associated with depressive symptoms, whereas imagination was positively associated. Including the squared terms resulted in a significant increment in model fit ($\Delta F(5;413) = 18.04, p < .001, \Delta R^2 = .11$). The quadratic term for extraversion was significant, again making the relative difference in strength of the association much more pronounced. The associations with benevolence, conscientiousness and emotional stability remained largely unchanged. In contrast to childhood, the quadratic term for imagination was not significant in adolescence, and the association remained positive in the quadratic model.

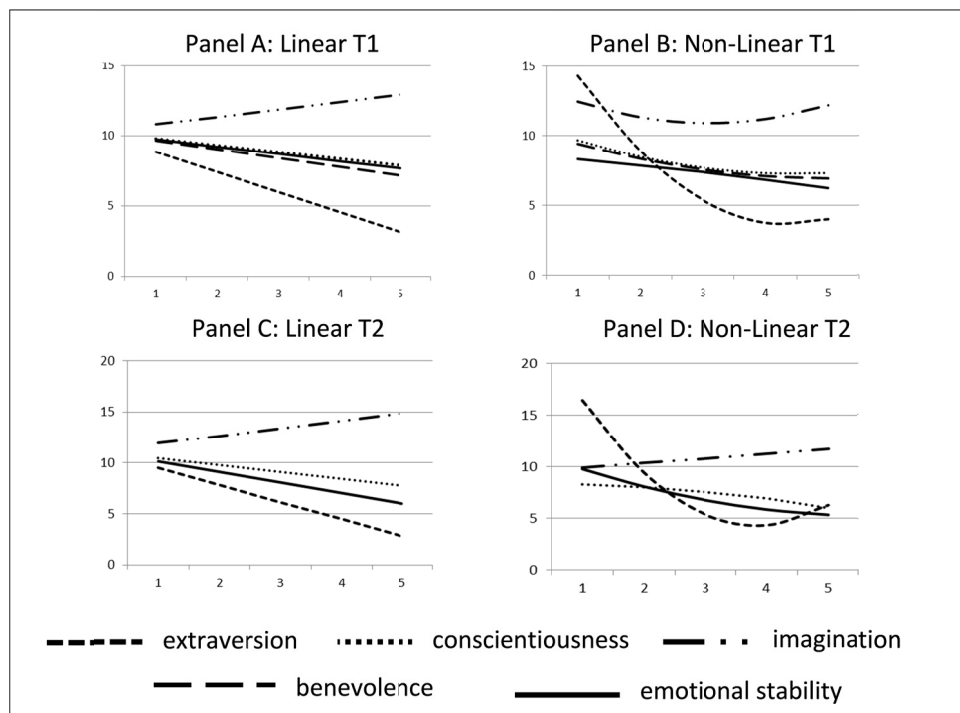


Figure 2. Predicted values of depressive symptoms.

Aggression

For *childhood* aggression, the linear model indicated that all dimensions were significant predictors ($F(5;568) = 106.03, p < .001, R^2 = .48$), with extraversion and imagination positively, and benevolence, conscientiousness and emotional stability negatively associated. Benevolence was the strongest predictor, but again negative values were estimated for extremely benevolent children. Adding the quadratic terms resulted in a significant increment in model fit ($\Delta F(5;563) = 8.28, p < .001, \Delta R^2 = .04$), and quadratic terms for extraversion, benevolence, and conscientiousness were significant. Again, the difference between benevolence and the other dimensions became much more pronounced, although the association still resulted in the prediction of slight negative values. Conscientiousness also increased in strength towards the low end, and interestingly, the association with extraversion was now u-shaped, rather than simply positive, indicating that both lower and higher extraversion were associated with more aggression than moderate levels. The associations with emotional stability and imagination remained largely unchanged.

In *adolescence*, the linear model indicated that extraversion was positively, whereas benevolence, emotional stability, and conscientiousness were negatively associated with aggression ($F(5;418) = 103.94, p < .001, R^2 = .55$). The linear model again predicted negative values for extremely benevolent children. The quadratic model revealed that quadratic terms for extraversion, benevolence and emotional stability were significant ($\Delta F(5;413) = 12.27, p < .001, \Delta R^2 = .06$). For extraversion, low levels no longer appeared associated with aggressive problems, as they were in childhood, but the strength of the association increased towards the high end of the dimension. The association with emotional stability increased toward the low end of the dimension, and again benevolence now appeared as a much stronger predictor.

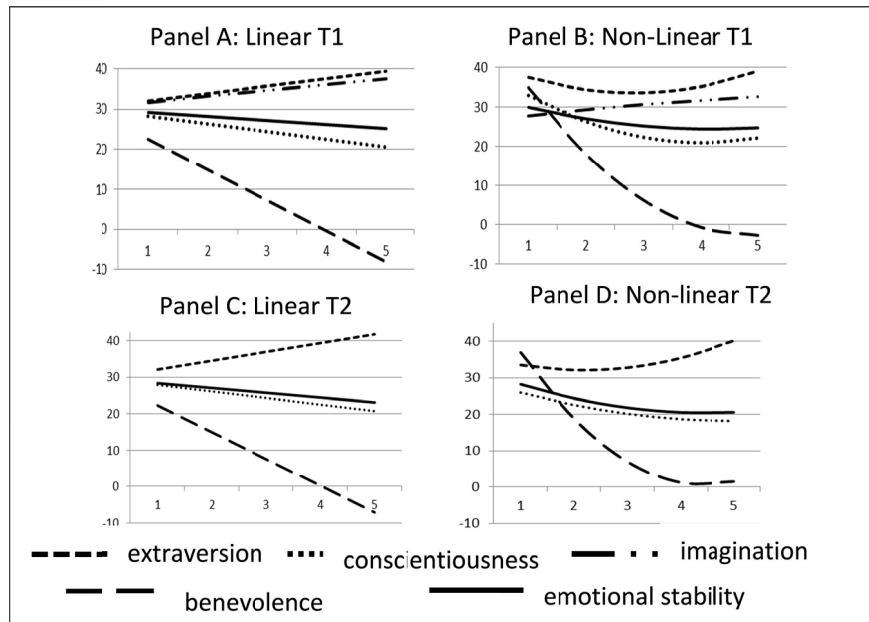


Figure 3. Predicted values of aggressive symptoms.

Rule-breaking behavior

For rule-breaking behavior, the model including only the linear terms was significant ($F(5;568) = 37.52, p < .001, R^2 = .25$). *Childhood* rule-breaking behavior was most strongly negatively associated with benevolence, followed by conscientiousness, and a slight negative relation with emotional stability. Extraversion was positively associated with rule-breaking behavior. The linear model predicted negative values of rule-breaking behavior for children who were extremely benevolent, which are impossible. The model including the squared terms provided a significant increment in model fit ($\Delta F(5;563) = 6.43, p < .001, \Delta R^2 = .04$). The quadratic terms for benevolence and emotional stability were significant, and benevolence was now much more strongly related to rule-breaking behavior, with the strength of the association increasing towards the low end of the personality dimension. The model no longer resulted in the prediction of negative values. Emotional stability was still negatively associated with rule-breaking behavior at the low end of the personality dimension, but the relation now became positive at the high end. However, this was a very small effect.

In *adolescence*, results for the linear model were highly similar, except that emotional stability was no longer a significant predictor of rule-breaking behavior ($F(5;418) = 45.83, p < .001, R^2 = .35$). The linear model again predicted negative values of rule-breaking behavior for extremely benevolent children. In the quadratic model ($\Delta F(5;413) = 20.41, p < .001, \Delta R^2 = .13$), only the quadratic term for benevolence was significant. Although the associations between conscientiousness and extraversion also appear quadratic, these effects were only marginally significant. Finally, extraversion remained positively, and conscientiousness remained negatively associated. Interestingly, the association with benevolence, although again much more strongly negative at the low end of the dimension, became positive at the high end of the dimension, indicating that children who were extremely benevolent exhibited more rule-breaking behavior than children who were moderately high on benevolence.

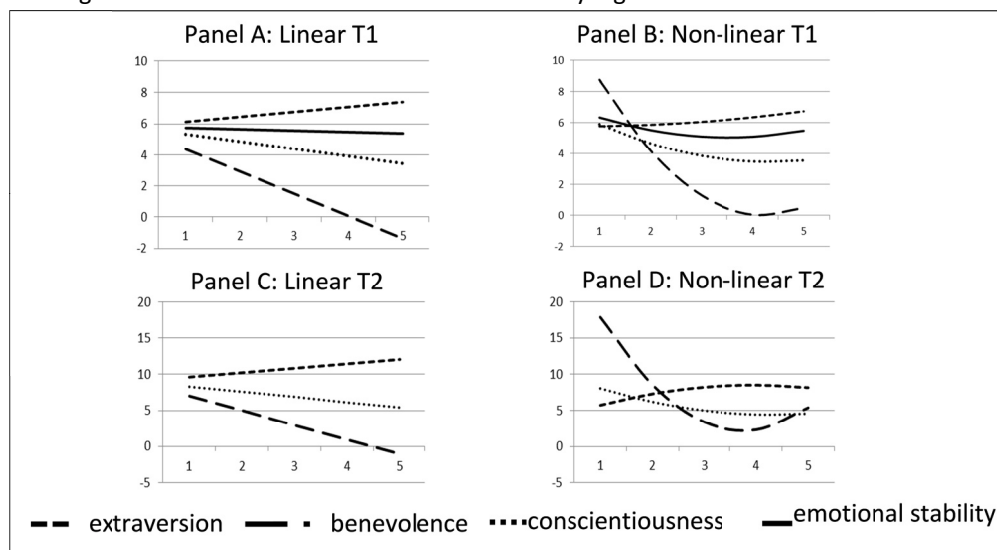


Figure 4. Predicted values of rule-breaking behavior.

In sum, for all four types of adjustment problems, adding quadratic terms for the personality dimensions resulted in a significant increment in model fit, accounting for 8 to as much as 27% of the total explained variance. The relative difference in predictive value of emotional stability for anxiety symptoms, extraversion for depressive symptoms, and benevolence for both rule-breaking and aggression became much more pronounced in the models including quadratic terms. As expected, these associations all increased in strength towards the low end of the personality dimensions.

Discussion

In this study we investigated associations between the Big Five personality dimensions and four subtypes of internalizing and externalizing adjustment problems, in children and adolescents. We found evidence for non-linear associations between the personality dimensions and all four types of adjustment problems. For each type of adjustment problems, the non-linear effect was especially pronounced for a single dimension. For both aggressive and rule-breaking behavior this was benevolence, for depressive symptoms this was extraversion, and for anxiety symptoms this was emotional stability. The non-linear effects do not appear to be negligible, as they accounted for 8 to 14 percent of the total explained variance in adjustment problems in childhood, and for 10 to 27 percent of the total explained variance in adolescence. Each of these non-linear relations indicated that the strength of the associations increased towards the low end of the personality dimensions.

Research on associations between Big Five personality dimensions in community samples has, to date, mostly investigated associations between personality and broadband internalizing and externalizing adjustment problems (De Pauw & Mervielde, 2010; Klein et al., 2012; Lynam et al., 2005; Ozer & Benet-Martinez, 2006; Tackett et al., 2012; Van Leeuwen et al., 2004). Results of the present study indicate that with regards to internalizing problems, the personality dimensions are differentially related to subtypes of internalizing symptoms: emotional stability was related to both anxiety and depression, whereas extraversion was related to depressive symptoms only, supporting the tripartite model (Clark & Watson, 1991).

Although these differential associations were already present in the linear models, quadratic effects were significant for both types of adjustment problems, and revealed interesting additional information. The non-linear associations showed an even further differentiation between the two types of internalizing symptoms: the association with anxiety increased in strength towards the low end of emotional stability only, whereas the association with depressive symptoms increased towards the low end of extraversion only. Previously, research on personality has not found extraversion to differentiate anxious from depressive symptoms in childhood (Kushner et al., 2012; Lonigan et al., 1999), whereas a study of temperament found an effect for adolescents, but not for children (Lonigan et al., 1999). Results of this study are an indication that extraversion differentiates depressive from anxiety symptoms, in childhood as well as adolescence. In terms of the spectrum hypothesis, findings

of the present study indicate that anxiety may be a more extreme manifestation of emotional instability, whereas depression may be a more extreme manifestation of introversion.

