



# Empathy in adolescence

Jolien van der Graaff

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**Layout** Renate Siebes, Proefschrift.nu  
**Printed by** Ridderprint, Ridderkerk  
**ISBN** 978-90-393-6131-3

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# **Empathy in adolescence**

## **Empathie in de adolescentie**

(met een samenvatting in het Nederlands)

### **Proefschrift**

ter verkrijging van de graad van doctor aan de  
Universiteit Utrecht op gezag van de rector magnificus,  
prof.dr. G.J. van der Zwaan, ingevolge het besluit van het  
college voor promoties in het openbaar te verdedigen  
op vrijdag 16 mei 2014 des ochtends te 10.30 uur

door

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geboren op 12 september 1977

te Bruinisse

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A grayscale microscopic image of plant tissue, showing a network of cell walls and large, irregularly shaped cells. The image is used as a background for the page.

# 1

General introduction

Empathy, the ability to understand and to share another's emotional state, is seen as a fundamental social skill that underlies various capabilities and behaviors. Empathy may, for instance, foster positive social behavior (Eisenberg & Miller, 1987) and inhibit harmful behavior towards others (Feshbach & Feshbach, 2009; Miller & Eisenberg, 1988). The current dissertation investigates empathy in adolescence. Although the basis of empathy is already established in early childhood, several cognitive, relational, and physical changes take place during adolescence which may impact the ability or tendency to take others' perspectives and to experience feelings of concern (Hoffman, 2000; Selman, 1980). In particular, it has been suggested that empathy development might undergo a temporary decline due to cognitive and physiological changes that go together with puberty (Blakemore & Choudhury, 2006). This suggested dip in the development of empathy shows striking similarities with the developmental trajectories of adolescents' antisocial behavior and parent-adolescent relationships. Antisocial behaviors, such as skipping school, vandalizing property, and engaging in aggressive behavior, tend to increase during adolescence with a peak in middle adolescence (Meeus, Branje, & Overbeek, 2004). During that same period, the parent-adolescent relationship is characterized by a temporary incline in conflicts and a decline in warmth and closeness (Branje, Laursen, & Collins, 2013). Empathy is believed to be an important factor in helping adolescents to refrain from antisocial behavior (Davis, 1996; Miller & Eisenberg, 1988), and also relates positively to the quality of adolescents' relationship with their parents (e.g., Heller et al., 2007; Miklikowska et al., 2011). Changes in adolescents' tendencies to empathize with others may thus play a role in the temporary increase in antisocial behavior and in the decrease in parent-adolescent relationship quality.

Yet, despite the growing attention in current research to the role of empathy in social behavior, there is relatively little longitudinal research investigating the development of empathy, as well as its antecedents and consequences in adolescence. Moreover, although researchers increasingly recognize that the construct of empathy in fact comprises motor, affective, and cognitive processes (e.g., Batson, 2009; Davis, 1996; Hoffman, 2000), little is known about the interrelations of these, and about their potential differential associations with adolescents' social adjustment.

The general aim of this dissertation is to extend our understanding of empathy development in adolescence, to investigate its role in adolescents' social behavior, and to explain individual differences in adolescents' empathy. The first aim of the current dissertation is to study the interrelations of motor, affective, and cognitive empathy-related processes, as well as the association between adolescents' general tendency to empathize with others (i.e., trait empathy) and their empathic responses elicited in concrete situations (i.e., state empathy). The second aim is to investigate the development of empathy across adolescence,

and the role of pubertal status in this development. The third aim is to examine the role of empathy, and its interaction with parent-adolescent relationship quality, in predicting adolescents' aggressive and delinquent behavior. The fourth aim is to examine the role of adolescents' resting respiratory sinus arrhythmia (RSA), as a marker of dispositional self-regulation, and of parent-adolescent relationship quality in predicting adolescents' empathy and antisocial behavior.

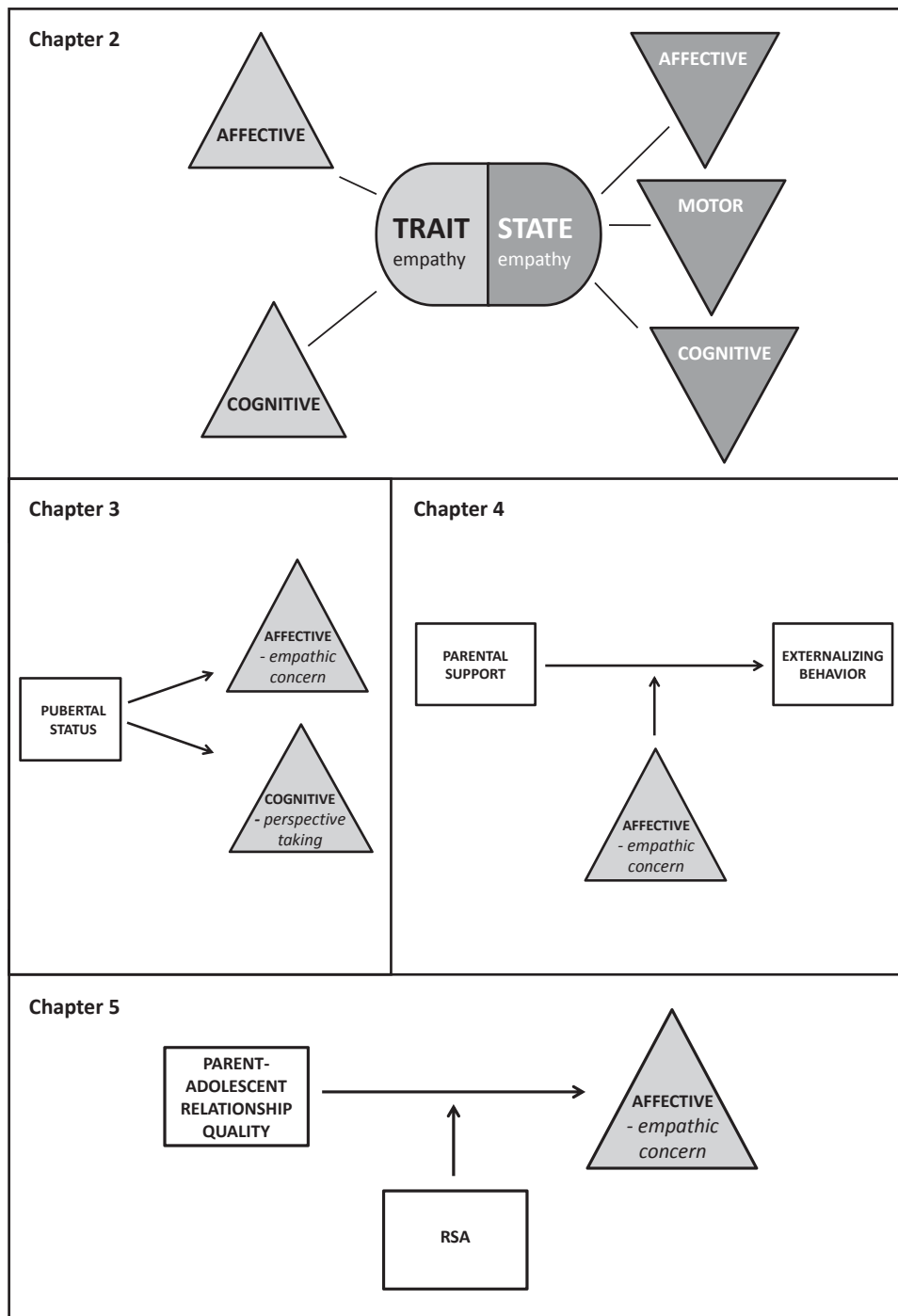
## The multidimensional nature of empathy

### Dimensions of empathy

The nature and definition of empathy is a topic of ongoing debate. In the literature, the term empathy has been applied to many different phenomena. Whereas some scholars have considered empathy primarily as a cognitive phenomenon (e.g., Wispé, 1986), others have defined it primarily as an affective phenomenon (e.g., Eisenberg & Strayer, 1987; Hoffman, 2000). Currently, most scholars agree that empathy should be seen as a complex multidimensional construct (see Figure 1.1), involving cognitive, affective, and motor processes that all concern responses of one individual to the experiences of another (see Davis, 1996, 2006; Decety & Jackson, 2004).

*Cognitive empathy* refers to the perspective taking processes that an individual uses to imagine the other's situation in order to understand what the other is feeling, and is closely related to processes involved in theory of mind (Davis, 1983; Decety, 2010). Emotion recognition and mentalizing are also considered aspects of cognitive empathy.

*Affective empathy* refers to an emotional response that stems from another's emotional state or condition and is congruent with the other's emotional state or condition (Eisenberg, Shea, Carlo, & Knight, 1991, pp. 65). Affective empathy, which is thought to involve at least some differentiation between self and other (Eisenberg, Spinrad, & Morris, 2013; Hoffman, 2008) should be distinguished from pure emotional contagion, which concerns the catching of another's emotion, and may occur without a distinction between one's own emotions and the emotions of the other (Hatfield, Cacioppo, & Rapson, 1994). Two constructs that are closely related to, or may stem from affective empathy, are empathic concern and personal distress. Empathic concern, or sympathy, refers to the emotional response based on the apprehension of another's emotional state or situation. It is an other-oriented emotion, consisting of feelings of sorrow or concern for the other, and is considered to involve affective empathy but also cognitive processing (Eisenberg, Shea et al., 1991). Another type of emotional response that



**Figure 1.1** The dimensions of empathy, and schematic overview of studies described in the chapters of this dissertation.

may stem from affective empathy is personal distress. Especially in response to another's *negative* emotions, the observer may experience an aversive reaction, such as discomfort, anxiety, or worry. This personal distress, in contrast to empathic concern, is a self-oriented emotion (Eisenberg, Shea et al., 1991; Hoffman, 1982).

*Motor empathy* refers to the automatic mimicking of others' facial expressions, voices, gestures or postures (e.g., Dimberg, 1990; Dimberg, Thunberg & Elmehed, 2000). These mimicry processes are thought to be a determinant of emotional contagion (Hatfield et al., 1994). Motor empathy not only involves automatic mimicry, but may also comprise facial expressions induced by vicarious emotional experiences (Dimberg & Thunberg, 2012; Lundqvist & Dimberg, 1995). Positive emotions typically evoke an increase in activity of the zygomaticus major muscle (involved in smiling), and negative emotions typically evoke an increase in activity of the corrugator supercilii muscle (involved in frowning) (e.g., Lundqvist, 1995; Lundqvist & Dimberg, 1995). Facial electromyography (EMG) is a highly sensitive method to measure these motor responses. Even facial muscle activity that remains under the visual detection threshold can be detected with use of EMG, and, due to the good time resolution, rapid changes in muscle activity can be reliably measured (Van Boxtel, 2010).

Furthermore, besides the distinction between cognitive, affective, and motor processes that play a part in empathy, it is important to distinguish between empathy as a stable dispositional characteristic, or an individual's general tendency to empathize with others (i.e., trait empathy), and empathy as it occurs in specific situations (i.e., state empathy) (see Figure 1.1). According to Davis' (1996) organizational model of empathy, affective and cognitive trait empathy are among the personal factors that influence the likelihood to engage in empathy-related processes in particular situations. However, state empathy may also depend on contextual or interpersonal factors. For instance, past experience, and familiarity may also affect the extent to which an individual shows empathy in a given situation (Hoffman, 2000).

### **Interrelations of empathy dimensions**

Despite the general consensus that empathy is a complex multidimensional construct, encompassing motor, affective and cognitive processes, and involving trait and state empathy, research on empathy in adolescence has mainly focused on self-reported trait empathy. Hence, little is known about the interrelations of these different processes that are assumed to play a part in empathic responding.

Motor, affective, and cognitive empathy are generally assumed to be interrelated, although there is ongoing debate about the underlying mechanisms and the direction of relationships. Whereas some theorists have proposed motor empathy to underlie affective

empathy, which in turn would facilitate cognitive empathy, others have stressed the importance of cognitive empathy for individuals to be able to experience affective empathy, or in particular, empathic concern.

According to the first perspective, motor empathy is a relatively automatic and rather non-cognitive process (Hoffman, 1984), resulting in emotional contagion, or the tendency to converge emotionally with others (Hatfield et al., 1994). According to the perception-action model of empathy (Preston & De Waal, 2002), observation of someone's emotional state leads to motor mimicry, and subsequently to an affective and cognitive empathic response. Similarly, the facial feedback hypothesis asserts that facial muscle activity resulting from the automatic mimicking of others' emotional expressions induces corresponding emotions in the observer through a feedback process. In turn, this affective empathy should facilitate emotion understanding, and thus cognitive empathy (Hatfield et al., 1994; Hoffman, 1984; Lipps, 1907). This perspective thus suggests that motor empathy evokes affective empathy, and that affective state empathy mediates the association between motor empathy and cognitive state empathy.

According to the second perspective, to experience affective empathy, individuals need to be able to label others' emotional states and to understand others' perspectives (Feshbach, 1978; Hoffman, 1984). Especially the more advanced forms of affective empathy, such as empathic concern, are assumed to involve sophisticated cognitions regarding the emotional state of the other, implying that cognitive empathy leads to affective empathy (Decety, 2007; Eisenberg, Shea, Carlo, & Knight, 1991). Similarly, according to Davis' organizational model, motor empathy and cognitive state empathy are the mechanisms that produce several outcomes, one of which is affective empathy (Davis, 1996; 2006). Hence, this perspective suggests that both motor empathy and cognitive state empathy induce affective state empathy.

The empirical literature is also limited with regard to studies on the associations between the trait and state dimensions of empathy. According to Davis' (1996) organizational model of empathy, individual differences in both affective and cognitive trait empathy influence the likelihood to engage in empathy-related processes in particular situations, and thus trait empathy should be positively related to state empathy. Yet, it also has been argued that people lack "metaknowledge" regarding their empathic abilities. Therefore, individual differences in self-reports of trait empathy may not be consistently related to empathic performance in a given situation (Davis & Kraus, 1997; Ickes et al., 2000).

In Chapter 2 a multi-method design is adopted to study the relations between adolescents' trait and state empathy. In this study we included not only assessments of affective and cognitive trait empathy, but also assessments of motor empathy (facial electromyography), and affective and cognitive state empathy in response to both happiness and sadness (see Figure 1.1).

## Empathy development in adolescence

### Changes in capacities

Although the first signs of empathy are apparent in infancy, the capacity to show both affective and cognitive empathy is thought to develop well into adolescence. Even in the first days of life infants show a primitive form of empathy in their capability to detect and imitate others' emotions and in their emotional arousal in response to others' distress, which suggests a biological predisposition to empathize with others (Hoffman, 2000; Meltzoff & Decety, 2003; Trevarthen & Aikten, 2001). The emotional contagion experienced by infants may provide a mechanism by which empathy develops, but it is not until the second year of life that children come to understand that others are separate beings, which is needed to make the shift from self-concern in response to others' distress to an other-directed empathic response (Hoffman, 2000; Zahn-Waxler & Radke-Yarrow, 1990). As children develop, they become increasingly aware of other people's feelings and that other's perspectives may differ from their own. This, in combination with language development and a growing understanding of the causes, consequences, and correlates of emotions, is believed to facilitate the ability to show empathic concern in more complex situations and in response to a wider range of emotions throughout childhood and adolescence (Hoffman, 2000).

According to Hoffman (2000), during adolescence perspective taking capacities should increase, due to the growing awareness of others as persons with stable histories and identities, which provides adolescents with the ability to consider chronic aspects of the others' life beyond the immediate situation. In addition, increasing interactions with peers are believed to help adolescents to develop the ability to "step outside" an interaction and to simultaneously consider self and other perspectives from a third person view, which also should facilitate the development of perspective taking (Selman, 1980). In line with these theories assuming an ongoing development of cognitive empathy during adolescence, neurobiological research revealed that the neural circuits involved in emotion understanding and theory of mind still undergo maturation until late adolescence (see Decety, 2010). Thus, although a primitive form of affective empathy is already present in infancy, the cognitive component of empathy is believed to follow a protracted course of development well into adolescence, which in turn is expected to facilitate the development of mature affective empathy during adolescence (Batson, 2009; Hoffman, 2000).

Besides these cognitive advances, changes in self-regulation may also play a role in adolescents' development of empathy. To be able to take someone else's perspective and to show empathic concern, individuals need to modulate their own thoughts and their own negative

vicarious emotion. Self-regulation allows one to inhibit one's own perspective in order to evaluate the perspective of another. Moreover, self-regulation prevents empathic overarousal induced by the vicarious experiencing of another's emotion, which may bring about a self-focused, aversive reaction instead of feelings of concern for the other. Especially individuals who are high in negative emotionality and low in self-regulation are assumed to be prone to overarousal (Decety & Jackson, 2004; Eisenberg & Eggum, 2009). Self-regulatory abilities emerge in early childhood and gradually improve over childhood and adolescence (Zelazo, Craik, & Booth, 2004). However, despite a steady increase in the ability to control one's thoughts and emotions during adolescence, which may facilitate growth in empathic abilities, it has been suggested that neurodevelopmental changes in affective processing in mid-adolescence temporarily challenge adolescents' (not yet fully developed) self-regulation capacities. This may result in stagnated growth or even a dip in empathy (Blakemore & Choudhury, 2006; Crone & Dahl, 2012).

To conclude, adolescents' capacity to take others' perspectives and to show empathic concern is thought to increase during adolescence due to advances in meta-cognition and in self-regulation, although challenged self-regulation may result in stagnated growth.

### **Changes in motivation**

Theories on the development of empathy in adolescence have mainly focused on the development of the *capacity* to empathize with others. However, especially in adolescence when a considerable basis of empathy is already established, it is important to consider that possessing a capacity does not ensure that this capacity is used (Davis & Franzoi, 1991). Adolescents' *actual performance* in taking others' perspectives and showing empathic concern may not only be influenced by the development of their cognitive abilities, but also by changes in their motives and interests. In particular, the social and physiological changes that go together with pubertal development are believed to induce alterations in adolescents' motivation and emotions, which are likely to affect socio-cognitive development (see Steinberg, 2005). On the one hand, the increasing importance of the opinions and evaluations of peers, as well as the growing interest in intimate relationships may promote other-oriented thoughts and emotions, and may therefore foster the tendency to empathize with others (Fabes, Carlo, Kupanoff, & Laible, 1999). On the other hand, as adolescents' bodies mature, gender-specific socialization pressures strengthen, which may result in increased adherence to gender stereotypical behavior. Whereas girls may be encouraged to show emotional and caring behavior, boys may be encouraged to inhibit these kinds of behavior (Fabes et al., 1999; Hill & Lynch, 1983). In this way, pubertal maturation may for girls go together with an increase in empathy, but for boys with a decrease in empathy.



Thus, the extent to which adolescents tend to show empathy can be expected to change during adolescence due to cognitive maturation, the development of emotion regulation, and motivational changes induced by puberty. In addition, developmental patterns may be different for boys and girls. However, there has been little longitudinal research on the development of empathy during adolescence and differential developmental patterns for boys and girls haven't been addressed. Chapter 3 describes a study in which we investigate the development of boys' and girls' tendency to show cognitive empathy (i.e., perspective taking) and affective empathy (i.e., empathic concern) from age 13 to 18, and the role of pubertal status in this development (see Figure 1.1).

## The role of empathy in social adjustment

### Empathy and externalizing behavior

Empathy is for multiple reasons expected to be negatively related to externalizing problems, such as aggression and delinquency (see Miller & Eisenberg, 1988), although the associations may differ between the cognitive and affective component of empathy. According to the social information processing model aggressive children show hostile attribution biases and deficits in anger encoding and interpretation (Crick & Dodge, 1994; Orobio de Castro et al., 2002). *Cognitive* empathy might reduce these hostile attributions (Lemerise et al., 2005). Further, according to Feshbach's (Feshbach & Feshbach, 2009) cognitive-affective model of empathy, both *cognitive* and *affective* empathy are important in inhibiting aggressive behavior. First, the ability to discriminate and label the emotions of others is a precondition to take others' needs into account. Second, the ability to examine a conflict situation from the perspective of the other should foster the use of positive problem solving techniques instead of destructive ones. Third, responsiveness to others' negative emotions should function as an inhibitor of aggression. The observation of a victim's pain and distress may lead to the sharing of these negative emotions in an empathic observer, which should motivate to increase the victim's wellbeing by stopping the harmful behavior (Feshbach & Feshbach, 2009). In contrast, based on an evolutionary perspective, Blair's (1995) violence inhibition model suggests in particular *affective* empathy to play an inhibitory role in aggression. According to this model, humans (as well as most social animals) possess mechanisms for the control of aggression. This violence inhibition mechanism is selectively activated by the observation of expressions of fear or sadness, which induces an aversive emotional response, resulting in withdrawal and the interruption of aggressive behavior.

Empirical evidence with regard to the association between *cognitive* empathy and aggression is mixed. Some studies indeed found a negative association (e.g., Mayberry & Espelage, 2007), but others found no significant association (e.g., Batanova & Loukas, 2013), or even found higher perspective taking to be related to higher relational aggression (e.g., Batanova & Loukas, 2011). It has been argued that heightened cognitive empathy may not inhibit, but even facilitate certain forms of aggressive behavior. In particular proactively aggressive adolescents (e.g., bullies), may use their perspective taking skills to manipulate others and to inflict suffering in subtle ways, while they lack the ability or willingness to feel compassion or concern for others (Sutton, Smith, & Swettenham, 1999a, 1999b).

Whereas the literature is equivocal regarding the role of cognitive empathy in externalizing behavior, the theoretical assumption that *affective* empathy inhibits antisocial behavior, tends to be supported by empirical research (see Lovett & Sheffield, 2007, for a review). However, the literature on this topic is still limited by the predominance of cross-sectional studies and the use of male samples. Therefore, Chapter 4 describes the results of a study investigating the longitudinal association between adolescents' affective empathy (i.e., empathic concern) and externalizing behavior.

### **The moderating role of empathy**

Despite the attention to the potential protective effects of empathy on the development of externalizing behavior, only few studies have taken into account that the effects of empathy on adolescents' adjustment may also interact with environmental influences. Supportive relationships with parents have been found important in preventing adolescents from developing aggressive and delinquent behavior (see Branje et al., 2008). However, positive parent-adolescent relationships may influence some children more than others due to individual differences in responsiveness to socialization efforts (Belsky, 1997; Boyce & Ellis, 2005). Adolescents low in particularly *affective* empathy may care less about having warm and affective relationships (Lahey, Waldman, & McBurnett, 1999) and may be less sensitive to the communicatory signals that are given by others' emotional expressions (Blair, 2003), which may result in a lower responsivity to socialization practices. Results from studies in clinical samples indeed found that for children who lack empathy, parenting was unrelated to externalizing behavior (e.g., Edens, Skopp, & Cahill, 2008; Oxford, Cavell, & Hughes, 2003; Wootton, Frick, Shelton, & Silverthorn, 1997). Only few studies have addressed the interactive effects of empathy and the quality of the parent-child relationship in community samples, and results are inconsistent (e.g., De Kemp, Overbeek, De Wied, Engels, & Scholte, 2007; Miller, Johnston, & Pasalich, 2013). Therefore, besides addressing the direct effects of empathic

concern and parental support on adolescents' adjustment, the study described in Chapter 4 also investigates whether empathic concern moderates the longitudinal association between parental support and adolescents' aggressive and delinquent behavior (see Figure 1.1).

## Explaining individual differences in empathy

### Parent-adolescent relationship

Parental socialization is seen as an important source of influence on the development of empathy. In interaction with parents, the child gains its first experience with the way the child's own and others' emotions are handled (Zahn-Waxler & Radke-Yarrow, 1990), but also in adolescence warm and supportive relationships with parents may contribute to greater empathy in several ways. According to social learning theory, supportive parents, who are sensitive to their children's needs and emotions, show their children that they are willing to take their perspective and to sympathize with their feelings. In this way, they provide their children with a role model for empathic skills (Barnett, 1987). Similarly, according to attachment theory, adolescents whose emotional needs are satisfied by supportive caregiving, may be less preoccupied with their own emotions and concerns and therefore be better able to be responsive to others' emotions (Bowlby, 1980; Eisenberg, Spinrad, & Morris, 2013; Van der Mark, Van IJzendoorn, & Bakermans-Kranenburg, 2002). Moreover, according to Hoffman (1970, see Eisenberg & Valiente, 2002), a warm parent-child relationship provides an optimal environment for the socialization of moral emotions and cognitions. In the context of a supportive relationship, children are more likely to attend to their parents and to be responsive to their parents instructions than are children in the context of a less supportive relationship. Further, whereas a supportive parent-adolescent relationship is expected to facilitate empathy development, negative interaction between parent and adolescent may discourage adolescents to take others' perspective and to show concern for others. A relationship with parents which is characterized by hostility and negative affect may contribute to difficulties in emotion regulation and to lower levels of empathy (Eisenberg & Valiente, 2002; Morris, Silk, Steinberg, Myers, & Robinson, 2007). However, whereas several (mostly cross-sectional) studies have investigated the association between supportive parenting and adolescents' empathy (e.g., Laible & Carlo, 2004; Laible, Carlo, & Roesch, 2004; Miklikowska et al., 2011; Soenens et al., 2007), the effects of negative interaction in the parent-adolescent relationship on adolescents' empathy has received little attention (but see Batanova & Loukas, 2012). Chapter 5 presents the results of a study in which we address the longitudinal effects

of adolescents' perceived parental support and the negativity they experience in the relation with their parents on adolescents' empathic concern (see Figure 1.1).

## **Self-regulation**

Besides characteristics of the parent-adolescent relationship, an individual characteristic that may explain individual differences in adolescents' empathy is self-regulation. Self-regulation is seen as a vital component of empathy. Individuals who are well-regulated are thought to maintain optimal levels of arousal in response to others in distress, which allows them to inhibit their own perspective in order to evaluate the perspective of another, and to experience feelings of concern for another instead of experiencing overarousal as a result of their own negative vicarious emotion (Eisenberg & Eggum, 2009). Hence, individuals high in self-reported self-regulation indeed have been found to report more perspective taking and empathic concern (e.g., Eisenberg, & Okun, 1996; Eisenberg, Fabes et al., 1994; Okun, Shepard, & Eisenberg, 2000).

Resting respiratory sinus arrhythmia (RSA) is seen as a physiological index of self-regulation. RSA, as the high frequency component of heart rate variability, is mainly determined by vagal influences on the heart and therefore provides an index of parasympathetic activity (Berntson et al., 1997). Resting RSA is considered to reflect the degree to which an individual is able to respond flexibly to changes in the internal and external environment (Porges, 1995; Thayer & Lane, 2000). In addition, the vagus is, in safe situations, suggested to function as a brake, which slows heart rate by increasing the parasympathetic influence on the heart, resulting in an enhanced ability to attend to the environment. Hence, high resting RSA can be expected to facilitate the tendency to show empathy. However, the link between resting RSA and empathy-related responding has less often been studied, and results of the few studies are inconsistent (e.g., Eisenberg et al., 1996; Diamond, Fagundes, & Butterworth, 2012; Oveis et al., 2009). Chapter 5 presents the results of a two-wave longitudinal study in which we examine in a community sample of adolescents whether resting RSA at age 17 predicts empathic concern one year later.

In addition, resting RSA may also function as a moderator in the association between environmental influences and adolescents' social adjustment, although theories about the nature of this potential interaction are diverging. On the one hand, it has been suggested that resting RSA functions as a protective factor (Beauchaine, 2001; Thayer & Lane, 2000). Some studies indeed found resting RSA to buffer the impact of adverse environmental influences on children's social adjustment (e.g., El-Sheikh, 2005; Gordis et al., 2010). On the other hand, in line with differential susceptibility theory and the notion of biological sensitivity-to-context

(e.g., Belsky, 1997; Boyce & Ellis, 2005), individuals high in resting RSA may, because of their more active engagement with the environment (Beauchaine, 2001; Thayer & Lane, 2000), be more sensitive to environmental influences than adolescents low in resting RSA. Thus, in line with the first perspective, adolescents high in resting RSA can be expected to show relatively high levels of empathic concern, even if they experience negative environmental influences, whereas adolescents low in resting RSA may show lower empathic concern, especially in the context of negative environmental factors. In line with the second perspective, adolescents' low in resting RSA are expected to be rather unaffected by environmental influences, whereas adolescents high in resting RSA would show higher empathic concern in the context of positive environmental influences and lower empathic concern in the context of negative environmental influences.

Only few studies have tested the interactive effects of resting RSA and environmental influences on adolescents' adjustment, and moreover, the majority of these studies have only investigated the effects of potential *negative* contextual influences. Further, to the best of our knowledge, there are no studies that investigated the effects of resting RSA and environmental influences on empathy. Therefore, besides examining the direct effects of resting RSA on both adolescents' empathic concern and externalizing behavior, the study in Chapter 5 also investigates the interactive effects of resting RSA with both perceived parental support and negative interaction with parents on adolescents' empathic concern and externalizing behavior (see Figure 1.1).

