FRIENDSHIPS
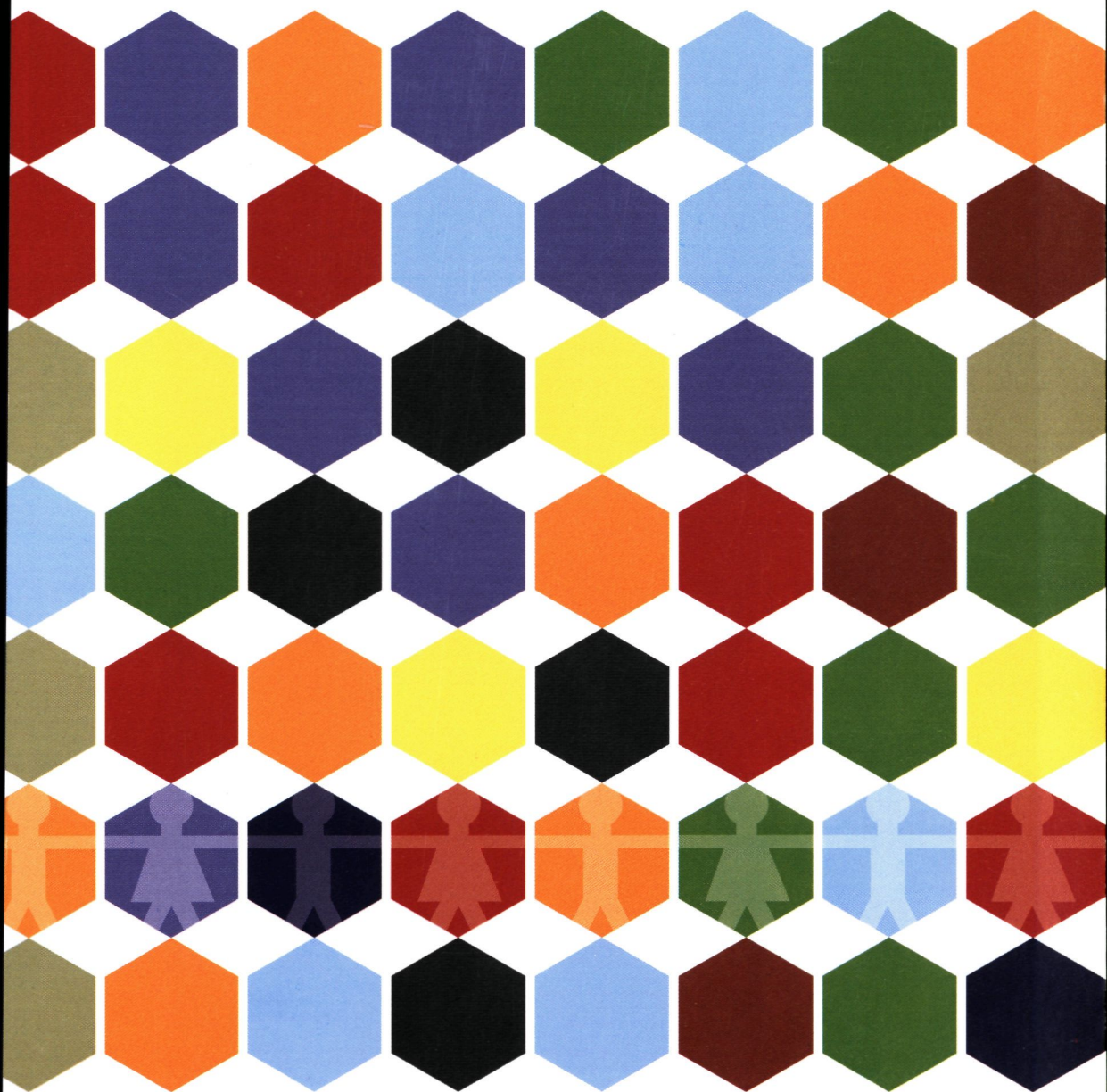## IN MIDDLE CHILDHOOD

LINKS WITH PSYCHOBIOLOGY, PARENTING, AND PEER GROUP FUNCTIONING

ELLEN PETERS

Friendships in Middle Childhood

Links with Psychobiology, Parenting, and Peer Group Functioning

Ellen Peters

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Friendships in Middle Childhood:

Links with Psychobiology, Parenting, and Peer Group Functioning

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Contents

Chapter 1

General Introduction

1.1 The Topic of this Thesis: Friendships in Middle Childhood

In middle childhood, peers play a vitally important role in children's lives At this age, which concerns the years from circa 6 to 12 years old, more than 30% of children's social interactions involve peers (Gifford-Smith & Brownell, 2003) How well elementary school children function with peers influences not only their concurrent psychosocial adjustment and school achievement, but also their later psychosocial adaptation in adolescence and even adulthood (e g , Bagwell, Newcomb, & Bukowski, 1998, Deater-Deckard, 2001)

Most studies of peer functioning in middle childhood have focused on the effects of peer group acceptance and rejection Such studies have provided abundant evidence for the developmental significance of children's status in the peer group (Rubin, Bukowski, & Parker, 1998) More recently, increasing numbers of studies have focused on another important source of peer influence, namely dyadic relationships with peers, especially friendships It is now recognized that friendships and peer group status capture distinct aspects of peer experience (Hartup, 1996) Indeed, research has shown that some highly accepted children have few or no reciprocal friendships, whereas some unaccepted children have friends (see, e g , Ladd, Kochenderfer, & Coleman, 1997, Parker & Asher, 1993, Vandell & Hembree, 1994) Also, friendships and peer group status contribute differentially to children's well-being and adaptation (Bagwell et al , 1998, Nangle, Erdly, Newman, Mason, & Carpenter, 2003, Parker & Asher, 1993) Parker and Asher (1993) found that having friends and friendship quality were significantly and negatively associated with children's reports of loneliness, even after controlling for peer group acceptance Likewise, Vandell and Hembree (1994) found that mutual friendships and peer acceptance independently predicted social competence, self-esteem, and achievement in elementary school children Thus, peer group acceptance and friendship make unique contributions to children's adjustment and well-being

Three important aspects of friendship have been distinguished (Hartup, 1996), namely 1) having or not having friends and the number of friends in the child's network, 2) the quality of friendship, and 3) characteristics of the child's friends These aspects are partly independent and have all been found to contribute to child adjustment

This thesis is about peer relations in middle childhood, focusing on friendships in the context of children's functioning in the larger peer group In a sample of 118 nine-year

old children, attending 83 different classrooms, all three earlier mentioned aspects of their friendships were assessed as well as their peer status among classmates. The data collection constituted the fifth measurement wave of the Nijmegen Longitudinal Study, which started with a community sample of 129 families when the children were 15 months old (see Van Bakel & Riksen-Walraven, 2002a, 2002b, 2004a, 2004b, 2009). Together with the longitudinal data available from earlier measurement waves (see Smeekens, Riksen-Walraven, & Van Bakel 2007a, 2007b, 2008, 2009), the present data set bridges some of the gaps in the literature on peer relations, particularly concerning the development of friendships and the role of friendships in children's functioning and development. In doing so, this thesis addresses four separate but related topics in the field of peer relations that are introduced below.

1.2 Longitudinal Predictors of Friendship

The present project provided the unique possibility to examine some of the early developmental roots of friendship. Experiences in the parent-child relationship are important influences on later social relationships (e.g., Granot & Mayseless, 2001; Kerns, 1996; Rubin & Burgess, 2002). Attachment theory provides a framework to explain the pathway from parent–child relationships to later peer relationships, especially friendships (both are close dyadic relationships). In the case of secure attachment, children form positive cognitive representations about relationships and a belief that they are competent and worthy of positive responses from others. Such internal representations are thought to generalize to other relationships later in life, leading to higher quality relationships (Belsky & Cassidy, 1994; Bowlby, 1969).

The link between relationships with parents and with peers is often explained by the idea that early relational experiences with parents contribute to the development of various child competencies, which in turn promote success in later close relationships. Although such mediating pathways have often been hypothesized, they have rarely been tested (Booth-LaForce & Kerns, 2009), and certainly not in combination. Recent developments in statistical mediation analysis (Preacher & Hayes, 2008) now make it possible to simultaneously test multiple mediating pathways. The study presented in *Chapter 2* is the first to simultaneously examine several mediated developmental pathways from children's early relationships with parents to their later friendships.