In contrast to the internalizing symptoms, both rule-breaking and aggressive behavior were most strongly and consistently associated to a single dimension: benevolence. These findings are in line with those of a meta-analysis of studies of older children and adults, which showed agreeableness, the adult factor for benevolence, as the most important factor with regards to both antisocial and aggressive behavior (Jones et al., 2011). Conscientiousness, as an index of (dis)inhibition, is also seen as an important factor in determining risk for externalizing problems (Jones et al., 2001; Widiger & Clark, 2000; Roberts, Jackson, Burger, & Trautwein, 2009). Conscientiousness was also consistently related to both rule-breaking behavior and aggression in the present study. However, the relative difference in strength of the association between benevolence and conscientiousness became especially pronounced in the non-linear models. Quadratic effects for benevolence were significant for both types of problems, in childhood as well as in adolescence, whereas there was only one quadratic effect for conscientiousness. Furthermore, conscientiousness was not more strongly related to either rule-breaking behavior and aggression, than extraversion and emotional stability were. In terms of the spectrum hypothesis, results of this study indicate that rule-breaking behavior and aggression may be an extreme manifestation of a *disagreeableness*, rather than of a *disinhibition*. Related to our findings, a study of maladaptive personality traits in children has also found that disagreeableness (with only some aspects of low conscientiousness) was most important in determining externalizing problems (De Clercq, De Fruyt, Van Leeuwen, & Mervielde, 2006).

Another interesting finding is that, although imagination is not usually thought of as important for adjustment problems, we found several associations with both internalizing and externalizing problems. In children, imagination was positively associated with anxiety, whereas the association with depression was u-shaped. In adolescence, higher imagination was associated with more depression. Finally, higher levels of imagination in children, but not adolescents, were related to slightly higher levels of aggression. In adults, openness to experience is associated with aggression, but not antisocial behavior (Jones et al., 2011). Imagination has also been found to be positively related to total (internalizing and externalizing) problems in children (Herzhoff & Tackett, 2012), whereas other aspects of openness to experience (creativity/intellect) were negatively associated (Herzhoff & Tackett, 2012). Although findings have been inconsistent so far, it seems that imagination is worthy of further investigation. It appears especially important to investigate non-linear associations, as imagination was positively associated to adolescent depressive symptoms in the linear model, but the association disappeared in the non-linear model.

Strengths and limitations

The present study has several strengths. First, whereas studies to date have mostly investigated linear associations between personality and adjustment problems, we investigated both linear and non-linear associations. Second, we included a large community sample of

children who were assessed both in childhood and adolescence. This allowed us to investigate the replicability of our findings across these developmental periods. Third, the HiPIC is an especially reliable and comprehensive measure of personality, including 144 items, and specifically designed to assess personality in children and adolescents. Fourth, we investigated specific subcategories of adjustment problems, allowing us to differentiate between them.

In addition to these strengths, some limitations are also worth mentioning. First, although the absence of any non-linear associations would provide evidence against the spectrum hypothesis, the presence of non-linear associations does not allow us to rule out the vulnerability hypothesis. For instance, it is possible that personality causes adjustment problems, but is distinct from it, with this causal relation increasing in strength towards the low end of the personality dimensions. Additionally, other models of the relation between personality and adjustment problems, such as the notion that adjustment problems may impact, or *scar* personality, or that personality may alter the course of adjustment problems (*pathoplasty association*), may be responsible for the associations. Indeed, the models are not mutually exclusive, and it has been stressed that they likely all play a role in determining the association between personality and adjustment problems (Tackett, 2006). However, it is important to note that non-linear effects may be important to take into account regardless of which model you choose to investigate, and that they are relatively simple to include.

Second, we only included informant reports of child personality and problem behavior. As children were assessed at as young as six years, when they were just learning to read and write, they did not provide self-reports at this time. However, self-reports may provide unique information, and should be included in further investigations of personality extremity. It should be noted that evidence indicates that other-reports of personality are very valuable, especially when they are provided by someone who is close to the target individual, as they provide predictive value incremental to self-reports (Connelly & Ones, 2010). Third, research on relations between personality dimensions and problem behavior has been criticized by stating that relations are due to item-overlap. However, investigations of the measures used in the present study have shown that item-contamination is rather limited (Lemery, Essex, & Smider, 2002; Prinzie, Onghena, & Hellinckx, 2005; De Bolle, Beyers, De Clercq, & De Fruyt, 2012). Finally, in the present study we used the CBCL internalizing scale to assess anxiety and depressive symptoms. Although the CBCL is a valid and reliable measure of child adjustment symptoms (Vignoe, Bérubé, & Achenbach, 2000), the internalizing scale was not specifically designed to differentiate anxiety from depressive symptoms. Other measures are available that are better suited to assess pure anxiety (e.g., the *SCARED*; Birmaher et al., 1997) and depressive symptoms (e.g., the *CDI*; Kovacs, 1985) in children. It will be important to investigate whether the specific, non-linear associations with the Big Five personality dimensions replicate across these measures.

Conclusion

Results of the present study indicate that relations between the Big Five personality dimensions and adjustment problems include non-linear effects. Linear associations indicated

that low emotional stability was associated with both anxiety and depression, whereas low extraversion differentiated depression from anxiety, supporting the tripartite model. The non-linear associations indicated an even further differentiation. Associations with anxious problems increased in strength towards the low end of emotional stability, whereas associations with depressed problems increased in strength towards the low end of extraversion. In terms of the spectrum hypothesis, depressive symptoms may be a more extreme manifestation of introversion, whereas anxiety symptoms may be a more extreme manifestation of emotional instability. Benevolence had the strongest non-linear association with both rule-breaking behavior and aggression, indicating that the externalizing problems may be an extreme manifestation more of *disagreeableness*, rather than *disinhibition*. Non-linear associations are important to take into account when investigating risk for adjustment problems, as neglecting these associations may lead to an underestimation of the strength of the association with personality.

|Chapter 8|

Affective Variability in Mother-Toddler Dyads: Domain-Specific Relations to Child Adjustment Problems

Abstract

Emotions in toddlers are thought to be largely co-regulated in interaction with others. The real-time process of exchanging emotional expressions provides the basis for this emotional co-regulation and is deemed important for many socialization outcomes in children. The implications of this process may be dependent on the context, or domain of interaction. In this longitudinal study, we investigated domain-specific relations between affective variability in mother-toddler dyads and child adjustment problems. At Time 1, 75 mother-toddler dyads (mean age = 29 months) participated. Measures of variability were obtained by modeling observations of real-time mother and toddler affective displays during free play (reciprocity domain), tower-building (guided-learning domain) and clean-up (control domain), in dyadic trajectories on state space grids. Mothers reported toddlers' internalizing and externalizing problems at Time 1 and 2. Relations between affective variability and outcomes were context specific: Dyadic affective variability in the reciprocity domain predicted more internalizing and externalizing problems. In the guided-learning domain, variability predicted more internalizing problems, whereas in the control domain, variability predicted more externalizing problems. Dyadic affective variability was related to increased adjustment problems in toddlers and thus appears to be a structural aspect of emotion that is indicative of emotional dysregulation. The implications of this dysregulation for internalizing versus externalizing problems were dependent on the domain of interaction, indicating that domain-specificity should be taken into account in studies of parent-child interaction processes.

Van den Akker, A. L., Deković, M., Asscher, J. J., Prinzie, P., & Granic, I. (2013). Affective variability in mother-toddler dyads: Domain-specific relations to child adjustment problems. *Manuscript submitted for publication.*

Introduction

Toddlers' ability to regulate their emotions develops rapidly. As children acquire language, processes of self-regulation transition from largely sensorimotor, to more symbolic in nature (Cicchetti, Ganiban, & Barnett, 1991). Problems with effective regulation of emotion may lead children to experience internalizing and externalizing adjustment problems (Dodge & Garber, 1991). Adjustment problems first arise in toddlerhood and for some children remain stable from this early age (Keenan, Shaw, Delliquadri, Giovanelli, & Walsh, 1998; Shaw, Lacourse, & Nagin, 2005). Investigating risk factors for adjustment problems in toddlerhood is thus crucial for timely intervention.

Toddlers are very much attuned to their mothers' emotional expressions, as they convey information about objects and events as desirable, forbidden or potentially dangerous. The real-time process of exchanging emotional expressions between parents and children provides the basis for emotional co-regulation, and is deemed important for many socialization outcomes in children, as it places demands on self-regulation, and helps them understand emotions in others and appraise the appropriateness of their own behavior (Laible & Thompson, 2007). Thus, although toddlers' self-regulation is rapidly developing, emotion regulation in toddlers is still in large part a dyadic process in which emotions are thought to be co-regulated in interaction with parents (Calkins, Smith, Gill, & Johnson, 2001; Cicchetti et al., 1991; Eisenberg et al., 2001; Kochanska & Murray, 2000).

Given that toddlers' emotions are in large part co-regulated in interaction with others, it is important to study emotions at the level of the dyad. Although most research on parent-child interaction investigates how mean levels of parenting behaviors are associated with child outcomes, it is important to realize that mother-child interaction is a dyadic process that unfolds in real time. Dyadic characteristics of mother-child interaction may be the proximal engines that are important in determining children's adjustment problems (Bronfenbrenner & Morris, 1998). The present study was designed to fit into a tradition that takes a dynamic systems approach to investigating mother-child interaction (e.g., DeRubeis, & Granic, 2012; Granic, O'Hara, Pepler, & Lewis, 2007; Hollenstein, Granic, Stoolmiller, & Snyder, 2004; Lewis, Lamey, & Douglas, 1999; Lunkenheimer, Olsen, Hollenstein, & Sameroff, 2011). In this approach, mother and child are investigated as they behave as a system, and behavior/affect is measured at a dyadic level. When mother and child interact, their behavior becomes linked and self-organizes into a system, with properties that are not necessarily deducible to each individual in the system. These system properties do however feedback onto the individuals, accounting for how the system's behavior may be associated with adjustment problems in the child. Thus, either the child's behavior or the mother's behavior, or both may be responsible for the variability observed in the system. However, the implications are the same in each of these instances, namely that the system is characterized by heightened variability, and this characteristic of the system may be associated with child adjustment problems.

Others, outside of the dynamic systems approach, have also emphasized that dyadic characteristics may be important for young children's adjustment. For instance, the degree to

which mother and child's behavior are coordinated, or synchronous with each other at the dyadic level, has been related to lower levels of externalizing symptoms in children (Criss, Shaw, & Ingoldsby, 2003; Harrist & Waugh, 2002), as well as to their development of conscience (Kochanska & Murray, 2000).

Mother-toddler dyadic affective variability

Affective expressions can be characterized by their degree of variability. Some dyads may only express a very limited range of affect, whereas other dyads may express a wide range of affective states and quickly switch between them. Several findings indicate that the variability of mother-child dyadic affect is a characteristic that may be especially important in relation to child adjustment problems (Granic et al., 2007; Hollenstein et al., 2004). Several studies of older children indicate that higher affective variability represents flexibility to adjust to changing circumstances, signifying a reduced risk for adjustment problems. In studies of older children, dyadic affective variability has for instance been associated with improvement in externalizing behavior problems after an intervention (Granic et al., 2007), as well as lower levels of both internalizing and externalizing problems and less growth in externalizing problems over time (Hollenstein et al., 2004).

Although dyadic affective variability has not received much attention in toddlerhood, one study showed that it may be implicated in toddlers' adjustment problems as well (Lunkenheimer et al., 2011). However, in contrast to studies of older children, affective variability in mother-toddler dyads was related to more, rather than fewer adjustment children. Specifically, mother-child dyads' affective variability in toddlerhood predicted higher levels of teacher-, but not mother-reported externalizing problems when children had entered kindergarten (Lunkenheimer et al., 2011). Heightened variability may in toddlers' may represent affective dysregulation, a process that has been indicated as underlying both internalizing and externalizing problems (Dodge & Garber, 1991). Affective dysregulation may be especially problematic for toddlers because it may interfere with their developing self-regulation. Additionally, developing a theory of mind is a key developmental task in this period (Dunn, Brown, Slomkowski, Tesla, & Youngblade, 1991), and heightened affective variability may impede their developing understanding of emotions in others.

In short, empirical findings are inconsistent with regards to whether high affective variability signifies dysregulation, and as such indicates vulnerability to adjustment problems (Lunkenheimer et al., 2011), or whether it is a sign of the ability to flexibly adjust to changing circumstances (Granic et al., 2007; Hollenstein et al., 2004; Hollenstein & Lewis, 2006). One study of mother-adolescent dyads found that dyads who reported more stressful life events, were less variable when discussing a positive topic. However, high- and low-stress dyads were equally variable when discussing a conflict topic, indicating that the context of the interaction may be important in determining the implications of affective variability (Hollenstein & Lewis, 2006). The present study investigates whether the implications of mother-toddler dyadic affective variability depend on the context of parent-child interaction.