## The current dissertation

### Data

To extend the understanding of empathy development in adolescence and its role in adolescents' social functioning, the current dissertation describes four empirical studies. In these studies, data are used from two Dutch longitudinal samples focusing on adolescents' relationships and problem behavior. The study in Chapter 4 on the moderating role of empathy in the association between parental support and adolescents' antisocial behavior, uses data of the ongoing CONflict And Management Of Relationships project (Meeus et al., 2004), in which adolescents were followed during annual measurement waves in adolescence and during ongoing follow-up assessments in early adulthood. In this dissertation, data are used of the two consecutive measurement waves of the CONAMORE family study during which empathy was assessed, consisting of 323 adolescents (aged 14 years at Time 1) from

Dutch two-parent families. Participants, recruited from various high schools in Utrecht and surroundings, annually completed a series of questionnaires at schools. Adolescents of the CONAMORE family study participated in additional annual home visits, during which (among other assessments) empathy was measured.

The studies in Chapter 2, 3, and 5 use data of the young cohort of the ongoing project Research on Adolescent Development and Relationships (RADAR Young; Van Lier et al., 2011), in which 497 adolescents were followed during 6 annual measurement waves from age 13 on. Each year adolescents, their families and best friends completed a series of questionnaires during a home visit. Currently, the participants have entered early adulthood and are involved in biennial follow-up assessments. The longitudinal study in Chapter 3 on gender differences and developmental changes in perspective taking and empathic concern, uses 6-wave questionnaire data of the RADAR Young sample on adolescents' empathy from age 13 to age 18.

The studies in Chapter 2 and Chapter 5 use data of a subsample from RADAR Young of 379 adolescents who, in addition to the questionnaire assessments of the RADAR project, also participated in a test session at the university around the time of measurement wave 5 (age 17). During this test session, participants first watched a 5-minute relaxation video, and second, watched empathy eliciting film clips interspersed with 1-minute fragments of the relaxation video. Self-reported empathic responses to the empathy eliciting film clips were assessed, and in addition, facial electromyography (EMG) and the electrocardiogram (ECG) were continuously recorded while participants watched the relaxation film clip and the emotional film clips. The cross-sectional study in Chapter 2 on the interrelations of trait and state empathy measures uses data of facial EMG measures and self-reported measures assessed during the test session, and questionnaire data on trait empathy assessed during the fifth measurement wave of RADAR. The two-wave longitudinal study in Chapter 5 on the moderating role of resting respiratory sinus arrhythmia (RSA) in the relation between parent-adolescent relationship quality and social adjustment, uses ECG data recorded while participants watched the relaxation video during the test session, and questionnaire data of the fifth and sixth RADAR measurement wave on adolescents' relationships with their parents, empathy, and antisocial behavior.

## **Outline**

The first aim of this dissertation is to study the interrelations of motor, affective and cognitive state empathy in response to both happiness and sadness, and to investigate the associations of trait affective empathy (i.e., empathic concern) and trait cognitive empathy (i.e., perspective

taking) with adolescents' state empathy. Chapter 2 describes the cross-sectional multi-method study that addresses this aim.

The second aim is to investigate how trait empathy develops during adolescence. To address this aim, Chapter 3 presents the results of a longitudinal six-wave study in which gender differences and developmental changes in perspective taking and empathic concern are investigated from age 13 to age 18. The role of pubertal status in the development of perspective taking and empathic concern is also addressed in Chapter 3.

The third aim is to examine whether adolescents' empathy and the support they perceive to get from their parents predict adolescent's aggressive and delinquent behavior, and moreover, whether adolescents' high in empathy are more responsive to parental support than are adolescents low in empathy. Chapter 4 describes a two-wave study investigating the associations of empathy and parental support at age 14 with adolescents' aggression and delinquency at age 15, and the moderating role of empathy in the association between parental support and adolescents' antisocial behavior.

The fourth aim, to address factors that may explain individual differences in adolescents' empathy, is described in Chapter 5. The two-wave longitudinal study investigates whether adolescents' resting RSA, as a marker of dispositional self-regulation, and parent-adolescent relationship quality at age 17, are predictive of adolescents' empathy and antisocial behavior one year later. Moreover, the study investigates whether resting RSA plays a moderating role in the association between environmental influences (i.e., parent-adolescent relationship quality) and adolescents' social adjustment.





A grayscale microscopic image of plant cells, showing a network of cell walls and large, irregularly shaped cells. The image is used as a background for the document cover.

# 2

## Motor, affective and cognitive empathy in adolescence: Interrelations between facial EMG and self-reported trait and state measures

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Motor, Affective and Cognitive Empathy in Adolescence: Interrelations Between Facial EMG  
and Self-Reported Trait and State Measures. *Manuscript submitted for publication.*

## **Abstract**

This study examined interrelations of trait and state empathy in an adolescent sample. Self-reported affective and cognitive trait empathy were assessed during a home visit. During a test session at the university, motor empathy (facial electromyography), and self-reported affective and cognitive state empathy were assessed in response to empathy-inducing film clips portraying happiness and sadness. Adolescents who responded with stronger motor empathy consistently reported higher affective state empathy. Adolescents' motor empathy was also positively related to cognitive state empathy, either directly or indirectly via affective state empathy. Whereas trait empathy was consistently but modestly related to state empathy with sadness, for state empathy with happiness few trait-state associations were found. Together the findings provide support for the notion that empathy is a multi-faceted phenomenon. Motor, affective and cognitive empathy seem to be related processes, each playing a different role in the ability to understand and share others' feelings.

## Introduction

Empathy-related responding is thought to play an important role in adolescents' prosocial behavior and moral development (Hoffman, 2000; Eisenberg & Miller, 1987). Empathy is not a single ability, but a complex multi-dimensional construct. Empathy involves affective, cognitive, and motor processes (Davis, 1996). Affective empathy refers to the vicarious experience of emotions consistent with those of the observed person (Cohen & Strayer, 1996; Hoffman, 2000) and often results in sympathy, or empathic concern, which involves feelings of sorrow or concern for another and is an other-directed emotional response. Cognitive empathy, or perspective taking, can be defined as the ability to understand others' emotions (Davis, 1983). Motor empathy refers to the automatic mimicking of others' facial expressions, voices and gestures (e.g., Dimberg, 1990; Dimberg, Thunberg & Elmehed, 2000), but motor empathy may also comprise facial expressions induced by vicarious emotional experiences (Dimberg & Thunberg, 2012; Lundqvist & Dimberg, 1995). Positive emotions typically evoke an increase in activity of the zygomaticus major muscle (involved in smiling), and negative emotions typically evoke an increase in activity of the corrugator supercilii muscle (involved in frowning) (e.g., De Wied, Van Boxtel, Matthys, & Meeus, 2012; Larsen, Norris, & Cacioppo, 2003; Lundqvist & Dimberg, 1995). In addition to the distinction between affective, cognitive, and motor processes, empathy can also be distinguished in terms of trait and state empathy. Trait empathy is the general ability to show empathy, whereas state empathy is the transient affective reaction elicited in concrete situations. Although these different empathy-related processes are assumed to be related to one another (Batson, 2009), there is a lack of empirical research studying these processes simultaneously.

We examined the interrelations of empathy-related processes in adolescence, which is generally seen as a formative period for empathy development. Although an important basis is established in childhood, several cognitive, relational and physical changes that take place during adolescence might affect the capacity or tendency to show empathy (Hoffman, 2000; Selman, 1980; Van der Graaff, Branje, De Wied, Hawk, Van Lier, & Meeus, 2013). Research on empathy in this age period has almost exclusively employed self-report measures of trait empathy, but it is unclear how these are related to the more objective state empathy measures. The current study aimed to investigate in a comprehensive manner the interrelations of adolescents' motor, affective, and cognitive responses to empathy-eliciting film clips, and to test whether adolescents' reports of trait empathy are related to these state empathy-related responses.

### **Interrelations of motor, affective, and cognitive state empathy**

Although motor, affective, and cognitive state empathy are generally assumed to be interrelated, the underlying mechanisms are still a topic of debate. Several theorists have proposed motor empathy to underlie affective empathy, which in turn would facilitate cognitive empathy. Motor empathy is seen as a relatively automatic and rather non-cognitive process (Hoffman, 1984), resulting in emotional contagion, or the tendency to converge emotionally with others (Hatfield et al., 1994). According to the perception-action model of empathy (Preston & De Waal, 2002), observation of someone's emotional state leads to motor mimicry, and subsequently to an affective and cognitive empathic response. Similarly, the facial feedback hypothesis asserts that the facial muscle activity resulting from the automatic mimicking of others' emotional expressions induces corresponding emotions in the observer through a feedback process. In turn, this affective empathy should facilitate emotion understanding, and thus cognitive empathy (Hatfield et al., 1994; Hoffman, 1984; Lipps, 1907). Thus, from a theoretical perspective, the observation of emotional states can be expected to elicit motor empathy, and positive associations can be expected between motor, affective, and cognitive state empathy. Moreover, affective empathy may mediate the association between motor empathy and cognitive state empathy.

Searching the literature, we found no studies that simultaneously investigated motor, cognitive, and affective state empathy, although the separate relations have been investigated in several studies. Positive but weak associations between motor empathy and affective state empathy were found when visual coding techniques were used to assess motor empathy (Anastassiou-Hadjicharalambous & Warden, 2007; Eisenberg, Fabes, Miller et al., 1989; Eisenberg et al., 1994; Chisholm & Strayer, 1995; Zhou et al., 2002). However, when facial EMG was used to detect motor empathy, results were inconsistent and seemed dependent on the intensity of the emotional stimuli (Lundqvist & Dimberg, 1995; Blairy, Herrera, & Hess, 1999; Hess & Blairy, 2001). Further, the relation between motor and cognitive state empathy has only been examined for emotion recognition, which is just one aspect of cognitive empathy, and results are inconsistent (e.g., Hess & Blairy, 2001; Sato, Fujimura, Kochiyama, & Suzuki, 2013; Stel & Van Knippenberg, 2008). Thus, results of previous studies on the interrelations of motor, cognitive and affective state empathy are inconsistent and are difficult to interpret due to different methods to assess motor empathy (visual coding techniques versus facial EMG) and the use of different kind of stimuli (empathy eliciting film clips portraying emotions in a natural context versus pictures of posed facial expressions). The fact that the studies that used film clips portraying emotions in true to life situations mainly used visual coding techniques (e.g., Eisenberg et al., 1994), whereas the studies that used pictures of posed

emotional expressions mainly used facial EMG to assess motor empathy (e.g., Lundqvist & Dimberg, 1995), makes it even harder to integrate previous findings. A major limitation of the first category of studies is that visual coding techniques are a less reliable method to assess motor empathy than is facial EMG, with which also visually undetectable motor responses can be assessed (Van Boxtel, 2010). A drawback of the second category of studies is the use of posed emotional stimuli, which are less ecologically valid than are stimuli portraying natural emotions, and thus may constitute a weaker empathy eliciting stimulus (McLellan, Johnston, Dalrymple-Alford, & Porter, 2010). Therefore, we aimed to extend the literature by investigating the interrelations of motor, affective, and cognitive state empathy to empathy-eliciting film clips portraying natural expressions of happiness and sadness in true to life contexts, using the highly sensitive facial EMG technique to assess motor empathy.

### **Associations between trait empathy and state empathy**

Besides the expected associations between empathy-related processes in a given situation, or the *state* empathy responses, it is a common assumption that people who have in general a higher tendency to empathize with others, and thus are higher in *trait* empathy, are also higher in *state* empathy. According to Davis' (1996) organizational model of empathy, individual differences in both affective and cognitive trait empathy influence the likelihood to engage in empathy-related processes in particular situations, and thus trait empathy should be positively related to state empathy.

However, as was the case for previous research on state empathy interrelations, the empirical literature with regard to associations between trait and state empathy is fragmented due to a lack of comprehensive studies and a use of different methodologies, and results are inconsistent. With regard to associations of trait empathy with motor empathy, respondents who reported higher affective trait empathy were found to show more pronounced facial EMG activity in response to pictures of posed facial emotion expressions (Dimberg & Thunberg, 2012; Sonnby-Borgström, 2002; Sonnby-Borgström, Jönsson, & Svenson, 2003) and in response to film clips of humans and animals in distressing situations (Westbury & Neumann, 2008), than respondents who reported lower affective trait empathy. However, when motor empathy was assessed with visual coding techniques, results on the association between affective trait empathy and motor empathy in response to empathy inducing film clips were inconsistent (Eisenberg et al., 1988; Fabes, Eisenberg, Eisenbud, 1993). With regard to the relation between cognitive trait empathy and motor empathy, respondents who reported high cognitive trait empathy mimicked postures and movements of a confederate more often (Chartrand & Bargh, 1999), but did not show more motor empathy (measured with facial EMG) in response to film

clips portraying emotional expressions (Achaibou, Pourtois, Schwartz, & Vuilleumier, 2008) than respondents reporting low cognitive trait empathy. However, the latter study used a measure to assess trait empathy, which not purely assesses cognitive empathy, but mixes it with affective trait empathy (Baron-Cohen & Wheelwright, 2004). Thus, the empirical literature is inconsistent with regard to the associations of affective and cognitive trait empathy with motor empathy, and the results appeared to vary by method.

Whereas there is a lack of studies on the associations between trait empathy and cognitive state empathy, several studies investigated the associations of affective or cognitive trait empathy with affective state empathy. Positive relations between affective trait empathy and affective state empathy were found in several studies (Batson, Bolen, Cross, & Neuringer-Benefiel, 1986; Eisenberg, Miller et al., 1989; Eisenberg et al., 1988; Eisenberg et al., 1994; Westbury and Neumann, 2008; but see Eisenberg et al., 1991). Results on the association between cognitive trait empathy and affective state empathy are less clear. In one study a positive association was found (Eisenberg et al., 1988), but in other studies the association was non-significant (Eisenberg et al., 1994), only significant for girls (Eisenberg, Miller et al., 1989) or only significant in a condition in which respondents were explicitly instructed to imagine how the protagonist of an empathy evoking film clip felt and to concern oneself with the protagonist's feelings (Eisenberg et al., 1991). Thus, most of the research on the link between affective trait empathy and affective state empathy revealed positive relations, but for the relation between cognitive trait empathy and affective state empathy results are inconclusive.

Thus, as was the case for previous research on state empathy interrelations, the empirical literature on associations between trait and state empathy is fragmented due to a lack of comprehensive studies and the use of different methodologies. Despite the common assumption that people high in trait empathy are more likely to engage in empathy-related processes in particular situations, previous research revealed inconsistent results, especially with regard to cognitive trait empathy.

### **The present study**

The current study extends past research on the relations between trait and state empathy by including assessments of affective and cognitive trait empathy as well as motor empathy, and affective and cognitive state empathy. Furthermore, we included assessments of state empathy in response to both happiness and sadness. Although previous empathy research has mainly focused on empathy with others' sadness or distress, empathy is not restricted to these emotions (Hoffman, 1982). Evidence from the limited available research including

other emotions suggests that cognitive and affective empathic responses to one emotion are not equivalent to empathic responses to another emotion (e.g., Duan, 2000; Eisenberg et al., 2001; Zhou et al., 2002). Therefore, we examined the relationships separately for each emotion.

Although, due to our correlational design, we cannot address questions regarding causality, our comprehensive approach allowed us (1) to investigate whether motor, affective, and cognitive state empathy indeed are interrelated, and (2) to explore whether our data yield support for a model in which affective state empathy mediates the relation between motor empathy and cognitive empathy, and (3) to investigate the relations of adolescents' trait empathy scores (affective and cognitive) to state empathy responses. Further, based on previous research suggesting that the relations between measures of empathy-related responding may differ between boys and girls (e.g., Anastassiou-Hadjicharalambous & Warden, 2007; Eisenberg et al., 1988), we used multi-group models to explore the associations for boys and girls separately, and to test for sex differences in the associations. We also tested for sex differences in levels of empathy across all measures.

## Method

### Participants

The present study used data from the ongoing RADAR (Research on Adolescent Development and Relationships) project. Adolescents participating in RADAR were recruited from randomly selected schools in the province of Utrecht and four cities in The Netherlands. Participants of the current study were 379 adolescents who participated in a test session at the university and completed questionnaires during a home visit. Of the original 382 adolescents who participated in the test sessions, data of three participants were lost due to technical problems or experimenter error, and thus the sample consisted of 379 adolescents of which 212 boys ( $M$  age = 17.04,  $SD$  = .46) and 167 girls ( $M$  age = 16.94,  $SD$  = .41). The majority of the adolescents was native Dutch (95.8%), lived with both parents (78.4%), and came from families classified as medium or high socioeconomic status (91.8%).

### Procedure

**Home visit.** During a home visit, adolescents filled out a battery of questionnaires, among which a self-report measure on trait empathy. A trained research assistant provided verbal

instructions in addition to written instructions that accompanied the questionnaires. Parents provided written informed consent before adolescents participated in the home visit. Adolescents received 30 Euros for their participation in the home visit.

**Test session.** Adolescents visited the university to participate in an individual test session during which self-reported and physiological responses to emotional film clips were assessed. Parents and adolescents both provided written informed consent before the adolescent participated in the test session. The session took place in a testing room equipped with a personal computer and a 17-inch computer screen (HP 1730) to present the stimulus material and to record participants' self-reported responses to the film clips. An adjacent observation room with a one-way mirror, through which the experimenter could observe the participant, was equipped with a personal computer for online monitoring of physiological data collection. Both computers were connected to a portable digital recorder for the preprocessing and storage of physiological data (Vitaport III, TEMEC Instruments B.V., Kerkrade, The Netherlands), which was attached to the participant's chair. A trained female experimenter, who followed a written protocol detailing the verbal instructions and electrode placement, received the participant. After familiarizing the participant with the procedure, electrodes were attached for EMG and ECG recording and the participant was seated in a comfortable chair at a table facing the monitor of the stimulus computer (at approximately 90 cm distance). Participants were instructed to relax and watch a relaxation video (see below). Subsequently, the experimenter demonstrated the computerized empathy task using a mock film clip and gave instructions for completing ratings after each of six film clips (see below). The experimenter then dimmed the light and left the testing room after which the participant watched the film clips in randomized order and completed the questions after each film clip. EMG and ECG (ECG results not reported here) recordings were continuously made throughout the task. Adolescents received 50 Euros for their participation in the test session.

## Materials

**Emotional film clips.** During the test session, participants were exposed to empathy-inducing film clips, assembled from Dutch documentary films (De Wied et al., 2012). Two film clips represented happiness (i.e., a girl passing her finals, and a boy winning a song contest), and two film clips represented sadness (i.e., a girl sent to a boarding school, and a boy who is rejected to join a select soccer team). The film clips, varying in length between 153 and 172 s, each started with a voice-over sketching the situation and ended with a target scene in which the central figure portrayed intense facial and vocal expressions of the target emotion. Facial EMG responses during these target scenes were analyzed, varying in length between



35 and 56 s, and those during the first 10 s of the opening scene, which served as baseline value (see De Wied et al., 2012).

**Relaxation video.** Prior to the empathy task, participants viewed a 5-min fragment from an aquatic video (*Coral Sea Dreaming*, Small World Music, Inc.), which has been found to foster relaxation (Piferi, Kline, Younger, & Lawler, 2000). Prior to each film clip of the empathy task, participants also viewed a 1-min fragment from the same video to ensure recovery from emotional arousal induced by the previous film clip (different 1-min fragments of the aquatic video preceded different film clips).

## Measures

**Motor empathy.** Bipolar EMG recordings were made from the left zygomaticus muscle and left corrugator muscle, using surface Ag/AgCl electrodes (contact area 2 mm) filled with conductive paste. Signals were antialiasing filtered using a 512 Hz lowpass filter and were digitized at 1024 Hz. Offline, a 20 Hz highpass filter was used to remove movement artifacts from the data, and a 48–52 Hz bandreject filter was used to reduce influence of 50-Hz power line interference. Data were then visually inspected for remaining artifacts. In a small minority of participants, strong movement artifacts or 50-Hz interference appeared not to be completely removed which was resolved by additional filtering of the EMG signals. Mean EMG amplitude during the target scene of each film clip was expressed as a percentage of the mean amplitude during the baseline period because EMG amplitude is measured on a ratio scale. The resulting values were averaged across the two film clips associated with each emotion, resulting in a single value for zygomaticus and corrugator for each emotion.

**Self-reported state empathy.** A computerized procedure, adapted from Strayer's (1993) Empathy Continuum, was used to assess adolescents' affective and cognitive responses to the emotional film clips (De Wied, Goudena, & Matthys, 2005). After each film clip questions were asked about the quality and intensity of observed and experienced emotions. Based on participants' ratings a score on affective state empathy and cognitive state empathy was composed (see below). The prominent emotion in each clip was identified by almost all participants in the current study (ranging from 98.4% to 100%). Thus, individual differences in motor, affective, and cognitive responses to the film clips *cannot* be attributed to differences in emotion recognition.

**Affective state empathy.** Respondents identified the *quality* of the emotion expressed by the protagonist by marking through a mouse click one or more pictograms portraying: (1) fear, (2) anger, (3) happiness, (4) sadness, (5) surprise, or (6) neutral/no emotion. Next, respondents identified the *quality* of their own experienced emotions using the same pictograms (except

if they had chosen option 6). They were also asked to indicate the *intensity* of the emotion(s) they had experienced on a scale ranging from 1 ('a little') to 4 ('very much'). In the current study, affective state empathy responses refer to an exact match between observed and experienced emotions, scored on a 5-point scale (0 = no emotion, 4 = very much). Respondents received a 0 score if they identified the target emotion incorrectly and/or did not experience the target emotion. If the target emotion was correctly identified and experienced by the respondent, they received higher scores (1-4). Scores were averaged across the two film clips for each emotion. In response to the happiness clips, 62% of all respondents received a score higher than 0 on the affective state empathy scale. In response to the sadness clips 46.2% received a score higher than 0.

**Cognitive state empathy.** Following the questions on affective empathy, respondents were asked whether they felt happy or sorry (yes/no) for the protagonist. If they indicated "yes", they were asked to explain aloud why they sympathized. Cognitive attributions were collected after a sympathy (rather than affective empathy) rating because far more respondents report sympathy than empathy. In response to the happiness clips, 95% of all respondents reported that they felt happy for the protagonist. In response to the sadness clips 88.4% reported the felt sorry. Respondents' answers were recorded and coded by two trained coders.

In accordance to Strayer's (1993) Empathy Continuum, cognitive attributions were coded on an 8-point scale, based on developmental models of social cognition and empathy development (Hoffman, 1975; Hughes, Tingle, & Sawin, 1981). Respondents received a score 0 if they did not correctly identify the target emotion experienced by the protagonist. If participants identified the emotion correctly, but reported no sympathy (answer "no" to the question whether they felt happy/sorry for the protagonist) they received score 1. The presence of a sympathetic response, and a correct identification of the protagonist's emotion were necessary to get a score level 2 or higher on the cognitive state empathy scale: 2 = no or irrelevant attribution, 3 = attribution based on events only, 4 = minimal mention of the stimulus person in the event, 5 = attribution indicating association to own experience, 6 = attribution indicating responsiveness to character's internal state or general life situation, 7 = attribution indicating explicit role taking. Inter-scoring reliabilities between the two coders ranged from Cohen's kappa = .65 to .88 (mean  $\kappa$  = .76) across the four film clips. Scores on cognitive state empathy were averaged across the two film clips for each emotion.

**Self-reported trait empathy.** During the home visit, adolescents reported on their own empathic disposition, using two subscales of the Dutch version of the Interpersonal Reactivity Index (IRI; Davis, 1983; Hawk et al., 2013): empathic concern, which taps affective aspects

of empathy, and perspective taking, which taps cognitive aspects. Adolescents scored the items on a 5-point scale, ranging from 0 (*doesn't describe me at all*) to 4 (*describes me very well*). The Dutch version of the IRI has adequate internal consistency and validity (Hawk et al., 2013). The correlation between affective trait empathy and cognitive trait empathy was  $r = .52$  ( $p < .001$ ) in the current sample.

**Affective trait empathy.** The 7-item empathic concern subscale assessed adolescents' tendency to sympathize with others in need. A sample item of this subscale is "I often have tender, concerned feelings for people less fortunate than me". For the current sample Cronbach's alpha was .70.

**Cognitive trait empathy.** The 7-item perspective taking subscale assessed adolescents' tendency to consider others' viewpoints. A sample item of this subscale is "I try to look at everybody's side of a disagreement before I make a decision", For the current sample, Cronbach's alpha was .78.

### Missing data

Across all measures on average 4.4% (ranging from 0 to 6.6%) was missing. Little's Missing Completely at Random (MCAR) test revealed a normed  $\chi^2$  ( $\chi^2/df$ ) value of 1.34 indicating that the data were likely missing at random and missing values could safely be imputed (Bollen, 1989). The Expected Maximization (EM) algorithm in the Multiple Imputation module of LISREL9.1 was used to impute missing values. Imputed data of all 379 cases were used in further analyses.

### Statistical analyses

Before answering our research questions, we checked whether the emotional film clips evoked the expected facial muscle responses, using one-sample  $t$ -tests (two-tailed) on changes in zygomaticus and corrugator EMG activity from baseline level during target scenes. Further, repeated measures analyses of variance (ANOVAs) were conducted on these changes for each muscle with Emotion (Sad vs. Happy) as the repeated measures factor. Subsequently, we tested for sex differences on self-reported and facial indices, using independent samples  $t$ -tests. Eta squared values ( $\eta^2$ ) are reported as estimates of effect size, and can be classified as follows: no substantial ( $\eta^2 < .02$ ), small ( $.02 \leq \eta^2 < .13$ ), medium ( $.13 \leq \eta^2 < .26$ ), or large ( $\eta^2 \geq .26$ ) (see Cohen, 1988, pp. 413–414). To answer our first and second research question, path analyses were conducted using MPlus version 7 (Muthén & Muthén, 2012), in which we tested separately for happiness and sadness whether indices of state empathy (motor,

affective and cognitive) were interrelated. With regard to our first research question, we tested in these models whether motor empathy (zygomaticus EMG activity for happiness, corrugator EMG activity for sadness) was predictive of self-reported affective and cognitive state empathy in response to the stimuli. With regard to our second research question, we tested whether affective state empathy mediated the relation between motor empathy and cognitive empathy. To answer our third research question, we also tested in these models whether adolescents' affective and cognitive trait empathy predicted motor empathy, and affective and cognitive state empathy.

In addition, a series of nested multiple group models was examined to test for sex differences on each regression path. If the results of a chi-square difference test indicated that constraining a parameter did not deteriorate the model fit significantly, the parameter was assumed to be equal for boys and girls (Kline, 2005). Models were estimated using a robust maximum likelihood estimation method (Satorra & Bentler, 1994).

## Results

### Preliminary analyses

**Validity checks.** Figure 2.1 shows the facial EMG responses to the emotional film clips. To check whether the emotional film clips evoked the expected facial muscle response, one-sample *t*-tests on changes from baseline level during target scenes were conducted. Consistent with the literature (e.g., De Wied et al., 2012; Larsen et al., 2003) this revealed a significant increase in zygomaticus EMG activity,  $t(378) = 14.36, p < .001$  and a significant decrease in corrugator EMG activity,  $t(378) = -14.37, p < .001$ , in response to film clips portraying happiness. Corrugator activity increased significantly in response to film clips portraying sadness,  $t(378) = 14.46, p < .001$ . Zygomaticus activity also showed a significant increase in response to sadness,  $t(378) = 3.04, p < .01$ , but this increase was much smaller than that in corrugator activity. Furthermore, results from repeated measures ANOVAs showed exposure to happiness to evoke significantly stronger zygomaticus EMG responses than sadness:  $F_{\text{happiness vs sadness}}(1, 377) = 207.88, p < .001, \eta^2 = .36$ . In contrast, corrugator EMG activity increased stronger during sadness than during happiness:  $F_{\text{sadness vs happiness}}(1, 377) = 475.12, p < .001, \eta^2 = .56$ . Thus, the stimuli on average evoked the expected facial muscle responses.

**Sex differences in mean levels.** Descriptive statistics for boys' and girls' facial EMG responses to the emotional film clips are presented in Table 2.1. Independent *t*-tests revealed for happiness no significant sex differences in mean zygomaticus EMG responses, although boys decreased



**Figure 2.1** Boys' and girls' mean level (+ SE) of corrugator EMG activity (1a) and zygomaticus EMG activity (1b) for happiness and sadness.

significantly less in corrugator EMG activity than girls. For film clips portraying sadness, there were no sex differences in corrugator or zygomaticus EMG activity.