1.3 Friendships and Psychobiological Functioning

In the past, several cognitive, behavioral and psychosocial mechanisms have been proposed to explain how friendships may contribute to developmental outcomes in children (Deater-Deckard, 2001). Since recently, there has been growing evidence that

psychobiological mechanisms may also play a role. Particular attention has been given to the physiological regulation of stress, as evident from levels of the "stress hormone" cortisol. Cortisol is a stress-sensitive glucocorticoid which is produced by the hypothalamic-pituitary-adrenocortical (HPA) system and can be reliably measured in saliva. When a child experiences stress, the HPA-system increases the release of cortisol, which helps the child to adapt to the stressful situation. Repeated exposure to high levels of cortisol negatively affects children's cognitive, socio-emotional and health functioning (e.g., Coe, Rosenberg, & Levine, 1988; Heffelfinger & Newcomer, 2001; Smider, Essex, Kalin, Buss, Klein, Davidson, & Goldsmith, 2002).

Peer rejection is an important stressor in children's lives, as evidenced by, for example, associations with loneliness, social anxiety, and depression (see Sandstrom, 2004). The present project measured children's cortisol at school to quantify the stress of peer rejection. This study also investigated whether positive social experiences, such as friendships, reduce this stress. Prior studies have shown that friendship can buffer against the negative effects of peer rejection on children's development (Hodges, Boivin, Vitaro, & Bukowski, 1999; Hodges, Malone, & Perry, 1997; Parker & Asher, 1993), but no studies have yet examined the protective role of friendship in the link between peer rejection and psychobiological stress.

Another benefit of the current project was the ability to gain more insight into the influence of continuous high levels of stress on diurnal cortisol patterns. Normally, cortisol production follows a diurnal pattern with the highest level shortly after wake-up and a decline in the remaining daytime. But chronically high cortisol levels lead to dysregulation of the HPA-system, which in the long-term may result in flattened cortisol curves over the day (Gunnar & Donzella, 2002; Gunnar & Quevedo, 2007). Flat diurnal cortisol curves are found, for example, in maltreated, depressed or aggressive children (Cicchetti & Rogosch, 2001; Hart, Gunnar, & Cicchetti, 1996). The current study measured children's cortisol patterning over the day to detect whether peer rejection is related to flattened curves, and whether friendship prevents such long-term effects.

Insight in the effects of social experiences and friendships on psychobiological functioning may uncover the mechanisms through which negative and positive peer experiences interactively affect children's concurrent and long-term adjustment in other areas. *Chapter 3* contributes to the literature by studying the associations between peer rejection and cortisol, and the protective role of friendship.

1.4 The Characteristics of Children's Friends

The present thesis not only examined the effects of friends on children's psychobiological functioning, but also on their behavior. Children are not only affected by wheth-

er or not they have friends, or the quality of their friendships, but also by the characteristics their friends (Bukowski, Newcomb, & Hartup, 1996; Hartup, 1996). Whether children are affected positively or negatively by their friends depends on what their friends are like. For example, friendships with antisocial peers can lead to increasing aggression and delinquency (e.g., Dishion, Spracklen, Andrews, & Patterson, 1996), while prosocial friends can contribute to the development of prosocial behavior (e.g., Wentzel, Barry, & Caldwell, 2004).

In addition to their behaviors, children may also be influenced by other characteristics of their friends. One salient characteristic in middle childhood is peer group status. No prior studies have examined whether children are influenced by the status of their friends; the present study was the first to examine this. We focused on two constructs of status that are often distinguished in recent studies, that is, *social preference* or the extent to which children are liked by their peers, and *perceived popularity* or prominence in the peer group (Cillessen & Mayeux, 2004; Cillessen & Rose, 2005; Parkhurst & Hopmeyer, 1998). Popularity and preference are highly correlated in younger elementary school children, but start to become different from one another by the middle of elementary school. They are differentially associated with children's social behavior: while both popularity and preference are positively correlated with prosocial behavioral, only perceived popularity is also positively associated with aggression (Cillessen & Mayeux, 2004; Parkhurst & Hopmeyer, 1998).

The unique behavioral correlates of preference and popularity may imply that both forms of status have different effects in friendships. Having a friend who is highly popular may influence children's aggressive and prosocial behavior differently than having a friend who is highly preferred in the peer group. These behavioral influences are important because aggression contributes to adjustment difficulties (Coie, Dodge, & Kupersmidt, 1990; Parker & Asher, 1987). Prosocial behavior, in contrast, predicts positive social adjustment (Coie et al., 1990). The present project could study such complex models of influence because data were available on the status and behavior of the participants' classroom friends. The study presented in *Chapter 4* addresses this issue of behavioral influence and similarity in friendship.

1.5 Peer Group Status and Psychobiological Functioning

The fourth and final study further examines *perceived popularity*, specifically its relation with cortisol levels and regulation of the HPA-system. Perceived popularity is positively associated with aggression. Aggression, in turn, is associated with psychobiological functioning. Although much attention has been given to the association between aggression and cortisol, the findings are inconsistent (see, for a review, Alink, Van IJzen-

doorn, Bakermans-Kranenburg, Mesman, Juffer, & Koot, 2008) While some researchers found that aggression was related to high levels of cortisol or dysregulated diurnal cortisol curves, others found the exact opposite Several moderator variables have been suggested to account for these contradictory findings, such as age, maltreatment, and type of aggression (e g , Alink et al , 2008, Cicchetti & Rogosch, 2001, Murray-Close, Cicchetti, Crick, & Rogosch, 2008)

The peer context in which aggression is often expressed has nevertheless been overlooked Although aggression correlates with both peer status and cortisol, there are no studies that have integrated them Including children's peer group status may reveal a "missing link" in the explanation of the mixed findings so far *Chapter 5* examines perceived popularity as a moderator of the link between aggression and HPA-functioning This study aims to provide more insight in how children's individual behavior and physiology interact with their peer group experiences

1.6 Overview of the Data Collection for the Present Thesis

The present thesis thus contains four empirical studies which each address different but interrelated questions in the field of friendship research All four studies use data collected in Wave 5 of the Nijmegen Longitudinal Study, conducted at age 9 In addition, Study 1 also uses data collected in previous waves at 15 months and 5 years These two earlier waves have been extensively described in two earlier theses (Van Bakel, 2002, Smeekens, 2007) Each of the four studies contains a description of the methods from Wave 5 relevant to it, but none provides an overview of the complete Wave 5 data collection Therefore, this overview is given below

The data for Wave 5 were collected in one school year, between August, 2006 and July, 2007 First, the 129 study families from the original sample of the Nijmegen Longitudinal Study were sent a letter in which the new measurement wave was announced Next, all families were called to ask whether they were willing to participate again Of them, 118 families agreed They did not differ from the original community sample on the variables relevant for the current thesis (e g , education, attachment security, parenting quality) After agreement for all parts of the data collection was obtained, the parents were mailed a questionnaire to rate their children's internalizing and externalizing behavior problems They also received a letter which they could hand over to their children's teachers to inform them about the research project Parents were asked to return the behavioral questionnaire as soon as possible

Next, the children's teachers were called to ask if they were willing to participate in the school visits If so, two school visits were planned within a two week period During the first visit, teachers were asked to complete a questionnaire to rate the study children's

behavioral problems (internalizing and externalizing behavior) Also a peer nomination procedure was conducted in the classrooms The study children and their classmates were asked to complete a peer nomination questionnaire, containing questions about likeability, popularity, friendship, exclusion, victimization, prosocial behavior, and overt aggression They also completed a self-report question about relational aggression Peer nominations provide reliable measures of peer status and behavior (Cillessen, 2009) At the end of the school visit, the peer nominations of friendship ("Who of your classmates are your friends? Start with the name of your best friend and so on") were used to identify the study child's best reciprocal friend in class This friend was then given a letter for his or her parents to inform them about the project The parents of the friend were subsequently called to ask permission for their child's participation in the second school visit The parents of all friends allowed their children to participate in the project