Domain-specificity of parent-child interaction processes

In a domain-specific approach to parent-child interaction processes, Grusec and Davidov (2010) distinguish several domains or contexts of interaction, suggesting that the implications of parent-child interaction processes may depend on the domain the dyad is operating in. Five domains are distinguished: the reciprocity domain, the guided-learning domain, the control domain, the protection domain and the group-participation domain. We examined whether the relation between dyadic affective variability on the one hand, and child outcomes (internalizing and externalizing problems) on the other, differs across three domains that are important for children at this age: the reciprocity domain, the guided-learning domain (building a tower), and the control domain (clean-up).

Parent and child operate in the reciprocity domain when they interact as equal status partners, as during play. If parent and child are responsive to each other's needs, mutual cooperation is expected to emerge. The reciprocity domain is relevant from early on in the child's life, as parent and infant engage in joint play, but the child's voluntary control over the initiation and course of interaction in this domain is rapidly increasing at this age. In the guided-learning domain, parents support children's acquisition of skills. Parents must be responsive to the child's current skill level and change their guidance according to the child's skill development. Finally, whenever goals of parent and child conflict, interaction is part of the control domain. In this domain, parents must exert appropriate control to gain compliance from their children. The guided-learning and control domains become important during the second year of life as children acquire language and their mobility increases.

In support of context-specificity of parent-child interactions, parents' emotional availability (a combination of parental sensitivity and positive affect) in interaction with their 18-month old children, has been found to be higher in a teaching task than in a free play task. However, parents' emotional availability was more reliably associated with the child outcome of positive affect in the free play task than in the teaching task (Volling, McElwain, Notaro, & Herrera, 2002). These findings indicate that qualities of parent-child interaction may be differentially associated to child outcomes across different contexts or domains of interaction. The findings of the one study that investigated dyadic affective variability across different contexts (Hollenstein & Lewis, 2006), indicate that dyadic affective variability could be adaptive in the reciprocity domain (low-stress dyads more variable during positive topic), but not related to adjustment problems in the control-domain (high- and low-stress dyads equally variable in conflict discussion). The one study on dyadic affective variability in toddlerhood, observed dyads in a challenging 'block' design, a task that is difficult to complete for children and for which they require the parent's assistance (Lunkenheimer et al., 2011). Dyadic affective variability in this task, representing the guided-learning domain, was related to more adjustment problems in this study, suggesting that variability is maladaptive specifically in the guided-learning domain.

The present study

The present study investigated longitudinal relations between mother-toddler dyads' affective variability, as observed in real-time, and toddlers' internalizing and externalizing problems. Specifically, we investigated whether these relations differed between the 'reciprocity-', 'guided learning-', and 'control-domain'. As development in toddlers is rapid, and relatively short times between assessments are needed to pick-up on important changes, the present study included two measurements, six months apart.

We hypothesized that dyadic affective variability would be differentially related to child adjustment problems across domains. Based on previous findings (Hollenstein & Lewis, 2006), we expected that affective variability in the reciprocity domain would be related to reduced adjustment problems, whereas it would be related to increased adjustment problems in the guided-learning domain (c.f., Lunkenheimer et al., 2011). In contrast, affective variability was not expected to be related to adjustment problems in the control domain (c.f., Hollenstein & Lewis, 2006). In order to determine whether dyadic affective variability explained unique variance in adjustment problems that could not be attributed to differences in content alone, we also tested alternative models in which toddler's adjustment problems were predicted by dyadic positive and negative affective content.

Method

Participants and Procedures

The sample consisted of 75 mothers and their children (37 girls and 38 boys). The children's mean age was 29 months at T1 ($SD = 7$ months, range = 14-42 months). The mothers' mean age was 33 years at T1 ($SD = 5.5$, range = 19-46 years). Ninety-seven % had the Dutch nationality, and 27% were single mothers. Percentages of mothers' educational levels were: 4% for elementary school, 23% for secondary school, 65% for non-university higher education, and 8% for university or higher. Thirty-two % of the families were of low Socio-Economic Status (SES) (<€1,400 per month), 47% of intermediate SES (€1,400 - €2,800 per month), and 21% of high SES (>€2,800 per month).

Dyads of the present study were those for which the mothers reported the highest and lowest sense of competence from a larger sample of 165 mother-toddler dyads. Ninety-nine mothers were mailed a short questionnaire informing about their parenting stress and need for support. To obtain a larger range of problem behavior, 66 families were recruited through coordinators of the Home-Start program.

After parents gave informed consent, the research staff made a home visit for the Time 1 assessment, lasting about 45 min. The home visit included a twelve minute, standardized and video-taped observation of mother-child play interactions. A box of Lego blocks with two little cars was offered on a carpet of approximately one m². For the present study, three tasks were included: free play (2 min.; Mothers were asked to play with their child as they usually would), building a tower (4 min.; Dyads were instructed to build a tower as high as they possibly could; Mothers were instructed to touch the blocks a maximum of three times), and cleaning up (3

min.; Dyads were instructed to put all the blocks back in the box and put the lid back on; Mothers were instructed to touch the blocks a maximum of three times). The videotapes of this first assessment were later coded by the first, second and third authors of the present study. Coders trained on a subset of 25% of the tapes until they reached a minimum of 75% agreement. Inter-rater reliability was established on 15% of the tapes: Overall coder agreement was 77%, Cohen's Kappa = .72. Coders were blind to study variables (including maternal sense of competence). Additionally, questionnaires were sent to the mothers at Time 1, and again six months later (Time 2).

Measures

Dyadic affective variability. Observations of interactions at Time 1 were coded in real-time with an adaptation for children (Granic lab, 2006) of the 10-code version of the Specific Affect Coding System (SPAFF) (Gottman, McCoy, Coan, & Collier, 1995). The ten codes include both negative (whine, fear, sad, anger, contempt), and positive codes (interest, enthusiasm, humor, affection) as well as a neutral code to indicate the absence of any other codable affect. Dyadic positive affect was the total duration that mother or child expressed positive affect (interest/enthusiasm/humor/affection). Dyadic negative affect was the duration that mother or child expressed negative affect (whine/ fear/sad/anger/contempt). For negative affective content, 57 dyads did not display any negative affect during free play, 35 dyads did not display any negative affect during the tower-building task, and 26 dyads did not display any negative affect during the clean-up task. With regards to positive affect, 23 dyads did not show any positive affect during free play, 8 dyads did not show any positive affect during the tower-building task, and 10 dyads did not show any positive affect during the clean-up task. As these variables were highly skewed (with values for skewness ranging from 1.53 to 5.00, and for kurtosis from 2.85 to 28.09), they were logtransformed (skewness: -.88 to .72; kurtosis: -.93 to .84).

To obtain measures of dyadic affective variability, trajectories of dyadic affective states were modelled in State Space Grids (Lewis et al., 1999), using the GridWare program (Lamey, Hollenstein, Lewis, & Granic, 2004). From the resulting 10 X 10 grid (10 affective codes for the mother, and 10 affective codes for the child), three indices of dyadic variability were modelled to load on a latent variable, for each subtask: number of transitions between dyadic affective states (transitions), range of affective states visited by the dyad (range), and a measure of the evenness of the distribution of behavior across all the dyadic affective states (duration entropy).

To assess measurement invariance of the variability construct across tasks, confirmatory factor analysis was performed in Mplus including a latent variable for dyadic affective variability, with three indicators, for each of the three tasks. A model in which the factor loadings of the indicators were constrained to be equal across tasks, did not fit the data significantly worse than a model in which the factor loadings were freely estimated, indicating measurement invariance across tasks (unconstrained model: CFI = .95, SRMR = .03; constrained model: CFI = .95, SRMR = .05, $\Delta\chi^2(4) = 5.19$, $p = ns$). Factor loadings were all significant and in

the expected direction (standardized loadings: .81 – .96, $p < .001$), and correlations between the latent dyadic affective variability constructs were all significant ($r = .45 - .55, p < .01$).

Adjustment problems. Mothers rated the internalizing and externalizing problem behavior subscales of the Dutch version of the Child Behavior Check List (CBCL/2-3) (Achenbach, 1992) at Time 1 and Time 2. The internalizing subscale consists of 25 items (e.g., ‘My child cries a lot’), whereas the externalizing subscale consists of 26 items (e.g., ‘My child disobeys’). Each item is rated: 0 (*not true*), 1 (*sometimes/somewhat true*), or 2 (*often/very true*). The CBCL is a valid, reliable instrument to measure child behavior (Vignoe, Bérubé, & Achenbach, 2000). Cronbach’s *alphas* ranged from .84 to .94. At Time 1, 5.3% of the sample reported internalizing problems in the borderline clinical range ($T = 60 - 63$), and 22.7% of the sample experienced internalizing problems in the clinical range ($T > 63$). With regards to externalizing problems, 4% of the sample scored in the borderline clinical range ($T = 60 - 63$), and 18.7% scored in the clinical range ($T > 63$).

Statistical analysis

We performed structural equation modelling in Mplus 6.11 (Muthén & Muthén, 2010) using maximum likelihood (ML) estimation. Mplus uses full information maximum likelihood to handle missing data, making optimal use of available data. We assessed model fit with the comparative fit index (CFI), with $CFI > .90$ indicating a good fit; and the standardized root mean square residual (SRMR), with $SRMR < .08$ indicating an acceptable fit, as these have been indicated as the preferred fit statistics with smaller samples and ML estimation (Hu & Bentler, 1998).

A model was fit for each domain, including a latent variable representing dyadic affective variability in that domain, child internalizing problems and externalizing problems at Time 1 and Time 2. Because not all dyads took the entire three minutes to perform the clean-up task, total duration of task was controlled for in the analyses for this task. A graphical representation of the models is provided in Figure 1.

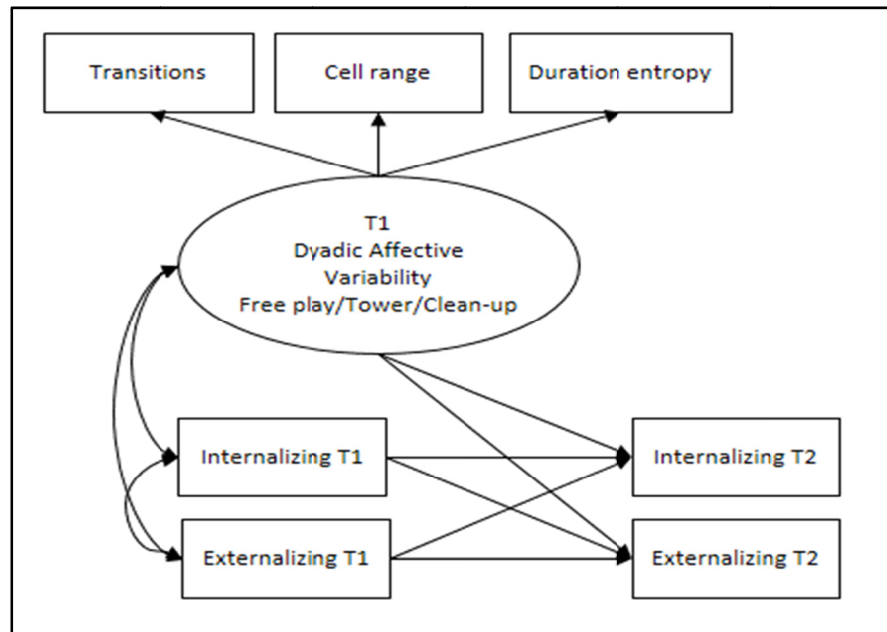


Figure 1. Model of the relations between dyadic affective variability during free play/tower-building/clean-up and toddler internalizing problems and externalizing problems.

Results

Preliminary analyses

As outliers can distort the results, values of internalizing and externalizing problems at Time 2 were replaced by missing values for one case ($>1.5 \times$ interquartile distance above the third quartile on both internalizing and externalizing problems at Time 2). Mothers reported more externalizing than internalizing problems at both Time 1 and Time 2. Externalizing problems were significantly lower at Time 2 than at Time 1, whereas levels of internalizing problems did not change significantly. Descriptives of child adjustment problems are provided in Table 1.

Table 1.

Descriptives of Child Adjustment and Maternal Parenting

Measure	1.	2.	3.	<i>M(SD)</i>
1. Internalizing	--			8.11(6.60)
2. Externalizing	.84**	--		16.70(11.61)
3. Internalizing	.68**	.62**	--	6.98(5.29)
4. Externalizing	.76**	.80**	.82**	13.87(9.98)

* $p < .05$. ** $p < .01$.

The number of transitions and the range of affective states were higher in the tower-building and the clean-up task than in the free-play task. Duration entropy increased from the free-play task to the tower-building task, as well as from the tower-building task to the clean-up task. For descriptives of the dyadic affective variability measures across the three contexts, see Table 2.