Results in Table 2.1 show that girls reported significantly higher mean levels of affective state empathy than boys in response to happiness ( $\eta^2 = .05$ ) and sadness ( $\eta^2 = .06$ ). In addition, girls' cognitive state empathy in response to happiness ( $\eta^2 = .05$ ), and sadness ( $\eta^2 = .04$ ) was significantly higher than boys' cognitive state empathy. Results in Table 2.1 also show that girls reported significantly higher levels of affective trait empathy ( $\eta^2 = .18$ ) and significantly higher levels of cognitive trait empathy ( $\eta^2 = .06$ ) than boys (see Table 2.1).

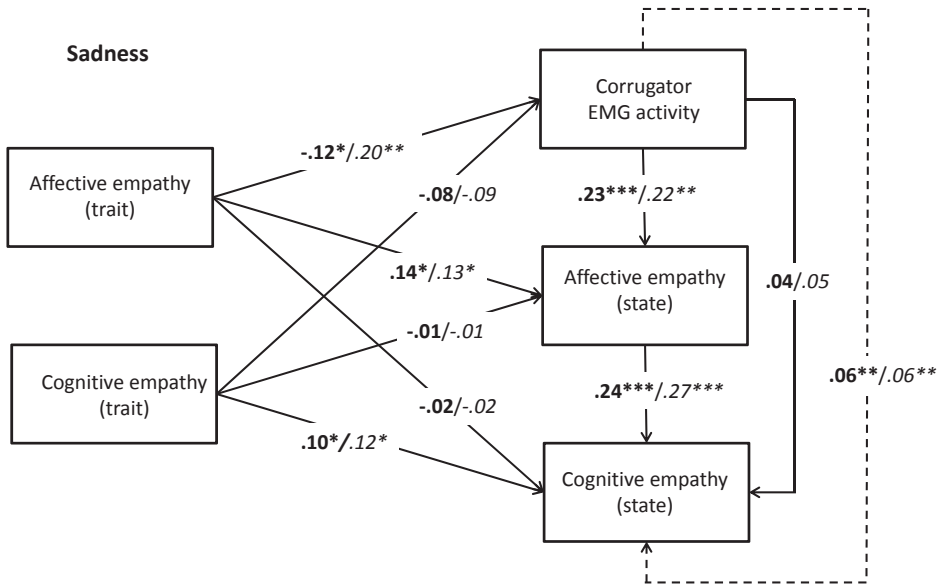
**Table 2.1** Mean scores for boys and girls on facial EMG and self-reported measures of empathy-related responding

	Total (N = 379)		Boys (n = 212)		Girls (n = 167)		Boys vs. Girls	
	M	SD	M	SD	M	SD	t	$\eta^2$
<b>State empathy</b>								
<b>Happiness</b>								
Zygomaticus EMG	174.07	100.39	167.74	94.82	182.10	106.79	-1.39	.01
Corrugator EMG	79.91	27.22	86.24	27.27	71.88	25.01	5.28***	.07
Affective state empathy	1.15	0.88	0.98	0.87	1.37	0.85	-4.40***	.05
Cognitive state empathy	4.79	1.25	4.55	1.29	5.11	1.13	-4.42***	.05
<b>Sadness</b>								
Zygomaticus EMG	104.59	29.38	106.12	28.09	102.64	30.92	1.15	.00
Corrugator EMG	128.29	38.08	128.03	38.50	128.62	37.64	-0.15	.00
Affective state empathy	0.68	0.74	0.52	0.70	0.90	0.73	-5.11***	.06
Cognitive state empathy	4.53	1.46	4.28	1.47	4.84	1.38	-3.79***	.04
<b>Trait empathy</b>								
Affective trait empathy	2.45	0.56	2.24	0.52	2.72	0.50	-9.01***	.18
Cognitive trait empathy	2.22	0.61	2.09	0.57	2.38	0.61	-4.86***	.06

Note. \*\*\*  $p < .001$ .

**Path analyses on interrelations of trait and state empathy-related measures**

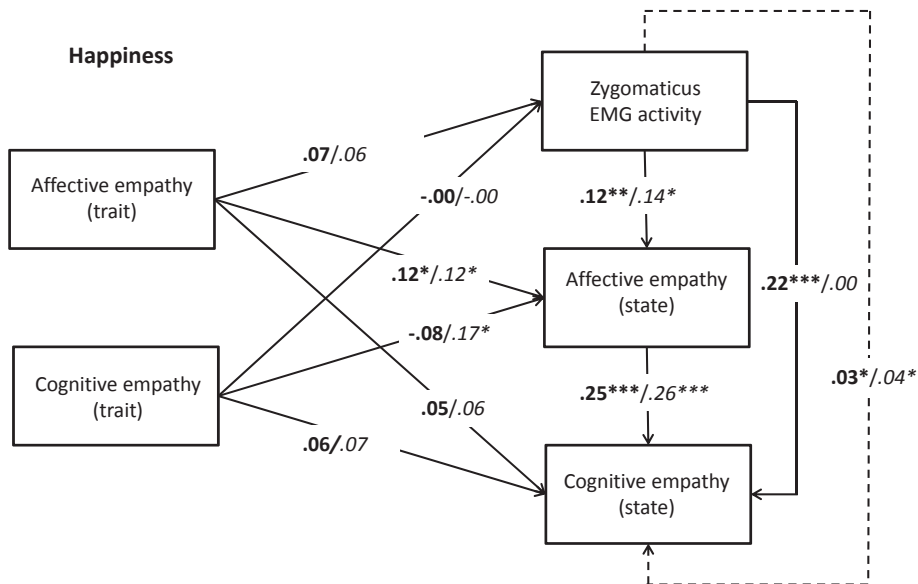
**Happiness.** Figure 2.2 shows the results of the final path model for happiness. Results of chi-square difference tests indicated that constraining across sex the estimates of the path between cognitive trait empathy and affective state empathy ( $\Delta\chi^2(1) = 6.74, p < .01$ ), and the path between motor empathy (zygomaticus EMG activity) and cognitive state empathy ( $\Delta\chi^2(1) = 9.82, p < .01$ ) worsened the model fit significantly. The fit of the final model in which these two paths were allowed to freely vary and all other paths were constrained to be equal across sex was good,  $\chi^2(7) = 2.78, p = .90, RMSEA = .00, CFI = 1.00$ . Boys' and girls' higher motor empathy (zygomaticus EMG activity) significantly predicted higher affective state empathy, and only for boys, higher motor empathy significantly predicted cognitive state empathy. For boys and girls, higher affective state empathy was significantly predictive for higher cognitive state empathy. Moreover, mediational analyses revealed a significant indirect effect of boys' and girls' motor empathy on cognitive state empathy, mediated by affective



**Figure 2.2** Standardized estimates of boys' (printed bold) and girls' (printed in italics) relations between trait empathy (affective and cognitive) and state empathy (motor, affective, cognitive) in response to film clips portraying happiness. Only the path from cognitive trait empathy to affective state empathy, and the path from motor empathy (zygomaticus EMG activity) to cognitive state empathy were allowed to freely vary across sex. All other paths were constrained to be equal between boys and girls. The dashed line represents the indirect effect of motor empathy (zygomaticus EMG activity) on cognitive state empathy, mediated by affective state empathy.  
 Note. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .

state empathy. Affective trait empathy and cognitive trait empathy were not significantly predictive for adolescents' motor empathy (zygomaticus EMG activity). However, higher affective trait empathy was significantly predictive for boys' and girls' higher affective state empathy. For girls, but not for boys, higher cognitive trait empathy significantly predicted higher affective state empathy. For both boys and girls, cognitive trait empathy was not significantly predictive for cognitive state empathy ( $p > .05$ ).

**Sadness.** Figure 2.3 shows the results of the final path model for sadness. Results of chi-square difference tests indicated that constraining the estimates of the path between affective trait empathy and motor empathy (corrugator EMG activity) across sex worsened the model fit significantly,  $\Delta\chi^2(1) = 8.21, p < .01$ . The fit of the final model in which this path was allowed to freely vary and all other paths were constrained to be equal across sex was good,  $\chi^2(8) = 5.85, p = .66, RMSEA = .00, CFI = 1.00$ . Boys' and girls' higher motor empathy (corrugator EMG activity) significantly predicted higher affective state empathy, and higher



**Figure 2.3** Standardized estimates of boys' (printed bold) and girls' (printed in italics) relations between trait empathy (affective and cognitive) and state empathy (motor, affective, cognitive) in response to film clips portraying sadness. Only the path between affective trait empathy and motor empathy (corrugator EMG activity) was allowed to freely vary across sex. All other paths were constrained to be equal between boys and girls. The dashed line represents the indirect effect of motor empathy (corrugator EMG activity) on cognitive state empathy, mediated by affective state empathy.

Note. \*  $p < .05$ , \*\*  $p < .01$ , \*\*\*  $p < .001$ .



affective state empathy significantly predicted higher cognitive state empathy. Further, although adolescents' motor empathy could not directly predict cognitive state empathy, mediational analyses revealed a significant indirect effect of adolescents' motor empathy on cognitive state empathy, mediated by affective state empathy. In addition, boys' affective trait empathy was negatively predictive for their motor empathy (corrugator EMG activity), but for girls higher affective trait empathy was predictive for higher motor empathy. Furthermore, for both boys and girls, higher affective trait empathy was predictive for higher affective state empathy, but not significantly predictive for cognitive state empathy. For both groups, cognitive trait empathy was not significantly predictive for motor and affective state empathy, but significantly predicted higher cognitive state empathy.

## Discussion

Using a multi-measure approach, the present study examined interrelations of state and trait measures of empathic functioning. Regarding state empathy, the study revealed that, for both happiness and sadness, adolescents who responded with stronger motor empathy consistently report higher affective state empathy, which supports the theoretical notion that motor and affective responses to others' emotional states are related (Hatfield et al., 1994; Preston & De Waal, 2002). Furthermore, in accordance with the facial feedback hypothesis (Hatfield et al., 1994; Hoffman, 1984; Lipps, 1907), motor empathy was positively related to cognitive state empathy, indirectly via affective state empathy. Positive relations between trait and state empathy were most consistently found for state empathy to sadness. To our knowledge, this study is the first to include facial EMG measurement of motor empathy together with trait and state measures of both cognitive and affective empathy. The findings of consistent, but modest associations, provide support for the notion of empathy as a multi-faceted phenomenon.

### Interrelations of state empathy measures

In line with our expectations, our findings revealed that motor empathy responses were consistently related to respondents' self-reported affective state empathy. Adolescents who showed stronger zygomaticus EMG activity in response to happiness and corrugator EMG activity in response to sadness, reported to have stronger experienced the observed emotion. Also, adolescents' motor empathy was positively related to cognitive state empathy, mediated by affective empathy. Although our correlational findings cannot confirm the theoretical

assertion that motor empathy *induces* the experience of the corresponding emotion, which in turn *facilitates* cognitive empathy, our findings reveal that motor, affective and cognitive responses to observed emotions are positively related, in line with theories on emotional contagion (Hatfield et al., 1994; Hoffman, 1984; Lipps, 1907). The fact that previous studies found no significant relation between motor empathy and emotion recognition (Blairy et al., 1999; Hess & Blairy, 2001), may be explained by two important methodological differences between our study and those previous studies. First, our measure of cognitive empathy not only concerned emotion recognition, but also cognitive attributions. Second, in the current study we used stimuli that portrayed natural emotions in true-to-life situations, whereas the previous studies used posed facial expressions (Blairy et al. 1999) or used an emotional imagery task (Hess & Blairy, 2001). Thus, our findings suggest that in response to natural emotions, motor empathy is modestly but significantly positively related to affective state empathy and indirectly to cognitive state empathy.

### **Associations between trait empathy and state empathy**

In line with Davis' (1996) organizational model of empathy, which suggests individual differences in trait empathy to affect the likelihood to engage in empathy-related processes in particular situations, we expected adolescents' trait empathy to be positively related to their motor, affective, and cognitive state empathy responses. With regard to motor empathy, we did not find strong evidence to support this notion. Only for girls, affective trait empathy was positively related to motor empathy in response to sadness. Remarkably, for boys, a negative relationship was found. Affective and cognitive trait empathy were not significantly related to motor empathy in response to happiness. Thus, we did not find strong support for a link between trait empathy and motor empathy. This is not inconsistent with previous research that also did not provide strong support for such a relation (e.g., Achaibou et al., 2008; Fabes et al., 1993; Sonnby-Borgström et al., 2003). Although differences in motor empathy between high and low affective trait empathy groups have been reported in studies using pictures of prototypical happy and angry facial expressions (Dimberg & Thunberg, 2012), in two studies such group differences were only significant at short stimulus exposure times during which the stimuli could hardly be consciously perceived (Sonnby-Borgström, 2002; Sonnby-Borgström et al., 2003). When participants were longer exposed to the stimuli so that they could be consciously perceived, group differences were not significant. Further, most of the studies that found positive associations between trait empathy and motor empathy assessed trait empathy directly before or after the state empathy assessment, which may have inflated the trait-state associations (e.g., Eisenberg et al, 1988; Westbury & Neumann,

2008). The substantial time period between the measurement of trait empathy (during a home visit) and state empathy (during a test session at the university) in the current study, might explain why we found few significant trait-state relations.

With regard to the associations between trait empathy and the verbal state empathy measures, we did find the expected positive associations in several cases, particularly in response to sadness. Adolescents who reported higher affective trait empathy reported higher affective state empathy in response to sadness, and adolescents who reported higher cognitive trait empathy also showed higher levels of cognitive state empathy in response to sadness. Also, higher affective trait empathy (and for girls also cognitive trait empathy) was positively related to affective state empathy in response to happiness. However, the magnitude of the associations was modest. Thus, in line with our hypothesis, we found positive relations between trait and state empathy measures, although associations were more consistent for sadness than for happiness. This finding may be due to the fact that the measure we used to assess trait empathy (IRI; Davis, 1983) particularly focuses on empathy with others' sadness or distress. Previous studies on the interrelations between trait and state empathy make no distinction between different emotions, and most measures mainly reflect empathy with others' sadness (e.g., Eisenberg et al., 1988; Eisenberg et al., 1994). Thus, our study extends previous research by differentiating between state empathy with happiness and sadness. Our findings suggest that individual differences in affective and cognitive trait empathy play a modest role in affective and cognitive state empathy, and that empathy with sadness should be distinguished from empathy with happiness.

### **The measurement of empathy**

The modest effect sizes of the associations of the trait empathy measures with our measure of motor empathy, as well as the pattern of sex differences in mean levels across the measures, suggests that demand characteristics may play a role in the self-reported measures, and in particular in the trait empathy measures. Consistent with the literature, girls overall reported higher levels of both affective and cognitive trait empathy than boys (e.g., Lennon & Eisenberg, 1987; Rueckert & Naybar, 2008), with the strongest sex differences on affective trait empathy (e.g., Davis & Franzoi, 1991; Hoffman, 1977). Interestingly, sex differences were smaller on the state empathy measures than on the trait empathy measures, and there were no significant sex differences at all in motor empathy. That is, girls did not show stronger corrugator activity in response to sadness, or stronger zygomaticus activity in response to happiness than boys, although boys showed less inhibition of corrugator activity (i.e. frowning) in response to happiness. These findings of the largest sex difference on affective trait empathy, only small

sex differences on self-reported state empathy measures, and majorly absent differences on facial EMG measures, supports the notion that social desirability and gender stereotypes play a role in adolescents' self-reports of empathic tendencies. When it is obvious that (particularly affective) empathy is assessed, boys seem for instance to be less willing to report themselves as empathic as girls (Hoffman, 1977; Lennon & Eisenberg, 1987). The fact that demand characteristics likely have played a larger role in the trait empathy assessments than in the state empathy assessment, may also be an explanation for the modest effect sizes of the trait-state associations.

### **Limitations**

Even though major strengths of the current study are the comprehensive design, the relatively large sample size and the use of the highly sensitive EMG technique to measure adolescents' motor empathy, our results should be interpreted in light of some limitations. First, due to the correlational design of the current study, we cannot address the direction of effects in our models. Our findings show that the observation of emotional film clips evoked the corresponding motor responses in the participants, but instead of being an automatic reaction to the stimuli, the motor responses may have resulted from the emotional experience that was also evoked by the stimuli. Second, although an important strength of the current study is the use of different measures to assess the affective and cognitive dimensions of empathy, a limitation is that our trait and state measures of affective and cognitive empathy did not assess exactly the same aspects of the dimensions. For instance, whereas our affective trait empathy measure assessed the tendency to sympathize with others, our affective state empathy measure assessed pure affective empathy, or the vicarious experience of emotions consistent with those of the observed person. These differences in focus of trait and state measures may partly explain the modest associations we found between trait and state empathy. Third, although our facial EMG measurement of the corrugator and zygomaticus muscles revealed the expected motor empathy in response to happiness and sadness, we cannot exclude the possibility that these motor responses are primarily a response to a general negative emotional experience in the case of corrugator activity, and a response to a general positive experience in the case of zygomaticus activity, rather than motor empathy associated with specific target emotions (see Hess & Fischer, 2013). Corrugator and zygomaticus tend to exhibit a generalized increase in activity in response to stimuli with a negative or positive emotional valence, respectively, irrespective of the specific type of emotion elicited by the stimulus (Larsen et al., 2003; Overbeek, Van Boxtel, & Westerink, 2012).

## Conclusion

Despite the limitations, the current study advances our understanding of the multi-dimensional construct of empathy by using a multi-measure design which captured motor, affective, and cognitive processes related to state empathy, as well as the trait dimensions of empathy. In accordance with theories that assume motor empathy to be related with the experience of emotions (Hatfield et al., 1994; Preston & De Waal, 2002), we consistently found adolescents who showed stronger motor empathy to have experienced higher affective state empathy. In line with the facial feedback hypothesis (Hatfield et al., 1994), adolescents who showed stronger motor empathy, not only experienced higher affective empathy, but also showed higher levels of cognitive state empathy. Interestingly, consistent but modest trait-state associations were found for state empathy with sadness.

To our knowledge, this study is the first to include facial EMG measurement of motor empathy together with trait and state measures of both cognitive and affective empathy. The modest magnitude of the effect sizes that our study revealed provides support for the notion that empathy is a multi-faceted phenomenon (Batson, 2009). Motor, affective and cognitive empathy seem to be related processes that each play a different role in the ability to understand and share others' feelings.



A grayscale microscopic image of plant cells, showing various cell walls and internal structures, serving as a background for the page.

# 3

## Perspective taking and empathic concern in adolescence: Gender differences in developmental changes

Van der Graaff, J., Branje, S., De Wied, M., Hawk, S., Van Lier, P., & Meeus, W. (2014).  
Perspective Taking and Empathic Concern in Adolescence: Gender Differences in  
Developmental Changes. *Developmental Psychology*, 50, 881-888. doi: 10.1037/a0034325

## Abstract

Empathy is an important social skill and is believed to play an essential role in moral development (Hoffman, 2000). The present longitudinal study investigated adolescents' development of perspective taking and empathic concern from age 13 to 18 (mean age at Wave 1 = 13 years,  $SD = .46$ ) and examined its association with pubertal status. Adolescents (283 boys, 214 girls) reported for 6 consecutive years on their dispositional perspective taking and empathic concern, and for 4 consecutive years on pubertal status. Latent growth curve modeling revealed gender differences in levels and developmental trends. Gender differences in perspective taking emerged during adolescence, with girls showing steeper increases than did boys. Girls also showed higher levels of empathic concern than did boys. Whereas girls' empathic concern remained stable across adolescence, boys showed a decrease from early to middle adolescence with a rebound to the initial level thereafter. Boys who were physically more mature also reported lower empathic concern than did their less physically developed peers. The current study supports theoretical notions of ongoing development of perspective taking during adolescence. Moreover, the results suggest that pubertal maturation plays a role in boys' development of empathic concern.



## Introduction

Empathy is a fundamental social skill that underlies important capabilities and behaviors and plays a pivotal role in moral development and prosocial behavior (Hoffman, 2000). Adolescence is an important period for empathy development. Cognitive and relational changes can be expected to impact adolescents' abilities or tendencies to take others' perspectives and to experience feelings of concern. Adolescence is also marked by rapid physical changes, and empathy development might undergo a temporary decline that coincides with puberty (Blakemore & Choudhury, 2006). In addition, girls often report higher levels of empathy than do boys (e.g., Eisenberg & Lennon, 1983), and there is some evidence suggesting that boys and girls diverge in their tendency to empathize with others as they move through adolescence (Fabes, Carlo, Kupanoff, & Laible, 1999). As of yet, there has been little longitudinal research on gender differences in empathy development during adolescence, and findings are inconsistent (e.g., Davis & Franzoi, 1991; Eisenberg, Cumberland, Guthrie, Murphy, & Shepard, 2005). Further, due to the different age ranges of previous longitudinal studies, it is difficult to fully delineate developmental patterns in empathy across adolescence. The current study, therefore, covers the entire age range of early through late adolescence (i.e., from ages 13–18 years). A multi-wave longitudinal design was used to examine age trends and gender differences in affective and cognitive empathy from age 13 to 18. In addition, the role of puberty maturation status in empathy development was examined.

Empathy is a complex phenomenon, involving cognitive and affective processes that might follow different developmental patterns. Cognitive empathy, or perspective taking, can be defined as the awareness and understanding of another's emotion. Affective empathy refers to the vicarious experience of emotions consistent with those of the observed person and often results in empathic concern, which involves feelings of sorrow or concern for another (Davis, 1983).

Although longitudinal research on adolescents' empathy development is scarce, there are theoretical reasons to expect perspective taking to increase. First, adolescents reach "formal operations", Piaget's last stage of cognitive capacity (Piaget, 1932/1965), and youths develop the ability to "step outside" an interaction and to simultaneously consider self and other perspectives from a third person view. This should facilitate perspective taking development (Selman, 1980). Second, the awareness grows in early adolescence that others' emotions can be affected by factors beyond the immediate situation, which also should contribute to perspective taking (Hoffman, 2000). Third, congruent with these theories that assume ongoing development in perspective taking, recent neurological studies showed brain regions involved in perspective taking to become more active during adolescence (see

Crone & Dahl, 2012). Although cross-sectional studies show conflicting results regarding the association between age and perspective taking in adolescence (e.g., Hawk et al., 2013; Karniol, Gabay, Ochion, & Harari, 1998), results of the few available longitudinal studies reveal increases in adolescents' perspective taking between ages 15 and 17 (Davis & Franzoi, 1991), and between ages 15 and 25 (Eisenberg et al., 2005). One study also found a stronger increase in perspective taking for girls than for boys from age 13 to 14 (Mestre, Samper, Frías, & Tur, 2009). Thus, based on theoretical and empirical accounts, we expect increases in adolescents' perspective taking. We further explore whether increase rates differ between boys and girls.

With regard to the development of empathic concern in adolescence, the literature is not unambiguous. Theorists propose that, although affective empathy is already evident in early childhood, advances in perspective taking will still enhance the ability to sympathize with others in adolescence, resulting in increasing empathic concern (Batson, 2009; Hoffman, 2000). However, although cognitive advances are expected to facilitate growth in empathic concern, changes in adolescents' affective processing might also play a role. Emotion regulation has been found to be important for the ability to respond to others' negative emotions with concern instead of with self-focused distress (e.g., Eisenberg et al., 1998). Although emotion regulation develops in childhood, neurodevelopmental changes in affective processing might temporarily challenge emotion regulation in mid-adolescence (see Crone & Dahl, 2012), and this could result in stagnated growth in empathic concern. Results of empirical studies do not give decisive support for either increasing empathic concern as a result of cognitive advances or stagnating empathic concern development due to challenged emotion regulation. Cross-sectional studies found no association between age and empathic concern among 8<sup>th</sup> and 11<sup>th</sup> graders (e.g., Karniol et al., 1998); other studies found a positive association only for girls in a sample of 13- to 16-year-olds (e.g., Olweus & Endresen, 1998). Results of longitudinal studies are also inconsistent. Boys' and girls' empathic concern has shown increases between ages 13 and 14 (Mestre, et al., 2009). Increases were also found in a 3-year longitudinal study, but only for adolescents in 10th grade at the first measurement, and not for adolescents in 9th grade at the first measurement (Davis & Franzoi, 1991). No changes in empathic concern were found between ages 15 and 25 (Eisenberg et al., 2005). Because of the inconsistencies in the theoretical and empirical literature, we will explore the age trends in boys' and girls' empathic concern in the current study without making firm hypotheses.

To our knowledge, the link between pubertal maturation and the development of perspective taking and empathic concern has not yet been investigated, although there are conceptual reasons to expect pubertal changes to affect adolescents' empathy, and especially empathic concern. First, gender intensification theory (Hill & Lynch, 1983) suggests that as adolescents' bodies mature, gender-specific socialization pressures strengthen. These

pressures result in increased adherence to gender stereotypical behavior, and in turn, result in increasing behavioral and psychological differences between boys and girls (e.g., Galambos, Almeida, & Petersen, 1990; Pettitt, 2004). Whereas girls are encouraged to show emotional and caring behavior, boys are encouraged to inhibit these kinds of behavior. In this way, pubertal maturation might accompany increased empathic concern for girls, but decreased empathic concern for boys. Congruent with this idea, results from a meta-analysis revealed increasing gender differences in prosocial behavior during adolescence (Fabes et al., 1999). Second, boys' testosterone levels increase dramatically between early and mid-adolescence (Buchanan, Eccles, & Becker, 1992). High levels of testosterone have been found to accompany behavior intended to dominate and to achieve power (Mazur & Booth, 1998), which in turn might reduce emotional empathy (Lanzetta & Englis, 1989). Results of correlational and experimental studies have indeed suggested testosterone to relate negatively to empathy, although effect sizes are typically small (see Yildirim & Derksen, 2012).

In conclusion, longitudinal research on gender differences in developmental trends in perspective taking and empathic concern is scarce and has, particularly with regard to empathic concern, revealed inconsistent results. Moreover, although there are conceptual reasons to expect pubertal maturation to be associated with adolescents' empathy, to our knowledge the role of puberty in empathy development has not yet been examined. Therefore, the aim of the current study is to investigate boys' and girls' development of perspective taking and empathic concern longitudinally from ages 13 to 18, and to examine associations with pubertal status.

## Method

### Participants and procedure

A sample of 497 adolescents (214 girls) was drawn from RADAR (Research on Adolescent Development And Relationships), an ongoing longitudinal study in the Netherlands. To date, six annual measurement waves have been completed. At first measurement, the adolescents were in their first year of Junior High ( $M_{\text{age}} = 13.03$ ,  $SD = .46$ ). Most adolescents were native Dutch (95%), lived with both parents (86%), and came from families classified as medium or high SES (89%). Adolescents participating in RADAR were recruited from randomly selected schools in the province of Utrecht, and four cities in The Netherlands. Before the start of the study, parents were required to provide informed consent. Adolescents filled out questionnaires during annual home visits. Trained research assistants provided verbal

instructions in addition to written instructions that accompanied the questionnaires. At each wave, adolescents received the equivalent of \$40 in Euros for their participation.

Of the original sample, 425 adolescents (86%) were still involved in the study at Wave 6, and the average participation rate over the 6 waves was 90%. Results of Little's MCAR test indicated that missing values on study variables were missing completely at random for boys ( $\chi^2(536) = 497.70, p = .88$ ) and for girls ( $\chi^2(432) = 459.52, p = .17$ ). Therefore, all 497 cases could be included in the analyses using a Full Information Maximum Likelihood procedure in Mplus (Muthén & Muthén, 2010).

## Measures

**Empathy.** Adolescents reported on their own empathic disposition, using two 7-item subscales of the Dutch version of the Interpersonal Reactivity Index (IRI; Davis, 1983; Hawk et al., 2013). A sample item of the perspective taking (PT) subscale is "I try to look at everybody's side of a disagreement before I make a decision", and a sample item of the empathic concern (EC) subscale is "I often have tender, concerned feelings for people less fortunate than me". Adolescents scored the items on a 5-point scale, ranging from 0 (*doesn't describe me at all*) to 4 (*describes me very well*). For the current sample, Cronbach's alpha on PT from age 13 to age 18 was  $\alpha = .59, \alpha = .66, \alpha = .77, \alpha = .76, \alpha = .78$ , and  $\alpha = .76$ . On EC Cronbach's alpha was  $\alpha = .62$  at age 13 and ranged from  $\alpha = .72$  to  $\alpha = .77$  at age 14 to age 18. The Dutch version of the IRI has adequate internal consistency and validity (Hawk et al., 2013).