The second school visit was conducted to gain more insight into the quality of children's best friendships For that purpose, the study children and their friends were taken out of their classrooms into a mobile lab to complete a self-report questionnaire about specific aspects of their friendship (e g , companionship, intimacy, conflict) They were also video recorded while interacting together This interaction session lasted 30 minutes and consisted of different interaction tasks (e g , planning a party together and playing a board game) The behavior of both children was rated afterwards from the videotapes by trained observers

In the week after the second school visit, the study children received a package by mail with instructions and materials needed for the saliva sampling procedure, in order to assess their cortisol levels After delivery of the package, families were called to explain to them the sampling procedure once again and to answer possible questions Children were asked to collect their saliva five times a day on two consecutive school days, by chewing on a cotton role which could be placed in a plastic tube after saturation During the two days of collection, children kept a diary in which they could write down events that might have interfered with the data (such as illnesses, medication use, sleeping problems) The information was cross-examined by an additional questionnaire about potential confounders during saliva collection, filled out by the parents Parents were asked to store the collected saliva in their fridge, and return it to the university by mail after the two days of collection The samples were stored in a fridge at the university until the saliva samples of all study children were received Next, the salivary samples were sent to the Biochemisches Labor at the University of Trier, Germany, to be analyzed for cortisol concentrations The total data collection procedure, from the first letter to the parents to the receipt of the saliva samples took up approximately 2 months for each study child

1.7 Thesis Outline

The present thesis contains four empirical studies described in four separate chapters. *Chapter 2* concerns a study on the link between aspects of the early parent-child relationship experiences and later friendship quality by investigating three important mediator variables at preschool age. *Chapter 3* addresses the association between two forms of peer rejection (victimization and exclusion) and cortisol levels, and investigates whether this association is affected by the number of friends children have and the quality of these friendships. *Chapter 4* focuses on the characteristics of children's friends and examines whether the peer status of a best friend influences children's aggression and prosocial behavior. *Chapter 5* elaborates on the topic of peer status by examining its role in the complex relationship between aggression and physiological adjustment. The final chapter *(Chapter 6)* summarizes the results, followed by the main conclusions and a general discussion that places the research findings in the broader context of research on friendships and peer relationships.

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Chapter 2

From the Parent-Child Relationship in Infancy to Friendships in Middle Childhood: Continuity and Mediating Processes[1]

This study examined the association between attachment security and the quality of parental behavior at 15 months and the quality of children's best friendships at age 9, and the degree to which this association was mediated by children's attachment representation of the parent, peer competence, and ego-resiliency at age 5 The sample included 112 children (53% boys) At 15 months, attachment security was assessed with the Attachment Q-Set, and quality of parental behavior was observed in two settings At age 9, best friendships were identified using sociometric nominations, and the quality of these friendships was observed during a 30-minute child-friend interaction episode The hypothesized direct and mediated effects of early attachment and parenting on later friendships were tested using multiple mediation analysis Attachment security and parenting quality independently predicted later friendship quality The association between early parenting and later friendship was mediated by peer competence and ego-resiliency The association between early attachment and later friendship was not mediated by any of the three preschool variables The findings shed new light on how early parent-child interaction affects later dyadic relationships

2.1 Introduction

It has often been proposed that the early parent-child relationship sets the stage for children's relationships with friends at later ages (see, e g , Kerns, 1996) Indeed, several studies have demonstrated a link between parent-child attachment and the quality of children's later friendships (see, for a review, Schneider, Atkinson, & Tardif, 2002) The continuity of close relationships from children's early interactions with primary caregivers to later friendships has been explained by assuming that children develop competencies in the interactions with their parents that they carry forward into later interactions with peers Although this has often been proposed, these hypothesized pathways have hardly been tested longitudinally

In a recent review, Booth-LaForce and Kerns (2009) concluded that statistically appropriate mediation models of the association between early relationships with parents

and later friendships occur in only a few studies. Consequently, they emphasized the importance of testing mediational models to more fully explain the link between early parent-child interactions and later peer relations.

The current longitudinal study examined the association between the quality of the parent-child relationship at 15 months and the quality of the children's best friendship at age 9. Data collected at age 5 were used to examine the mediating role of three child competencies at this age: *cognitive*, that is, the internal working model of the parent-child relationship; *behavioral*, that is, peer competence; and *personality*-related, that is ego-resiliency. We hypothesize that the association between the early parent-child relationship and middle childhood friendships is mediated by three developmental outcomes at preschool age: the security of the child's attachment representation of the parent, peer competence, and ego-resiliency (see Figure 1). We now turn to each of these three mediators in detail.
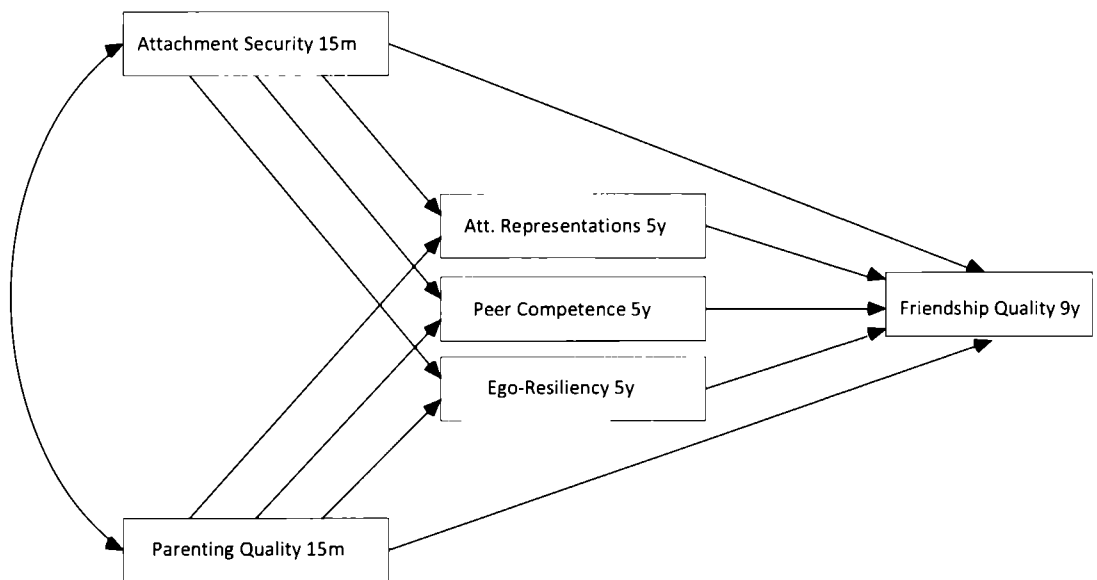
Figure 1 Hypothesized direct and mediated pathways from attachment security and parenting quality at 15 months to friendship quality at age 9.

Attachment Representations as a Mediator

The continuity between earlier and later relationships has been studied most extensively in the context of attachment theory. Bowlby (1969) proposed that children develop expectations about the availability and behaviors of their parents based on their

experiences with them early in life. Attachment theory hypothesizes that these expectations then generalize to other relationships later in life, and thereby influence the development of later friendships, romantic partnerships, and so on (Elicker, Englund, & Sroufe, 1992; Kerns, 1996; Park & Waters, 1989; Sroufe & Fleeson, 1986). Securely attached children learn that other people are responsive and rewarding. As a result, in interactions with peers, they are expected to approach them positively, thereby fostering the development of positive peer relationships.

According to our first mediation pathway secure early attachment will lead to later secure attachment representations, that in turn will lead to higher friendship quality. Several studies have shown evidence for the first leg of this path, that is, a positive association between attachment security in infancy and secure attachment representations at preschool age (e.g., Main, Kaplan, & Cassidy, 1985; Smeekens, Riksen-Walraven, & Van Bakel, 2009). The second leg of this mediating pathway, from attachment representations to friendship quality, has also been demonstrated – be it in a cross-sectional study (Cassidy, Kirsh, Scolton, & Parke, 1996). Putting these two legs together, we hypothesize that attachment security at 15 months contributes to friendship quality at age 9, via secure attachment representations at age 5. This mediating link has not been examined earlier.