Table 2.
Descriptives of Dyadic Affective Variability per Task

Measure	Free play <i>M(SD)</i>	Tower <i>M(SD)</i>	Clean-up <i>M(SD)</i>
Transitions	2.55(2.53) _a	3.29(2.40) _b	3.83(2.61) _b
Range	2.92(1.89) _a	4.48(2.13) _b	4.36(2.28) _b
Duration Entropy	.28(.30) _a	.36(.27) _b	.48(.38) _c

Note. 'Transitions' represent mean rates per minute; Significant differences across-contexts are denoted by different subscripts.

Dyadic affective variability and toddlers' adjustment problems

The models including dyadic affective variability fit the data well (free play task : $\chi^2(8) = 3.99$, $p = .858$; CFI = 1.00; SRMR = .01; tower-building task: $\chi^2(8) = 16.01$, $p = .042$; CFI = .97; SRMR = .03; clean-up task: $\chi^2(10) = 7.66$, $p = .662$; CFI = 1.00; SRMR = .03). Estimated path coefficients are provided in Table 3. Stability paths between T1 and T2 child problem behavior were significant and positive in all models, and one cross-path was significant: levels of T1 internalizing problems were positively associated with externalizing problems at T2. Internalizing and externalizing problems were significantly and positively related at T1.

During free play, dyadic affective variability predicted more internalizing problems ($\beta = .20$), and more externalizing problems six months later ($\beta = .19$). Constraining these paths to be equal did not significantly worsen model fit, indicating that these relations were similar in magnitude ($\Delta\chi^2(1) = 2.70$, $p = .101$). During the tower-building task, dyadic affective variability predicted more internalizing ($\beta = .19$), but not externalizing problems six months later ($\beta = .14$). During the clean-up task, dyadic affective variability predicted more externalizing problems six months later ($\beta = .20$), but not internalizing problems ($\beta = .09$)¹.

¹ Given the importance of socioeconomic Status (SES) in relation to individual differences in parenting and child problem behavior, we also tested our models controlling for SES (i.e., family income). The models provided a good fit to the data (free play task : $\chi^2(10) = 5.99$, $p = .816$; CFI = 1.00; SRMR = .02; tower-building task: $\chi^2(10) = 21.74$, $p = .017$; CFI = .96; SRMR = .04; clean-up task: $\chi^2(12) = 11.69$, $p = .471$; CFI = 1.00; SRMR = .03). Although SES was related to the child's Time 1 internalizing problems and Time 2 externalizing problems, as well as to higher levels of affective variability (in the clean-up task only), the main patterns of relations in the models including SES did not differ from those of the models presented here.

Table 3.

Parameter Estimates of the Models including Dyadic Affective Variability

Parameter	Free Play		Tower building		Clean-up	
	$\sigma/b(SE)$	r/β	$\sigma/b(SE)$	r/β	$\sigma/bSE(SE)$	r/β
IntT1 \leftrightarrow ExtT1	63.79(11.42)	.84**	63.88(11.42)	.63**	63.79(11.42)	.84**
VariabilityT1 \leftrightarrow IntT1	1.28(3.68)	.04	1.53(6.29)	.03	1.49(5.04)	.04
VariabilityT1 \leftrightarrow ExtT1	5.13(6.50)	.09	4.79(11.10)	.05	8.47(8.90)	.11
VariabilityT1 \rightarrow IntT2	.22(.09)	.20*	.13(.06)	.19*	.07(.07)	.09
VariabilityT1 \rightarrow ExtT2	.40(.14)	.19**	.17(.09)	.14	.31(.11)	.20**
IntT1 \rightarrow IntT2	.45(.12)	.56**	.43(.13)	.54**	.45(.13)	.34**
ExtT1 \rightarrow ExtT2	.44(.11)	.51**	.47(.11)	.54**	.44(.10)	.51**
IntT1 \rightarrow ExtT2	.48(.18)	.32**	.46(.19)	.30*	.52(.18)	.34**
ExtT1 \rightarrow IntT2	.06(.07)	.13	.07(.07)	.15	.07(.07)	.16

Note. * $p < .05$. ** $p < .01$.

To investigate whether variability could be related to adjustment problems due to differences in affective content, we fitted alternative models for each task in which adjustment problems were predicted by dyadic positive and negative affect duration (rather than variability). As the models were just-identified, they provided perfect fit to the data. Neither dyadic negative or positive content were predictive of either internalizing or externalizing problems, concurrently or longitudinally in any of the domains (Table 4).

Table 4.

Parameter Estimates of the Models including Affective Content

Parameter	Free Play		Tower building		Clean-up	
	$\sigma/b(SE)$	r/β	$\sigma/b(SE)$	r/β	$\sigma/b(SE)$	r/β
Positive Affect \leftrightarrow IntT1	.37(.33)	.15	.14(.37)	.04	-.19(.35)	-.07
Positive Affect \leftrightarrow ExtT1	.73(.61)	.16	.45(.65)	.08	-.02(.61)	-.01
Negative Affect \leftrightarrow IntT1	1.62(.87)	.50	.31(.50)	.10	.23(.53)	.06
Negative Affect \leftrightarrow ExtT1	2.45(1.32)	.43	1.09(.88)	.20	.43(.93)	.06
Positive Affect \rightarrow IntT2	3.03(2.31)	.22	1.59(.95)	.15	.70(1.15)	.06
Positive Affect \rightarrow ExtT2	1.43(2.98)	.06	1.82(1.45)	.09	2.31(1.83)	.10
Negative Affect \rightarrow IntT2	-2.59(2.67)	-.25	-.78(1.33)	-.07	-.34(.96)	-.04
Negative Affect \rightarrow ExtT2	-1.95(3.98)	-.10	-2.11(2.26)	-.10	2.71(1.42)	.16

In sum, variability was consistently related to more maladaptive behavior, and we found evidence for context-specific effects: during free play (reciprocity domain), dyadic affective variability was related to both increased internalizing and externalizing problems six months

later, during a tower-building task (guided-learning domain) it was related to internalizing problems, whereas during a clean-up task (control-domain) it was related to externalizing problems only.

Discussion

The results of the present study indicate that higher levels of dyadic affective variability are related to more adjustment problems in toddlers. Across domains, dyadic affective variability for mother-toddler dyads thus appeared to be an indication of a more general process of dysregulation that interferes with adaptive functioning. We also found evidence for domain-specific effects of affective variability. Moreover, the link between variability and adjustment problems was not an artefact due to the affective content of interactions, as indicated by non-significant findings when the content, instead of variability, was modelled to predict toddlers' adjustment problems. The lack of relations between affective content and adjustment problems, supports the notion that has long been proposed by emotion theorists (For an overview, see Campos, Frankel, & Camras, 2004), namely that all emotions, both negative and positive, are important to express for healthy development. Thus, the expression of negative emotions (nor positive) does not necessarily lead to the development of psychopathology. Rather, the degree to which individuals are able to regulate their emotions is crucial for healthy developmental outcomes (e.g., Bradley, 2000). Results indicate that even when quite mild levels of affect are displayed, as in the present study, affective variability is related to adjustment problems in children.

Previously, other aspects of dyadic mother-child emotion regulation have been shown to be important for children's adjustment. For instance, a mutual responsive orientation, or the degree to which mother-child interaction is characterized by mutual cooperation and shared positive affect, predicted a more developed conscience in children (Kochanska & Murray, 2000). Additionally, mothers' emotional expressiveness has been found to contribute to children's self-regulation and ultimately, externalizing and internalizing problems (Eisenberg et al., 2001), and mother-child dyads whose affective expressions could be characterized as regulated have been shown to improve more in externalizing problems after intervention than dysregulated dyads (De Rubeis & Granic, 2012). Results of this study extend previous findings by showing that dyadic affective variability, a structural aspect of dyadic emotion, is related to adjustment problems.

Why might affective variability be problematic for such young children? When dyadic affective variability in interactions with their mothers is heightened, toddlers may be prevented from learning what emotional reactions their behavior typically elicits. Variability may be particularly problematic for this stage in development, given that it falls just before the age at which children acquire (normatively) a theory of mind. As toddlers develop a theory of mind, their understanding of emotions in others increases (Brown & Dunn, 1996). Delayed understanding of the emotional reactions of others to their own rule-breaking behavior, may lead children to break rules more often (Arsenio & Fleiss, 1996), as well as make them anxious

about what emotional reactions to expect. Delayed understanding of emotions in others has been related to externalizing problems at age 3.5 (Hughes, Dunn, & White, 1998), aggression and anger in the classroom (Denham et al., 2002), children's internalizing problems (Izard et al., 2001) and social withdrawal (Schultz, Izard, Ackerman, & Youngstrom, 2001). Although dyadic affective variability is a characteristic of the system (in which mother and child contributions are weighed equally), it may interfere with processes in which the mother, as a more knowledgeable and powerful interaction partner, is responsible for supporting the child's developing emotion regulation skills.

In contrast to Time 2 adjustment problems, dyadic affective variability was not related to Time 1 adjustment problems in the present study. Dyadic processes of interaction for mothers and young toddlers are continuously developing and may change rapidly. Behavior that is observed at any given time, is likely to only show up in mother's reports of child adjustment after some time. Over time, the mother adjusts her view to the changes in her child's behavior, and then is able to report it. Specifically, the measure of adjustment problems that was used in the present study, asks the mother about the child's behavior during the past month. The dyadic behavior as observed in the observations thus likely only influences the mother's view of her child's adjustment problems after some time.

Contrary to the findings of the present study, studies of dyadic affective variability in older children and adolescents indicate that heightened variability is related to *better* adjustment. Although high affective variability may be problematic for toddlers' developing emotion understanding, it may be beneficial for older children who need ample opportunity to assert themselves in interaction with their parents in order to develop an increasing sense of autonomy (Galambos & Costigan, 2003).

Critically, one of the main strengths of this study is that it assessed domain-specific affective variability. Our findings showed that, although dyadic affective variability may interfere with adaptive functioning for toddlers more generally, relations to specific types of problem behavior were dependent on these domains. There may be several interesting explanations for these domain-specific results. In the reciprocity domain, dyadic variability was related to higher levels of both internalizing and externalizing problems. As free play is a context without a clear goal, heightened dyadic variability may lead children to feel especially uncertain about how to behave and anxious about what to expect. Hard to manage children at 3.5 years have been shown to be especially delayed in emotion understanding in ambiguous contexts (Hughes, Dunn, & White, 1998).

In the guided-learning domain, dyadic affective variability was specifically related to internalizing problems. The guided learning domain requires the parent to be responsive to the child's skill level, and the child to be attuned to the parent's scaffolding efforts. Heightened dyadic variability may impede this mutual attunement, resulting in feelings of failure. Mothers' less successful scaffolding of math problems, which represents ineffective functioning in the guided-learning domain, has been related to lower levels of children's sense of academic competence, controlling for actual math achievement and the more general effect of authoritative parenting (Mattanah, Pratt, Cowan, & Cowan, 2005). Although this study

assessed maternal behavior, rather than aspects of mother-child dyadic functioning, results indicate that functioning in the guided learning domain is linked to internalizing problems in children.

During the clean-up task, higher dyadic affective variability predicted higher levels of externalizing problems. Effective functioning in the control domain requires parents to communicate clearly and consistently what they expect of their children. Children need to encode this information, and adjust their behavior accordingly. Heightened dyadic variability may impede this process of clear and consistent communication between parent and child. Support for the notion that heightened variability in the control domain is related to less compliance in children, again comes from a study of maternal behavior: serial predictability of mothers' negative emotion, as observed during interaction with their toddlers in tasks representing the control domain, has been related to less effective disciplining strategies (Lorber & Slep, 2005). Although variable emotion can also be predictable, less predictable mothers showed more random variation, indicating they were more variable than their predictable counterparts. Further evidence for the notion that variability in the control domain may produce more externalizing problems comes from an experimental study showing that reprimanding half of children's inappropriate demands for attention and providing positive attention to the rest resulted in higher rates of both inappropriate demands for mother's attention and children's negative affect than consistent reprimands (Acker & O'Leary, 1996).

Dyadic affective variability was significantly and positively related across domains, indicating that dyads who were more likely to exhibit heightened variability in one domain, were also more likely to exhibit heightened variability in the other domains. However, it is important to note that these relations were only moderate in strength, indicating that some dyads will experience most heightened variability in for instance the reciprocity domain, whereas other dyads will be most variable in the control domain. In addition to differential relations of dyadic affective variability to outcomes across domains, this finding provides further evidence for domain-specificity theory: functioning in one domain is partly independent from functioning in another domain.

Strengths and limitations

The present study has several strengths. First, this study is the first to investigate domain-specific relations between affective variability and adjustment problems in toddlerhood. Second, the longitudinal design allowed us to control for stability of child problem behavior. Third, as measures of affective variability were obtained from observations, whereas measures of child adjustment were obtained from mothers' reports, relations could not have been due to informant bias.