**Pubertal status.** Adolescents' pubertal status was measured at the first four waves (age 13 to age 16) using an adapted version of the self-reported Pubertal Development Scale (PDS; Petersen, Crockett, Richards, & Boxer, 1988). Four items from this scale were used for both boys and girls. Boys were asked whether they had noticed the start of pubic hair growth, underarm hair growth, facial hair growth, and voice change. Girls were asked whether they had noticed the start of pubic hair growth, underarm hair growth, and breast development, and whether menarche had occurred. Responses on the items followed the structure of a Guttman scale, meaning that adolescents who reported noticing a certain change at Wave 1 should also report 'yes' on that question at subsequent Waves. In the current sample, Guttman's  $R$  ranged from .98 to 1.00, indicating good reliability (Guttman, 1944). For both boys and girls, the reported changes followed the typical sequencing of pubertal events as described by Tanner (1971). Scores on the four markers of pubertal status were averaged, to make a composite score at each wave, with higher scores representing a higher stage of physical maturation.

## Statistical analyses

Analyses were conducted in two steps. First, latent growth curve models (LGMs) were conducted in MPlus version 6.11, to examine developmental trajectories separately for PT and EC. To determine which growth curve best captured observed changes, we compared models with two latent factors (i.e. intercept and linear change) and models with three latent factors (i.e. intercept, linear, and quadratic change). We used a multiple group approach in these models, to test whether gender moderated growth in PT and EC. Models in which intercept means or slope means were constrained to be equal across the two gender groups were compared to the baseline model, in which all growth parameters were free to vary across the two gender groups. If the results of the chi-square difference test indicated the constrained model to fit significantly worse than did the baseline model, the parameter was assumed to differ between boys and girls (Kline, 2005).

Second, multivariate growth models were conducted, separately for boys and girls, to examine associations between pubertal status and growth in PT and EC. Because timing and tempo of pubertal development differ between adolescents, pubertal status was specified as a time-varying covariate in these models, predicting concurrent effects on PT and EC.

## Results

### Development of perspective taking and empathic concern

**Perspective taking.** Mean levels of PT are presented in Table 3.1. Comparing linear and quadratic multiple group LGMs revealed the quadratic model to fit the data significantly better than did the linear model,  $\Delta\chi^2(8) = 56.91, p < .001$ . Multiple group analyses revealed significant gender differences in initial levels,  $\Delta\chi^2(1) = 6.23, p < .05$ , with lower levels for boys than for girls. Boys and girls also differed significantly in linear change,  $\Delta\chi^2(1) = 21.17, p < .001$ , and in quadratic change,  $\Delta\chi^2(1) = 17.89, p < .001$ , (see Table 3.2). There was a small significant linear decrease for boys, and a significant positive quadratic change, implying that boys' PT decreased from early to middle adolescence but increased thereafter. For girls, the linear change factor was positive and the quadratic change factor was negative, implying an increase in PT that leveled off over time (see Figure 3.1a). The quadratic LGM, in which all growth parameters were free to vary across gender, showed a good fit to the data:  $\chi^2(24, N = 497) = 29.21, p = .21, CFI = 1.00, RMSEA = .03$ .

**Empathic concern.** Mean levels of EC are presented in Table 3.1. A quadratic LGM showed a better fit to the data than did a linear LGM did,  $\Delta\chi^2(8) = 47.63, p < .001$ . The fit of the quadratic

**Table 3.1** Descriptives for boys' and girls' empathic concern, perspective taking, and pubertal status

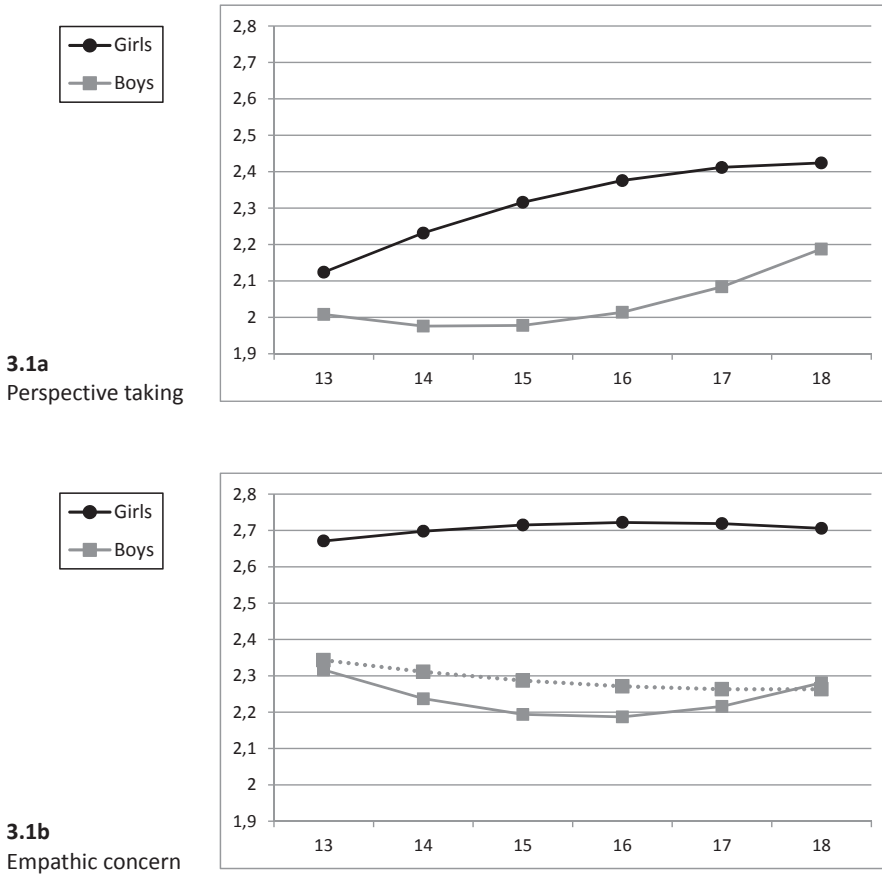
	Age 13		Age 14		Age 15		Age 16		Age 17		Age 18	
	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>	<i>M</i>	<i>SD</i>
Empathic concern												
Boys	2.32	.54	2.24	.57	2.18	.57	2.16	.63	2.11	.58	2.27	.56
Girls	2.65	.51	2.74	.57	2.77	.59	2.69	.57	2.70	.54	2.74	.55
Perspective taking												
Boys	2.01	.51	2.00	.51	1.94	.58	2.03	.59	2.11	.58	2.18	.56
Girls	2.10	.54	2.27	.63	2.33	.63	2.37	.60	2.37	.65	2.44	.62
Pubertal status												
Boys	.46	.34	.71	.29	.89	.19	.96	.11	-	-	-	-
Girls	.80	.24	.95	.13	.98	.08	.99	.06	-	-	-	-

**Table 3.2** Growth parameters of univariate multi-group latent growth curve models

	Intercept		Linear change		Quadratic change	
	Mean	Variance	Mean	Variance	Mean	Variance
Perspective taking						
Boys	2.01***	0.14***	-0.05*	0.06***	0.02***	0.002***
Girls	2.12***	0.11**	0.12***	0.01	-0.01*	0.000
Empathic concern						
Boys	2.32***	0.14***	-0.10***	0.05**	0.02***	0.00**
Girls	2.67***	0.13***	0.03	0.02*	-0.01	0.00

Note. \*  $p < .05$  \*\*  $p < .01$  \*\*\*  $p < .001$ .

LGM was acceptable:  $\chi^2 (24, N = 497) = 50.75, p < .01$ , CFI = .97, RMSEA = .07. Multiple group analyses revealed significant gender differences in initial levels,  $\Delta\chi^2 (1) = 55.56, p < .001$ , with lower levels for boys than for girls. Boys and girls also differed significantly in linear change,  $\Delta\chi^2 (1) = 13.31, p < .001$ , and in quadratic change,  $\Delta\chi^2 (1) = 12.25, p < .001$ , (see Table 3.2). For boys, the linear change was significant and negative, but a significant positive quadratic factor implied a decrease in EC from early to middle adolescence, and an increase thereafter. For girls, there was no significant linear or quadratic change, indicating stable mean levels of EC (see Figure 3.1b).

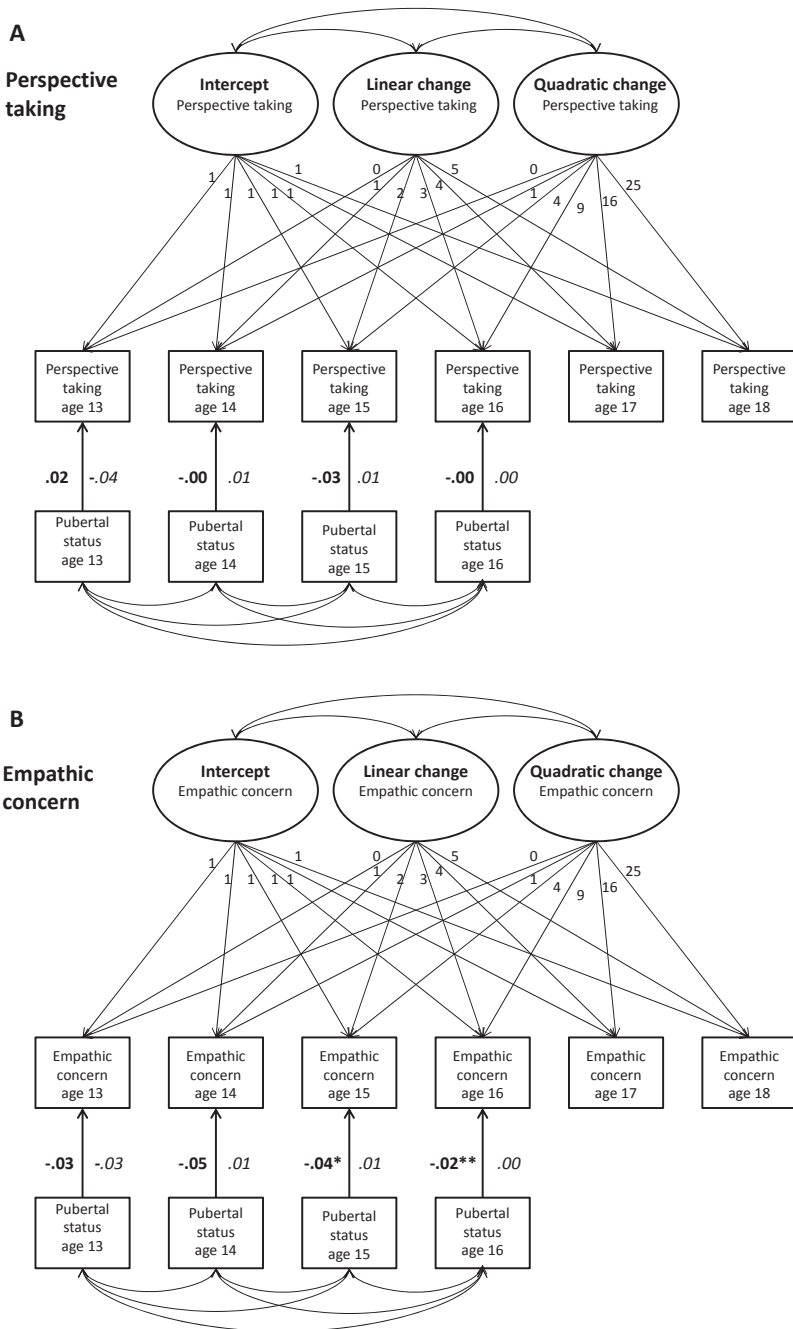


**Figure 3.1** Solid lines represent the best fitting models for development of (a) perspective taking  $\chi^2(24, N = 497) = 29.21, p = .21, CFI = 1.00, RMSEA = .03$ , and (b) empathic concern,  $\chi^2(24, N = 497) = 50.75, p < .01, CFI = .97, RMSEA = .07$ . Dashed line in Figure 3.1b represents boys' development of empathic concern corrected for differences in pubertal status from age 13 to age 16.

### Time-specific effects of pubertal status on boys' perspective taking and empathic concern

Multivariate growth models, examining the associations between pubertal status and growth in PT and in EC, were conducted separately for boys and girls because of the gender differences in developmental patterns in PT and EC.

**Perspective taking.** The model of boys' and girls' PT with concurrent pubertal status at ages 13–16 as a time varying covariate fit the data well, but pubertal status was not significantly associated ( $p > .05$ ) with PT (see Figure 3.2a).



**Figure 3.2** Latent growth model with concurrent associations of pubertal status with perspective taking (a) and empathic concern (b). Standardized estimates are printed bold for boys, and italic for girls.  
*Note.* \*  $p < .05$  \*\*  $p < .01$ .



**Empathic concern.** The model of boys' EC with concurrent pubertal status at ages 13-16 as a time-varying covariate (see Figure 3.2b) fit the data well,  $\chi^2(35, N = 283) = 48.21, p = .07$ , CFI = .98, RMSEA = .04. Pubertal status was significantly associated with EC at age 15 ( $\beta = -.04, p < .05$ ) and at age 16 ( $\beta = -.02, p < .01$ ); boys who were physically more developed reported lower levels of EC, compared with their less developed peers. When controlling for variance in pubertal status, the linear change and quadratic change were no longer significant ( $M_s = -0.04, p = .33, M_q = 0.00, p = .54$ ; see Figure 3.1a). The model of girls' EC with pubertal status as a time-varying covariate showed an acceptable fit to the data,  $\chi^2(37, N = 214) = 66.60, p < .01$ , CFI = .94, RMSEA = .06, but pubertal status was not significantly ( $p > .05$ ) associated with EC (see Figure 3.2b).

## Discussion

To our knowledge, the present research is the first multiple-wave longitudinal study in which age trends and gender differences in empathy were investigated across the entire span of adolescence. The results clearly showed perspective taking to increase during adolescence for both boys and girls, although boys' perspective taking increased only from age 15 onward. In contrast, levels of empathic concern did not significantly increase across adolescence. Boys showed a temporary decline in empathic concern, and girls showed stable levels. Moreover, our results suggest that pubertal processes might play a role in boys' development of empathic concern (but not perspective taking) between early- and mid-adolescence.

The finding that perspective taking showed an increase in adolescence for both boys and girls is consistent with results from previous longitudinal studies (e.g., Eisenberg et al., 2005), and is also in line with developmental theories assuming youths' growing ability to simultaneously consider self and other perspectives (Selman, 1980). Neurological studies comparing adolescents of different ages also suggest that perspective taking increases during adolescence as a consequence of continuing maturation in relevant brain regions (Crone & Dahl, 2012). Thus, our findings of increasing perspective taking in adolescence converge with results from previous research, as well as broader theories on empathy development.

Consistent with prior literature (e.g., Eisenberg & Lennon, 1983), girls had higher levels of perspective taking than boys had. Strikingly, at age 13 there was only a small gender difference in perspective taking. Girls' perspective taking increased between age 13 and 15, but boys' perspective taking did not increase until age 15, and even showed a slight dip before that age. This finding might be due to girls' faster maturation in cerebral cortical development from early adolescence to mid-adolescence (Colom & Lynn, 2004). As a result,

girls are generally about two years ahead of boys in intellectual and social-cognitive functioning during adolescence (Silberman & Snarey, 1993). These differences might account for girls' earlier development in perspective taking, compared to boys', who might catch up with girls in late adolescence. The finding of girls' increase and boys' slight dip in perspective taking between age 13 and 15 is also in line with gender role intensification theory (Hill & Lynch, 1983), suggesting that gender differences increase in adolescence as a result of strengthened gender role expectations (e.g., Fabes et al., 1999; Galambos et al., 1990; Pettitt, 2004). To summarize, our results suggest that there are marked gender differences in empathic concern from early adolescence onwards, and also that gender differences in perspective taking strengthen between early- and mid-adolescence.

Although developmental perspectives assume that adolescents' growing cognitive abilities facilitate experiences of empathic concern (Hoffman, 2000), we did not find an increase in empathic concern over the age range studied. Girls had higher levels of empathic concern than boys had and, in concordance with the literature, this difference was stronger than that for perspective taking (e.g., Davis & Franzoi, 1991; Hoffman, 1977). Girls' levels remained stable during adolescence, and boys reported decreasing levels until age 16 and a slight increase thereafter. A similar developmental pattern has been found for prosocial behavior (Carlo, Crockett, Randall, & Roesch, 2007). One possible reason that adolescents' empathic concern showed no increase is that, during mid-adolescence, changes in affective processing induce intensification of emotional experiences (Crone & Dahl, 2012). Intense emotionality in response to others' distress could lead to a self-focused reaction instead of empathic concern (Eisenberg et al., 1998). A second reason might be that we measured the *tendency* to experience feelings of concern in daily situations, rather than the *capacity* to respond with empathic concern in situations requiring high-level perspective taking (see Eisenberg et al., 2005). Although adolescents should increasingly be able to be compassionate in complex situations, their tendency to sympathize with others in everyday life might depend on motivation rather than on cognitive ability. For instance, gender role expectations might encourage boys to inhibit emotional and caring behavior (e.g., Karniol et al., 1998). The fact that girls' levels of empathic concern did not increase, even though increases could be expected as a result of gender-specific socialization pressures, might be due to girls' earlier maturation: girls already report relatively high levels of empathic concern at age 13.

Strikingly, boys showed a decline in empathic concern between ages 13 and 16, with a rebound to the initial level thereafter. Our results suggest that pubertal processes play a small role in this temporary decrease; boys who were physically more mature reported lower levels of empathic concern than did their physically less mature peers at ages 15 and 16. Moreover, when controlling for pubertal status, the dip in boys' mean levels of empathic

concern disappeared. The association between boys' pubertal status and empathic concern might be partly result from the increase in testosterone during pubertal maturation (Buchanan et al., 1992), which could induce an increase in competitive behavior (Mazur & Booth, 1998), thereby reducing empathy (Lanzetta & Englis, 1989). Our results are also in line with research on adolescent brain development indicating that pubertal processes influence emotional development (see Crone & Dahl, 2012). Further, gender role expectations might also play a role; boys who are physically more mature likely adhere more strongly to stereotypically masculine behavior, and might therefore be more inclined to inhibit empathic concern. However, it is important to emphasize that the effects concerning boys' pubertal status were small. The finding that pubertal status was related to boys' empathic concern, but not perspective taking, can be explained by the fact that, although empathic concern and perspective taking both encompass a response to another's emotion, empathic concern primarily refers to an *emotional* response, whereas perspective taking primarily refers to a *cognitive* response. Hence, empathic concern corresponds more closely than perspective taking to the stereotypical female role (Hoffman, 1977), and boys' empathic concern might therefore be more affected than perspective taking by changing social expectations during pubertal maturation. Further, the lack of an association between pubertal status and either empathic concern or perspective taking for girls could be due to the fact that several physical changes that accompany girls' pubertal maturation have already started at age 13, the time of our first assessment (Tanner, 1971). Hence, our assessments have started too late to capture girls' pubertal maturation. Therefore, it is important for future research to replicate the findings with regard to the association between boys' pubertal status and empathic concern, and to incorporate assessments of girls' pubertal status and empathy at an earlier age. At the same time, results of our study suggest that pubertal processes might play a small role in boys' dip in empathic concern.

Our results should be interpreted in light of some limitations. First, self-reports were used to assess empathic concern, perspective taking, and pubertal status. Although more objective data would be obtained when adding parent-reported or observational measures, previous studies have validated these measures (e.g., Hawk et al., 2013; Shirtcliff, Dahl, & Pollak, 2009). Moreover, since empathy is an internal process, adolescents might be better informants than parents or peers are, and these self-perceptions might still be important and guide behavior. Furthermore, even if social desirability would have biased adolescents' reports of empathy, the fact that boys report their empathic concern to decline in mid-adolescence and to incline thereafter is still of high interest. Social desirability partly reflects what adolescents think is appropriate for their gender, and they might actually behave in ways consistent with socially desirable expectations. Second, because the same measure was used

to assess empathy at six different time-points, retest effects could have biased our results. However, the one-year intervals between the time points make retest effects unlikely. Third, because we did not measure gender role orientation, we cannot exclude the possibility that the gender differences in developmental trends are (partly) due to differences in gender role orientation instead of gender per se (Karniol et al., 1998). Finally, most participants were Caucasian, and were from relatively high SES families, which limits the generalizability of the findings beyond the current sample.

Notwithstanding the limitations, the present study advances our understanding of empathy development. As yet, few studies have addressed gender differences in empathy development across adolescence. The findings that empathic concern and perspective taking development follow a non-linear pattern during adolescence, and that pubertal status is associated with boys' development of empathic concern, might explain inconsistencies in previous research. Results of the current study suggest that perspective taking and empathic concern develop differently, and that developmental trends are markedly different for boys and girls. Hence, future studies on empathy should separate perspective taking and empathic concern, and should take the diverging development of boys and girls into account. A particularly noteworthy finding of the current study is the temporary decrease in boys' empathic concern (and the slight dip in perspective taking) in mid-adolescence. It is important for parents, teachers, and other people working with adolescents to take these developmental changes into account, as they might affect adolescents' social interactions and the extent to which they show prosocial behavior. Further, associations between boys' pubertal status and empathic concern suggested that pubertal processes might play a role in the development of boys' empathic concern.





A grayscale, high-magnification microscopic image of plant cells, showing a complex network of cell walls and large, irregularly shaped cells. The image is used as a background for the page.

# 4

## The moderating role of empathy in the association between parental support and adolescent aggressive and delinquent behavior

Van der Graaff, J., Branje, S., De Wied, M., & Meeus, W. (2012). The moderating role of empathy in the association between parental support and adolescent aggressive and delinquent behavior. *Aggressive Behavior*, 38, 368-377. doi: 10.1002/ab.21435

## **Abstract**

The present two-wave longitudinal study addressed the role of affective empathy and parental support in aggressive and delinquent behavior in a sample of 323 adolescents (158 boys, 165 girls). Self-report questionnaires were used to assess affective empathy, perceived support from parents, delinquency, and aggression. Guided by theories on children's differential susceptibility to socialization, we expected adolescents with different levels of empathy to vary in their responsiveness to parental support. In agreement with our hypothesis, empathy moderated the relation of perceived parental support with aggressive and delinquent behavior. Controlling for the effect of gender and for the stability of aggression and delinquency, higher perceived parental support was predictive of lower levels of aggression at age 15, but only for adolescents high in empathy. Remarkably, adolescents low in empathy not only appeared to benefit less from parental support, but even showed more aggression and delinquency at age 15 when they perceived their parents to be more supportive at age 14.



## Introduction

The prevalence of aggressive and delinquent behavior among adolescents is cause of great concern. In 2010, over thirty percent of the Dutch adolescents reported having been involved in acts such as theft, vandalism and aggression in the past year (Van der Laan & Blom, 2011). A better understanding of factors that may prevent adolescents from developing these kinds of behavior is, therefore, of great importance. Empathy is believed to be an important factor helping adolescents to refrain from aggressive and delinquent behavior (e.g., Davis, 1996; Miller & Eisenberg, 1988). Parental support has also been found to be beneficial for adolescents' psychological adjustment and social behavior (e.g., Branje, Hale, & Meeus, 2008; Helsen, Vollebergh, & Meeus, 2000). However, there is little information on the combined effects of empathy and parental support on the development of aggressive and delinquent behavior. Children and adolescents who show little empathy may be less responsive to the emotional expressions of their parents and may therefore be less affected by parental socialization efforts (Blair, 2003). Thus, adolescents' empathy may moderate the association between parental support and aggressive and delinquent behavior. The aim of the present study is to examine the effects of empathy and parental support, and their interaction, on aggression and delinquency in a community sample of adolescents.

### Empathy and aggressive and delinquent behavior

Empathy is generally defined as the ability to understand and to share another's emotional state, and includes both a cognitive and an affective component. Cognitive empathy refers to the ability to understand another's internal state, whereas affective empathy refers to an experience of emotions consistent with those of the observed person (Cohen & Strayer, 1996; Hoffman, 2000). Affective empathy may engender sympathy or empathic concern for another (Eisenberg, 2000; Hoffman, 2000). Furthermore, dispositional empathy or the general ability to show empathy can be distinguished from situational empathy or the transient affective reaction elicited in concrete situations. Although mean levels of dispositional empathy tend to increase during adolescence, rank-order stability is substantial (Davis & Franzoi, 1991). The current study will look at dispositional empathic concern.

Especially the affective component of empathy is assumed to play a pivotal role in the inhibition of aggressive and delinquent acts (e.g., Jolliffe & Farrington, 2011; Shechtman, 2002). The observation of the victim's expressions of fear or sadness should lead to a sharing of these negative emotions in the aggressor, resulting in feelings of empathic concern. This, in turn, may motivate the aggressor to increase the victim's wellbeing by stopping the harmful

behavior (Davis, 1996; Feshbach & Feshbach, 2009). Individuals high in empathy are more responsive to others' emotional expressions and therefore are expected to be more likely to inhibit harmful behavior than individuals low in empathy.

Support for the negative relation between affective empathy and aggressive behavior was found in several cross-sectional studies in adolescent samples. For instance, affective empathy appeared to be negatively linked to relational aggression for boys and girls aged 13 to 16 years (Endresen & Olweus, 2001) and for boys aged 13 to 17 years (Jolliffe & Farrington, 2011). Higher affective empathy was also found to be associated with lower verbal, physical, and indirect aggression in early adolescents (Kaukiainen et al., 1999). In some studies the negative association between affective empathy and aggression was only found for male adolescents (e.g., Caravita, Di Blasio, & Salmivalli, 2009; Loudin, Loukas, & Robinson, 2003). Few longitudinal studies investigated the association between empathy and aggression in adolescence. Lower affective empathy at age 13 predicted a persistent trajectory of aggression and vandalism from age 11 to age 17 among boys (Carrasco, Barker, Tremblay, & Vitaro, 2006). In another longitudinal study, higher empathic concern at age 11 predicted lower overt and relational aggression one year later (Batanova & Loukas, 2011). Thus, both cross-sectional studies and the few available longitudinal studies show that higher empathy is related to lower levels of aggression in adolescence concurrently and over time.

For the relation between empathy and delinquency, the results of previous studies are less consistent. For instance, Robinson, Roberts, Strayer and Koopman (2007) found a group of adolescent incarcerated offenders not to have lower scores on a self-reported empathy scale than a control group, although the offenders did show less emotional empathy in reaction to videotaped stimulus material than the control group. However, in a study among students with a mean age of 20 years, self-reported empathic concern was found to be significantly negatively related to delinquency (Schaffer, Clark, & Jeglic, 2009). Furthermore, a meta-analysis across 14 studies showed emotional empathy to be negatively related to offending, although the effect size was small (Jolliffe & Farrington, 2004). Longitudinal studies on the relation between emotional empathy and delinquency in adolescence are scarce. Higher empathy was significantly associated with lower delinquency two years later in a sample of adolescents aged 14 to 19 years at the first measurement (Bandura, Caprara, Barbaranelli, Gerbino, & Pastorelli, 2003). In a study among boys from low income families, lower empathy at age 12 predicted higher moral disengagement at age 15, which in turn predicted higher levels of delinquency at age 17 (Hyde, Shaw, & Moilanen, 2010). Thus, the results of several studies and a meta-analysis show affective empathy to be negatively related to delinquency in adolescence.

## Parental support and aggressive and delinquent behavior

Parental support is believed to be an important factor in preventing adolescents from developing aggressive and delinquent behavior (see Branje et al., 2008). Adolescents who perceive their parents as available for support when needed and who feel encouraged by their parents are less likely to show aggressive or delinquent behavior than adolescents who experience the relationship with their parents to be less supportive. In previous research, parental support was found to be negatively related to both aggression (e.g., Arim, Dahinten, Marshall, & Shapka, 2011) and delinquency (e.g., Barnes, Hoffman, Welte, Farrell, & Dintcheff, 2006).

Negative relations between perceived parental support and aggressive behavior were found in several cross-sectional studies (e.g., Carlo, Raffaelli, Laible, & Meyer, 1999; Estévez, Herrero, Martínez, & Musitu, 2006) and also in few longitudinal studies. For instance, perceptions of parental nurturance at age 10 predicted lower levels of indirect and direct aggression at age 12 for girls, whereas parental nurturance at age 12 was predictive of less aggressive behavior at age 14 for boys (Arim et al., 2011). Furthermore, a study on the impact of corporal punishment and parental support showed that not persistent corporal punishment *per se*, but the lack of parental support and involvement that often accompanies a harsh parenting style, increased the adolescent's risk for developing delinquent and aggressive behavior (Simons, Johnson, & Conger, 1994). Thus, parental support is negatively related to aggressive behavior during adolescence both concurrently and over time.