To provide a broad picture of children's early experiences with their parents, we not only measured attachment security, but also the quality of the parents' behavior towards the child at 15 months. Because attachment security presumably reflects the history of parent-child interactions, and especially parents' sensitive responsiveness in these interactions (see, e.g., De Wolff & Van IJzendoorn, 1997), we expected attachment security and parental behavior to be related. But because our parenting measure included other aspects of parental behavior beyond those that contribute to attachment security, we expected the correlation between attachment security and parenting at 15 months to be moderate.

Peer Competence as a Mediator

The second mediated pathway involves peer competence or the child's social behavior and competence with peers (see Figure 1). In addition to attachment representations (the first pathway), children also acquire more or less cooperative and responsive interaction styles and social skills of reciprocity and empathy in interactions with their parents. These are also expected to be carried forward into later interactions with peers (e.g., Elicker et al., 1992; Putallaz & Heflin, 1990). Social behaviors and skills may be learned from parents through modeling or reinforcement (Kerns, 1994; Youngblade & Belsky, 1992).

The separate associations between early parent-child experiences and peer competence on the one hand, and between peer competence and friendship on the other hand, have been thoroughly examined. There is considerable evidence that young children's attachment security is related to their behavior and competence with peers (e.g., Kerns, Klepac, & Cole, 1996; Sroufe, Carlson, & Shulman, 1993; see, for a review, Belsky & Cassidy, 1994; Parke, Cassidy, Burks, Carson, & Boyum, 1992). Further, peer competence is clearly related to making friends, keeping friends, and friendship quality in childhood (e.g., Berndt, 1989, 1996; Bukowski, Newcomb, & Hartup, 1996; Hartup, 1996; Parker & Asher, 1993).

Putting these separate pathways together, we hypothesized that attachment security and quality of parenting at 15 months significantly contribute to friendship quality at age 9, via peer competence at age 5. To our knowledge, this link has not been examined earlier.

Ego-Resiliency as a Mediator

A third possible way in which children's early experiences with parents may influence their later friendships is through general abilities that are acquired by the child in the context of the early parent-child relation. The present study focuses on the broad personality construct of ego-resiliency. Ego-resiliency is the general capacity for flexible management of impulses, emotions and behavior, and resourceful adaptation to changing situational demands, particularly in stressful situations (Block & Block, 1980). According to Block and Block (1980), children's ego-resiliency is fostered by nurturant, responsive parenting. This has been confirmed in longitudinal research (Riksen-Walraven & Van Aken, 1997; Roberts & Strayer, 1987). Children's ego-resiliency is not only associated with parental responsiveness, but also – in line with attachment theory – with attachment security (Arend, Gove, & Sroufe, 1979; Oppenheim, Sagi, & Lamb, 1988).

Although the association between ego-resiliency and friendship quality has not been directly examined, ego-resiliency is expected to predict the development of high-quality friendships. Ego-resiliency is positively related to social functioning (Eisenberg et al., 2003). Resilient children's capacity for self-regulation (Eisenberg, Fabes & Spinrad, 2006), their ability to cope with stress, and their tendency to act in constructive ways make them attractive interaction partners. Also, ego-resiliency positively predicts friendship understanding in middle childhood (Hart, Keller, Edelstein, & Hofmann, 1998).

Based on the above, we hypothesized that attachment security and the quality of parenting at 15 months would significantly contribute to the quality of children's best friendship at age 9, via ego-resiliency at age 5. To our knowledge, this mediating link has not been examined in earlier studies.

Summary of Research Aims and Hypotheses: Model to be Tested

Figure 1 summarizes the mediational model tested in this study. The double headed curved arrow between parenting quality and attachment security at 15 months indicates the hypothesized association between these predictors. As indicated, we expected the strength of this association to be moderate, because parenting includes other behaviors beyond those leading to attachment security (in particular parental sensitivity). We also expected parenting quality at 15 months to independently contribute to friendship quality at age 9 beyond the contribution of attachment security. That is, we believe that the child's ability to use the parent as a secure base is important but not sufficient for developing high-quality friendships. In the context of a secure attachment relationship, parental behaviors such as adequate structure and limit setting and high-quality instructions (all included in our parenting measure) were expected to independently contribute to the emergence of high quality friendships.

2.2 Method

Participants

The research questions of this study were addressed using three waves of data from the Nijmegen Longitudinal Study on Infant and Child Development. This study started in 1998 with a community sample of 129 healthy 15-month-old children (*M* age = 15.1 months, *SD* = .25; 52% boys) and their primary caregivers (see Van Bakel & Riksen-Walraven, 2002). Children and their mothers were recruited based on records from health care centers in the city of Nijmegen. The majority of the participants were Caucasian (98%); in 126 families the mother was the primary caregiver. The primary caregivers were between 22 and 47 years old at the time of recruitment and had an average educational level of 4.95 (*SD* = 1.77) on a 7-point scale ranging from low (elementary school) to high (college degree or higher).

Of the original sample of 129 children, 116 participated in the age 5 assessment (*M* age = 5.30 years, *SD* = .10, 53% boys; see also Smeekens, Riksen-Walraven, & Van Bakel, 2007, for additional sample details). A total of 118 children participated in the age 9 assessment (*M* age = 9.27 years, *SD* = .20; 53% boys). Of these 118 children, 112 (*M* = 9.28 years, *SD* = .20; 53% boys) completed the measures of the present study. Informed consent for the data collection was obtained from parents and teachers following school policies. All involved parents agreed to the data collection procedures and the videotaping of child-friend interactions in advance. Of all approached teachers, one decided not to participate.

To check for selective attrition between the assessments at 15 months and age 9, the 112 families in the final sample were compared to the 17 non-participating families on the two 15-month variables included in the present study (attachment security and parenting quality) No significant differences were found between the two groups on either measure

Procedure and Measures at 15 Months

The 15-month data were collected during a home visit and a visit of the primary caregiver and child to the university laboratory During the home visit, parent-child interaction was video recorded during four 3- to 4-minute instruction tasks The parent was asked to have the child unlock a puzzle box, put a puppet together, do a jigsaw puzzle, and "read" a set of picture books Parents were told to that they could help their child whenever they felt the need to During the rest of the home visit the child was observed during free play while the parent completed several questionnaires, interspersed with breaks during which she was fully available to the child In the lab, another parent-child interaction episode was video recorded that was almost identical to the instruction episode recorded at home

Attachment security A Dutch translation of the Attachment Q-sort (AQS version 3, Waters, 1995) was used to assess infant attachment security After the home visit, the trained visitor applied the AQS to her observations during the visit The 90 descriptive statements of the AQS were sorted into nine categories indicating how applicable each item was to the child An attachment security score was obtained by correlating the child's Q-sort description with the criterion sort provided by experts for a prototypical securely attached infant (Waters, 1995) The scores could range from +1 00 for a perfectly secure infant to -1 00 for a most insecure infant Reliability checks on our data indicated that the Q-correlations for five independents sorts of the same children to exceed the standard of 75

Parenting quality The two videotaped 12- to 15-minute parent-child interaction episodes (home and lab) were rated for the quality of parental behavior using five 7-point scales (Erickson, Sroufe, & Egeland, 1985) (1) supportive presence or the provision of emotional support, (2) respect for the child's autonomy or nonintrusiveness, (3) effective structure and limit setting, (4) quality of instructions, and (5) hostility Each episode was rated independently by two trained observers Coding of 25 cases (19% of the total number available) yielded interrater reliabilities (weighted kappa's) above 83 for all scales, both at home and in the lab The internal consistency reliability (Cronbach's α) was 84 and 83 for the home and lab measures, respectively Composite scores for parenting quality in each setting were then obtained by averaging the five standardized scale scores

(after reversing the hostility score). The correlation between the two composite scores was .74 (*p* < .001). Therefore, they were averaged to one robust overall score for quality of parental behavior.

Procedure and Measures at Age 5

The data from age 5 used in the current study were collected during a school visit in which the child was taken out of the classroom into a separate room to complete several measures. This included a measure of the parent-child attachment representation. The child's teacher was asked to complete a Q-sort and several questionnaires to assess child ego-resilience and peer competence. These questionnaires were returned by regular mail.