In addition to these strengths, some limitations are also worth mentioning. First, as is more often the case in studies with intensive real-time coding of observations, the sample was relatively small. Second, although results of the present study indicate the utility of distinguishing domains of interaction, it is also important to note that interactions in real life are less clear-cut, usually combining different types of contexts in one interaction episode

(Grusec & Davidov, 2010). Because in the present study the instructions were clearly related to the domains and the tasks were confined to only a few minutes, it is likely that one context dominated. However, it was also clear that some parents for instance turned a clean-up task into a play context, by singing a clean-up song. Thus, the ecological validity of our findings still needs to be established. Third, we did not investigate the protection or the group participation domains, which are also distinguished as part of the domain-specific approach (Grusec & Davidov, 2010). Future studies could investigate the implications of dyadic affective variability in these domains. Fourth, in addition to investigating dyadic affective variability *within* domains of interaction, future research may investigate variability *across* domains of interactions. Dyad's ability to adjust their affective expressions in response to changing contextual demands may also be implicated in child adjustment (Hollenstein et al., 2004). Finally, the levels of both positive and negative affect expressed in the present study can be considered mild. This could have been the reason that affective content was unrelated to child adjustment. The present study thus shows, that even when the level of affect expressed can be considered mild, variability in affective expressions is implicated in child adjustment. However, relations between variability and child adjustment may be different when dyads for instance display prolonged, strong negative affect. Future research may investigate whether relations between variability and child adjustment are different at mild versus strong levels of (negative) affect.

Conclusion

Results of the present study indicated that for toddlers, dyadic affective variability in interaction with their mothers, predicts less adaptive functioning. Relations of dyadic affective variability with outcomes provided evidence for domain-dependent relations of dyadic emotional variability and outcomes. Intervention efforts targeted at internalizing and externalizing problems in children may take into account that dyadic affective regulation in interaction with mothers is important for these problems in toddlers, as well as that dyads may differ with regards to which interaction context is specifically problematic for them.

| Chapter 9 – General Discussion |

The aims of this dissertation were (1) to investigate which subgroups can be identified based on configurations of temperament in toddlers, (multiple informants' reports of) personality in childhood, and trajectories of personality extremity development across childhood and adolescence; (2) to investigate changes in temperament types in toddlers, and personality dimensions in children and adolescents; (3) to investigate how temperament and personality are associated with parenting behavior across development; (4) to investigate how child temperament and personality are interrelated with parenting in the etiology of internalizing and externalizing adjustment problems. In the following paragraphs we provide a general discussion of our findings.

What have we learned by taking a person-centered approach to temperament and personality?

Our first aim was to investigate which subgroups can be identified based on configurations of temperament in toddlers, (multiple informants' reports of) personality in childhood, and trajectories of personality extremity development across childhood and adolescence.

In *Chapter 2*, we found that three profiles characterized configurations of temperament traits in toddlers: a *typical* profile, characterized by low levels of social fear, anger proneness and activity level, an *expressive* profile, characterized by low levels of social fear, and high levels of anger proneness and activity level, and a *fearful* profile characterized by high levels of social fear, and intermediate levels of anger proneness and activity level.

Interestingly, the temperament profiles we found in toddlers, resembled the resilient, under-, and overcontroller types that we identified based on personality dimensions in older children. In *Chapter 3*, we investigated configurations of latent variables for the personality dimensions, estimated from multiple informants reports (mother/father/teacher) in children, and replicated the resilient, undercontroller, and overcontroller personality types previously found in a study using the same analysis method in adolescents (Meeus et al., 2011), and in studies using other statistical methods to delineate children's personality types (Asendorpf & Van Aken, 1999; De Fruyt, Mervielde, & Van Leeuwen, 2002; Robins et al., 1996). Because we included multiple informants' reports, it is not likely that the coherence of the dimensions into types was due to informants' tendency to be guided by the 'halo effect,' i.e., a tendency of general perceptions of an individual to influence perceptions of specific traits (Thorndike, 1920).

The three temperament and personality types were also similar in their adjustment. The typical/resilient type was generally well-adjusted, the fearful/overcontroller type had heightened internalizing problems, whereas the expressive/undercontroller type was highest on externalizing problems. We also extend previous findings on differences between resilient, under-, and overcontroller personality types by investigating how they differ in their likelihood of belonging to different *trajectories* of internalizing and externalizing problems, rather than how they differ in their *mean-level* of problems. Undercontrollers, in addition to being more likely to belong to a group that experienced heightened and persistent externalizing problems, were also at heightened risk of belonging to a small but especially problematic group that had very high levels of both externalizing and internalizing problems. As expected, children with an overcontrolling personality type were more likely than the resilient to belong to a trajectory with heightened internalizing problems. However, they were *less* likely to belong to the externalizing trajectory, indicating, paradoxically, that one type of problems (internalizing) protects them from developing another type of problems (externalizing).

Some differences between the temperament profiles found in our study of toddlerhood, and the resilient, under-, and overcontroller personality types found in childhood, can also be noted. The fearful and expressive types both have higher levels of fearfulness and anger proneness compared to the typical group, whereas the undercontrolled type is less fearful and the overcontrolled type is less anger prone than the resilient group. It appears that as the child grows older, and temperament becomes differentiated into personality, the two less well-adjusted profiles become more distinct from each other. Perhaps the most salient feature of the profile becomes more strongly entrenched into the child's developing personality, magnifying differences between these profiles.

In short, through the person-centered approach, we replicated a three-type solution, including a typical/resilient type, a fearful/overcontroller type, and an anger prone/undercontroller type (e.g., Asendorpf & van Aken, 1999; Hart, Hoffman, Edelstein, & Keller, 1997; Robins, John, Caspi, Moffitt, & Stouthamer-Loeber, 1996; Van den Akker, Deković, Asscher, Shiner, & Prinzie, 2013; Van Leeuwen, de Fruyt, & Mervielde, 2004). We add to the literature by showing that these are types that can be robustly obtained from temperament traits as well as Big-Five personality dimensions, and from multiple informants' reports, in addition to single informant-reports of personality. These findings indicate that although personality may be described by five relatively independent dimensions, not all configurations of these types are equally likely. Additionally, similar types may be obtained from three temperament traits. Finally, the differentiation of types may be useful in determining the relative risk of internalizing versus externalizing problems in toddlers and children.

However, some drawbacks of the person-centered approach should also be noted. Although it may be informative to know that three configurations are most likely, the person-centered approach may result in a loss of information. In a typological approach not all individuals will match the prototype to a similar degree. These differences are lost when assigning everyone to their most likely type. The newer, more sophisticated statistical techniques employed in this dissertation do provide estimates of the probability of belonging

to a certain type, allowing us to take this into account. However, when the probability of belonging to a certain profile is associated to an outcome, it is not clear what is driving this association. In other words, if an individual's probability of belonging to a certain profile is low, it is not clear how exactly he or she differs from the prototype.

The utility of the typological approach has also been questioned by pointing out that types usually do not add much predictive value over traits (Asendorpf, 2003; Asendorpf & Denissen, 2006; Costa, Herbst, McCrae, Samuels, & Ozer, 2002; Huey & Weisz, 1997; Rovik et al., 2007; Van Leeuwen, De Fruyt, & Mervielde, 2004). Interestingly, we showed that the extremity of children's personality configurations did provide incremental predictive value for adjustment problems above and beyond the personality dimensions. This finding indicates that the whole personality configuration may be more than the sum of its parts. However, we would like to stress that the operationalization of extremity as an individual's vector length in five-dimensional personality space has not been investigated much to date, and more research is necessary to determine its validity in describing an aspect of the personality configuration that is associated to adjustment.

Although personality types may indeed be especially useful when they provide additional predictive value over the traits they are made up of, we agree with others who have argued that they need not add to the dimensions to be considered an equally good approach (Asendorpf & Denissen, 2006). In fact, in case of equal predictive power, it may be more parsimonious to speak of three types than five dimensions when describing individuals. Additionally, the person-centered approach may be informative in other ways than providing predictive power, such as for instance when we showed that personality configurations are already highly stable in toddlers, whereas traits are only moderately stable in this age period. Additionally, types may hold clinical utility as a prototype for clinicians to hold in mind in determining a general expectation or direction for diagnosis (i.e., is this an individual who is more likely to experience internalizing problems or externalizing problems?). Finally, it is important to examine such types in relations to parenting for instance, as, noted by Robins and Tracy (2003), "*. . . it is unlikely that environmental events and contexts ever influence a single trait in isolation. Parents, teachers, and other socializing agents interact with the whole child, not with one trait at a time*" (p. 114).

The variable-centered Big Five approach has in turn not been without critique. The empirical foundations have been questioned, by indicating that it is entirely based on factor-analytic results, and may have been driven more by characteristics of factor-analysis rather than characteristics of the individuals they intend to describe (Block, 1995). A related, and perhaps more fundamental critique is that the five factor model is in fact only grounded in empirical findings, and can thus be considered a-theoretical. However, several scholars have attempted to capture the five dimensions in a theoretical framework, where they represent variations on a general design of human nature, that has emerged over the course of evolution (McAdams & Pals, 2006; McCrae & Costa, 1997). The individual variations on this general design can be maintained across evolution as the same traits may be favorable under some conditions, and harmful under others (Penke, Denissen, & Miller, 2007).

Additionally, the dimensional approach may provide its own clinical utility for instance, by providing more insight into which aspects of a person are particularly problematic, and which may be considered ‘strengths’. In other words, the dimensional approach may provide us with information that is lost in the person-centered approach. To conclude, as the variable-, and person-centered approach each have their own advantages and pitfalls, it is our position that they are best seen as complementary approaches to the study of personality.

Do child temperament and personality change?

Our second aim was to investigate stability of temperament types in toddlers, mean-level changes of the personality dimensions across childhood and adolescence, and trajectories in the development of personality extremity across childhood and adolescence.

When investigating temperament and personality change, it is important to keep in mind that there are several, relatively independent types of change. Children may change their relative standing on a trait, compared to others (*relative stability*), while the configuration of traits within children remains largely unchanged (*profile stability*). Indeed, although it has been shown that *relative stability* of temperament traits is only moderate in toddlerhood (Roberts & Delvecchio, 2000), our findings in *Chapter 2* add to this knowledge by showing that *profile stability* is already high at this early age: between 68% and 75% of children retained their profile between consecutive time points, and 72% was classified in the same profile at the first and the fourth time point. Thus, although relative differences *between* children may change, relative differences of the personality traits *within* children, or the personality structure, is much less likely to change. That these two types of change may be relatively independent, again indicates the complementarity of the variable-, and person-centered approaches.

Investigations of *relative-* and/or *profile stability*, do not answer the question regarding whether levels of personality traits of the population as a whole generally change (*mean-level stability*). In *Chapter 4*, we investigated mean-level development of the Big Five dimensions across childhood and adolescence, both in mother- and child reports.

Results of a meta-analysis of mean-level changes across the lifespan have been taken to indicate that most change occurs during young adulthood (Roberts et al., 2006). Social Investment Theory (Roberts et al., 2005) proposes that the taking on of adult social roles is the driving force behind mean-level personality change. It predicts that most change would occur in emerging adulthood when adult social roles are taken on, and that individuals are most likely to increase on those traits that make them better able to perform the tasks associated with these roles.

However, our findings, indicating that mean levels for all personality dimensions change across childhood and adolescence, are in line with theories of personality development that posit that early individual differences become elaborated into personality through maturation and experience across development, and predict that most change is likely to occur during this period (Shiner & Caspi, 2003). Results of our longitudinal, multi-informant study indicate, as did those of a very large cross-sectional study (Soto et al., 2011), that the changes

that take place during this period are especially interesting, as for several dimensions they are not aimed at increasing maturity. Rather, both mothers and children reported *decreases* on benevolence, conscientiousness and imagination, from late childhood to mid-adolescence. These decreases appeared to be temporary, as children reported that benevolence, conscientiousness, and openness increased again from late adolescence to early adulthood, in line with the maturity principle.

Finally, in *Chapter 6* we investigated trajectories of mean-level development of personality extremity. We found that three subgroups of children could be identified based on how extreme their personality configurations were across development. The majority of children had relatively short vectors (i.e., not extreme) that were stable across development. A minority of children was thus classified as relatively extreme. We found two distinct subgroups among the children with a relatively extreme personality configuration. One group was relatively extreme in childhood, but decreased in extremity across childhood and adolescence. These children thus appear to mature into a less extreme personality configuration across childhood and adolescence. The second group of children started out at levels comparable to those of the majority of children, but increased to levels of extremity well beyond those at which the other extreme group started out. It thus appears that children's *initial levels* of personality extremity are less important than their *development over time*, in determining the extremity of their personality configuration in late adolescence.