Parental support was also found to be negatively related to delinquency in several cross-sectional studies (e.g., Deković, Janssens, & As, 2003; Windle, 1992). A meta-analysis (Hoeve et al., 2009), showed parental support to be negatively related to delinquent behavior across 72 studies and a total of 49,960 (mainly adolescent) subjects. Furthermore, in a longitudinal six-wave study, adolescents who reported high family support showed lower initial delinquency levels and showed less increase of delinquency over time (Barnes et al., 2006). Meeus, Branje, and Overbeek (2004) found similar effects in a six-year longitudinal study for single adolescents aged 12 till 20 years. Thus, a lack of parental support appears to be a risk factor in the development of delinquent behavior during adolescence.

## The moderating role of empathy

Although rearing experiences, such as parental support, are believed to have beneficial effects for psychological adjustment, a growing number of studies shows that the degree to which children are responsive to parental socialization efforts may be affected by certain

child characteristics (e.g., Caspi & Moffitt, 2006; Klein Velderman, Bakermans-Kranenburg, Juffer, & van IJzendoorn, 2006, Kochanska, 1997). Belsky's (1997; 2005) theory on differential susceptibility suggests that the particular characteristics that make children more vulnerable to environmental adversity also make them more likely to benefit from supportive contextual influences. Although most of the empirical studies on differential susceptibility have focused on the effects of early rearing influences, there is some evidence suggesting that beyond early childhood, environmental influences may also differentially affect children and adolescents with different characteristics (Branje, Hale, Frijns, & Meeus, 2010; Essex, Armstrong, Burk, Goldsmith, & Boyce, 2011). Thus, although parental support seems to be negatively related to the development of delinquent and aggressive behavior during adolescence, for some adolescents this association may be stronger than for others.

An individual characteristic that may make adolescents differentially susceptible to parental support is empathic concern. Individuals low in empathic concern for others may care less about having warm and affective relationships and may therefore be less affected by socialization efforts than individuals who show more empathic concern (Lahey, Waldman, & McBurnett, 1999). Furthermore, adolescents low in empathy are less sensitive to the communicatory signals that are given by emotional expressions of their parents and may have difficulties in interpreting these signals (Blair, 2003). This may result in a lower susceptibility to the effects of parental support and approval.

Evidence from cross-sectional studies in clinical samples showed that for children who lack empathy, parenting was unrelated to externalizing behavior, suggesting that a lack of empathy inhibits the effects of parenting (e.g., Edens, Skopp, & Cahill, 2008; Oxford, Cavell, & Hughes, 2003; Wootton, Frick, Shelton, & Silverthorn, 1997). However, the children in these clinical samples not only displayed little empathy but were also characterized as unemotional and lacking feelings of guilt. Few studies have examined the combined effects of empathy and parental support in community samples. Only one study (De Kemp, Overbeek, De Wied, Engels, & Scholte, 2007) investigated the moderating role of empathy in the relation between parental support and aggressive and delinquent behavior in adolescence. The association between parental support and aggressive and delinquent behavior appeared not to be moderated by empathy in this study. However, this could be due to the design of the study in that empathy was measured at the second time point. Thus, although results of studies in clinical samples suggest that the effect of parenting on aggressive and delinquent behavior may differ for children varying in empathy, there is a lack of studies in community samples on the moderating role of empathy in adolescence.

## Gender differences

Gender differences in empathy, parental support, and aggressive and delinquent behavior are well-established in the literature. Previous studies consistently found girls to score higher on empathy than boys, especially when empathy is self-reported (e.g., Eisenberg & Lennon, 1983, Davis & Franzoi, 1991, Olweus & Endresen, 1998). For aggressive and delinquent behavior, boys generally show higher levels than girls (e.g., Card, Stucky, Sawalani, & Little, 2008; Moffitt & Caspi, 2001). Furthermore, previous studies found girls to report more parental support than boys (Helsen et al., 2000). In the current study, gender differences in empathy, aggression, delinquency, and parental support will be examined, and gender will be included as a covariate in further analyses to control for gender differences.

## Research aims and hypotheses

The aim of the present study is to investigate the effects of emotional empathy, parental support, and their interaction on adolescents' aggressive and delinquent behavior. We expect adolescents who report lower affective empathy to show more aggressive and delinquent behavior than adolescents who report higher levels of affective empathy. Further, we hypothesize perceived parental support to be negatively related to aggression and delinquency. Moreover, we expect that parental support will interact with empathy in the prediction of aggressive and delinquent behavior. Highly empathic adolescents are expected to be more susceptible to the beneficial effects of parental support as well as the adverse effects of a lack of support, than adolescents with low empathy. Therefore, parental support is predicted to be more strongly related to changes in aggressive and delinquent behavior in highly empathic adolescents than in adolescents with low empathy.

## Method

### Participants

The current sample of 323 adolescents (158 boys, 165 girls) was drawn from the ongoing CONAMORE longitudinal study [CONflicts And Management Of Relationships; Meeus, Akse, et al., 2004] in which 938 adolescents annually completed a battery of questionnaires at school from early adolescence on. The 323 adolescents of the current study not only participated in the school assessments, but also in home visits in which the adolescent and both parents filled out questionnaires. This so called 'family sample' was selected from the total sample as

follows: First, we asked all adolescents who came from two-parent Dutch families ( $n = 656$ ) if they were willing to participate with both parents in additional home visits. Second, because of the restricted financial budget for the study, out of the 401 families who accepted this invitation, 323 were randomly selected to participate in the family sample. The current study uses data of two measurement waves with a 1-year interval from the family sample. Mean age of the adolescents at Time 1 of the current study was 14.30 ( $SD = .53$ ), and 98.4% of the adolescents lived with both parents. Different levels of education were represented, with approximately 49% at schools preparing for university, 34% preparing for higher education and 17% for lower-level jobs. The main ethnic identity of all adolescents was Dutch (for a full description of the sample and procedure see Van Doorn, Branje, & Meeus, 2011).

T-tests were performed to examine whether there were differences between adolescents of two-parent Dutch families who participated in the family sample ( $n = 323$ ) and those who participated in the school assessments only ( $n = 333$ ). There were no differences in delinquency ( $p = .10$ ), aggression ( $p = .54$ ) and perceived parental support ( $p = .09$ ) between the two groups. Differences in adolescent empathy could not be tested, because only adolescents of the family sample completed this questionnaire.

## Procedure

Adolescents participating in this study came from various high schools located in the province of Utrecht, The Netherlands. Both adolescents and their parents received written information before the start of the study, and were required to provide informed consent. Interviewers visited the schools and asked participants to gather in classrooms to fill out a questionnaire. During annual home visits, adolescents filled out an additional questionnaire. Results were processed anonymously. Each wave, families received €27 for participation and adolescents received an additional amount of €10 for participating at school.

## Measures

**Affective empathy.** A Dutch version of Bryant's (1982) Index of Empathy for Children and Adolescents (IECA) was filled out by the adolescents during the home visit at Time 1. This 22-item questionnaire assesses dispositional affective empathy. Adolescents were asked to indicate how strongly they agreed or disagreed with the items on a 9-point scale (-4= strongly disagree to +4 strongly agree). A study on the structure of the IECA (De Wied et al., 2007) showed that the IECA consisted of two factors, with the items of the first factor reflecting responsiveness to another person's sadness, and the items of the second factor reflecting

attitudes rather than feelings. For the current study, mean scores were calculated from the 7 items of the IECA in which responsiveness to another person's sadness is measured. This subscale showed good construct validity and the items are relevant to affective empathy (De Wied et al., 2007). Sample items are "Seeing a boy/girl crying makes me feel like crying" and "It makes me sad to see a boy/girl who can't find anyone to play with". Cronbach's alpha of the scale Empathic Sadness was .82.

**Parental support.** The amount of perceived support from mothers and from fathers was measured at Time 1, using the support subscale of the short version of the Network of Relationships Inventory (NRI; Furman & Buhrmester, 1985; 1992). The support subscale consists of twelve items tapping several relationship qualities like affection, companionship and admiration (e.g., "Does your mother like or approve of the things you do?" or "How much does your father really care about you"). Adolescents filled out the questionnaire for the perceived support from mothers and from fathers separately. Items are rated on a five-point Likert scale (ranging from 1 = *a little or not at all* to 5 = *more is not possible*). Previous studies provided support for the reliability and validity of the NRI (Furman & Buhrmester, 1985; 1992). In the current sample Cronbach's alpha was .89 for perceived support from mothers and .90 for perceived support from fathers. The scores of perceived support from mothers and from fathers were highly correlated ( $r = .73, p < .001$ ), and therefore were averaged to compose one score for perceived parental support.

**Aggression.** The Direct and Indirect Aggression Scale (Bjorkqvist, Lagerspetz, & Österman, 1992) was used to measure aggression, at Time 1 and Time 2. In the current study the 17 items of two subscales were used: the subscale direct aggression (e.g., "I kick or strike the other one" or "I call the other one names") and indirect aggression (e.g., "I spread vicious rumors as revenge" or "I tell others not to associate with that person"). Both subscales have good reliability and construct validity (Bjorkqvist, Lagerspetz, & Kaukiainen, 1992). Adolescents indicated on a 4-point Likert scale ranging from 'never' to 'four times or more often', whether they show certain behaviors when they are angry at someone in the classroom. A total aggression score was computed by averaging the scores of the 17 items of direct and indirect aggression Cronbach's alpha of the total aggression scale was .88 at Time 1 and .89 at Time 2. A logarithmical transformation was used on the scores on aggression to reduce skewness.

**Delinquency.** At Time 1 and Time 2, information about delinquency of the participants was derived from a 16-item questionnaire from Baerveldt, Van Rossem & Vermande (2003), designed to measure minor offences. Adolescents were asked to indicate on a 4-point scale ranging from *never* to *four times or more* how often they had shown certain forms of delinquent behavior (e.g., 'stolen a bike, 'deliberately broken something at the street') during the last 12 months. Results of the study of Baerveldt and colleagues (2003) provide support

for the internal consistency and validity of the measure. Cronbach's alpha in the current sample was .83 at Time 1 and .82 at Time 2. The scores on delinquency were logarithmically transformed to reduce skewness.

## Results

Prior to testing study hypotheses, gender differences in all measures were assessed in preliminary analyses (see Table 4.1). Girls scored significantly higher on empathy than boys,  $t(321) = -12.37, p < .001$ . There were no gender differences in perceived parental support ( $p = .54$ ). Boys reported higher levels of aggressive behavior than girls,  $F(1, 321) = 26.70, p < .001$ , and boys also reported higher levels of delinquent behavior than girls,  $F(1, 321) = 21.48, p < .001$ . There was no significant difference between age 14 and age 15 mean levels of aggressive behavior ( $p = .08$ ) and delinquent behavior ( $p = .29$ ). Table 4.2 shows the bivariate correlations for all study variables. As expected, adolescents who reported higher empathy scored lower on aggression and on delinquency at both age 14 and age 15 than adolescents who reported lower empathy. Higher perceived parental support was associated with lower aggression at age 14 (but not age 15) and with lower delinquency at both age 14 and 15.

Two hierarchical linear regression analyses were performed to test the main effects of empathy and perceived parental support at age 14 in the prediction of aggression and delinquency at age 15. Interactions between empathy and parental support were entered

**Table 4.1** Mean scores for boys and girls on empathy, parental support, aggression (logtransformed), and delinquency (logtransformed)

	Total ( $N = 323$ )		Boys ( $n = 158$ )		Girls ( $n = 165$ )		Boys vs. Girls
	$M$ (SD)		$M$ (SD)		$M$ (SD)		$t$
Empathy							
age 14	0.22	(1.68)	-0.76	(1.44)	1.15	(1.33)	-12.37***
Parental support							
age 14	3.58	(.58)	3.52	(0.59)	3.56	(.57)	0.61
Aggression							
age 14	0.88	(.14)	0.92	(0.14)	0.85	(.14)	4.07***
age 15	0.87	(.14)	0.91	(0.14)	0.83	(.12)	5.20***
Delinquency							
age 14	0.75	(.10)	0.77	(0.11)	0.72	(.08)	4.89***
age 15	0.75	(.10)	0.77	(0.12)	0.73	(.09)	3.65***

Note. \*\*\*  $p < .001$ .



to the regressions to test the hypothesis that empathy would moderate the relationships between parental support and aggression and between parental support and delinquency. The scores on empathy and parental support were centered before creating the interaction terms. Gender was recoded into a dummy variable (0 = female, 1 = male). In each regression analysis, the predictors were entered in three hierarchical steps: (1) gender, and aggression or delinquency at age 14, (2) parental support, and empathy at age 14, (3) the interaction of empathy and parental support. In Table 4.3, standardized beta coefficients, R-squares and changes in R-squares are reported for each step of the two hierarchical regressions.

**Table 4.2** Inter-correlations between affective empathy (age 14), parental support (age 14), aggression (logtransformed, age 14 and 15), and delinquency (logtransformed, age 14 and 15)

	1.	2.	3.	4.	5.	6.
1. Affective empathy (age 14)	--					
2. Perceived parental support (age14)	.22***	--				
3. Aggressive behavior (age 14)	-.14*	-.18**	--			
4. Delinquency (age 14)	-.25***	-.30***	.37***	--		
5. Aggressive behavior (age 15)	-.16**	-.11	.63***	.37***	--	
6. Delinquency (age 15)	-.20***	-.19***	.33***	.72***	.40***	--

Note. \*  $p < .05$  \*\*  $p < .01$  \*\*\*  $p < .001$ .

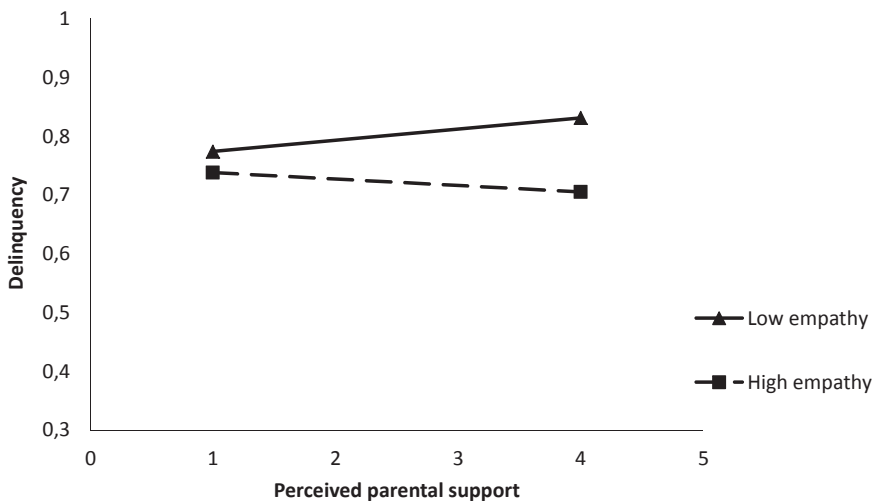
**Table 4.3** Longitudinal hierarchical regression analyses predicting aggression (logtransformed) and delinquency (logtransformed) at age 15 as a function of parental support and empathy, and the interaction of parental support and empathy

	Aggression (age 15)			Delinquency (age 15)		
	$R^2$	$\Delta R^2$	$\beta$	$R^2$	$\Delta R^2$	$\beta$
<i>Step 1</i>	.41	.41***		.51	.51***	
Sex			.15**			.01
Delinquency/Aggression (age 14)			.59***			.71***
<i>Step 2</i>	.41	.00		.52	.00	
Parental support (age 14)			.00			.03
Empathy (age 14)			.01			-.03
<i>Step 3</i>	.42	.01*		.52	.01**	
Parental support X Empathy			-.10*			-.09*
Regression equation	$F(5, 317) = 46.66, p < .001$			$F(5, 317) = 69.26, p < .001$		

Note. \*  $p < .05$  \*\*  $p < .01$  \*\*\*  $p < .001$ .

Significant interactions were examined applying the Johnson-Neyman technique with use of the computational tool provided by Hayes and Matthes (2009) that identifies for which regions in the range of the moderator variable, effects of the focal predictor on the outcome variable are statistically significant (Bauer & Curran, 2005; Hayes & Matthes, 2009).

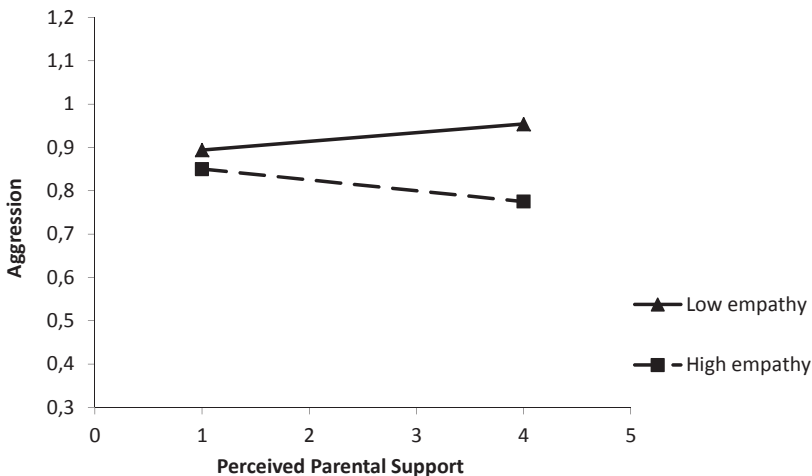
The first hierarchical regression was conducted on aggression at age 15 with empathy, perceived parental support, and the interaction of empathy and parental support as predictors. The results from the second step of the model show that, after controlling for aggression at age 14, empathy and perceived parental support at age 14 could not predict aggression at age 15. However, in the third step, the interaction of parental support contributed significantly to the prediction of aggression (see Table 4.3). Thus, the association between parental support and aggression differs for adolescents varying in level of empathy. Using the Johnson-Neyman technique (see Hayes & Matthes, 2009), the interaction was probed, revealing that for adolescents with empathy scores higher than 1.57 standard deviations above mean, the effect of perceived parental support on aggression was significantly negative ( $p < .05$ , significant coefficients ranging from  $b = -.04$  to  $b = -.05$ ). Remarkably, for adolescents with empathy scores lower than 1.84 standard deviations below mean, higher perceived parental support was associated with higher aggression scores ( $p < .05$ , ranging from  $b = .04$  to  $b = .05$ ). Figure 4.1 visualizes the interactive effect by showing simple slopes for adolescents with high and low empathy scores (1 *SD* above and below mean).



**Figure 4.1** Interaction of perceived parental support and empathy (at 1 *SD* above and below mean) in the prediction of aggression (logtransformed) at age 15, accounting for the effects of gender and baseline levels of aggression.

The second hierarchical regression was conducted on delinquency at 15 years with empathy and perceived parental support, and the interaction of empathy and parental support as predictors. Again, results of the second step of the analysis showed that perceived parental support and adolescent empathy at age 14 did not predict delinquency at age 15, but the interaction of parental support and empathy in the third step did contribute significantly and negatively to the prediction (see Table 4.3), indicating that the association between perceived parental support and delinquency differs for adolescents with varying levels of empathy. Probing the interaction revealed that the negative association between perceived parental support and delinquent behavior did not reach significance within the range of the empathy scores in our sample (for highest empathy score  $p = .09$ ). However, for adolescents with empathy scores lower than 1.13 standard deviations below mean, the positive association between perceived parental support and delinquency was significant ( $p < .05$ , ranging from  $b = .02$  to  $b = .04$ ). The interactive effect is visualized in Figure 4.2, showing simple slopes for adolescents with high and low empathy scores (1  $SD$  above and below mean).

Thus, the findings of the current study indicate that adolescents' empathic abilities play a moderating role in the association between perceived parental support at age 14 and aggressive and delinquent behavior at age 15. Parental support seems to have more beneficial effects for adolescents high in empathy than for adolescents low in empathy. Whereas highly empathic adolescents who perceive their parents to be supportive show less



**Figure 4.2** Interaction of perceived parental support and empathy (at 1  $SD$  above and below mean) in the prediction of delinquency (logtransformed) at age 15, accounting for the effects of gender and baseline levels of delinquency.

aggressive behavior one year later, adolescents low in empathy who perceive their parents to be supportive even show more aggressive and delinquent behavior one year later.

## Discussion

The aim of the present study was to examine the effects of adolescent empathy and perceived parental support on aggressive and delinquent behavior longitudinally. Convergent with our hypotheses, adolescents' empathy moderated the association between perceived parental support and aggressive and delinquent behavior one year later. The associations tended to be negative for adolescents reporting high empathy, but were positive for adolescents reporting low empathy. In contrast, there were no main effects of empathy and of perceived parental support on aggression and delinquency. The results of the current study correspond with theories emphasizing that children vary in their susceptibility to parental support (Belsky, 1997; 2005; Kochanska, 1997).

Consistent with our expectations, empathy interacted with perceived parental support in the prediction of aggression and delinquency. Only for high empathic adolescents, perceived parental support negatively predicted aggression, and marginally significant, negatively predicted delinquency. Thus, adolescents high in empathy gain more from parental support than adolescents low in empathy do, which may be due to a higher sensitivity to positive parental behavior (Blair, 2003). These results are consistent with the outcomes of studies in clinical samples, in which parental influences were differently related to children's adjustment for children who did or did not lack empathy (Oxford et al., 2003; Wootton et al., 1997). The current study extended these findings by showing the moderating role of empathy in a community sample of adolescents and in a longitudinal design.

A remarkable result of our study is that low empathic adolescents not only appeared to benefit less from perceived parental support, but moreover, appeared to be detrimentally affected by higher perceived parental support. When low empathic adolescents reported higher perceived support from their parents, they even showed higher levels of aggression and delinquency one year later. A possible explanation for this finding is that adolescents reporting low empathy have more difficulty with decoding the signals given by their parents than adolescents high in empathy (Blair, 2003; Davis, 1996). Low empathic adolescents may interpret the support from their parents as acceptance of their misbehavior, and therefore their parents' efforts to offer them warm and supportive care may encourage instead of inhibit them to show aggressive and delinquent behavior. This explanation may be particularly likely when these low empathic adolescents not only perceive their parents to be more supportive,

but also experience a lack of control of their parents. This combination characterizes a permissive parenting style.

Although both for aggression and delinquency, the significant interaction effect indicates more positive effects of parental support for adolescents with high empathy scores than for adolescents with low empathy scores, among high empathic adolescents higher support was only significantly related to lower levels of aggression. The negative association between perceived parental support and delinquent behavior one year later for adolescents with high empathy scores did not reach significance within the range of scores in our sample. A possible explanation is that delinquency in our assessment mainly involved property offenses, which are not straightforwardly directed towards persons. For instance, stealing goods from a shop or damaging public properties does not directly involve visible harm to a victim, and acts like this may therefore be less consistently influenced by empathy and parental support.

We expected that adolescents' affective empathy would inhibit aggression and delinquency (Davis, 1996; Miller & Eisenberg, 1988) and that adolescents who feel supported by their parents would also be less inclined to show aggressive and delinquent behavior (Branje et al., 2008). These hypotheses were supported by bivariate concurrent associations in the expected directions, but when we accounted for the effect of gender and for the stability of aggression and delinquency, empathy and perceived parental support at age 14 did not contribute to the prediction of aggression and delinquency one year later. However, our result is in line with a transactional view on children's development, which suggests that the interaction between adolescent and environmental characteristics likely explain adolescent development better than do either of these factors on their own (Sameroff & Chandler, 1975).

Our results should be interpreted in light of some limitations. Firstly, we used self-reports to assess empathy, parental support, aggression, and delinquency. However, it is not likely that our results are inflated by common method variance, since interaction effects cannot be artificially created (Evans, 1985). In fact, we found significant interactions despite the influence of common method variance, which offers strong evidence that the interaction effect exists (Siemsen, Roth, & Oliveira, 2010). Yet, results might have been different when using parents' report of the support they provide, because adolescents' perception of parental support may be influenced by their level of empathy. Secondly, probing the interaction showed that only for adolescents with fairly high and low empathy scores the associations between perceived parental support and aggression and delinquency are significantly different from zero. This may be due to the characteristics of our sample, consisting of adolescents with relatively high education levels and from two-parent families, which may have reduced the range of empathy scores. However, our hypothesis that adolescents low in empathy are less responsive to parental support was based on findings of studies with clinical samples. The

fact that in our relatively well-functioning community based sample we do find support for the hypothesis that low empathic adolescents benefit less from parental support than do high empathic adolescents, but that the effects are only significant at the lower and higher end of the range of scores in our sample, suggests that it actually is a phenomenon of more diverse populations. Thirdly, as we used only a subscale of the IECA (Bryant, 1982; de Wied et al., 2007), in which responsiveness to another person's sadness is measured, we do not know whether our results will hold for affective empathy in general. Finally, our study is correlational. Therefore, we cannot draw conclusions about causality, and the effects we found of perceived parental support on aggressive and delinquent behavior, could include influences of adolescent behavior on the parent. Experimental designs are needed to examine whether empathy indeed affects adolescents ability to derive benefit from parental support.

Despite the limitations, we believe the present study advances our understanding of the role of empathy and parental support in the development of aggressive and delinquent behavior. By investigating these associations longitudinally in a community sample, we extended research that was done in clinical samples. Empathy indeed appeared to play an important role in the relation between perceived parental support and aggressive and delinquent behavior in adolescence. Although perceived parental support is an important factor in adolescent adjustment, the effects vary for adolescents with different levels of empathy. High empathic adolescents show less aggressive behavior when they perceive their parents to be more supportive, whereas low empathic adolescents seem not to derive this benefit and even show more aggressive and delinquent behavior when they perceive their parents to be more supportive.







A grayscale microscopic image of plant cells, showing various cell walls and internal structures, serving as a background for the page.

# 5

## Respiratory sinus arrhythmia moderates the relation between parent-adolescent relationship quality and adolescents' social adjustment

Van der Graaff, J., Meeus, W., de Wied, M., van Boxtel, A., Van Lier, P., & Branje, S. Respiratory Sinus Arrhythmia Moderates the Relation Between Parent-Adolescent Relationship Quality and Adolescents' Social Adjustment. *Manuscript submitted for publication.*

## Abstract

This two-wave longitudinal study aimed (1) to investigate whether high resting RSA predicted adolescents' lower externalizing behavior and higher empathic concern, and (2) to address the potential moderating role of resting RSA in the association between parent-adolescent relationship quality and adolescents' externalizing behavior and empathic concern. In a sample of 379 adolescents (212 boys, 167 girls), resting RSA was assessed during a laboratory session, and adolescents reported on parental support, negative interaction with parents, empathic concern and externalizing behavior during a home visit. We found no support for high resting RSA predicting low externalizing behavior or high empathic concern. However, girls' resting RSA moderated the association between negative interaction with parents and externalizing behavior, and the association between parental support and empathic concern. Boys' resting RSA moderated the association between negative interaction with parents and empathic concern. In line with differential susceptibility and biological sensitivity-to-context models, parental support was a positive predictor of empathic concern for girls high in resting RSA, whereas the association was non-significant for girls low in resting RSA. However, the interactions between resting RSA and negative interaction with parents did not support these theories. Boys low in resting RSA who experienced higher negative interaction reported higher empathic concern than when they experienced lower negative interaction, and girls low in resting RSA who experienced higher negative interaction reported less externalizing behavior than when they experienced lower negative interaction. The findings suggest that adolescents with different levels of resting RSA may respond differentially to relationship quality with parents.

## Introduction

High self-regulation has been related to lower levels of externalizing behavior and to higher levels of empathic concern (e.g., Fabes, Eisenberg, Karbon, Troyer & Switzer, 1994; Oldehinkel, Hartman, Ferdinand, Verhulst, & Ormel, 2007). Resting respiratory sinus arrhythmia (RSA) is generally seen as a physiological marker of dispositional self-regulation (Porges, 1991; Thayer & Lane, 2000). Individuals low in resting RSA, indicating reduced parasympathetic activation of the heart, are thought to have more difficulties in physiological and behavioral self-regulation and are therefore less capable to display situation-appropriate reactions than individuals high in resting RSA (Porges, 1991). Low resting RSA indeed has been related to higher externalizing behavior in clinical or at risk samples (see Kibler, Prosser, & Ma, 2004) and to lower empathic concern (e.g., Fabes, Eisenberg, & Eisenbud, 1993). Besides potential direct effects, there are conceptual reasons to expect resting RSA to moderate the association between environmental influences and adolescents' adjustment, although theories regarding the nature of this interaction are diverging (see Eisenberg et al., 2012). Therefore, we examined in a community sample of adolescent boys and girls (1) whether low resting RSA predicted higher externalizing behavior, (2) whether low resting RSA predicted lower empathic concern, and (3) whether and how resting RSA moderated the link between parent-adolescent relationship quality and adolescents' social functioning.