Security of attachment representation. The Attachment Story Completion Task (Bretherton, Ridgeway, & Cassidy, 1990; Cassidy, 1988), adapted for use with 5-year-olds by Verschueren and Marcoen (1994) was used to assess the security of children's attachment representation of their primary caregiver. Children were asked to use a child doll and a mother or father doll (depending on the sex of the primary caregiver) to complete five attachment-related story beginnings: "stolen bicycle," "giving a present," "saying I'm sorry," "fight with another child at school," and "monster in the bedroom." The videotaped story completions were transcribed and rated by four trained observers according to Verschueren and Marcoen's (1994) coding system. The story completions were rated separately on a 5-point scale for security, with higher scores reflecting higher security. The security scores for the five stories were summed to an overall security of attachment representation score for each child (Cronbach's α = .78).

Peer competence. Identical to earlier studies (Smeekens et al., 2009; Verschueren & Marcoen, 1999), three teacher rating scales for popularity, acceptance, and prosocial behavior were combined to create a robust measure of children's peer competence. Teachers rated children's popularity on a 6-point scale (1 = not at all popular; 6 = very popular). They also rated children's peer acceptance on a similar 6-point scale (1 = not at all accepted, 6 = very well accepted by peers). Finally, they rated children's prosocial behavior using a subscale from the Preschool Social Behavior Questionnaire (Tremblay, Vitaro, Gagnon, Piché, & Royer, 1992). This scale has 10 items measuring children's altruistic behaviors with peers (e.g., "comforts a child who is crying or upset" or "will invite bystanders to join in a game") that are rated on a 3-point scale (0 = does not apply, 1 = sometimes applies; 2 = frequently/certainly applies). Cronbach's α for this scale was .94.

The teacher ratings of popularity, acceptance, and prosocial behavior were standardized Cronbach's α across the three standardized scores was 73 They were then summed to one final composite score for peer competence

Ego-resiliency Teachers rated children's ego-resiliency using a Dutch translation of the California Child Q-set (CCQ, Block & Block, 1980), consisting of 100 descriptive statements of behavioral, affective, and cognitive characteristics Teachers were asked to sort the statements into a fixed, 9-category distribution ranging from "extremely uncharacteristic" (1) to "extremely characteristic" (9) for the child An ego-resiliency score was obtained by correlating the Q-sort description for each child with the criterion profile for a prototypically ego-resilient child provided by experts (see Block & Block, 1980) The ego-resiliency scores could range from -1 00 (very ego-brittle) to +1 00 (very ego-resilient)

Procedure and Measures at Age 9

At age 9, children were visited at school two times During the first visit, sociometric data were collected to identify mutual friendships in the classroom During the second visit, the interaction between the child and her or his best friend was observed

Sociometric measure As part of a larger sociometric test, all children in the participants' classrooms were asked to name and rank order their classroom friends They could name as many or as few as they wished From this data, reciprocal friendships were identified and each participant's highest ranked reciprocal friend was asked to join the participant in the friendship part of the second school visit

Friendship quality Friendship quality was observed during the interactions between children and their best friends during the second school visit Each child and her or his best friend were taken out of the classroom into a mobile laboratory There they were videotaped during a 30-minute interaction episode that consisted of five cooperative, competitive, and joint problem-solving tasks The complete episode was coded later by three trained coders using the Child-Friend Interaction Rating Scales (C-FIRS, Peters, Van den Bosch, & Riksen-Walraven, 2007), an adapted version of the Observed Friendship Quality Scale (OFQS) developed by Flyr, Howe, and Parke (1995)

For the purpose of the current study, the dyadic quality of the interaction was rated on six 5-point scales measuring positive connectedness, disharmony, disclosure, balance of power, conflict, and conflict resolution Interrater reliability was computed based on 23 (20%) interaction sessions, and ranged from 66 to 90 (ICCs) The internal consistency reliability (Cronbach's α) of the six scales was 63 After reversing the scores for disharmony and conflict, a composite score for friendship quality was obtained by calculating the average of the six standardized scale scores

Statistical Analyses

The hypothesized model was tested using multiple mediation analysis (Preacher & Hayes, 2004, 2008). Multiple mediation analysis is meant for models with more than one mediator and has several advantages over simple mediation analysis in which each mediator is examined separately. First, a multiple mediation analysis tests the existence of an overall mediation effect prior to examining the individual effect of each mediator. This is done by testing both the indirect effects of all mediators together (the total indirect effect), and the indirect effect of each mediator separately (the specific indirect effects). Second, a multiple mediation analysis can determine the unique mediating effect of each mediator, while controlling for the effects of other mediators and covariates. Third, multiple mediation analyses provide more parsimonious model specification, which enhances statistical power and decreases the probability of Type I errors (Preacher & Hayes, 2004, 2008).

The multiple mediation analyses were run using Preacher and Hayes' (2008) SPSS macro developed for this purpose. This program estimates direct and indirect effects using bootstrapping resampling, that has been recommended for mediation analyses (see, e.g., MacKinnon, Lockwood & Williams, 2004; Shrout & Bolger, 2002). Bootstrapping generates a sampling distribution by repeated random resampling from the available data. This distribution is then used to construct confidence intervals. In the current study, 5,000 resamples were generated, with bias-corrected and accelerated (BCa) 95% confidence intervals. Confidence intervals that do not include zero imply that the parameter estimate is statistically reliable at $p < .05$.

The Preacher and Hayes macro can handle multiple mediators but only one independent variable. Therefore, two separate multiple mediator analyses were performed, one with attachment security as the independent variable and parenting quality as the covariate, and one with parenting quality as the independent variable and attachment security as the covariate. In both cases, friendship quality was the dependent variable and attachment representations, peer competence, and ego-resiliency were the mediators. Missing data was handled with maximum likelihood estimation (MLE), by using the Estimation Maximization (EM) algorithm in the SPSS Missing Values option.

2.3 Results

Preliminary Analyses

Table 1 present correlations and descriptive statistics of all study variables. All correlations were significant (*r*'s ranging from .20 to .52), except for the correlation between attachment security at 15 months and ego-resiliency at age 5.

Gender differences were examined for all study variables using *t*-tests. There were no gender differences for the variables assessed at 15 months and age 9. At age 5, girls scored higher than boys on security of attachment representations, $t(98) = 4.46$, $p < .001$, and on peer competence, $t(103) = 3.05$, $p < .01$.

Table 1 Intercorrelations and Descriptive Statistics of Main Study Variables

	1	2	3	4.	5	*N*	*M*	*SD*
15 Months Predictors								
1. Attachment Security						112	25	26
2. Parenting Quality	46**					112	00	77
Age 5 Mediators								
3 Att Representations	34**	37**				100	13 71	3.78
4 Peer Competence	.24**	29**	26**			105	- 04	95
5 Ego-resiliency	.16	.37**	28**	51**		104	45	27
Age 9 Outcome								
6 Friendship Quality	31**	.20*	.22**	36**	33**	112	00	3 52

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

Mediation Analyses

To test the model, the two multiple mediation analyses (one with attachment security and one with parenting quality as the independent variable) were run. Both explained 20% of the variance in friendship quality ($p < .001$). Each analysis tested: 1) the *direct effect* of the independent variable on the dependent variable, 2) the *specific direct effects* of the independent variable on the mediators, 3) the *specific direct effects* of the mediators on the dependent variable, 4) the *total indirect effect* of the three mediators together, and 5) the *specific indirect effects* of each mediator (Preacher & Hayes, 2008). These are reported below for each of the two model tests.

Effects of attachment security. Table 2 displays all direct and mediated (indirect) effects of attachment security on friendship quality. First, bootstrap results indicated that the direct effect of attachment security on friendship quality was significant (the confidence interval did not include zero). Of the specific direct effects of attachment security on the mediators, the effect on attachment representations was significant. Two mediators (peer competence and ego-resiliency) had a significant direct effect on friendship quality.

Next, the total indirect effect and the specific indirect effects were calculated. The effect of attachment security on friendship quality was not mediated by the three mediators; zero was contained within the bootstrap confidence intervals for the total indirect effect and the specific indirect effects. Thus, the link between attachment security and friendship was not mediated by the variables of the model.