Although we found mean-level changes for all personality dimension, as well as for subgroups of children with regards to the extremity of their personality configuration, it is important to note that these are small effects (i.e., there is relatively little change). Of course, we expect small changes in personality traits, as they are defined as highly stable. However, these small effects may have large consequences, as was for instance shown by Mroczek and Spiro (2007) who found that half a standard deviation decrease in emotional stability per decade, was associated with a 40% increase in mortality in adults. In *Chapter 5* we also show that intra-individual changes in personality may have important implications, as they were associated with both internalizing and externalizing problems in adolescence, above and beyond *initial levels*. Results of our study revealed that decreases in extraversion and emotional stability were predictive of internalizing problems, indicating that adolescents might be relatively high on these dimensions, and still experience internalizing problems, if they decrease in these dimensions during the transition to adolescence. For externalizing problems, we found that decreases in benevolence, conscientiousness and emotional stability were significant predictors.

In *Chapter 6*, we investigated how the extremity of children's personality configurations was associated with adjustment problems. Belonging to a trajectory characterized by increasingly extreme personality configurations across childhood and adolescence, was associated with higher levels of internalizing problems and externalizing problems in late adolescence, above and beyond the initial associations with adjustment problems, gender, and the personality dimensions. Results were highly replicable across mother- and father reports, both within- and across informants (although less so for teacher-

reports). The probability of belonging to the extreme/decreasing vector class was not associated with adjustment problems at the final moment, indicating that heightened personality extremity in childhood is not a marker for adjustment problems in late adolescence, whereas an increasingly extreme personality configuration is.

These findings indicate that studying *changes* in risk factors over time can reveal information that studying absolute levels cannot. Although an adolescent might have been at low risk for adjustment problems during childhood, facing the stressors associated with the transition to adolescence may have initiated personality change, resulting in increased risk in adolescence.

To conclude, the answer to the question of whether child temperament and personality change, is dependent on the type of change under study. Although temperament traits are only moderately stable in toddlerhood, personality profiles are already highly stable. Mean-levels of personality change, and although these changes are small, they are especially interesting for children and adolescents, as they are not aimed at increasing maturity. Finally, although by far most children do not change in extremity of their profile configuration over time, some children do. Although mean-level changes in personality are small, and not many children become increasingly extreme, these changes are important, because they are associated with increased risk for both internalizing and externalizing problems.

What drives temperament and personality change?

Our third aim was to investigate how temperament and personality are associated with parenting behavior across development. Although we showed that temperament profiles were highly stable, and mean-level changes for the population as a whole were small, we also found that individuals differed in their degree of change. In search for an explanation for these individual differences in change, we turned to contextual factors, and examined how initial levels of child traits elicit changes in parenting behavior, how parenting behaviors shape child traits, and how changes in parenting and personality were associated. In *Chapters 2 and 5*, we found that initial levels of child traits elicited changes in parenting: In *Chapter 2* we showed that toddlers who were initially more likely to belong to the *typical* profile had parents who increased less in positive parenting over time, whereas higher initial expressiveness and fearfulness were related to stronger increases in positive parenting over time. In *Chapter 5*, we found that children who were more benevolent in late childhood, had parents who increased their overreactive parenting. Across these two studies, there were two associations that indicated that parenting may shape child traits: children of parents who were more overreactive initially, became more benevolent and emotionally stable over time.

It should be noted that these effects were all counterintuitive, and in the opposite direction of what we would expect based on associations between levels of temperament/personality traits and parenting (e.g., benevolence is associated with lower overreactivity). As change itself may be dynamic (changing direction, such as the increases and

decreases in mean-levels of personality that we found), it may more useful to look at shorter intervals of change. In *Chapter 4*, we looked more closely at the associations, by separating the changes across intervals, rather than looking at the entire mean change across multiple measurement times. We found five elicitation effects: Children who rated themselves as more benevolent initially had parents who decreased in overreactivity, and increased in warmth over time; Children who were more extraverted had parents who increased in overreactivity and warmth, and children who were more imaginative initially, had parents who increased in warmth. Additionally, there were two shaping effects of maternal parenting on child personality, such that higher levels of maternal overreactivity predicted decreases in conscientiousness, and higher levels of maternal warmth predicted subsequent decreases in emotional stability. We indeed found that the effects were not the same for the changes across consecutive intervals, indicating the utility of separating changes across measurement times.

Although conclusions regarding directionality of effects can never be definitive from correlational analyses, we found more evidence for child-effects, or the process of environmental elicitation, than for parent-effects, or the shaping process. Traditionally, theories on parenting have emphasized influence processes from parents on children, because parents are more powerful interaction partners (for an overview, see Belsky & Jaffee, 2006). In his parenting process model, Belsky (1984) acknowledged the possibility of child effects and placed child personality as a central factor that may influence parenting. Evidence on relations between personality and intimate partner relationship quality have led to the conclusion that personality is more important for determining relationship quality than vice versa (Neyer & Asendorpf, 2001; Neyer & Lehnart, 2007; Robins, Caspi, & Moffitt, 2002). In line with these findings, results of this dissertation overall indicate that child personality is also more important for determining maternal parenting behavior, than vice versa.

Although we found somewhat more evidence for child personality eliciting parenting, than vice versa, it should be noted that there were not many over-time relations overall. However, we did find much more evidence for associated change. In *Chapter 2*, we found that increases for typicalness were related to increases in positive parenting and decreases in negative parenting, and increases in expressiveness and fearfulness were related to decreases in positive parenting. In *Chapter 5*, decreases in overreactive parenting were related to other-reported increases in benevolence and emotional stability. In *Chapter 4*, we show that increases in benevolence and conscientiousness were associated with decreases in overreactivity and increases in warmth, whereas increases in imagination were associated with increases in warmth. These associated changes indicate that child temperament/personality and parenting are parallel processes, changing in tandem.

At first glance, these associated changes may be very dissatisfying, as they do not give us any indication as to who is driving the association: do parents influence the child, or does the child influence the parent? In fact, some argue that associated changes that are not accompanied by lagged associations are an indication that the processes are in fact not causally related (Littlefield, Verges, Wood, & Sher, 2012). We do not share this view. It is easy to imagine how overreactive parenting could for instance directly influence child

conscientiousness, without changes in conscientiousness being dependent on initial levels of overreactive parenting. Individuals are built to perceive changes in their environment and react to them. Any time something is stable, an equilibrium is likely to be soon established. Thus, unless the initial level as measured in a study, is in fact the natural starting point of the process (McArdle, 2009), this initial level is not likely to predict the degree of change in the other process. Only if the strength of responding differs depending on the starting levels (for instance, similar to when an increase in volume from 15 to 16 db is easier to perceive than an increase in volume from 25 to 26 db, a change from moderate overreactivity to high overreactivity may be more influential than a change from high to very high overreactivity), may change in one process still be dependent on the initial level of the other process. Thus although the presence of over-time relations may indeed indicate which process is driving the association, a lack of over-time relations cannot be seen as evidence that the correlated change is not due to a causal relation between the processes.

In short, individuals are continuously changing in interaction with their context, and these associated changes are of interest. Although we do not see how associated change would be an indication that the processes *are not* causally linked, they can of course also not be taken as proof that they *are* causally linked. It is still possible that the association is spurious, due to third variables that were not measured, as with any and all correlational research. One such third variable, that is always a likely candidate in research uncovering parent-child associations, is genetic similarity between parents and offspring. For instance, a genetic similarity in impulsivity may underlie an association between parental overreactivity and child conscientiousness, without the experience of overreactive parenting specifically leading to low conscientiousness in children. However, although genetic similarity is a likely candidate in explaining correlations between *levels* of parenting and child characteristics, they are not likely to be responsible for associations between *changes* in parenting and child characteristics. Although personality change is partially genetically determined (Bleidorn, Kandler, Riemann, Angleitner, & Spinath, 2009), it seems highly unlikely that when parents and children, who are at completely different developmental stages, are changing together, this could be due to mere heredity of an underlying trait. In this way, associated change gives us more information than a correlation between levels. Finally, if changes are associated, this may indicate that the process is ongoing, and relevant for the developmental period under investigation.

Overall, we found that there were more associations between child traits and positive aspects of parenting (warmth, support, sensitivity), than negative aspects (hostility, harshness, overreactivity). Studies of child adjustment have found similar results. For instance, a lack of positive affective displays has been found to be a stronger predictor of child behavior problems than coercive parenting (Pettit & Bates, 1989). Overall this supports the notion that parenting is a multidimensional construct, and that it is important to include multiple dimensions.

To conclude, temperament and personality change, these changes are important for child adjustment outcomes, and the studies in this dissertation support the view that the parenting children receive, is an important contextual factor for their developing temperament/personality (Shiner & Caspi, 2003). We found some evidence for shaping effects

(parent-effects), somewhat more evidence for elicitation effects (child-effects), and even more evidence for associated changes between child temperament/personality and parenting behavior.

How are child temperament/personality and parenting implicated in the etiology of adjustment problems?

Our fourth, and final aim was to investigate how child temperament and personality are individual-level factors, that are interrelated with the contextual factor of parenting, in the etiology of child adjustment problems.

Child temperament and personality: Individual-level factors in the etiology of adjustment problems

We have already discussed several findings that indicate that personality may leave children vulnerable to the development of adjustment problems, as they pertain to the question of utility of the person- versus the variable-centered approach, as well as indicate why it is important to study changes in child personality. To summarize, In *Chapter 2*, we showed that temperament profiles in toddlers represent a vulnerability for internalizing and externalizing adjustment problems. That a certain personality type may be a vulnerability, but need not necessarily lead to problems, is indicated by our findings presented in *Chapter 3*: when children experienced low levels of overreactivity, all children were most likely to belong to a well-adjusted trajectory, regardless of their personality type. However, relative to the resilient, the under- and overcontroller personality types were more likely to belong to the problematic trajectory groups. In *Chapter 6* we showed that the extremity of personality configuration is associated with internalizing and externalizing problems, over and above mean-levels of the dimensions, and in *Chapter 5* we found that changes in the personality dimensions were associated with both internalizing and externalizing problems, above initial levels.

However, although personality may be a vulnerability for adjustment problems, other models for the association between personality and adjustment problems have been proposed. The spectrum model proposes that adjustment problems may best be placed on a continuum with personality (Widiger & Clark, 2000). Thus, rather than that personality as a vulnerability causes adjustment problems, they may be different manifestations of the same underlying dimensions. The spectrum hypothesis predicts that personality dimensions and adjustment problems are partially overlapping distributions with a different mean, and associations between the two should thus be non-linear. In *Chapter 7*, we found that for different subtypes of internalizing and externalizing adjustment problems, a single personality dimension showed an especially strong non-linear relationship. Associations with anxious problems increased in strength towards the low end of emotional stability, whereas associations with depressive problems increased in strength towards the low end of extraversion. In terms of the spectrum hypothesis, depressive symptoms may be a more extreme manifestation of introversion, whereas anxiety symptoms may be a more extreme manifestation of emotional instability.

Benevolence had the strongest non-linear association with both rule-breaking behavior and aggression, indicating that the externalizing problems may be an extreme manifestation more of *disagreeableness*, rather than *disinhibition*.

Parenting: A contextual factor in the etiology of child adjustment problems

In addition to child personality, we investigated overreactive parenting as a risk-factor for adjustment problems. In *Chapter 3*, we found that high maternal overreactivity was a risk-factor for elevated internalizing, externalizing, and co-occurring adjustment problem trajectories. In *Chapter 5*, increases in overreactive parenting across the transition to adolescence predicted adolescents' levels of externalizing adjustment problems. Overreactive parenting was not related to internalizing problems, indicating that whereas consistently high maternal overreactivity was a risk-factor for heightened internalizing as well as externalizing problems, adolescents were more likely to 'act out' than 'withdraw' in reaction to increases in overreactive parenting.

In addition to these independent effects of child personality and parenting, we also found that child personality interacted with maternal overreactivity in the prediction of adjustment problems. In *Chapter 3* we found that in a context of consistently low levels of maternal overreactivity, overcontrollers were more likely than resilients to belong to an internalizing problem trajectory, whereas at high overreactivity they were not. It thus appears that overreactivity was associated with better adjustment for overcontrolling children. We found some similar associations in the associations between parenting and child personality: Although maternal warmth and support were overall associated to positive child outcomes, whereas hostility and overreactivity were associated with less positive outcomes, for those outcomes most related to inhibition and fearfulness, higher warmth and/or lower hostility appeared to be problematic. In toddlers, we found that fearfulness was related to increases in positive parenting, and in children, we found that maternal warmth predicted decreases in emotional stability. Related to our findings, inconsistent discipline has been shown to predict decreases rather than increases in child fearfulness (Lengua, 2006), and children whose parents acted understanding and helpful when they were frightened (i.e., warm and supportive), have been found to experience more internalizing problems (O'Neal & Magai, 2005).