### Resting respiratory sinus arrhythmia (RSA) as a marker of self-regulation

RSA is the high frequency component of heart rate variability, and is a measure of the magnitude of the rhythmic fluctuations in heart rate across the respiratory cycle which are characterized by increasing heart rate during inhalation and decreasing heart rate during exhalation. RSA is mainly determined by vagal influences on the heart, and therefore provides an index of parasympathetic activity (Berntson et al., 1997). Theorists suggest that resting RSA reflects the degree to which an individual is able to respond flexibly to changes in the internal and external environment, although they emphasize different aspects of the neural control of the heart (Porges, 1995; Thayer & Lane, 2000). Whereas Porges (1995) stresses the central role of the vagus in regulating heart rate frequency in response to external stimuli, Thayer and Lane (2000) emphasize the neural feedback mechanisms between the central nervous system and the autonomic nervous system that allow the organism to respond to environmental demands. Yet, both views postulate that parasympathetically mediated inhibition of autonomic arousal is essential in the regulation and expression of emotions, and both propose resting RSA as an index of these self-regulatory capacities (Appelhans &

Luecken, 2006). Low resting RSA has been related to a wide range of psychiatric disorders that are characterized by affect dysregulation, such as depression, anxiety and aggression (Beauchaine, 2001; Thayer & Lane, 2000).

### **Associations between resting RSA and externalizing behavior**

When confronted with a social stimulus, individuals either attend to and engage with it or perceive it as threatening and initiate fight or flight responding. Whereas social engagement requires sustained attention, characterized by increased vagal activity producing heart rate deceleration, fight or flight responses require large sympathetically mediated heart rate accelerations and decreased vagal activity. In situations of rest, RSA reflects the tonic activity of the vagal nerve, which suppresses the baseline heart rate. Hence, a low basal RSA, indicating reduced vagal tone, may mark a predisposition to show fight and flight responding and thus a low threshold to show aggression (Beauchaine, Katkin, Strassberg, & Snarr, 2001; Porges, 1995).

Research on the association between resting RSA and externalizing behavior in adolescence has mainly been conducted in clinical or high risk samples, and has often only involved boys. Negative associations were quite consistently found in clinical studies (e.g., Beauchaine, Gatzke-Kopp, & Mead, 2007; De Wied, Van Boxtel, Posthumus, Goudena, & Matthys, 2009), as well as in samples consisting of boys at risk for externalizing behavior (e.g., Mezzacappa et al., 1997; Pine et al., 1998). However, results of studies that investigated this link in community samples are inconsistent. Higher RSA was related to lower father-reported problem behavior for 6–8 year old boys, but this association was not significant for girls (Eisenberg, Fabes, Murphy, Maszk, Smith, & Karbon, 1995). Further, in a Chinese sample of 7-year-olds, vagal tone was negatively related to reactive aggression, but not significantly related to proactive aggression (Xu, Raine, Yu, & Krieg, 2013). Also no significant association between resting RSA and externalizing behavior was found among 5 year old boys and girls (Calkins, Graziano, & Keane, 2007), nor in a sample of early adolescents (El-Sheikh & Whitson, 2006). Also, a comparison between 10 to 13 year old boys and girls with current externalizing behavior and control children revealed no significant difference in resting RSA (Dietrich et al., 2007). Moreover, in a student sample, resting RSA was positively related to self-reported aggression, but only among non-victims and not among students who had been a victim of community violence (Scarpa & Ollendick, 2003). These inconsistencies in results may be due to differences in the assessment of resting RSA (e.g., under standardized laboratory conditions versus assessment at schools) or characteristics of the sample (e.g., school age children versus young adults). Thus, whereas research in clinical samples quite consistently

found boys with low resting RSA to show more externalizing behavior, results from studies in community samples are inconsistent.

### **Associations between resting RSA and empathic concern**

To be able to show empathic concern, self-regulation is thought to be essential. Empathic concern, also labeled sympathy, is an emotional response stemming from the apprehension of another's emotional state that consists of feelings of sorrow or concern for the other. When lacking adequate self-regulation, the confrontation with others' emotions may instead of resulting in empathic concern, bring about a self-focused, aversive, emotional reaction to the vicarious experiencing of another's emotion (Eisenberg & Eggum, 2009). Hence, as a physiological index of self-regulation, low resting RSA may be expected to be related to lower empathic concern. In addition, it has been suggested that higher RSA not only reflects better regulation, but also a psychophysiological state that facilitates social engagement. In safe situations, the vagus functions as a brake slowing heart rate by increasing parasympathetic influence on the heart, which results in an enhanced ability to attend to the environment (Porges, 1995) and thus may facilitate the tendency to show empathic concern.

Results of the few studies that investigated the association with empathic concern are inconsistent. Among toddlers, the association between resting RSA and empathic concern was marginally significant (Liew et al., 2011). Among school-aged children, one study found heart rate variability (which also is an indicator of parasympathetic activity) to be positively related with empathic concern, but only in girls (Fabes et al., 1993), whereas another study found it positively related to boys' empathic concern but negatively related to girls' empathic concern (Eisenberg, Fabes, Murphy, Karbon, Smith, & Maszk, 1996). With regard to empathy-related processes, adolescents' resting RSA was positively related to accuracy in estimating their mothers' affect and to concordance between their own and their mothers' affect (Diamond, Fagundes, & Butterworth, 2012), and young adults' resting RSA was not significantly related to responses to compassion-inducing stimuli (Oveis et al., 2009), but positively related to emotion recognition (Quintana, Guastella, Outhred, Hickie, & Kemp, 2012). In addition, in a sample of school-aged children, resting RSA was positively related to comforting behavior towards an infant (Fabes et al., 1994). Thus, despite the conceptual reasons to expect individuals high in resting RSA to report higher empathic concern, evidence from previous research is equivocal (as was the case for the association between RSA and externalizing behavior) and studies on this link in adolescence are lacking.

### **The moderating role of resting RSA**

Besides the potential direct associations between resting RSA and social functioning, recent research suggests that RSA may also play a moderating role in the relation between environmental influences and children's social adjustment (e.g., Eisenberg et al., 2012; El-Sheikh, 2005), although theories regarding the nature of this interaction are diverging. On the one hand, high resting RSA may function as a protective factor. Individuals with high levels of resting RSA are expected to have better self-regulatory capacities (Beauchaine, 2001; Thayer & Lane, 2000) and may, because of this, be better able to cope with environmental stressors. If high RSA indeed functions as a protective factor, negative environmental influences are expected to have impact on individuals low in RSA, but not (or to a lesser extent) on individuals high in RSA. On the other hand, high resting RSA may function as a susceptibility factor. According to differential susceptibility theory and the notion of biological sensitivity-to-context, certain characteristics that make individuals more vulnerable to environmental adversity also make them more likely to benefit from positive environmental influences (Belsky, 1997; Boyce & Ellis, 2005; Ellis, Boyce, Belsky, Bakermans-Kranenburg, & Van IJzendoorn, 2011). Individuals high in resting RSA may, because of their more active engagement with their environment (Beauchaine, 2001; Thayer & Lane, 2000), be more sensitive to environmental influences than adolescents low in resting RSA. This would imply stronger effects of both positive and negative environmental factors on individuals high in resting RSA than on individuals low in resting RSA.

In line with the perspective of high resting RSA as a protective factor, some studies indeed found high resting RSA to buffer the impact of adverse environmental influences on children's social adjustment. For instance, in a sample of school aged children, parental problem drinking was stronger related to adjustment for children low in resting RSA than for children high in resting RSA (El-Sheikh, 2005). Also, among 9 to 16 year boys, maltreatment was positively related to aggression, but only for boys with low levels of RSA (Gordis, Feres, Olezeski, Rabkin, & Trickett, 2010). In addition, the relation between marital conflict and behavior problems was stronger for children low in resting RSA than for children high in resting RSA (Katz & Gottman, 1997).

In line with the perspective of high resting RSA as a susceptibility factor, some studies found children high in resting RSA to be more responsive to environmental influences than children low in resting RSA. Among 4- to 7-year-olds, maternal depressive symptomatology was negatively related to emotion regulation for children high in resting RSA, but not significantly related for children low in resting RSA (Blandon, Calkins, Keane, & O'Brien, 2008). Further, parental psychiatric symptomatology was stronger related to problem behavior for children

high in resting RSA than for children low in resting RSA (Shannon, Beauchaine, Brenner, Neuhaus, & Gatzke-Kopp, 2007). In addition, Eisenberg and colleagues (2012) found that environmental quality negatively predicted mother-reported aggression at 54 months of age for children with high and average resting RSA at 18 months of age, whereas this association was non-significant for children with low resting RSA. However, resting RSA did not significantly moderate the association between stressful life events and adolescents' externalizing behavior (Oldehinkel, Verhulst, & Ormel, 2008).

Thus, although a growing body of literature suggests RSA to moderate the relation between contextual influences and children's adjustment, results of previous studies are conflicting about the direction of the effects. Moreover, the majority of studies have only investigated the effects of potential *negative* contextual influences (e.g., Oldehinkel et al., 2008; Bandon et al., 2008), or have only assessed *negative* outcomes, such as various forms of problem behavior (e.g., Eisenberg et al., 2012; Shannon et al., 2007).

### **The current study**

The first aim of the current two-wave longitudinal study was to examine in a community sample of adolescent boys and girls whether resting RSA at age 17 could predict externalizing behavior one year later. Although low resting RSA has conceptually been related to high externalizing behavior and studies among boys in clinical samples have indeed revealed negative associations, results of previous studies in community samples were inconsistent. We therefore explored this relationship without making firm hypotheses. The second aim was to investigate whether adolescents' resting RSA could predict empathic concern one year later. Although not many studies have investigated this association and studies in adolescent samples are lacking, we expected to find a positive association based on the modest empirical support and the notion that high RSA reflects better emotion regulation and a physiological state that facilitates social interaction (Porges, 1995). The third aim was to examine whether the interaction between resting RSA and parent-adolescent relationship quality predicted relative changes in externalizing behavior and empathic concern. Individuals high in resting RSA may, due to their better self-regulation, be less affected by negative environmental influences or, conversely, they may be more sensitive to positive as well as negative influences due to their higher emotional reactivity and higher engagement with their environment. Therefore, we investigated the effects of both a positive environmental characteristic (i.e., perceived parental support) and a negative characteristic (i.e., perceived negative interaction with parents) of the parent-adolescent relationship on both adolescents' adaptive behavior (i.e., empathic concern) and maladaptive behavior (i.e., externalizing behavior). Parent-adolescent

relationship quality has been found to be associated with adolescents' externalizing behavior (for a review see Branje, Hale, & Meeus, 2008) as well as with empathic concern (e.g., Miklikowska, Duriez, & Soenens, 2011). The current study tested whether the direction and strength of these associations are dependent on adolescents' levels of resting RSA. Because of the inconsistencies in the theoretical and empirical literature with regard to the nature of the interaction, we explored this without making firm hypotheses. Further, based on sex differences that previous studies found in associations between resting RSA and social functioning (e.g., Eisenberg et al., 1996; Fabes et al., 1993; Gordis et al., 2010), we investigated the relations separately for boys and girls.

## Method

### Sample

This two-year longitudinal study used data from the ongoing Research on Adolescent Development and Relationships (RADAR) project. Adolescents participating in RADAR Young ( $N = 497$ ) were recruited from randomly selected schools in the province of Utrecht and four cities in The Netherlands. They participated in seven annual home visits during which they completed several questionnaires. The current study used data from a subsample that also participated in an individual laboratory session at the university ( $n = 382$ ). The laboratory session took place around the time of the fifth annual questionnaire wave. In addition, we used questionnaire data of adolescents and their mothers collected during the fifth and sixth wave (from now on referred to as Time 1 and Time 2). Of all adolescents who participated in the laboratory session, data of 3 participants were lost due to technical problems or experimenter error, and thus the sample consisted of 379 adolescents, among which 212 boys ( $M$  age at Time 1 = 17.04,  $SD = .46$ ) and 167 girls ( $M$  age at Time 1 = 16.94,  $SD = .41$ ). The majority of the adolescents was native Dutch (95.8%), lived with both parents (78.4%), and came from families classified as medium or high socioeconomic status (91.8%).

### Procedure

**Home visits.** During the home visits, adolescents and their mothers filled out a battery of questionnaires. A trained research assistant provided verbal instructions in addition to the written instructions that accompanied the questionnaires. For each home visit, parents provided written informed consent before adolescents participated. Adolescents received



30 Euros for their participation in each of the home visits.

**Laboratory session.** Adolescents visited the university to participate in an individual laboratory session during which (among other assessments) resting RSA was assessed. Parents and adolescents both provided written informed consent before participation of the adolescent in this session. The session took place in a testing room equipped with a personal computer and a 17-inch computer screen (HP 1730) for presentation of an aquatic video (see below) was presented. An adjacent observation room with a one-way mirror, through which the experimenter could observe the participant, was equipped with a personal computer for online monitoring of physiological data collection. Both computers were connected to a portable digital recorder for preprocessing and storage of physiological data (Vitaport III, TEMEC Instruments B.V., Kerkrade, The Netherlands), which was attached to the participant's chair. A trained female experimenter, who followed a written protocol detailing the verbal instructions and electrode placement, received the participant. After familiarizing the participant with the procedure, electrodes were attached for ECG recording and the participant was seated in a comfortable chair at a table facing the monitor of the stimulus computer (at approximately 90 cm distance). Participants were instructed to relax and watch an aquatic video after which the experimenter dimmed the light and left the testing room. ECG was continuously recorded throughout the time the participants watched the video. Adolescents received 50 Euros for their participation in the laboratory session.

## Materials

**Relaxation video.** A 5-min fragment from an aquatic video (*Coral Sea Dreaming*, Small World Music, Inc.) was presented on the computer screen. This video has been found to foster relaxation (Piferi, Kline, Younger, & Lawler, 2000).

## Measures

**Resting RSA.** The electrocardiogram (ECG) was recorded with electrodes on the chest (sternum-V6 lead). The ECG signal was anti-aliasing filtered (512 Hz lowpass filter), digitized at a rate of 1024 Hz, and digitally bandpass filtered (5–30 Hz) to suppress baseline shifts, exceptionally large T-waves, and high-frequency artifacts such as EMG potentials. A computer-assisted procedure was executed to detect ECG R-waves and to make corrections for (a) prolonged heart periods due to missing R-waves and (b) short heart periods due to false R-waves. A prolonged heart period was defined as being either longer than 1400 ms or longer than 150% of the mean value of the preceding 10 periods. A short heart period was defined

as being either shorter than 400 ms or shorter than 50% of the mean value of the preceding 10 periods. If a prolonged or short heart period was detected, the respective ECG signal segment was visually displayed and missing or false R-wave detections could be manually corrected using a cursor, if necessary.

RSA during the presentation of the aquatic film clip was determined by applying power spectral analysis on the heart periods using the computer program CARSPAN for Windows 1.34 (Mulder, Hofstetter, & van Roon, 2007). The 300-s presentation period was divided into five 50% overlapping data segments of 100 s duration consisting of a series of R-wave events as a function of time. Each 100-s data segment was cross-multiplied with a cosine window tapering 5% of each end of the segment. Next, it was subjected to power spectral analysis using the Sparse Direct Fourier Transform algorithm (Rompelman, Snijders & van Spronsen, 1982) that was directly applied on the arrival times of the R-waves in the ECG without interpolation of the non-equidistant time series. Spectral power was determined in the 0.15–0.40 Hz frequency band, averaged across the five data segments, and subjected to natural logarithmic transformation. The power in this frequency band is associated with RSA and is generally believed to be an index of tonic parasympathetic control of the heart (Berntson, Cacioppo, & Quigly, 1993; Berntson et al., 1997).

***Perceived quality of adolescent-parent relationship.*** The perceived quality of the relationship with parents was measured during the home visit at Time 1, using two subscales of the Network of Relationships Inventory – Short Form (NRI; Furman & Buhrmester, 1985, 1992): support and negative interaction. Adolescents completed these subscales separately for the relationship with their father and their mother. The support subscale consists of 8 items tapping relationship qualities like affection, companionship, and admiration (e.g., “how much does your mother/father really care about you?”). The negative interaction subscale consists of 6 items tapping the intensity of negative interaction in the relationship (e.g., “do you and your mother/father get at each other’s nerves?”). Items were rated at a 5-point Likert scale, ranging from 1 (a little or not at all) to 5 (more is not possible). Previous studies provided support for the reliability and validity of the NRI (De Goede, Branje, & Meeus, 2009; Furman & Buhrmester, 1985, 1992). For the current sample, Cronbach’s alpha for perceived support from mothers and fathers was .85 and .89, respectively, and for perceived negative interaction with mothers and fathers, it was .95 and .94, respectively. The scores on perceived support and negative interaction in the relationship with the mother and father were averaged providing a single score for perceived support from parents and a single score for perceived negative interaction with parents.

***Externalizing behavior.*** During the home visits at Time 1 and Time 2, adolescents reported on their antisocial behavior, using the subscale externalizing behavior of the Youth Self

Report questionnaire (YSR; Achenbach, 1991; Verhulst, Van der Ende, & Koot, 1996). The externalizing behavior subscale consists of 30 items assessing whether the adolescent shows aggressive behavior (e.g., "I destroy things that belong to others") and delinquent behavior (e.g., "I lie or cheat"). Items were rated on a three-point Likert scale, ranging from 0 (never) to 2 (often). Previous studies found support for the reliability and validity of the Dutch version of the YSR (e.g., De Groot, Koot, & Verhulst, 1996). For the current sample, Cronbach's alpha on externalizing behavior was .88 at Time 1 and .88 at Time 2. The scores on externalizing behavior were logarithmically transformed to reduce skewness.

**Empathic concern.** Adolescents' self-reported empathic concern was measured at Time 1 and Time 2, using a 7-item subscale of the Dutch version of the Interpersonal Reactivity Index (IRI; Davis, 1983; Hawk et al., 2013). This subscale assessed adolescents' tendency to sympathize with others in need. A sample item is "I often have tender, concerned feelings for people less fortunate than me". Adolescents scored the items on a 5-point Likert scale, ranging from 0 (doesn't describe me at all) to 4 (describes me very well). The Dutch version of the IRI has adequate internal consistency and validity (Hawk et al., 2013). For the current sample, Cronbach's alpha on empathic concern was .70 at Time 1 and .72 at Time 2.

### Missing data

Adolescents who participated in the laboratory session did not significantly differ in empathic concern from their counterparts who joined the annual questionnaire waves but who did not participate in the test session ( $t = .93, p = .36$ ) and who therefore were not part of the current sample. However, they reported higher externalizing behavior at Time 1 than adolescents who did not participate in the current study, ( $t = -2.26, p = .02$ ). Within the current sample of adolescents, across all measures on average 5.0% (ranging from 0.0% to 9.8%) of the data were missing. Little's Missing Completely at Random (MCAR) test revealed  $\chi^2(86) = 90.89, p = .34$ , and normed  $\chi^2(\chi^2/df) = 1.06$ , indicating that the data were likely missing at random and that missing values could safely be imputed (Bollen, 1989). Missing values were imputed using the Expected Maximization algorithm in the Multiple Imputation module of LISREL9.1. Data of all 379 cases were used in the statistical analyses.

### Statistical analyses

First, descriptive statistics were computed for all study variables, and independent sample  $t$ -tests were conducted to test for sex differences in mean levels on these variables. Second, bivariate correlations between study variables were calculated. Third, we ran a series of

regression models, using robust maximum likelihood estimation, in MPlus 7.0 (Muthèn & Muthèn, 2012). To investigate whether the Time 1 variables resting RSA, parental support, and parental negative interaction could predict externalizing behavior and empathic concern one year later at Time 2, a separate model was run for each of the two outcome variables. Moreover, to test whether resting RSA moderated the association between relationship quality and adolescents' social functioning, we tested in these models the effects of the 2-way interactions between resting RSA and parental support, and between resting RSA and parental negative interaction, on each outcome variable. Concurrent associations between all predictors were included in the models although for reasons of clarity only associations with the dependent variables are reported. Further, we added age of the adolescent and socioeconomic status of their families as control variables to the models. Since this did not alter our findings, results of the models without these control variables are presented. All predictor variables were standardized to a mean of 0 and a standard deviation of 1, and interaction terms were computed using these standardized variables. We used a multi-group approach to explore associations separately for boys and girls, and to test for sex differences in these associations. Models in which all parameters were constrained to be equal were compared to the baseline model in which all parameters were free to vary across gender. We used the chi-square difference test, delta RMSEA ( $> .015$ ) and delta CFI ( $> .010$ ) to compare model fit (Chen, 2007). If the results of at least two of the three tests for model comparison indicated the constrained model to fit significantly worse than the baseline model, associations were assumed to differ between boys and girls (Kline, 2005) and results of the unconstrained model are reported. In addition, for paths of interest (the paths from resting RSA, and the interaction terms including RSA, to the dependent variable) we tested whether constraining each path separately worsened the model fit significantly.

Finally, we applied the Johnson-Neyman technique to examine significant interactions, using the computational tool of Preacher, Curran, and Bauer (2006). This technique identifies for which regions in the range of the moderator variable, effects of the focal predictor on the outcome variable are significant ( $p < .05$ ) (Bauer & Curran, 2005; Hayes & Matthes, 2009).

## Results

### Preliminary analyses

Table 5.1 presents means and standard deviations of all study variables separately for boys and girls. Independent sample *t*-tests revealed a sex difference in adolescents' resting RSA.

**Table 5.1** Mean scores for boys and girls on resting RSA, parental support, negative interaction with parents, externalizing behavior and empathic concern

	Total ( <i>N</i> = 379)	Boys ( <i>n</i> = 212)	Girls ( <i>n</i> = 167)	Boys vs. Girls
	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )	<i>M</i> ( <i>SD</i> )	<i>t</i>
Resting RSA				
Time 1	7.61 (.89)	7.47 (.91)	7.79 (.84)	-3.62***
Parental support				
Time 1	3.47 (.58)	3.42 (.55)	3.55 (.60)	-2.26*
Negative interaction with parents				
Time 1	1.79 (.56)	1.77 (.57)	1.82 (.56)	-0.93
Externalizing behavior				
Time 1	0.28 (.17)	0.29 (.18)	0.26 (.17)	1.72
Time 2	0.26 (.17)	0.27 (.17)	0.25 (.17)	1.16
Empathic concern				
Time 1	2.45 (.56)	2.24 (.53)	2.71 (.50)	-8.76***
Time 2	2.46 (.58)	2.26 (.55)	2.73 (.52)	-8.45***

Note. \*  $p < .05$  \*\*  $p < .01$  \*\*\*  $p < .001$ .

Girls showed higher levels of resting RSA than boys. Further, girls reported higher levels of support from their parents, and higher levels of empathic concern than boys at both Time 1 and Time 2. We found no significant sex differences in perceived negative interaction with parents ( $p = .35$ ), nor in externalizing behavior at Time 1 ( $p = .09$ ) and Time 2 ( $p = .25$ ).

Bivariate correlations for boys and girls in Table 5.2 showed that boys with higher levels of resting RSA reported higher empathic concern at Time 1. Boys' resting RSA was not significantly related to parental support ( $p = .56$ ), negative interaction with parents ( $p = .64$ ), empathic concern at Time 2 ( $p = .82$ ) and externalizing behavior at Time 1 ( $p = .30$ ) and Time 2 ( $p = .18$ ). Girls higher resting RSA was related to higher support and lower negative interaction with parents. Girls' resting RSA was not significantly related to empathic concern at Time 1 ( $p = .64$ ) and Time 2 ( $p = .99$ ), and to externalizing behavior at Time 1 ( $p = .96$ ) and Time 2 ( $p = .91$ ). Further, with regard to the associations between parent-adolescent relationship quality and the outcome measures, for boys higher parental support was significantly related to higher empathic concern at both Time 1 and Time 2, and to lower externalizing behavior at Time 1, but not at Time 2 ( $p = .66$ ). Boys' negative interaction with parents correlated positively to externalizing behavior at Time 1 and Time 2, but was not significantly related to empathic concern at Time 1 ( $p = .05$ ) and Time 2 ( $p = .13$ ). For girls, higher parental support

**Table 5.2** Intercorrelations of resting RSA, support from parents, negative interaction with parents, externalizing behavior, and empathic concern for boys (below diagonal) and girls (above diagonal)

	1.	2.	3.	4.	5.	6.	7.
1. Resting RSA (Time 1)	--	.17*	-.17*	.00	.01	.04	.00
2. Support from parents (Time 1)	.04	--	-.48***	-.24**	-.23**	.23**	.21**
3. Negative interaction with parents (Time 1)	.03	-.26***	--	.49***	.30***	-.22**	-.16*
4. Externalizing behavior (Time 1)	-.07	-.21**	.39***	--	.76***	-.19*	-.20**
5. Externalizing behavior (Time 2)	-.09	.03	.35***	.71***	--	-.24**	-.31***
6. Empathic concern (Time 1)	.14*	.29***	-.13	-.28***	-.15*	--	.58***
7. Empathic concern (Time 2)	-.02	.24***	-.11	-.20**	-.12	.66***	--

Note. \*  $p < .05$  \*\*  $p < .01$  \*\*\*  $p < .001$ .

was at both Time 1 and Time 2 related to lower externalizing behavior and higher empathic concern. Girls' higher negative interaction with parents was related to lower empathic concern and higher externalizing behavior at Time 1 and Time 2.

## Regression models

**Externalizing behavior.** A regression model was run to predict externalizing behavior at Time 1 and Time 2, with resting RSA, parental support, negative interaction with parents, and the interactions between resting RSA and parental support and between resting RSA and negative interaction with parents as predictors. Multiple Group analyses revealed the constrained model to fit significantly worse than did the model in which paths were free to vary between boys and girls,  $\Delta\chi^2(6) = 19.379$ ,  $p < .001$ ,  $\Delta RMSEA = .108$ ,  $\Delta CFI = .064$ . Therefore, results of the unconstrained model are reported (see Table 5.3). With regard to longitudinal associations, externalizing behavior showed considerable stability over time for both boys and girls. For boys, a higher negative interaction with parents at Time 1 predicted higher externalizing behavior at Time 2. Remarkably, boys who perceived their parents as more supportive, reported more externalizing behavior one year later. However, this may be a suppression effect, given that the correlation matrix showed the correlation to be non-significant. Boys' resting RSA did not significantly predict externalizing behavior at Time 2, and also the interaction effects were not significant. For girls, there were no significant longitudinal main effects of resting RSA, parental support or negative interaction with parents,

**Table 5.3** Concurrent and longitudinal associations of boys' and girls' resting RSA, perceived parental support and negative interaction with externalizing behavior and empathic concern

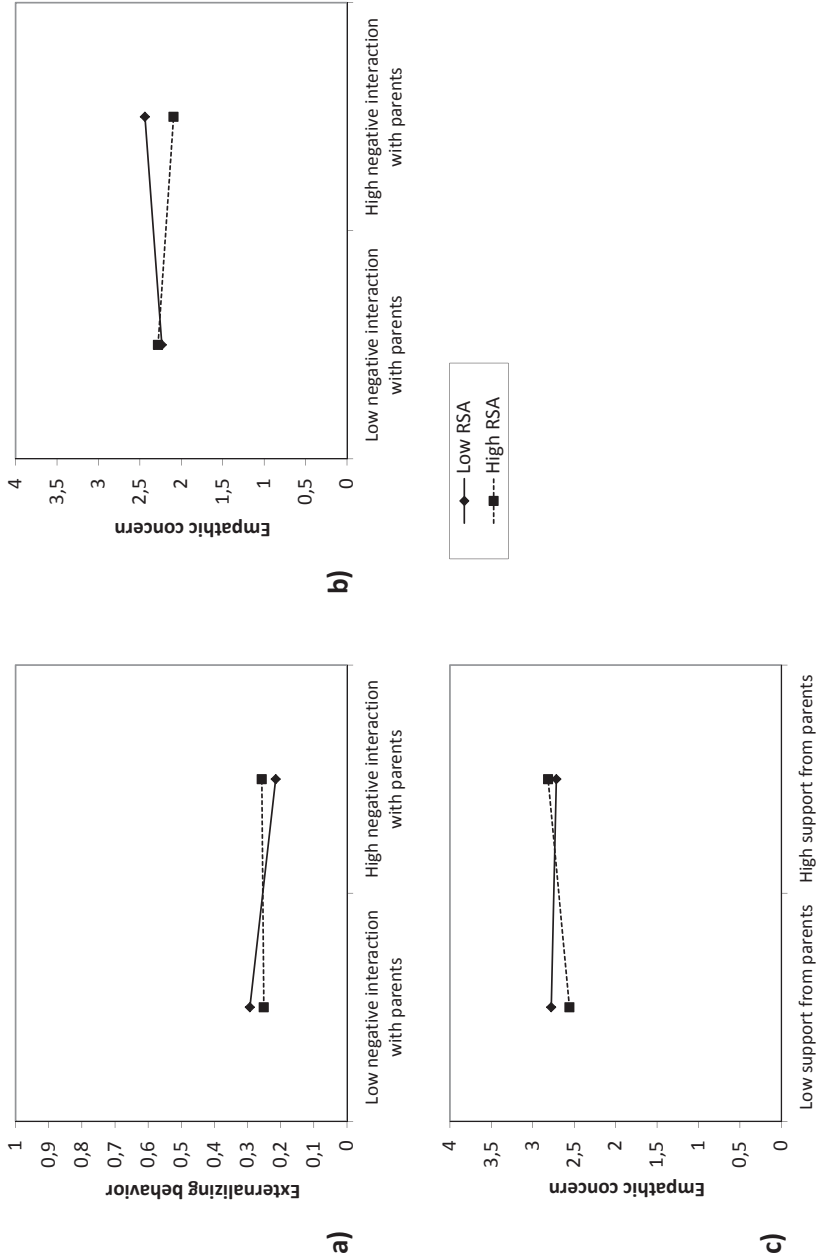
	Externalizing behavior		Empathic concern	
	Boys	Girls	Boys	Girls
Concurrent effects t1 → t1				
Resting RSA	-.07	.01	.14+	.04
Support from parents	-.21**	-.24**	.29***	.23**
Negative interaction with parents	.39***	.49***	-.13+	-.22**
RSA X support	-.04	.09	-.02	-.05
RSA X negative interaction	.06	-.06	.11	.13+
Stability effects t1 → t2				
Externalizing behavior	.70***	.79***	-	-
Empathic concern	-	-	.68***	.57***
Longitudinal main effects t1 → t2				
Resting RSA	-.06	-.00	-.14*	-.06
Support from parents	.22**	-.09	.06	.10
Negative interaction with parents	.13*	-.10	.01	.00
Longitudinal interaction effects t1 → t2				
RSA X support	-.04	.01	-.06	.15*
RSA X negative interaction	.01	.13*	-.17**	.04

Note. +  $p < .10$  \*  $p < .05$  \*\*  $p < .01$  \*\*\*  $p < .001$ .

but the interaction between resting RSA and negative interaction with parents significantly predicted girls' externalizing behavior one year later. Using the Johnson-Neyman technique (see Hayes & Matthes, 2009) the interaction was probed, revealing that for girls with resting RSA levels lower than  $-.22$  below mean, higher negative interaction with parents was related to lower externalizing behavior ( $b = -.02$ ). For higher levels of resting RSA, the association did not become significant within the range of scores of the current sample.