Table 2 Effects of Attachment Security on Friendship Quality Controlling for Parenting Quality

		B	*SE*	95% CI Lower	95% CI Upper
1	Direct Effect of IV on DV	2 91*	1 40	17	5 65
2	Specific Direct Effects of Attachment Security on				
	Attachment Representations	3 48*	1.58	40	6 58
	Peer Competence	.45	.40	- 33	1 23
	Ego-resiliency	-.02	.11	- 22	20
3.	Specific Direct Effects on Friendship Quality from.				
	Attachment Representations	01	.08	- 16	17
	Peer Competence	.56*	.27	.03	1.09
	Ego-resiliency	3.68*	1.33	1.06	6 29
4.	Total Indirect Effects	.21	.69	-1.16	1 58
5.	Specific Indirect Effects via				
	Attachment Representations	.03	08	-.51	.72
	Peer Competence	.26	27	-.09	1.03
	Ego-resiliency	-.07	42	-1.10	65

Note. * *p* < .05 Effect of the covariate (parenting quality) *B* = -.41, *SE* = 50, *p* = .40
IV=independent variable, DV=dependent variable

Effects of parenting quality. Table 3 displays the direct and mediated effects of parenting quality on friendship quality. First, the bootstrapping procedure showed that the direct effect of parenting on friendship quality was not significant (zero was contained within the bootstrap confidence interval). Of the specific direct effects of parenting quality on the mediators, the effects on both peer competence and ego-resiliency were significant. Ego-resiliency also had a significant direct effect on friendship quality.

The total indirect effect of parenting on friendship quality was also significant. Each specific indirect effect was then tested for significance. The indirect effect, mediated by attachment representations at age 5, was not significant. The other two indirect effects, mediated by peer competence and ego-resiliency at age 5, were both significant. Thus, the link between parenting and friendship was mediated by ego-resiliency and peer

competence.

To determine which mediated effect explained the most variance in friendship quality, contrast analyses were run within the Preacher and Hayes (2008) SPSS macro. The difference between the specific indirect effects of peer competence and ego-resiliency was not significant, 95% CI [−0.11, 0.18], indicating that both had equal mediating effects.

Table 3 Effects of Parenting Quality on Friendship Quality Controlling for Attachment Security

		B	SE	95% CI Lower	95% CI Upper
1	Direct Effect of IV on DV	- 42	50	-1.38	55
2	Specific Direct Effects of Parenting Quality on.				
	Attachment Representations	96	.54	-.09	2 02
	Peer Competence	36*	14	01	42
	Ego-resiliency	12*	.04	.05	20
3	Specific Direct Effects on Friendship Quality from				
	Attachment Representations	01	.08	- 16	17
	Peer Competence	56*	27	03	1 09
	Ego-resiliency	3 68*	1 33	1.06	6 29
4	Total Indirect Effects	66*	.29	.22	1 37
5	Specific Indirect Effects via				
	Attachment Representations	01	08	- 15	.20
	Peer Competence	20*	14	01	58
	Ego-resiliency	46*	.25	12	1 10

Note * p < 05. Effect of the covariate (attachment security) B = 2 91, SE = 1.40, p < 05
IV=independent variable, DV=dependent variable

In summary, there was a significant direct path from attachment security to friendship quality. This link was not mediated by attachment representations, peer competence, or ego-resiliency. The path from parenting quality to friendship quality was fully mediated by peer competence and ego-resiliency. Figure 2 summarizes the significant paths (direct and mediated) from attachment and parenting at 15 months to friendship at age 9.

The size of our sample did not allow us to run the multiple mediator analyses for boys and girls separately. However, we examined the effect of gender by including it as a second covariate in each multiple mediator analysis. Gender was not a significant covariate in either model and that the significance levels of all previous effects remained the same.
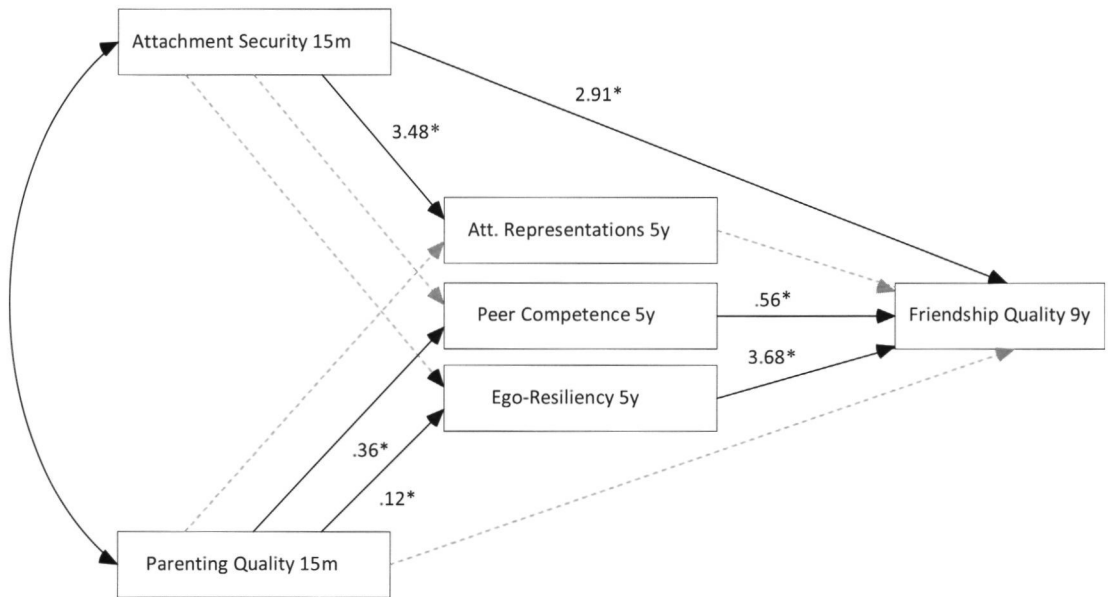
Figure 2 Significant direct and mediated pathways (unstandardized estimates) from attachment security and parenting quality at 15 months to friendship quality at age 9.
  Note. Specific indirect effects are not displayed. They can be calculated by multiplying the specific direct estimates from parenting quality to the mediator and from the mediator to friendship quality. Dotted lines indicate nonsignificant paths.

2.4 Discussion

This study examined the association between the parent-child relationship in infancy and the quality of children's best friendships in middle childhood. It was hypothesized that this association is mediated simultaneously by three mediators: the child's attachment representation of the parent, peer competence, and ego-resiliency at preschool age. Two aspects of the early parent-child relationship were considered: attachment security and parenting quality. The results showed that both independently predicted later friendship quality. Consistent with our hypotheses, the association between parenting quality and friendship was mediated by peer competence and ego-resiliency. The association between attachment security and friendship was not mediated by the hypothesized preschool variables.

The results point to the importance of including different measures of children's early relationship experiences in studies predicting later social development. The finding that early attachment security and parental behavior independently predicted later friendship quality indicates that they reflect different aspects of children's early expe-

riences with parents that are both relevant to the development of later friendships. Our results are in line with those of Raikes and Thompson (2008), who found early attachment security and parental behaviors to uniquely predict children's later social problem solving skills. It should be noted that in both studies the observations of parental behavior were not limited to attachment-relevant behaviors (sensitive responsiveness), but also included other parental behaviors (e.g., the quality of instructions and structure and limit setting) that may contribute to the development of high-quality relations with peers.

Contrary to our expectations, attachment representations did not mediate the association between the early parent-child relationship and later friendship quality. Perhaps the Attachment Story Completion Task that was used to measure attachment representations was not an ideal measure of this construct for preschool-age children, although the validity of this instrument has been established in other studies (see, for a review, Stevenson-Hinde & Verschueren, 2002; see also Gilissen, Bakermans-Kranenburg, Van IJzendoorn, & Linting, 2008). In the current study also, the ACST showed theoretically meaningful correlations with other variables. Especially, and in line with attachment theory, there was a direct relation between AQS attachment security and ASCT attachment representations in our model tests. But attachment representations, in turn, were not directly related to friendship quality. Perhaps that is because the ASCT measures cognitive representations, while friendship quality was assessed using behavioral observations. A self-report measure of friendship quality might have yielded a stronger association between attachment representations and friendship quality.