It has been suggested that inhibited children elicit unduly gentle parenting which limits their exposure to challenging contexts, thereby increasing their fearfulness and anxiety (Bayer, Sanson, & Hemphill, 2006; Kiel & Buss, 2010). Fearful children have indeed been shown to experience more protective parenting, which predicted their later levels of internalizing problems (Bayer, Sanson, & Hemphill, 2006; Kiel & Buss, 2010; Kiel & Buss, 2011). Thus, we would like to stress that our findings should not be taken to indicate that parents need to be less warm and more inconsistent in handling fearful children. Rather, we would expect that it is very specific behavior that is producing the association, where parents keep children away from challenging circumstances, and especially parents who are warm and low on overreactivity may be likely to do so. Parents could help children to be exposed to these circumstances, while remaining warm, and gentle with their children.

Indeed, although overcontroller children were more likely to belong to the internalizing trajectory at low levels of overreactivity, this should not be taken to indicate that overcontrollers were worse off at low levels of overreactive parenting. At high levels of overreactivity, fewer overcontrollers belonged to the internalizing trajectory and more children belonged to the externalizing trajectory. Thus, maternal parenting interacted with child personality type in determining the nature of adjustment problems that children experienced. This finding indicates the importance of studying both internalizing and externalizing problems, as well as both personality and parenting.

Although it is useful to investigate which parent- and child characteristics are associated across development, because it may indicate which aspects are meaningfully associated, it does not inform us on the processes that give rise to these associations. Mother-child interaction at a micro-scale can be thought of as the proximal processes that give rise to the associations at a more macro-level scale. When investigating mother-child interaction, aspects of the interaction at a dyadic level may be important to take into account. Indeed, we found that investigating mother and child at a dyadic level is useful in terms of predicting child adjustment problems. Dyadic affective variability has for older children been found to be associated with lower levels of adjustment problems, indicating that affective variability may be an index of flexibility rather than dysregulation. In *Chapter 8*, we replicated a previous finding on dyadic affective variability in mother-toddler interaction, by showing that heightened dyadic affective variability in toddlers was associated with higher levels of internalizing and externalizing problems, and thus appears to be an indication of affective dysregulation in toddlers, rather than flexibility. We extend previous findings by showing that dyadic affective variability was differentially related to adjustment problems, dependent on the context of interaction, providing support for the notion that the impact of parent-child interaction processes may be specific to the domain of interaction (Grusec & Davidov, 2010).

To conclude, the findings in this dissertation provide support for ecological transactional theories of the etiology of child adjustment problems, which state that risk factors at multiple levels of a child's ecology continuously interact to determine risk for adjustment problems (Belsky & Jaffee, 2006).

Strengths and limitations

The studies in this dissertation have several strengths. First, we took both a variable-, and a person-centered approach, allowing us to look at temperament and personality stability and change from different angles. Second, we investigated personality and both warm, supportive parenting and overreactive, hostile parenting in association with both internalizing and externalizing problems. In doing so, we were able to show that parenting and personality were both associated with adjustment problems, that aspects of parenting, as well as specific dimensions of personality were differentially associated with each other, as well as differentially related to internalizing and externalizing problems. Third, we took a micro-

approach of studying mother and child as they interact across minutes, in addition to a macro-approach of studying associations between parent and child across months and years. Investigations over longer timespans are useful because they allow for the identification of which variables are meaningfully associated, whereas more micro-level investigations may inform us about the processes that give rise to these associations. Fourth, the longitudinal design allowed us to investigate how children develop over time. Although assessment times are usually arbitrarily chosen, it is important that they are sufficiently large to capture the change that you expect during the developmental period under study. Additionally they should be small enough, so that non-linear changes may be captured. The studies in this investigation specifically investigated shorter spaced-assessments for very young children, when development is likely rapid, and larger spaced assessments for older children. Fifth, we took a multi-informant approach. For toddlers, we included both observations and questionnaires, whereas for older children mother-, father-, and teacher-reports were available, as well as self-reports. Although most studies only include a single informant, the main advantage of a multi-informant approach is to diminish the influence of informant bias. Sixth, the advanced modeling techniques, based on latent variable frameworks, which were employed in this dissertation, have the advantage of taking measurement error into account.

In addition to these strengths, there are several issues that limit our findings. First, although the multi-informant approach of this dissertation can be considered a strength, it also presents with difficulties in deciding how multiple informants' reports should best be incorporated. A multitude of approaches are possible, which all have their own advantages and disadvantages. For instance, combining reports into latent constructs may reduce measurement error, but it may also obscure informant-specific information. Each informant's report may hold unique information, that may be lost (Tackett, 2011). Parents know the child well, and have most access to relevant information, but their frame of reference may not be clear. Teachers are better able to objectively compare the child to other children, but because they are not as close to the child, they may be limited in their access to relevant information. Especially when children reach adolescence and enter secondary school, where children only have limited contact with a single teacher, their added value may become limited.

Second, although the younger sample was deliberately oversampled for problem behavior to obtain a wider range of problems, the *FSPPD* sample was a community sample. We thus investigated adjustment problems in children who were generally low on adjustment problems. In line with the notion that adjustment problems are dimensional in nature, we think that this is a useful approach to uncovering the etiology of clinical problems. However, whether these findings in fact generalize to clinical samples, needs to be investigated as well.

It is important to note that although the statistical approaches employed in this dissertation (latent profile analysis, latent class growth analysis) provide more objective means to determine the number of classes, the choice of a final solution is still ultimately based on judgments made by the researcher. In fact, it has been stressed that although these statistical tests can be helpful in reaching a decision, theoretical considerations should always be considered most important (Nylund, 2007).

Finally, it is important to note that the studies in this dissertation are all correlational in nature. Correlational studies can never be assumed to uncover causal effects, because variables that were not measured may be responsible for producing the associations. They can however point us in the direction of specific constructs that may be important to investigate in experimental research for instance.

Future directions

As previously noted, research on temperament has yet to reach consensus on a framework that best describes temperament. As the Big Five model is so well-established in adults and adolescents, work tracing back its developmental origins in terms of temperament traits is being done, which may help to reach consensus on a model to describe the most important individual differences as they appear early in development (De Pauw & Mervielde, 2010 ; De Pauw, Mervielde, & Van Leeuwen, 2009; Shiner & Caspi, 2003). Indeed, although temperament has been proposed to be a heritable, biologically based core of individual differences that would become elaborated into personality across development, it is becoming clear that temperament and personality are more similar than different (Caspi, Roberts, & Shiner, 2005). For instance both are moderately heritable (Bouchard & Loehlin, 2001), and the five personality factors have emerged from parental ratings of children as young as age two (Lamb, Chuang, Wessels, Broberg, & Hwang, 2002), indicating that they both appear early in life. Our findings add to the notion that temperament and personality may be more alike than different. First, we found temperament types that were highly similar to the resilient-, undercontroller-, and overcontroller types often found in personality research. Additionally, we found that both temperament and personality changes were related to the parenting context. However, it would be interesting to assess both temperament and personality longitudinally in the same children, to investigate whether the parenting they receive is (or is not) more strongly linked to their personality change than to their temperament change.

In this dissertation we show that parenting is associated with inter-individual differences in *intra-individual changes* in temperament and personality. To investigate what is driving *mean-level changes* in childhood and adolescence for a population as a whole, other factors, which are more general to all children will need to be investigated. Some changes are likely attributable to maturation, such as increases in conscientiousness and benevolence in childhood. However, especially across the transition to adolescence, where most change is not directed at maturation, it is likely that contextual factors will play a role. Although the taking on of adult social roles can be ruled out as a possibility, Social Investment Theory (Roberts et al., 2005) may still be relevant in formulating predictions about which contextual factors could be important. As children transition to adolescence, they enter secondary school. As they suddenly gain much more responsibility over their own school work, and need to make new friends, they may be getting a taste of the adjustments they will need to make when transitioning to adulthood. However, at this age, children have not established a stable sense of identity, nor are they autonomous in their decision making (Galambos & Costigan, 2003). It

is likely that they do not feel that they are choosing to take on these new roles, and as a result are not motivated to change their behavior. The sense of investment that is of course central to Social Investment Theory (Roberts et al., 2005), can be expected to be lacking. Perhaps facing these changes, without being intrinsically motivated is especially stressful, leading children to become less rather than more mature. Future research could investigate these hypotheses.

Another issue that may be important to investigate further, is related to our finding that high warmth and low overreactivity appear to increase fearfulness and inhibition in children. We suspect that this is due to the fact that parents may have been unduly gentle, or overprotective. However, we did not investigate this. Other studies indeed indicate that overprotection is associated to increased internalizing problems for fearful children specifically (Bayer, Sanson, & Hemphill, 2006; Kiel & Buss, 2010). It will be important to include multiple dimensions of parenting, to investigate whether overprotective parenting is responsible for associations between high warmth, low overreactivity and fearfulness/emotional stability.

With regards to our studies that concerned the relation between temperament/personality and adjustment problems, most took the vulnerability perspective as a starting point, as has most research regarding this topic. In one study we specifically paid attention to an alternative model, i.e. the spectrum model (Widiger & Clark, 2000). However, it should be noted that the studies in this dissertation cannot specifically provide evidence for or against either of these models. Indeed, most research that has taken a vulnerability perspective, and investigated associations between personality and adjustment problems, cannot rule out the spectrum hypothesis (Tackett, 2006). Specific evidence for the notion that personality is a causal factor in the etiology of adjustment problems, could be found when personality is investigated from before adjustment problems have arisen. More specific support for the spectrum hypothesis comes from studies investigating factors that may cause both personality and adjustment problems. Personality and adjustment problems have for instance been found to share genetic variance (Gjone & Stevenson, 1997) and biological correlates (Nigg, 2000). Parenting may also be a common cause that warrants further attention (Van Leeuwen, Mervielde, De Clercq, & De Fruyt, 2006).

In addition to the vulnerability and spectrum models, there are other models that should be considered as well: the scarring hypothesis states that once adjustment problems arise, they may alter personality, and the pathoplasty association states that the course of adjustment problems may be affected by personality (Tackett, 2006). In short, more prospective longitudinal research is necessary to uncover what the relative contribution of these pathways to associations between personality and adjustment problems are, as they likely all play a role to a certain extent.

Finally, we showed that child temperament/personality and parenting are interrelated factors in the etiology of internalizing and externalizing adjustment problems. Because changes in child personality and parenting are coupled, we would expect that intervening on either would change the other. Most success would likely be achieved when including both parents and children. With regards to parenting it may be most successful to focus on increasing

positive parenting, in addition to reducing negative parenting. For inhibited children the focus may lie specifically on teaching parents to provide exposure to challenging situations while remaining warm and consistent. Our findings are correlational, and intervention studies, which can be considered (quasi-) experimental, may uncover whether these processes are causal factors in the etiology of adjustment problems.

General conclusion

In line with the notion that temperament and personality may be more similar than different, the investigations of personality configurations in this dissertation showed that three types best described configurations of both temperament in toddlerhood, and (multiple informants' reports of) personality in childhood: a typical/resilient type that was well-adjusted, a fearful/overcontrolled type that experienced internalizing problems, and an expressive/undercontrolled type that exhibited externalizing problems. Taking a different person-centered approach, we identified a small group of children, with increasingly extreme personality configurations, who experienced heightened levels of internalizing and externalizing problems in adolescence. Although personality types usually do not add much predictive value over dimensions, the probability of belonging to this increasingly extreme group was predictive of adjustment problems, above and beyond levels of the personality dimensions.

Our investigation of temperament and personality development further showed that, although temperament traits are only moderately stable in toddlerhood, temperament profiles are highly stable at this age already. Although *profile stability* was high in toddlerhood, we found *mean-level changes* in all Big Five personality dimensions from childhood to emerging adulthood. Interestingly, children temporarily became *less* rather than *more* mature across the transition to adolescence. Although changes were small, we found that they were associated with internalizing and externalizing adjustment problems in adolescence. Additionally, we found that children differed in the degree of temperament and personality change.

The inter-individual differences in temperament and personality (change) were associated with parenting, with more associations to warm/supportive parenting than to hostile/overreactive parenting. In line with conclusions based on associations between personality and relationship quality, we found that child temperament/personality was more important in determining parenting behavior, than vice versa. However, most evidence was found for associated change, indicating that if either the child or the parent changes, the other changes in order to adjust. In addition to being associated with temperament and personality change, parenting predicted adjustment problems in children, both independently and in interaction with child personality. Finally, we found that when mother-child interaction was characterized by a high degree of variability in affective expressions, children experienced more internalizing and externalizing problems.