The interaction effect is visualized in Figure 5.1a by showing simple slopes for girls high and low in resting RSA (1 SD above and below mean). It should be noted that constraining the interaction path to be equal between boys and girls did not significantly worsen the model fit,  $\Delta\chi^2(1) = 1.548$ ,  $p = .21$ ,  $\Delta\text{RMSEA} = .054$ ,  $\Delta\text{CFI} = .003$ , indicating that the strength or direction of this path did not differ significantly between boys and girls.

**Empathic concern.** Table 5.3 summarizes the results of the regression model predicting empathic concern at Time 2 with EC at Time 1, resting RSA, parental support, negative interaction with parents, and the interactions between resting RSA and parental support and between resting RSA and negative interaction with parents as predictors. Multiple Group



**Figure 5.1** a) Interaction between girls' perceived negative interaction with parents and RSA, predicting (the logarithm of) externalizing behavior. b) Interaction between boys' perceived negative interaction with parents and RSA predicting empathic concern. c) Interaction between girls' perceived support from parents and RSA predicting empathic concern. RSA at 1 SD above and 1 SD below mean.



analyses revealed the constrained model to fit significantly worse than did the model in which paths were free to vary between boys and girls,  $\Delta\chi^2(6) = 11.50, p = .07, \Delta RMSEA = .07, \Delta CFI = .033$ . Therefore, results of the unconstrained model are reported (see Table 5.3).

With regard to the longitudinal associations, empathic concern showed considerable stability over time for both boys and girls. The only significant main effect was boys' higher resting RSA at Time 1 predicting lower empathic concern at Time 2, which was qualified by a significant interaction effect. The interaction between resting RSA and perceived negative interaction with parents at Time 1 significantly predicted boys' empathic concern at Time 2, indicating that the association between negative interaction and empathic concern differs for boys with varying levels of resting RSA. This interaction was not significant for girls. Further, constraining this path to be equal between boys and girls significantly worsened the model fit,  $\Delta\chi^2(1) = 8.72, p = .00, \Delta RMSEA = .20, \Delta CFI = .067$ , suggesting that the strength of the interactive effect of RSA and negative interaction on empathic concern differed significantly between boys and girls. Using the Johnson-Neyman technique (see Hayes & Matthes, 2009) the interaction was probed, revealing that for boys with resting RSA levels higher than 0.83 standard deviations above the mean value, higher negative interaction with parents significantly predicted lower empathic concern ( $b = -.077, p < .05$ ). Remarkably, the reverse was true for boys with resting RSA levels lower than 0.73 standard deviations below mean: their higher negative interaction with parents significantly predicted higher empathic concern ( $b = .076, p < .05$ ). The interactive effect is visualized in Figure 5.1b by showing simple slopes for boys high and low in resting RSA (1 *SD* above and below mean).

Interestingly, for girls (but not for boys), the interaction between resting RSA and perceived support from parents at Time 1 significantly predicted empathic concern at Time 2. Thus, the association between parental support and empathic concern differed for girls varying in level of resting RSA. Further, constraining this path to be equal between boys and girls significantly worsened the model fit,  $\Delta\chi^2(1) = 10.76, p = .00, \Delta RMSEA = .23, \Delta CFI = .059$ , indicating that the strength of the interactive effect differed significantly between boys and girls. Probing the interaction revealed that for girls with resting RSA levels higher than 1.34 standard deviations above mean, higher support from parents significantly predicted higher empathic concern ( $b = .16, p = .05$ ). For girls with low resting RSA levels there was no significant association between parental support at Time 1 and empathic concern at Time 2, within the range of RSA scores in the current sample. Figure 5.1c depicts the simple slopes for girls with high and low resting RSA (1 *SD* above and below mean).

## Discussion

The first aim of the present study was to examine whether resting RSA predicted adolescents' empathic concern and externalizing behavior. The second aim was to investigate whether and how adolescents' resting RSA moderated the associations between parent-adolescent relationship quality and, respectively, adolescents' empathic concern and externalizing behavior. We found no support for higher RSA as a predictor of lower externalizing behavior or higher empathic concern. However, our results revealed support for resting RSA as a moderator in the association between parent-adolescent relationship quality and adolescents' social adjustment. For girls, resting RSA moderated the association between negative interaction and externalizing behavior, and between parental support and empathic concern. For boys, resting RSA moderated the association between negative interaction and empathic concern. We found partial support for differential susceptibility and biological sensitivity-to-context theories (Belsky, 1997; Ellis et al., 2011), as girls high in resting RSA appeared to be more susceptible to parental support than girls low in resting RSA. Higher parental support predicted higher empathic concern for girls high in resting RSA, whereas this association was non-significant for girls low in resting RSA. However, for negative interaction with parents, the pattern looked different. Boys high in resting RSA indeed reported more empathic concern when they reported lower negative interaction than when they reported higher negative interaction, but boys low in resting RSA who reported higher negative interaction reported more empathic concern than boys who reported lower negative interaction. Also, girls low in resting RSA who reported high negative interaction reported less externalizing behavior than girls who reported low negative interaction.

Despite conceptual reasons to expect resting RSA to be negatively linked to externalizing behavior and positively linked to empathic concern, our findings did not support this. With regard to externalizing behavior, we found no significant association with boys' and girls' resting RSA. Our finding is in contrast with results in clinical samples (e.g., Beauchaine et al., 2007; Mezzacappa et al., 1997), but is in line with some studies conducted in community samples that also did not find a significant association between resting RSA and externalizing behavior (e.g., Calkins et al., 2007; El-Sheikh & Witson, 2006). This suggests that low basal RSA is a marker of dysregulation for youth showing externalizing behavior in the clinical range rather than for relatively well-functioning adolescents. In a community sample of adolescents, certain levels of externalizing behavior are part of the normative development instead of an expression of pathological dysregulation (Moffitt, 1993). Also with regard to empathic concern, our results did not support the expectation that high resting RSA (indicating better emotion regulation; Porges, 1995), is a positive predictor of empathic concern (e.g.,

Fabes et al., 1993). Only for boys, we concurrently found a tendency towards a significant positive correlation, but the longitudinal analyses revealed the inverse association (which was qualified by a significant interaction, interpreted below). Thus, our findings as well as the inconsistent results of previous studies in community samples, suggest that above a certain threshold inter-individual differences in resting RSA may have less impact on social functioning than at lower levels. Future research may test this by comparing adolescents with scores on problem behavior in the clinical range with adolescents who score within the normal range. Further, a relationship between biological factors and problem behavior may emerge rather in interaction with environmental risk factors than as a direct association (for reviews see Raine, 2005; Moffitt, 2005).

Consistent with our expectations, resting RSA indeed interacted with parent-adolescent relationship quality in the prediction of externalizing behavior and empathic concern. For boys, resting RSA interacted with negative parent-adolescent interaction in the prediction of empathic concern. For girls, resting RSA interacted with negative parent-adolescent interaction in the prediction of externalizing behavior, and with parental support in the prediction of empathic concern. The patterns of these three interactions were comparable, with adolescents high in resting RSA appearing to benefit relatively more from a positive relationship, but also to be hampered more by a negative relationship with their parents than adolescents low in resting RSA. This finding is consistent with previous studies that also found lower environmental quality to be only related to more problem behavior for children high in RSA, in early childhood (Eisenberg et al., 2012) and in school aged children (Bandon et al., 2008; Shannon et al., 2007). Thus, our results revealed no support for high resting RSA as a buffer for the impact of low environmental quality, but were partly in line with theories suggesting that individuals differ in the extent to which they are affected by environmental quality, and that the particular individual characteristics that make children more vulnerable to the effects of negative environmental influences also make them benefit more from positive influences (Belsky, 1997; Ellis et al., 2011).

Differential susceptibility theory and the notion of biological sensitivity-to-context propose that whereas some individuals are characterized by *heightened* environmental susceptibility, others are characterized by *diminished* environmental susceptibility (Ellis et al., 2011). Remarkably, although our results on girls' responses to parental support showed a close fit to this pattern, with higher parental support positively related to empathic concern for girls high in resting RSA but non-significantly related for girls low in resting RSA, the interactions between boys' and girls' resting RSA and negative interaction with parents showed a different pattern. That is, boys with low levels of RSA reported higher levels of empathic concern if they experienced a higher degree of negative interaction with their parents. Similarly, girls

with low levels of resting RSA reported lower levels of externalizing behavior the more they experienced a stronger negative interaction with their parents. Thus, instead of being less responsive than adolescents high in resting RSA, which could be expected to be based on differential susceptibility and biological sensitivity to context theories, adolescents low in resting RSA tended to be reversely affected by negative interaction with their parents. A possible explanation for this finding is that children with low resting RSA may be less easy to socialize by their parents than children with high resting RSA because of their difficulties in self-regulation. As suggested by Kochanska (1991), children with certain characteristics need more forceful parental strategies in order to develop conscience. In this way, parents' efforts to discipline and monitor these adolescents may go together with negative interaction.

Our results should be interpreted in light of some limitations. First, self-reports were used to assess parental support, negative interaction with parents, externalizing behavior and empathic concern. Especially our finding of no significant association between resting RSA and externalizing behavior may be due to adolescents' underreports of their externalizing behavior. However, previous studies have found adolescents to be more reliable reporters of their own problem behavior than parents (Edelbrock, Costello, Dulcan, Kalas, & Conover, 1985; Verhulst & Van der Ende, 1992). Second, due to our use of a rather broad measure of externalizing behavior, we do not know whether resting RSA, though not being associated with externalizing behavior in general, may be negatively related only to specific forms of externalizing behavior (Scarpa, Haden, & Tanaka, 2010; Xu et al., 2013). Third, resting RSA was assessed during a laboratory session several weeks apart from the home visit during which the Time 1 questionnaires were assessed. The fact that the period between the laboratory session and the home visit differed between participants may have confounded the concurrent associations. However, previous research has found resting RSA to be quite stable across time (e.g., El-Sheikh, 2004). Fourth, resting RSA was assessed at the beginning of the laboratory session whereas later during this session participants had to perform a public speech task in front of a pre-recorded, virtual audience which they were encouraged to prepare before at home. In an earlier study performed in a community sample of adolescents, moderate anticipatory physiological stress responses were demonstrated preceding this task (Westenberg et al., 2009). Such responses may have influenced the assessment of resting RSA in our study although participants watched an aquatic video which has been proven to be effective in lowering cardiovascular activity levels (Piferi et al., 2000).

Despite its limitations, the current study advances our understanding of the role of resting RSA in adolescents' social adjustment. By investigating in a community sample the interaction of resting RSA with both a positive and a negative facet of the parent-adolescent relationship, we extended previous research that mainly has been done in clinical or at risk

samples and has primarily focused on the interaction with negative contextual influences. In contrast to results of studies in clinical samples, we found no main effects of resting RSA on adolescents' externalizing behavior or empathic concern. However, we found resting RSA to interact with effects of the parent-adolescent relationship. Our findings revealed that adolescents high in resting RSA benefit more from a positive relation and are more affected by a negative relation with their parents than are adolescents low in resting RSA. Our study provides initial evidence for the notion that, also beyond childhood, environmental influences may differentially affect individuals with varying levels of resting RSA.



A grayscale microscopic image of plant tissue, showing a network of cell walls and large, irregularly shaped cells. The image is used as a background for the page.

# 6

General discussion

The general aim of this dissertation was to extend our understanding of empathy development in adolescence, to investigate its role in social behavior, and to examine the factors that may explain individual differences in adolescents' empathy. More specifically, our first aim was to study the interrelations between several processes that are thought to play a part in the construct of empathy. We investigated the associations between motor, affective, and cognitive empathy, and addressed the relations between adolescents' trait and state empathy. The second aim was to investigate the development of mean-levels in perspective taking and empathic concern across adolescence, to address potential differences in developmental patterns between boys and girls, and to examine whether pubertal status was related to this development. The third aim was to examine the role of empathy and parent-adolescent relationship quality in adolescents' aggressive and delinquent behavior, and to test whether adolescents high in empathy were more responsive to parental influences than were adolescents low in empathy. The fourth aim was to investigate the roles of resting RSA and parent-adolescent relationship quality in adolescents' empathic concern and externalizing behavior, and to test whether resting RSA moderated the associations between indices of parent-adolescent relationship quality and adolescents' social functioning.

The current chapter summarizes the main findings, discusses implications, strengths, and limitations of this research, and discusses directions for further research.

## **Summary of main findings**

### **The multi-dimensional nature of empathy**

Empathy is generally seen as a multi-dimensional construct, involving motor, affective and cognitive processes, and encompassing trait and state empathy. Although these processes are assumed to be interrelated, the multi-method study described in Chapter 2 was the first to comprehensively investigate the relations between all these processes, and to test whether the associations differed between boys and girls. Additionally, the comprehensive method of the study allowed us to test for sex differences in mean levels of empathy across self-reported, observational, trait and state measures.

In line with perspectives assuming motor empathy to evoke affective state empathy (Hatfield et al., 1994; Hoffman, 1984), adolescents' motor empathy, as measured using facial EMG, was consistently related to self-reported affective state empathy in response to happiness and sadness, although effect sizes were modest. Further, motor empathy was indirectly related to cognitive state empathy. For both happiness and sadness, the relation



between motor and cognitive state empathy was mediated by affective state empathy. Although our correlational design did not allow to test the theoretical assertion that motor empathy *induces* the experience of the corresponding emotion, in turn *leading* to cognitive empathy, the findings provided initial support for the notion that motor empathy facilitates affective and cognitive empathy (Hoffman, 1984; Lipps, 1907).

Interestingly, we did not find strong support for a close link between trait empathy and motor empathy. Girls' higher affective trait empathy was related to stronger corrugator EMG activity in response to sadness, but remarkably, this association was inverse for boys. Trait empathy was not significantly related to motor empathy in response to happiness. The study also revealed only modest positive associations between self-reported trait and state empathy measures, with more consistent results for the associations with state empathy in response to sadness than with state empathy in response to happiness. Thus, the findings suggested that individual differences in self-reported affective and cognitive trait empathy play a modest role in motor, affective and cognitive empathic responses to others' sadness and happiness.

In addition, in line with the commonly held gender stereotype that girls are more empathic than boys, we indeed found a large sex difference on self-reported trait empathy (in particular in the affective component). However, the study revealed only small sex differences on self-reported state measures, and majorly absent differences on the facial EMG measures of motor empathy. This finding yielded support for the suggestion of Eisenberg and colleagues that the more respondents are aware of what is being assessed (i.e., empathy), the more they attempt to respond in line with prevailing gender stereotypes (e.g., Eisenberg & Lennon, 1983; Eisenberg, Spinrad & Morris, 2013).

To conclude, the comprehensive method of the study in Chapter 2 advanced the understanding of the multi-dimensional construct of empathy, by showing consistent relations between motor, affective, and cognitive state empathy, and modest but consistent links between trait empathy and state empathy with sadness.

## **Empathy development in adolescence**

The ability to take others' perspective and to show empathic concern has been assumed to increase during adolescence as a result of cognitive maturation and increasing interactions with peers (Hoffman, 2000; Piaget, 1932/1965; Selman, 1980). However, it also has been suggested that empathy development undergoes a dip in mid-adolescence, due to affective changes that go together with pubertal development (Blakemore & Choudhury, 2006; Crone & Dahl, 2006). Further, boys and girls may diverge in their tendency to empathize with others

as they move through adolescence (Fabes et al., 1999; Hill & Lynch, 1983). Yet, there has been a lack of studies that have addressed this empirically. The six-wave longitudinal study described in Chapter 3 was the first to investigate the development of empathy across the entire span of adolescence. In particular, we addressed mean level changes in boys' and girls' perspective taking and empathic concern from age 13 to age 18, and we examined whether pubertal status was related to this development.

We found an incline in perspective taking for both boys and girls. This was in line with theories assuming that adolescents' awareness increases that others' emotions can be affected by factors beyond the immediate situation (Hoffman, 2000), and that their ability to consider self and other perspectives simultaneously from a third person view increases (Selman, 1980). Our finding of an increase in perspective taking was also in accordance with results from neurological studies suggesting that brain regions involved in perspective taking undergo continuing maturation throughout adolescence (see Crone & Dahl, 2012). Interestingly, the developmental pattern was strikingly different between boys and girls. Girls showed a steeper increase in perspective taking across adolescence than did boys. Moreover, whereas girls' perspective taking particularly increased between age 13 and 15, for boys it did not increase until age 15, and even showed a slight dip before that age. Thus, gender differences in perspective taking especially increased between early- and mid-adolescence.

Theorists have proposed that adolescents' growing perspective taking abilities also facilitate the development of empathic concern (Batson, 2009; Hoffman, 2000). However, we did not find an increase in empathic concern across adolescence. An explanation may be that the level of perspective taking skills in early adolescence is already high enough for the adolescent to be able to show high level empathic concern. Therefore, increases in perspective taking during adolescence may not further enhance the development of empathic concern. Further, adolescents may be increasingly *capable* to show empathic concern in complex situations due to cognitive advances, but their actual tendency to respond with empathic concern in everyday life may not increase, because it may depend on motivation rather than on cognitive ability.

Changes in motivation may also explain the fact that boys' empathic concern showed a dip in mid-adolescence. Whereas girls' empathic concern remained stable, boys' empathic concern declined between ages 13 and 16, with a rebound to the initial level thereafter. Pubertal processes appeared to play a small role in this dip; boys who were physically more mature reported lower levels of empathic concern than did their physically less mature peers at ages 15 and 16. This may partly result from the increase in testosterone during pubertal maturation (Buchanan et al., 1992), which could induce an increase in competitive behavior

(Mazur & Booth, 1998), thereby reducing empathy (Lanzetta & Englis, 1989). Further, boys who are physically more mature likely adhere more strongly to stereotypically masculine behavior, and might therefore be more inclined to inhibit empathic concern.

In sum, findings of Chapter 3 extended the literature by empirically testing the longstanding assumption that both perspective taking and empathic concern increase during adolescence as a result of cognitive maturation. We found support for increases in perspective taking, but not empathic concern. Our findings with regard to the tendency to show empathic concern, raises the question whether adolescents' changing motivations rather than their increasing cognitive abilities may affect this development. For boys, pubertal processes may play a role in this development.

### **The role of empathy in social adjustment**

Although adolescents' affective empathy and parental support are both thought to be important factors in preventing adolescents from developing antisocial behavior (e.g., Branje et al., 2008; Miller & Eisenberg, 1988), only few studies have addressed their potential interactive effects on adolescents' adjustment. Therefore, guided by theories on differential susceptibility (Belsky, 1997; Boyce & Ellis, 2005; Ellis, Boyce, Belsky, Bakermans-Kranenburg, & Van IJzendoorn, 2011), we tested in the two-wave longitudinal study described in Chapter 4, whether adolescents high in affective empathy are more responsive to parental support than are adolescents low in affective empathy.

Interestingly, the study revealed no longitudinal main effects of perceived parental support and affective empathy, but affective empathy indeed appeared to moderate the relation of perceived parental support with both aggression and delinquency. Only for high empathic adolescents, higher perceived parental support was predictive of lower levels of aggression, and marginally significant, of lower levels of delinquency. Thus, adolescents high in empathy appeared to gain more from parental support than did adolescents low in empathy, which may be due to a higher sensitivity to positive parental behavior (Blair, 2003). Remarkably, adolescents low in empathy not only appeared to benefit less from parental support, but even showed more aggression and delinquency at age 15 when they perceived their parents to be more supportive at age 14.

In sum, the results of this study partly corresponded with theories emphasizing that children vary in their susceptibility to parental support (e.g., Belsky, 1997; Boyce & Ellis, 2005). The results suggest that affective empathy is important for adolescents to be able to gain from a warm and supportive relationship with their parents.

## Explaining individual differences in empathy

The study in Chapter 5 investigated the role of resting RSA and parent-adolescent relationship quality in adolescents' empathic concern and externalizing behavior. Self-regulation is thought to play a vital role in individuals' capability to display situation-appropriate responses. As a physiological marker of dispositional self-regulation (Porges, 1991; Thayer & Lane, 2000), high resting RSA can be expected to be related to higher empathic concern and lower externalizing behavior. The findings in Chapter 5 extended previous research by investigating these associations longitudinally in a relatively large community sample. Moreover, the study addressed the potential moderating role of resting RSA in the relation between parent-adolescent relationship quality and adolescents' empathic concern and externalizing behavior.

We found no support for high resting RSA as a predictor of high empathic concern or low empathic concern. We also did not find longitudinal main effects of parental support or negative interaction with parents on adolescents' empathic concern. However, partly in line with differential susceptibility and biological sensitivity-to-context theories (Belsky, 1997; Ellis et al., 2011), we found resting RSA to moderate the association between parent-adolescent relationship quality and adolescents' social functioning. With regard to the prediction of empathic concern, girls high in resting RSA appeared to be more susceptible to parental support than girls low in resting RSA; higher parental support predicted higher empathic concern for them, whereas this association was non-significant for girls low in resting RSA. For boys, resting RSA moderated the association between negative interaction and empathic concern. For boys with high levels of resting RSA, negative interaction with parents negatively predicted empathic concern. However, remarkable was that boys low in resting RSA who reported more negative interaction reported higher empathic concern.

To conclude, the findings in Chapter 5 suggested that individual differences in resting RSA may not directly relate to empathic concern, but may have effects on empathic concern when in interaction with environmental influences. Interestingly, our results yielded no support for resting RSA as a protective factor, but partly supported theories on differential susceptibility and biological sensitivity-to-context. By investigating in a community sample the association of resting RSA with adolescents' social adjustment, the findings in Chapter 5 extended previous research that mainly has been done in clinical or at risk samples.

## Conclusions, implications, and future directions

### Dimensions of empathy and its measurement

**Motor, affective, & cognitive processes.** In line with theories considering motor empathy as the very essence of empathy (Hatfield et al., 1994; Hoffman, 2000; Preston & De Waal, 2002), findings in Chapter 2 showed adolescents' motor, affective, and cognitive state empathy to be consistently related. Yet, the modest magnitude of the associations suggests that the measures of motor, affective, and cognitive assess distinct processes each playing a different role in the ability to understand and to share others' feelings. Although this notion is in line with the general assumption of empathy being a multidimensional construct, comprising motor, affective, and cognitive processes (e.g., Batson, 2009; Decety & Jackson, 2004), to date our understanding of the interrelations of these processes, as well as their potential differential associations with adolescents' social functioning is limited. We recommend for future research to use a multi-method approach in the assessment of empathy, in combination with a longitudinal design, to further elucidate the underlying mechanisms of the interrelations between empathy-related processes, and to investigate their differential associations with adolescents' adjustment. A better understanding of how specific empathy-related processes are associated with adolescents' prosocial and antisocial behavior may provide new insights for developing interventions aimed at fostering adolescents' social functioning.

**Trait and state empathy.** Surprisingly, associations among indices of state empathy and among indices of trait empathy were stronger than associations between trait and state empathy. That is, the association between for instance state *affective* empathy and state *cognitive* empathy was stronger than the association between *trait* and *state affective* empathy. Our findings in Chapter 2, revealing only few significant (and small magnitude) associations between adolescents' trait and state empathy, raises important questions regarding the measurement of empathy. It is generally assumed that the widely used self-reported measures of trait empathy generalize to adolescents' empathic responding in everyday life, and that individual differences on these measures explain why some adolescents for instance show more helping behavior and less aggressive behavior than do others. Hence, it is remarkable that adolescents' responses to our stimuli, which represented true-to-life situations and clearly evoked motor, affective, and cognitive empathic reactions, were only weakly related to their reports on trait empathy measures. Even though a state factor is supposed to change over time, and to be also depending on situational factors (e.g., valence of the emotion, observer-target similarity or familiarity, the observer's mood), the trait factor should represent stable individual differences across time and situations. The fact that our data only supported this

notion to a limited extent suggests that our trait and state measures tap different aspects of the empathy construct, and moreover, raises the question how the trait measure on the one hand and the state measure on the other hand is related to adolescents' empathic responding in everyday life.

We thus might conclude that stable individual differences only explain a very limited amount of situation-specific empathic responding. However, the weak trait-state associations may also be explained by differences between the processes that are measured with the trait measures on the one hand, and state measures on the other hand. Trait empathy primarily taps adolescents' empathic *tendency* (i.e., the likelihood of engaging in empathic processes), whereas state empathy represent adolescents' *performance* (i.e., actual empathic behavior in a given situation). Both can be expected to have their own drawbacks, but also their own strengths in predicting adolescents' social functioning in everyday life. Adolescents' reports of *trait empathy* may be influenced by social desirability, reflecting their beliefs about the kind of behavior that is appropriate for their gender. Although the possibility that adolescents respond to the trait empathy measure in accordance with cultural values and beliefs may be a potential bias, it should be taken into account that these same values and beliefs may influence their actual behavior. For instance, an adolescent who prefers to present him- or herself as sensitive to others' emotions and perspectives on a questionnaire, may also be motivated to show these kinds of behavior in public. In contrast, adolescents' responses to our *state empathy* measures are less likely to be affected by self-representation, and may rather reflect aspects of the actual capacity to respond with concern to others and to take others' perspectives. Moreover, the fact that the stimuli portrayed children and adolescents in true-to-life situations that participants may also encounter in everyday life, increases the generalizability to behavior outside our lab. However, in a test situation participants may do their best to show what they are capable of, but this does not imply that they will utilize these capacities outside the laboratory. Thus, whereas adolescents' reports on trait empathy may reflect their motivation to show empathy, adolescents' responses on the state empathy measure may reflect their capability to show empathy.

To further elucidate how trait empathy and state empathy are interrelated, and which role both play in adolescents' empathy-related responding and social functioning, we have some suggestions for future research. First, we recommend replicating the current multi-method study, while adding tasks that assess adolescents' state prosocial behavior and antisocial behavior. This way the contributions of both trait and state empathy to adolescents' social behavior can be investigated. Second, future research may include repeated assessments of state empathy, and investigate whether multiple assessments of state empathy generalize to stable individual differences in empathic responding. This way, trait empathy may be assessed

in a way that is less likely to be affected by self-representational biases, and associations of this trait measure of empathic *performance* with the trait measure of empathic *tendency* can be addressed, as well as associations with other aspects of adolescents' social functioning.