It is noteworthy that our analyses demonstrated an unmediated association between attachment security at 15 months and friendship quality at age 9. What might explain this? It is important to realize that both AQS security and friendship quality were assessed with observations of the child in interactions with a dyadic partner –parent and best friend, respectively. Moreover, high scores on AQS security and friendship quality reflect similar interactions, namely positive, harmonious, well-attuned, and well-balanced behavioral and emotional exchanges. It is possible that the ability to establish such positive exchanges is acquired by the child in early interactions with parents (Stern, 1985) and carried forward into later interactions with friends. There is also evidence that children's ability to establish positive mutuality is in part genetically based (Deater-Deckard & O'Connor, 2000). Perhaps the association between the child's early attachment security and later friendship quality is partly due to underlying genetically determined behavioral characteristics.

Genetic factors may also explain part of the association between friendship quality at age 9 and the quality of parental behavior. On the one hand, the same genes – shared by parent and child – may affect both the quality of parental behavior in interac-

tion with the child and the child's behavior in interaction with a friend. On the other hand, there is also evidence that early parenting explains a substantial amount of variance in children's social development beyond the effect of parent-child genetic relatedness. For example, Stams, Juffer, and Van IJzendoorn (2002) showed that even in adopted children early mother-infant interactions and attachment security predict their later social development. Therefore, it is reasonable to assume that in the present study at least part of the variance in friendship quality is explained by children's early experiences with their parents.

Study Limitations and Directions for Future Research

This study also had some limitations. A first limitation is the somewhat limited sample. A larger sample size would have enabled us to examine the effect of gender as a moderator variable. A second limitation is that we only used an observational friendship quality measure as the outcome variable. It remains to be seen whether the mediation model also applies to other friendship quality measures (e.g., self-reported quality or satisfaction) or to other aspects of friendship, such as the number of friends a child has.

A third limitation is that we did not control for concurrent quality of parental behavior and parent-child attachment. Although our expectations were based on the assumption that early relational experiences determine later friendship quality, concurrent parenting may also play a role, especially in case of highly stable parental behavior. Several studies assessing both early and later parenting have indeed shown that later parenting independently predicts child outcomes beyond earlier parenting and attachment (e.g., Raikes & Thompson, 2008; Sroufe, Egeland, & Kreutzer, 1990; Stams et al., 2002). The relative contribution of earlier versus later parenting and attachment to the development of high-quality friendships in particular has not been examined and is an interesting issue for future research.

A remarkable finding of the present study is that dyadic friendship quality between two children can be reliably predicted from characteristics of only one member of the dyad. This may be due to the fact that friends tend to be similar to each other in social behavior (Haselager, Hartup, Van Lieshout, & Riksen-Walraven, 1998) and other characteristics such as peer status (Peters, Cillessen, Riksen-Walraven, & Haselager, in press; Rose, Swenson, & Carlson, 2004). However, despite their similarity, characteristics of friends explain unique variance in the quality of interactions between the friends. For example, Weimer, Kerns, and Oldenburg (2004) observed higher quality interactions between adolescent friends who were both securely attached than between adolescent friends of

which only one was securely attached Examining the contribution of characteristics of the friend is therefore an interesting issue for future research

This study showed that the quality of a child's relationship with the primary care-giver (mostly mother) in infancy can reliably predict friendship quality in middle childhood The question remains whether this also holds for fathers and whether early father-child relationships also uniquely contribute to later friendships Earlier studies have shown that father attachment uniquely predicts preschoolers' peer competence (Verschueren & Mar-coen, 1999), prosocial behavior (Kerns & Barth, 1995), and positive interactions with friends (Youngblade & Belsky, 1992) But to what extent and via what processes the early father-child relationship predicts later friendship quality remains a question for further research

In conclusion, this study extended earlier research in two ways First, our results demonstrated that parental behavior and parent-child attachment in infancy indepen-dently predict later friendship quality Second, this study was the first to use multiple mediation analysis to examine the unique effects of three hypothesized mediators of the association between the early parent-child relationship and the later friendships Two unique mediators were identified higher levels of child ego-resilience and peer compe-tence explained part of the link between high-quality parenting and high-quality friend-ships Further research is needed to confirm and refine these findings and to examine the role of other theoretically relevant mediators, especially in the social-cognitive realm

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Chapter 3

Peer Rejection and HPA Activity in Middle Childhood: Friendship Makes Difference[2]

This study examined the association between two forms of peer rejection, that is, exclusion and victimization by classmates, and cortisol levels in 97 fourth-graders (54 % boys, M = 9.3 years). The moderating role of friendship (number of friends and friendship quality) was also investigated. Salivary cortisol was collected five times daily on two consecutive school days. Excluded children had: (a) elevated cortisol levels at school, and (b) a flattened diurnal cortisol curve, suggesting HPA-system dysregulation. Consistent with the predictions, the flattening effect of exclusion on the cortisol curve was less when children had more friends or a higher quality friendship. Inconsistent with the predictions, victimization was not associated with cortisol. Together, the results indicate the importance and usefulness of HPA activity as a measure of the effects of peer group processes and also indicate that both group and dyadic processes interact in their contribution to children's stress responses in the peer group.

3.1 Introduction

The hypothalamic-pituitary-adrenocortical (HPA) system, responsible for cortisol release in humans, can be activated by psychological distress. This is particularly the case when stressors have a social-evaluative component and are seen as a threat to the self (Dickerson & Kemeny, 2004). Consequently, potential or explicit social rejection can seriously influence the human stress system. Indeed, social rejection has been related to increased cortisol levels in preschoolers (Gunnar, Sebanc, Tout, Donzella & Van Dulmen, 2003; Gunnar, Tout, De Haan, Pierce, & Stansbury, 1997), adolescents (Vaillancourt, Duku, Decantanzaro, Macmillan, Muir, & Schmidt, 2007), and adults (Blackhart, Eckel & Tice, 2007; Stroud, Salovey, & Epel, 2002).

However, little is known about the association between rejection and cortisol in middle childhood. This is a developmental period when the significance of children's position in the peer group is large and peer rejection is particularly stressful (see Rubin, Bu-

kowski, & Parker, 1998) In addition, friendships are also quite important at this age (see, e g , Bagwell, Newcomb, & Bukowski, 1998) An example of this importance is the fact that friendships can function as a buffer against the negative effects of peer rejection on children's well-being and adjustment (e g , Hodges, Boivin, Vitaro, & Bukowski, 1999, Hodges, Malone, & Perry, 1997) The current study examined whether rejection in the peer group, specifically victimization and exclusion, are related to increased levels of cortisol in a middle childhood sample, and whether number of friends and friendship quality can mitigate this association

Stress and the HPA-System

The HPA-system is a neuroendocrine system that produces the human stress hormone cortisol In response to psychological stress, cortisol is elevated beyond normal levels to mobilize energy and facilitate responses to a potential threat (Gunnar & Quevedo, 2007, Sapolsky, 1994) Cortisol responses to stress help an individual to cope with the stressor and adapt to the increased demands of stressful situations (e g , Gunnar et al , 1997) Increased cortisol levels are adaptive, but chronically high levels of cortisol have negative effects on various areas of functioning, such as the immune system (Coe, Rosenberg, & Levine, 1988), learning and memory performance (Heffelfinger & Newcomer, 2001), socio-emotional adjustment (Smider, Essex, Kalin, Buss, Klein, Davidson, & Goldsmith, 2002), and in the long run the functioning of the HPA-system itself

Cortisol and Rejection by Peers

Peer rejection is the collective disliking of group members of an individual in the group (Buhs & Ladd, 2001) Such disliking expresses itself in explicit behavioral manifestations of rejection such as exclusion and victimization (Boivin & Hymel, 1997, Ladd, 2009) A growing body of research has identified several concurrent and long-term consequences of victimization and exclusion, such as increased school avoidance, externalizing problems, loneliness, social anxiety, depression and negative health outcomes (e g , Baumeister & Leary, 1995, Boivin, Hymel, & Bukowski, 1995, Buhs & Ladd, 2001, Buhs, Ladd, & Herald, 2006, Crick & Grotpeter, 1996, Hawker & Boulton, 1999, Kochenderfer & Ladd, 1996, MacDonald, Kingsbury, & Shaw, 2005, Twenge, Baumeister, Tice, & Stucke, 2001, Williams, Chambers, Logan, & Robinson, 1996)