In conclusion, the findings of this dissertation indicate that children's temperament/personality configurations are highly stable, but that mean-level changes in dimensions do

occur. Additionally, children differ in the degree of both profile and mean-level change. Inter-individual differences in changes in temperament/personality and parenting are associated, and together are important in determining a child's risk for internalizing and externalizing adjustment problems.

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|Summary|

The overall aim of this dissertation was to examine how child temperament and personality change, what the role of parenting is in explaining these changes, and how child temperament/personality and parenting together predict child internalizing and externalizing problems. Four notions guided the investigation: (1) Person-, and variable centered approaches to child temperament and personality are complementary in nature and may each provide unique information; (2) Although stable by definition, child temperament and personality are subject to maturation and experience, and can thus be considered as developing; (3) The parenting that children experience is an important context for their developing temperament and personality, and may drive individual differences in temperament/personality change; (4) Child temperament/personality and parenting are interrelated factors in the etiology of child adjustment problems.

The results of this dissertation are based on two longitudinal samples. The first was a sample of toddlers whose mothers filled out questionnaires about their temperament and adjustment problems, and about their own parenting behavior, four times across one year. At each assessment time, observer reports were also available. The second was a sample of children who were assessed five times across eleven years, covering an age range of six to twenty years of age. Mother-, father-, teacher-, and child self-reports of personality and adjustment problems, as well as both mother-, and father reports of their own parenting behavior were available.

In this dissertation, we took both a person-, and a variable-centered approach to the study of temperament and personality. With regards to the person-centered approach, we investigated both temperament- and personality types. We showed that the personality types often found in research on personality in older children (i.e., a resilient/well-adjusted type, an overcontrolled type that experiences internalizing problems, and an undercontrolled type that exhibits externalizing problems) are also present in temperament configurations in toddlerhood, and that they can be obtained from multiple informants' reports of personality in childhood.

Additionally, we examined how temperament and personality change during two important developmental transitions: toddlerhood and the transition from childhood to adolescence. We investigated stability of temperament types in toddlers, and showed that, although temperament traits are only moderately stable in toddlerhood, temperament types are highly stable at this age already. Taking a different person-centered approach, we identified a small group of children whose personality configurations became increasingly extreme across development. These children experienced heightened levels of internalizing and externalizing

problems in adolescence. Although personality types usually do not add much predictive value over dimensions, the probability of belonging to this increasingly extreme group was predictive of adjustment problems, above and beyond levels of the personality dimensions. In addition to investigating the development of personality configurations, we examined mean-level changes of the personality dimensions across childhood and adolescence. We found *mean-level changes* in all Big Five personality dimensions from childhood to emerging adulthood. Interestingly, children temporarily became less mature across the transition to adolescence, i.e. mean levels of extraversion, benevolence, conscientiousness, emotional stability and imagination decreased across the transition to adolescence, with levels of benevolence, conscientiousness and imagination increasing again from mid-adolescence onwards. In addition to mean-level changes for the population as a whole, we found individual differences in personality change. Although changes were small, we found that decreases in extraversion and emotional stability across the transition into adolescence were predictive of internalizing problems, and that decreases in benevolence, conscientiousness and emotional stability were predictive of externalizing problems.

Whereas mean-level development of temperament and personality may be due to general maturation, or to experiences that similarly affect a population of children (e.g., transition to secondary school, developmental task of increasing autonomy), individual differences in development may occur due to contextual factors that are more specific to the individual. Results of our studies showed that inter-individual differences in temperament and personality (change) were associated with parenting, with more associations found for warm/supportive parenting than for hostile/overreactive parenting. Child temperament/personality was more important in determining parenting behavior (“child effect”), than vice versa (“parent effect”). However, most evidence was found for associated change (“parallel processes”), indicating that if either the child or the parent changes, the other changes in order to adjust.

Finally, we investigated how child temperament and personality are interrelated with parenting in the etiology of internalizing and externalizing adjustment problems. We found that, in addition to being associated with temperament and personality change, overreactive parenting predicted heightened adjustment problems in children, both independently and in interaction with child personality. Additionally, we investigated parent-child interaction processes as they unfold in real time, and found that when mother-child interaction was characterized by a high degree of variability in affective expressions, children experienced more internalizing and externalizing problems.

In conclusion, the findings of this dissertation indicate that children’s temperament/personality configurations are highly stable, but that mean-level changes in dimensions occur. Additionally, children differ in the degree of both profile and mean-level change. Inter-individual differences in changes in temperament/personality and parenting are associated, and together are important in determining a child’s risk for internalizing and externalizing adjustment problems.

| Samenvatting – Summary in Dutch |

In deze dissertatie is onderzocht hoe temperament en persoonlijkheid ontwikkelen tijdens de kindertijd en de adolescentie, hoe opvoeding aan deze ontwikkeling gerelateerd is, en hoe temperament/persoonlijkheid van het kind, samen met opvoeding, aanpassingsproblemen kunnen voorspellen. De vier belangrijkste uitgangspunten waren: (1) Persoons- en variabele-gerichte methoden kunnen worden gezien als complementair; (2) Hoewel per definitie stabiel, zijn temperament en persoonlijkheid onderhevig aan biologische groei en contextuele invloeden, en kunnen dus bestudeerd worden als ontwikkelingsprocessen; (3) De opvoeding is een belangrijke context voor ontwikkeling in temperament en persoonlijkheid van kinderen, en kan individuele verschillen in temperament- en persoonlijkheidsverandering verklaren; (4) Temperament/persoonlijkheid van het kind en de opvoedcontext zijn onderling gerelateerde factoren in de ontstaansgeschiedenis van aanpassingsproblemen in de kindertijd en de adolescentie.

De resultaten van deze dissertatie zijn gebaseerd op data van twee longitudinale studies. De eerste was een steekproef van peuters voor wie de moeders vier keer tijdens een periode van één jaar, vragenlijsten invulden over het temperament en de mate van aanpassingsproblemen van hun kinderen, en over hun eigen opvoedgedrag. Voor elke meting waren ook rapportages beschikbaar gebaseerd op observaties van moeder en kind. De tweede was een steekproef van kinderen voor wie vijf metingen over een periode van elf jaar beschikbaar waren. Moeders, vaders, leerkrachten, en kinderen rapporteerden over de persoonlijkheid en de aanpassingsproblemen van het kind, en beide ouders rapporteerden over hun opvoedgedrag.

In deze dissertatie is gekozen voor zowel een persoons-, als een variabele-gerichte aanpak om temperament en persoonlijkheid te bestuderen. Ten aanzien van de persoons-gerichte aanpak werden zowel temperament- als persoonlijkheidstypes onderzocht. De resultaten van deze studies toonden aan dat drie types de beste beschrijving vormden van zowel temperament bij peuters, als rapportages van meerdere informanten van persoonlijkheid in de kindertijd: een regulier/veerkrachtig type dat weinig aanpassingsproblemen had, een angstig/overgecontroleerd type met verhoogde niveaus van internaliserende problemen, en een expressief/ondergecontroleerd type dat externaliserend probleemgedrag vertoonde.

Daarnaast onderzochten we hoe temperament en persoonlijkheid veranderen gedurende twee belangrijke transities in de ontwikkeling: de peutertijd en de transitie van de kindertijd naar de adolescentie. We bestudeerden de stabiliteit van temperament types bij peuters, en toonden aan dat, hoewel temperamentkenmerken nog slechts matig stabiel zijn bij peuters, temperament profielen al zeer stabiel zijn op deze leeftijd. Met behulp van een

andersoortige persoonsgerichte aanpak, toonden we aan dat een kleine groep kinderen in toenemende mate gekenmerkt wordt door een extreme persoonlijkheidsconfiguratie. Deze kinderen ervoeren meer internaliserende en externaliserende problemen in de adolescentie. Hoewel persoonlijkheidstypes meestal niet veel voorspellende waarde toevoegen aan de persoonlijkheidsdimensies, was de kans om tot deze steeds extremer wordende groep te behoren, voorspellend voor aanpassingsproblemen bovenop de niveaus van de persoonlijkheidsdimensies. Naast de ontwikkeling van persoonlijkheidsconfiguraties, onderzochten we de gemiddelde ontwikkeling in persoonlijkheidsdimensies gedurende de kindertijd en de adolescentie. We vonden niveauveranderingen in alle 'Big Five' persoonlijkheidsdimensies. Interessant was dat de persoonlijkheid van kinderen tijdelijk niet meer maar minder volwassen werd gedurende de transitie naar de adolescentie: niveaus van extraversie, vriendelijkheid, consciëntieusheid, emotionele stabiliteit en vindingrijkheid namen af gedurende de transitie naar de adolescentie, waarna niveaus van vriendelijkheid, consciëntieusheid, en vindingrijkheid weer toenamen vanaf het midden van de adolescentie. Naast niveauveranderingen in de persoonlijkheidsdimensies voor de groep als geheel, vonden we individuele verschillen in de mate van verandering. Hoewel de veranderingen klein waren, vonden we dat afnames in extraversie en emotionele stabiliteit tijdens de transitie naar de adolescentie geassocieerd waren met meer internaliserende problemen, en dat afnames in vriendelijkheid, consciëntieusheid en emotionele stabiliteit geassocieerd waren met meer externaliserende problemen in de adolescentie.

Naast deze veranderingen in gemiddelde niveaus van temperament en persoonlijkheid, toonden de resultaten van onze studies aan dat verschillen tussen kinderen in de mate van temperament- en persoonlijkheidsverandering geassocieerd waren met de opvoeding die kinderen ervaren. We vonden meer associaties voor warm/ondersteunend opvoedgedrag dan voor vijandig/overreactief opvoedgedrag. Temperament/persoonlijkheid van het kind was een belangrijkere voorspeller van opvoedgedrag dan andersom. Echter, de meeste evidentie werd gevonden voor geassocieerde veranderingen; Zodra het kind of de ouder verandert, past de ander zich aan door mee te veranderen.

Ten slotte onderzochten we hoe temperament en persoonlijkheid van het kind, samen met opvoeding, determinanten vormen voor internaliserende en externaliserende problemen. We vonden dat overreactief opvoedgedrag en temperament/persoonlijkheid van het kind aanpassingsproblemen bij kinderen voorspelden, zowel onafhankelijk van elkaar als in onderlinge interactie. Hiernaast onderzochten we ouder-kind interactieprocessen zoals deze zich voordoen in 'real-time'. We vonden dat wanneer moeder-kind interacties gekenmerkt werden door hogere variabiliteit van emotionele expressies, kinderen meer internaliserende en externaliserende problemen vertoonden.

Concluderend tonen de bevindingen van deze dissertatie aan dat temperament/persoonlijkheidsconfiguraties een hoge mate van stabiliteit vertonen, terwijl gemiddelde niveaus van de dimensies veranderen. Verder verschillen kinderen in de mate van zowel configuratie-, als niveauveranderingen, zijn inter-individuele verschillen in temperament/persoonlijkheidsveranderingen en veranderingen in opvoeden aan elkaar gerelateerd, en

samen belangrijk in het bepalen van het risico dat een kind loopt op internaliserende en externaliserende problemen.

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| Curriculum Vitae |

Alithe van den Akker was born May 25th, 1982, in Utrecht. She graduated from high school in 1999 (Christelijk Gymnasium in Utrecht). In 2000, she obtained her propaedeutics in Dutch language and literature from Utrecht University. After finishing the second year of this study, she worked a full-time job for a year, to gain work-experience. In 2002, she started her studies in Psychology, and obtained a (research) master's degree *development and socialization in childhood and adolescence* in 2008. She graduated cum laude, on a thesis examining how changes in personality across the transition to adolescence, in relation to overreactive parenting, are predictive of adolescent adjustment problems. In September 2008, she started working at the research group of Clinical Child and Family Studies at Utrecht University. From then on, until March 2013, Alithe wrote her dissertation on the interrelated development of child temperament/personality and parenting as determinants of internalizing and externalizing adjustment problems. During her PhD training, she gained teaching experience as a lecturer in a course aimed at academic writing skills, and a supervisor of master's theses. She will continue her career working as a Post-Doc at the University of Amsterdam.

| Publication list |

Manuscripts in this dissertation

- Van den Akker, A. L.,** Deković, M., Asscher, J. J., Prinzie, P., & Granic, I. (2013). Affective variability in mother-toddler dyads: Domain-specific relations to child adjustment problems. *Manuscript submitted for publication.*
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