## Empathy development in adolescence

**Perspective taking.** This dissertation showed both boys' and girls' cognitive empathy (i.e., perspective taking) to increase during adolescence. Although several theories on the development of social cognition state that during adolescence important advances take place in social perspective taking abilities (Hoffman, 2000; Piaget, 1932/1965; Selman, 1980), in turn fostering moral reasoning and prosocial behavior (Eisenberg & Morris, 2004), to date surprisingly few studies have addressed the development of perspective taking and its antecedents in adolescence. Our longitudinal findings of growth in perspective taking are in line with the notion of continued social cognitive development during adolescence. Yet, our findings give also rise to new questions, as we still do not know what exactly changes in adolescents' perspective taking and *how* these changes are brought about. Perspective taking is generally assumed to develop according to Selman's (1980) model of the growth of interpersonal understanding, comprising four levels. The third and the fourth level are thought to be achieved during adolescence. However, there is a lack of empirical studies that have tested this model in adolescence. Selman's third level, the ability to take the view of a third-person in order to consider one's own and the other's view simultaneously, is thought to be reached in early adolescence. The fourth level of Selman's model, the awareness of a general integrated viewpoint that transcends individual perspectives and involves a mutual understanding of complex psychological systems within and between persons, should be achieved by middle adolescence (Selman, 1981). Starting from our findings of an increase in adolescents' tendency to take others' perspective, future research may address whether this increase indeed can be explained by adolescents passing Selman's cognitive levels.

Another pressing question is what the role of peers is in adolescents' growing tendency to take others' perspectives. In particular peer interactions, which are more egalitarian than interactions with parents or other adults, are thought to provide the opportunity to learn to integrate self-interest and others' interest in dealing with conflicts (Piaget, 1932/1965; Kohlberg, 1969), which may facilitate growth in perspective taking. By including observations of conflict interactions with peers, future studies may clarify which aspects of peer interactions promote adolescents' skills in coordinating self and other's perspectives, and whether this explains the increase in tendency to take others' perspectives. Further, by including not only a measure of adolescents' cognitive trait empathy, but by also including our assessment of

cognitive state empathy, the role of peer interactions and social cognitive advances in both the tendency and capacity to take others' perspectives may be better understood.

**Empathic concern.** Interestingly, despite the growth we found in adolescents' perspective taking, empathic concern appeared not to increase during adolescence. As mentioned before, empathic concern has been assumed to increase during adolescence as a result of advances in perspective taking (Batson, 2009; Hoffman, 2000), although it also has been argued that the cognitive components of empathy rather build upon the affective components than the other way around (De Waal, 2007). In line with the second perspective, a study on the longitudinal links between perspective taking and empathic concern in adolescence, which was conducted on the data set used in Chapter 3, revealed changes in empathic concern to predict changes in perspective taking and not vice versa (Van Lissa et al., 2013). Although in early childhood the ability to take others' perspectives is a prerequisite for the development of mature empathic concern, the level of perspective taking skills is probably at early adolescence already high enough for adolescents to show high level empathic concern. However, as long as researchers stick to exclusively using self-reported trait measures when investigating empathy in adolescence, controversy regarding the developmental processes will not be solved. For instance, our finding of stability (and even a dip in the case of boys) may be due to changes in adolescents' motivation to show empathic concern, and does not preclude that the capacity to experience empathic concern in complex situations may actually increase during adolescence. As proposed in our discussion on the measurement of empathy as a multidimensional construct (see Paragraph 6.2.1), multi-method studies are needed to shed further light on the development of empathy in adolescence. More specifically, a study which includes longitudinal assessments of both trait and state empathy and both cognitive and affective empathy, could test potential differences between the development of adolescents' general tendency to empathize with others and their actual performance, and moreover, could address the interplay between cognitive and affective empathic abilities.

### **Person-environment interaction and adolescents' social adjustment**

Remarkably, in our studies on the effects of individual characteristics and parental socialization efforts on adolescents' empathy (Chapter 5) and externalizing behavior (Chapter 4 and 5), we found no support for direct longitudinal effects of parent-adolescent relationship quality on either adolescents' empathy or externalizing behavior. Also, we did not find the expected effects of adolescents' individual characteristics. Low empathic concern did not predict high externalizing behavior (Chapter 4) and neither did low resting RSA predict high externalizing behavior or low empathic concern (Chapter 5). This may be due to our use of



longitudinal models in which effects are difficult to detect because of the substantial stability of externalizing behavior and of empathic concern over time, and due to correlated change in the predictors. However, our results also suggest that, in line with a transactional view on development, one individual characteristic alone or one environmental factor alone is not likely to explain a developmental course. Individual differences in adolescents' social adjustment are rather explained by the interaction between individual and environmental characteristics (Sameroff & Chandler, 1975). This may especially be the case in the samples we used in these studies, which both consisted of relatively well-functioning adolescents. The problem behavior reported by these adolescents may rather be part of normative development than being an expression of dysregulation (Moffitt, 1993).

We indeed found in both studies interaction effects between parent-adolescent relationship quality and individual characteristics of the adolescent in the prediction of externalizing behavior (Chapter 4 and 5) and empathic concern (Chapter 5). However, the interaction patterns were not consistent with either the notion that adolescents' empathic concern and resting RSA may function as protective factors, or with the notion of differential susceptibility and biological sensitivity-to-context. Although in both studies we found the expected susceptibility to the quality of the parent-adolescent relationship for respectively adolescents high in empathic concern and adolescents high in resting RSA, we found inverse effects for adolescents low in empathic concern and adolescents low in resting RSA. Our results thus suggest differential *reactivity* rather than differential *susceptibility*. These findings raise the question what happens in the interaction between adolescents low in empathic concern or low in resting RSA and their parents. Future research may use observations of parent-adolescent interaction to investigate whether parents of these adolescents are less adequate in their communication, or whether these adolescents have problems in correctly interpreting their parents' signals. Further, intervention studies directed at improving parent-adolescent communication may include assessments of adolescents' empathic concern and resting RSA, in order to test whether changes in parents' socialization efforts have differential effects on adolescents with different levels of empathic concern or resting RSA.

## Strengths and limitations

Strengths of the research presented in this dissertation are the comprehensive multi-method design of the study in Chapter 2, the relatively large sample involved in the physiological assessments (facial EMG, resting RSA) included in the studies in Chapter 2 and Chapter 5, and the longitudinal design of the studies described in Chapter 3 to Chapter 5.


However, despite its strengths, the current research is not without limitations. Besides the limitations that are specific to individual studies and were discussed in the respective chapters, there are some general limitations that warrant discussion. An important limitation of the current research is the use of relatively homogeneous samples. For instance, participants were mostly Caucasian, and came from families that generally were of middle to high socioeconomic status. This limits the generalizability of the results of our studies, and moreover, the use of samples consisting of relatively well-functioning adolescents, may have limited the range of scores on externalizing behavior in the studies described in Chapter 4 and Chapter 5. Nevertheless, studying these processes in non-clinical, relatively well-functioning samples is also important. Particularly because current knowledge on several of the topics that were studied in this dissertation (for instance the role of resting RSA in externalizing behavior) has mainly been based on empirical evidence from research in clinical samples, whereas the underlying processes of externalizing behavior may differ well between clinical populations and normal populations. Another limitation of the current research is that we used quite broad measures of parent-adolescent relationship quality (i.e., support, negative interaction), as well as of adolescents' adjustment (i.e., aggression, delinquency, externalizing behavior) in our investigations of the correlates of empathy, whereas different aspects of parental socialization as well as different forms of antisocial behavior may differentially relate to empathy. For instance, differential associations with empathy have been reported for overt versus relational aggression (e.g., Batanova & Loukas, 2011). Moreover, the multi-method approach used in Chapter 2 to assess empathy as a multidimensional construct, could not be utilized in our studies on the correlates of empathy. Longitudinal studies that use a multi-method approach in the assessment of empathy are needed to extend our understanding of the development of empathy in adolescence. Further, including observations of adolescents' interactions with parents and peers, as well as observations of adolescents' (pro)social behavior, may give insight in how specific aspects of socialization facilitate the development of adolescents' empathy-related responding, and in turn, their social adjustment.

## **Conclusion**

This dissertation addressed important issues regarding adolescents' empathy that have received relatively little attention in previous empirical research. Even though empathy is generally assumed to play a pivotal role in adolescents' social functioning, the current research was the first to longitudinally investigate its development across adolescence, and to thoroughly address associations between empathy dimensions. The present dissertation

highlights adolescence as a period of change in empathic tendencies, but calls for future research to disentangle the cognitive, emotional and socialization processes that may underlie these changes. Further, our findings on the moderating role of empathic concern and resting RSA, may be used as a starting point for future research to look more in depth at patterns in parent-adolescent interaction that may explain adolescents' differential reactivity to parental socialization efforts. Moreover, results of this dissertation illustrate the usefulness of applying a multi-method approach in research on adolescents' empathy.



The image shows a microscopic view of plant tissue, likely a cross-section of a stem or root. The cells are arranged in a regular, brick-like pattern, characteristic of parenchyma tissue. The cell walls are clearly visible, and the cells are roughly rectangular. A dark horizontal band is superimposed over the middle of the image, containing the text "Reference list".

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The background of the entire page is a grayscale microscopic image of plant tissue, showing a network of cell walls and large, rounded cells. A dark, semi-transparent horizontal band is positioned across the middle of the image, serving as a background for the text.

Samenvatting  
(Summary in Dutch)

Empathie, het vermogen om de emoties van anderen te begrijpen en mee te leven in deze emoties, is een belangrijke sociale vaardigheid. Zo wordt verondersteld dat empathie pro sociaal gedrag bevordert, terwijl het agressief gedrag remt. Dit proefschrift onderzoekt empathie in de adolescentie. Hoewel in de vroege kindertijd al een belangrijke basis gelegd wordt voor het vermogen om empathisch te reageren op anderen, vinden er tijdens de adolescentie cognitieve, sociale en fysieke veranderingen plaats die impact kunnen hebben op de mate waarin adolescenten empathie laten zien. Tijdens de midden-adolescentie is er een piek te zien in antisociaal gedrag, zoals spijbelen, vandalisme en agressie. Daarnaast wordt de ouder-kindrelatie in deze periode gekarakteriseerd door een tijdelijke toename in conflicten en een afname in warmte en intimiteit. Veranderingen in het empathisch vermogen van adolescenten zouden een rol kunnen spelen in deze piek in antisociaal gedrag en de dip in de kwaliteit van de ouder-kindrelatie. In deze dissertatie worden de ontwikkeling van empathie en het verband met sociaal gedrag in de adolescentie longitudinaal onderzocht.

Empathie wordt over het algemeen gezien als een complex multidimensionaal construct dat cognitieve, affectieve en motorische processen omvat. *Cognitieve empathie* verwijst naar het innemen van andermans perspectief om de gevoelens van de ander te proberen te begrijpen. *Affectieve empathie* verwijst naar een emotionele reactie die voortkomt uit de emotie die bij de ander geobserveerd wordt. Een hieraan gerelateerd proces is *empathische betrokkenheid*, ofwel het ervaren van gevoelens van bezorgdheid of compassie voor de ander. *Motor empathie* refereert naar de automatische imitatie van andermans gezichtsexpressies, gebaren, of houdingen, maar kan ook gezichtsexpressies omvatten die samengaan met de emoties die de observator zelf ervaart in reactie op de emotie van de ander. Naast het onderscheid tussen cognitieve, affectieve en motorische processen, is het ook van belang om onderscheid te maken tussen empathie als een stabiele karaktertrek, oftewel *dispositionele empathie* en empathie als een reactie die in een specifieke situatie opgeroepen wordt, oftewel *situationele empathie*. Doordat in onderzoek naar empathie in de adolescentie bijna altijd gebruik gemaakt wordt van vragenlijsten waarin dispositionele empathie gemeten wordt, is nog weinig bekend over hoe de verschillende processen die verondersteld worden een rol te spelen in empathie met elkaar verband houden. Het doel van dit proefschrift is dan ook om de kennis te vergroten over de relaties tussen verschillende dimensies van het construct empathie, over de ontwikkeling van empathie tijdens de adolescentie en over de rol van empathie in het sociale gedrag van adolescenten. Door deze vragen te beantwoorden zullen we daarnaast beter begrijpen waarom sommige jongeren empathischer zijn dan anderen.

In de eerste studie onderzochten we de relaties tussen de verschillende empathie-dimensies. We lieten zien dat adolescenten die met meer motor empathie reageerden op filmpjes die situaties verbeelden waarin kinderen blijdschap en verdriet meemaken, ook

meer affectieve empathie ervoeren bij het zien van de filmpjes. Ook bleek dat meer motor empathie niet alleen samenhang met meer affectieve empathie, maar ook met een hoger niveau van cognitieve empathie in reactie op de filmpjes. Verbazingwekkend was dat we maar zwakke verbanden vonden tussen de metingen van dispositionele empathie en de metingen van situationele empathie. Samenvattend liet deze studie zien dat situationele cognitieve, affectieve en motor empathie consistent met elkaar samenhangen, terwijl er slechts bescheiden associaties zijn tussen metingen van dispositionele en situationele empathie.

In de tweede studie onderzochten we hoe dispositionele cognitieve empathie (d.w.z. *perspectief nemen*) en dispositionele affectieve empathie (d.w.z. *empathische betrokkenheid*) zich ontwikkelen tijdens de adolescentie. Deze studie liet zien dat de neiging om andermans perspectief te nemen voor zowel jongens als meisjes toeneemt tussen 13- en 18-jarige leeftijd. Bij meisjes was de stijging echter sneller dan bij jongens. Het perspectief nemen van meisjes steeg vooral tussen 13- en 15-jarige leeftijd, maar de groei voor jongens startte pas vanaf 15-jarige leeftijd, terwijl voor die leeftijd zelfs een kleine dip te zien was. Er was geen stijging in empathische betrokkenheid tijdens de adolescentie. Bij meisjes bleef het niveau stabiel, terwijl het bij jongens daalde tussen 13- en 16-jarige leeftijd, en daarna weer steeg naar het oorspronkelijke niveau. Puberteitsontwikkeling bleek verband te houden met deze dip. Jongens die verder waren in de puberteitsontwikkeling lieten lagere niveaus van empathische betrokkenheid zien.

In de derde studie onderzochten we in hoeverre dispositionele affectieve empathie, ofwel empathische betrokkenheid, en de steun die adolescenten ervaren van hun ouders, voorspellend waren voor agressief en delinquent gedrag een jaar later. Daarnaast onderzochten we in deze studie of adolescenten die meer empathisch zijn responsiever reageren op de steun van hun ouders dan adolescenten die minder empathisch zijn. Affectieve empathie en de ervaren steun van ouders bleken beiden niet voorspellend te zijn voor agressie of delinquentie een jaar later. Wel bleek affectieve empathie het verband van ouderlijke steun met zowel agressie als met delinquentie te modereren. Hoog-empathische adolescenten bleken meer te profiteren van ouderlijke steun dan laag-empathische adolescenten, in die zin dat ze bij meer ouderlijke steun minder agressie en (marginaal significant) minder delinquentie rapporteerden dan wanneer ze minder ouderlijke steun kregen. Dit zou te maken kunnen hebben met een hogere sensitiviteit voor positieve signalen van ouders. Opmerkelijk was dat laag empathische adolescenten niet alleen minder profiteerden van ouderlijke steun, maar zelfs meer agressie en delinquentie rapporteerden op 15-jarige leeftijd wanneer zij meer steun kregen van hun ouders op 14-jarige leeftijd. De resultaten van deze studie corresponderen gedeeltelijk met theorieën waarin verondersteld wordt dat kinderen variëren in hun ontvankelijkheid voor ouderlijke invloeden. Daarnaast maken de resultaten van deze studie duidelijk dat affectieve


empathie van belang is voor adolescenten om te kunnen profiteren van een warme en ondersteunende relatie met hun ouders.

In de vierde studie onderzochten we de rol van *respiratoire sinus aritmie* (RSA) gemeten in rust in de mate waarin adolescenten empathische betrokkenheid en externaliserend gedrag vertonen. Deze studie liet zien dat RSA niet rechtstreeks voorspellend was voor empathie of externaliserend gedrag. Wel vonden we in een aantal gevallen een interactie tussen RSA en de kwaliteit van de ouder-kindrelatie. Zo bleken meisjes met een hoge RSA meer ontvankelijk te zijn voor ouderlijke steun dan meisjes met een lage RSA; hogere steun was voor hen voorspellend voor hogere empathische betrokkenheid, terwijl dit verband niet significant was voor meisjes met een lage RSA. Voor jongens hoog in RSA bleek meer negatieve interactie met ouders voorspellend voor minder empathische betrokkenheid. Opmerkelijk was dat jongens laag in RSA, die meer negatieve interactie met hun ouders hadden, hogere empathische betrokkenheid rapporteerden. De resultaten van deze studie suggereren dus dat individuele verschillen in RSA gemeten in rust niet direct voorspellend zijn voor de empathische betrokkenheid en het externaliserend gedrag van adolescenten, maar dat RSA mogelijk wel effecten heeft op het sociaal functioneren in interactie met omgevingsinvloeden.

Concluderend werd in dit proefschrift een aantal belangrijke kwesties met betrekking tot empathie in de adolescentie onderzocht, waar in eerder onderzoek nog weinig aandacht aan was besteed. Hoewel empathie van belang geacht wordt voor het sociaal functioneren van adolescenten, was het huidige onderzoek het eerste waarin de ontwikkeling van empathie tijdens de adolescentie onderzocht werd en waarin grondig bekeken werd hoe de verschillende dimensies van empathie met elkaar samenhangen. We lieten zien dat de adolescentie een periode is van veranderingen in empathie. In toekomstig onderzoek kan ontrafeld worden welke cognitieve, emotionele en sociale processen ten grondslag liggen aan deze veranderingen. Daarnaast vragen onze resultaten met betrekking tot de modererende rol van empathische betrokkenheid en RSA om verder onderzoek naar patronen in de interactie tussen ouder en adolescent die kunnen verklaren waarom de socialisatie van ouders mogelijk een verschillende uitwerking heeft op adolescenten. Tot slot illustreren de resultaten in dit proefschrift het nut van het gebruik van een multi-methodebenadering in onderzoek naar empathie in de adolescentie.





The image is a grayscale micrograph of plant tissue, likely showing large, rounded cells with thick, dark cell walls. A prominent dark horizontal band runs across the center of the image, partially obscuring the underlying cellular structure. The text is overlaid on this dark band.

Dankwoord  
(Acknowledgements)

Graag wil ik op deze plek een aantal mensen noemen die een bijdrage hebben geleverd aan de totstandkoming van dit proefschrift.

Allereerst wil ik mijn promotoren Susan en Wim, en mijn copromotor Minet bedanken. Ik had me geen beter begeleidingsteam kunnen wensen. Van jullie kreeg ik de vrijheid en het vertrouwen om het werk, van dataverzameling tot analyseren en schrijven, op mijn eigen manier aan te pakken. Tegelijkertijd waren jullie er steeds om mij te voorzien van waardevolle adviezen, mee te denken over statistische problemen, inhoudelijke discussies te voeren en met elkaar te brainstormen. **Susan**, wat ben ik blij dat ik jou als dagelijks begeleider had. Hoe vaak ik niet een overleg met jou ben ingegaan met een hoofd vol vraagtekens, om eruit te komen en niet eens meer te weten wat nou het grote probleem was. Overleggen met jou was altijd inspirerend en verhelderend. Ik ben blij dat ik daar als post-doc nog steeds gebruik van mag maken. **Minet**, aan jouw grote kennis over empathie en de daaraan gerelateerde fysiologie heb ik veel gehad. Daarnaast ben ik blij dat ik mocht werken met jouw mooie empathietaak, en ben ik je dankbaar voor je aanstekelijke enthousiasme voor mijn onderzoek op momenten dat ik het even somber inzag. **Wim**, hoewel mij bijstaat dat tijdens het maandelijks overleg eens het gebrek aan empathie van mannen ter sprake kwam, neem ik dit wat jou betreft volledig terug. Ik vond het fijn dat je zowel bij positieve emoties (acceptaties) als bij negatieve emoties (afwijzingen) altijd even je medeleven kwam betuigen. Daarnaast hebben jouw aandacht voor de grote lijn en jouw kritische vragen mij vaak verder geholpen. Ook dank voor je steun tijdens de stressvolle laatste fase.

**Ton van Boxtel**, dank voor je enorme hulp bij het maken van de EMG-labopstelling, de verwerking en analyse van de fysiologische data en het schrijven van de artikelen. Ik kijk met veel plezier terug op de leerzame bijeenkomsten waarin ook altijd veel te lachen viel. Hoewel de organisatie van honderden labsessies op twee locaties regelmatig voor stress zorgde door de technische problemen die keer op keer opdoken, heb ik er veel lol in gehad om die problemen als een detectiveduo samen met jou op te lossen. Jij en **Ton Aalbers** hebben mij zo goed wegwijs gemaakt in de technische details en het systematisch testen van apparatuur, dat ik op den duur de technici in Amsterdam op afstand kon vertellen dat ze een stekker moesten aanduwen, omdat uit de data bleek dat de onderste vier bits niet opkwamen... Wat een kennis je niet opdoet tijdens zo'n promotietraject in de pedagogiek!

Graag wil ik ook de beoordelingscommissie, bestaande uit **prof. dr. M. Deković**, **prof. dr. J.S. Dubas**, **prof. dr. B. Orobio de Castro**, **prof. dr. B. Soenens**, en **prof. dr. G.J.J.M. Stams**, bedanken voor hun bereidheid om mijn proefschrift te beoordelen en aanwezig te zijn bij de verdediging ervan.

Veel dank ben ik ook verschuldigd aan de **adolescenten van het RADAR-jong onderzoek** die (weliswaar na veel telefoontjes...) bereid waren om naar ons lab te komen om zich 3 uur



lang aan tests te laten onderwerpen. Ik heb geluk gehad met de bijzonder goede hulp van slimme en betrokken onderzoeksassistenten: **Daniëlle, Esther, Femke, Ivana, Laurien, Marije, Necibe** en **Saskia**, het was leuk samenwerken met jullie! Esther, het grote aantal documenten en mappen beginnend met het woord “overzicht...” op mijn computer, herinnert me aan jouw onmisbare hulp bij het structureren van de enorme hoeveelheid data. Dank voor al je werk en voor je gezelligheid als tijdelijke kamergenoot. Dank ook aan **Jacqueline** voor de samenwerking bij het organiseren van de dataverzameling en voor het coördineren en uitvoeren daarvan aan de VU. Wat wij allemaal niet konden oplossen met duct tape!

Collega’s van de onderzoeksgroep adolescentie en CAS, bedankt voor de fijne werksfeer. Een aantal collega’s wil ik in het bijzonder bedanken. **Loes**, bedankt voor je gezelligheid tijdens allerlei sportieve activiteiten en dank dat je mij *bijna* een supermooie baan bezorgd hebt. **Stefanie** en **Yongking**, het waren gezellige etentjes en een fantastische walvistrip in Seattle. Stefanie, dank voor de gezelligheid bij de koffieautomaat en voor jouw eerste-hulp-bij-statistiekpaniek tijdens de kerstdagen! **Saskia** en **Inge**, jullie verstaan de kunst om mij nèt op een labiel moment te vragen hoe het met me gaat ... met alle gevolgen van dien. Jullie steun was heel fijn! **Marloes** en **Natalie**, ik ben blij met de gezelligheid en humor die jullie komst aan onze onderzoeksgroep heeft toegevoegd! **Esmee**, fijn dat ik met jou de proefschriftstress kon delen. Jouw bemoedigende teksten werkten bijzonder opbeurend (*“Ik heb een heel zwaar leven... echt heel zwaar”*). Oud-collega en -kamergenoot **Sabine**, dank je voor je humor, je luisterend oor, en je verstandige adviezen.

**Daniëlle** en **Eline**, mijn paranimfen! Hoe spannend die verdediging ook is, jullie zijn het perfecte koppel om mij er doorheen te helpen. Daniëlle, tot mijn grote spijt ben je inmiddels mijn ex-collega. Wat een mazzel heb ik gehad dat ik mijn promotietraject samen met jou begon, en grotendeels samen met jou op één kamer heb kunnen doorlopen. Voor buitenstaanders waren we een apart koppel, en er werden soms (vooral voor mij, Daan!) beledigende conclusies getrokken, maar ik had het niet beter kunnen treffen met zo’n lief, gezellig en grappig maatje. We hebben heel veel met elkaar gedeeld als aio, en gelukkig blijven we dat ook doen nu we als post-docs op verschillende plekken werken. Eline, dat ze ons samen naar India stuurden was een gouden greep! Het maakte je van een anonieme studiegenoot, tot reisgenoot, beste vriendin, en vervolgens ook nog tot collega, buurvrouw, sportmaatje, en nu zelfs kamergenoot. Het wordt er alleen maar beter op. Ik ben zo blij met jou! En ook met je veelzijdige netwerk... **Lydia**, ik vind het fantastisch dat jouw kunstwerk de voorkant van mijn proefschrift siert. **Peter**, dank voor je geduldige gepruts met Word.

Gelukkig was er ook nog vrije tijd naast het werken aan het proefschrift. Lieve vriendinnen, het was fijn om met jullie te ontspannen. Ik ben er zeker van dat de pannenkoekenententjes met **Linda**, de sauna-uitjes met **Geertje**, en de kloosterweekenden met **Maartje** inspirerend

gewerkt hebben. **Schoonfamilie** dank voor jullie interesse, meeleven en hulp tijdens de drukke tijden! En wat ben ik blij met mijn lieve en super-empathische ouders en zussen. **Pap, Mam, Marike, Jan, Marleen** en **Raymond**, dank voor al jullie meeleven in de ups en downs van de afgelopen tijd.

Lieve **Tim**, hoewel we elkaar totaal niet volgen als het over statistiek gaat, en je me regelmatig uitlacht om doodnormale woorden (wat is er mis met het woord "*imputeren*"?), begrijp jij mij beter dan wie dan ook. Ik weet niet hoe het had gemoeten zonder jouw liefde, geduld en aanmoeding.

Met jou erbij is alles leuker.







About the author

## Curriculum vitae

Jolien van der Graaff was born in Bruinisse, The Netherlands, on September 12, 1977. After finishing pre-university education at RSG Professor Zeeman in Zierikzee (1995), she did a bachelor in social work and social services at the College for Higher Professional Education in Rotterdam, which she finished in 1999. Jolien then worked for 7 years as a family counselor in Child Welfare, where she conducted video-feedback training, and intensive family support to families with addicted parents. In 2003, she started studying at Leiden University in part-time. She obtained, cum laude, a bachelor's degree in Child and Family Studies in 2005. She stopped her work as a family counselor in 2006, and started teaching at the College for Higher Professional Education in Rotterdam (2006–2011). In 2009, Jolien obtained, cum laude, a research master's degree in Developmental Psychopathology. As part of the master's program she conducted a research internship in a children's home in Mumbai, India.

Also in 2009, Jolien started her PhD project at the Research Centre of Adolescent Development at Utrecht University. Jolien presented her work at international conferences and organized several international symposia, and was selected to participate in the summer school organized by the Royal Netherlands Academy of Arts and Sciences in 2009, and the international summer school of the European Association for Research on Adolescence and the Society for Research on Adolescence in 2011. Besides conducting research, Jolien started teaching in the master's program in 2009: she supervised internships in Youth Care, and supervised the writing of master theses. Jolien continues her research and teaching activities at the Research Centre of Adolescent Development as a post-doc, since February 2014.

## Publications

### This dissertation

- Van der Graaff, J., Branje, S., De Wied, M., Hawk, S., Van Lier, P., & Meeus, W. (2014). Perspective Taking and Empathic Concern in Adolescence: Gender Differences in Developmental Changes. *Developmental Psychology, 50*, 881-888. doi:10.1037/a0034325
- Van der Graaff, J., Branje, S., De Wied, M., & Meeus, W. (2012). The moderating role of empathy in the association between parental support and adolescent aggressive and delinquent behavior. *Aggressive Behavior, 38*, 368-377. doi: 10.1002/ab.21435
- Van der Graaff, J., Meeus, W., de Wied, M., van Boxtel, A., Van Lier, P., & Branje, S. Respiratory Sinus Arrhythmia Moderates the Relation Between Parent-Adolescent Relationship Quality and Adolescents' Social Adjustment. *Manuscript submitted for publication.*
- Van der Graaff, J., Branje, S., de Wied, M., van Boxtel, A., van Lier, P., Koot, H., & Meeus, W. Motor, Affective and Cognitive Empathy in Adolescence: Interrelations Between Facial EMG and Self-Reported Trait and State Measures. *Manuscript submitted for publication.*

### Other publications

- Hawk, S. T., Keijsers, L., Branje, S. J., Van der Graaff, J., de Wied, M., & Meeus, W. (2013). Examining the interpersonal reactivity index (IRI) among early and late adolescents and their mothers. *Journal of Personality Assessment, 95*, 96-106.