One of the mechanisms that may account for the link between peer rejection and concurrent and long-term adjustment problems may be stress that is caused by peer rejection It is known that victimization and exclusion are both associated with considerable subjective distress (Newman, Holden, & Deville, 2005) Children for example spontaneously report being teased or isolated by the peer group as examples of stressful daily expe-

riences (e.g., Spirito, Stark, Grace, & Stamoulis, 1991). However, little is known about how victimization and exclusion by peers are associated with more objective measures of stress, such as cortisol levels. In adult and adolescents samples, exclusion is associated with increased cortisol levels. For example, studies that experimentally manipulated social exclusion or isolation reported increased cortisol levels in excluded adults (Stroud, Foster, Papandonatos, Handwerger, Granger, Kivlighan, & Niaura, 2009; Stroud, Tanofsky-Kraff, Wilfley, & Salovey, 2000; Zwolinski, 2008). The only study that has examined victimization in relation to cortisol reported lower instead of higher cortisol among bullied adolescents (Vaillancourt et al., 2007). According to the researchers, this may have been the result of chronic exposure to high levels of stress, which may lead to dysregulation of the stress system and lower cortisol levels in the long run. This mechanism will be explained in more detail below.

The goal of the current study was to assess the contribution of two forms of peer rejection, victimization and exclusion, to cortisol levels in middle childhood. It was expected that children who are victimized and excluded by classmates have higher cortisol levels at school than children who are not subjected to these forms of negative treatment by peers.

The Role of Friendship

That children are rejected by classmates does not by definition imply that they have no friends in class. Peer rejection is defined and measured at the group level and refers to the behavior of the peer group in general toward a child, while friendship is defined and measured at the dyad level and refers to an intimate relationship between two children. Those two levels are related but not identical (see, e.g., Asher, Parker, & Walker, 1996). Children who do not have the social skills to function effectively in the larger peer group, may still be able to maintain harmonious dyadic relationships. Children who are rejected by the peer group as a whole are not necessarily friendless.

Several studies have shown that a few good friends may protect children from the negative outcomes of being rejected by peers (Hodges et al., 1997, 1999; Hodges & Perry, 1999; Laursen, Bukowski, Aunola, & Nurmi 2007). Parker and Asher (1993) showed that loneliness among rejected children is reduced if they have at least one high quality friendship. Friends may have these positive and buffering effects because they provide a sense of security in a stressful environment (Berndt & Keefe, 1995; Goldstein, Field, & Healy, 1989; Ladd, 1990). A close friend can provide the social support that is known to reduce stress (Gunnar & Donzella, 2002; Uchino, Cacioppo, & Kiecolt-Glaser, 1996).

According to Cohen and Wills (1985), social support modulates stress in two ways. First, threatening conditions are seen as less stressful when support is available.

Second, support enhances the regulation of actual stressful experiences, thereby leading to a reduced physiological stress response Heinrichs, Baumgarter, Kirschbaum, and Ehlert (2003) suggested that the neuropeptide oxytocin may play a role in this mechanism, because it is involved in positive social interactions and able to inhibit HPA activity

The current study also examined the moderating role of friendship in the association between rejection and cortisol Two measures of friendship were used number of friends, and friendship quality (Hartup, 1996) Higher levels of cortisol were expected in victimized or excluded children with fewer friends and/or a lower quality friendship

The Diurnal Cortisol Curve

The available studies on the associations between rejection and cortisol have focused primarily on cortisol at school rather than on the patterning of cortisol over the day (see, e g , Gunnar et al , 1997, Gunnar et al , 2003) Normally, cortisol production follows a circadian rhythm with the highest level shortly after wake-up followed by a progressive decline during the day (Kirschbaum & Hellhammer, 1989) In case of adequate regulation of the HPA-system, exposure to high levels of cortisol is minimized via a "negative feedback" mechanism, whereby cortisol shuts down its own release But in case of chronically high levels of cortisol, the elasticity of the system may become overstrained, leading to flattened or even increased (in young children) cortisol curves over the day (Gunnar & Donzella, 2002, Gunnar & Vazquez, 2001, Miller, Chen & Zhou, 2007, Hart, Gunnar, & Cicchetti, 1996) This can be interpreted as a sign of HPA dysregulation (Caplan, Cobb, & French, 1979) For example, flattened cortisol curves have been found in clinical populations of maltreated or depressed children (Hart et al , 1996, Kauffman, 1991)

Thus, the diurnal cortisol curve reflects children's long-term adjustment to chronic stress (see also Granger, Stansbury, & Henker, 1994, Perez-Edgar, Schmidt, Henderson, Schulkin, & Fox, 2008, Stansbury & Gunnar, 1994) Rejection by peers is a source of chronic stress that can negatively influence the HPA-system Therefore, in addition to the level of cortisol, we also examined the decline of the diurnal cortisol curve Excluded and victimized children were expected to show a relatively small diurnal decline in cortisol, particularly when they had few friends or low quality friendships

Control Variables

Gender and behavior problems were included as two variables that might influence the association between rejection and HPA activity Studies have shown gender differences in cortisol responses to psychological stress (e g , Kirschbaum, Wust, & Hellhammer, 1992), and gender differences in peer rejection have also been reported in numerous studies For example, boys typically receive higher scores for victimization than

girls (e.g., Solberg & Olweus, 2003).

With regard to behavior problems, both externalizing and internalizing problems have been related to victimization and exclusion, and also to cortisol secretion. For example, externalizing behavior has been found associated with both basal cortisol and cortisol reactivity (Alink et al., 2008), and externalizing behavior is also related to peer rejection (e.g., Hodges et al., 1997; Hodges & Perry, 1999). And internalizing problems, particularly depression, have also been found related to both HPA functioning (Gunnar & Quevedo, 2007) and measures of peer rejection (e.g., Boivin et al., 1995; Hawker & Boulton, 2000).

Summary of Research Questions

This study examined the extent to which peer victimization and exclusion in middle childhood are related to HPA activity. It was hypothesized that both would predict higher levels of cortisol at school, particularly for children with fewer friends and/or a lower quality friendship. It was also expected that victimization and exclusion would predict smaller declines in cortisol over the day, resulting in flatter diurnal curves. This effect was also expected to be stronger for children with fewer friends and/or a lower quality friendship.

3.2 Method

Participants

Participants were part of the Nijmegen Longitudinal Study on Infant and Child Development, which started in 1998 with a community sample of 129 15-month-old children (Van Bakel & Riksen-Walraven, 2002a). The families were recruited via local health care centers in the city of Nijmegen in the Netherlands. Families with a 15-month-old baby were sent an invitation to participate in the study that aimed to "gain more insight into children's development in the first years of life". If they met the two eligibility criteria (i.e., sufficient fluency in Dutch and child without serious health problems) and were interested in participation, they could return a response card. Of the 639 families approached, 174 replied and 129 families were then randomly selected for the study. As indicated by the distribution of parental and child measures at 15 months, the initial sample was representative of the Dutch population of families with young children (Van Bakel & Riksen-Walraven, 2002a, 2002b).

Attrition was low throughout the longitudinal study; see Smeekens, Van Bakel, & Riksen-Walraven (2007a, 2007b) for the 5-year wave, for example. In the present measurement wave, at age nine, 118 of the 129 children in the original sample participated (53.4 % boys, *M* = 9.27 years, *SD* = .20). The primary caregivers were between 30 to 55

years old and had a mean level of education of 5 03 (*SD* = 1 72) on a scale of 1 (elementary school) to 7 (college degree or more), which was not significantly different from that of the primary caregivers in the 11 families that had dropped out of the study The 118 children attended 83 classrooms in 53 elementary schools These schools served lower-middle to middle-class families The majority of the participants were Caucasian (83 4%), the ethnic minority children in the sample were Turkish (3 0%), Moroccan (2 0%), Surinamese (1 1%), from the Antilles (1 0%), or of other background (9 5%) Ninety-five percent of the children were from two-parent families

Consent was obtained from parents and teachers following school policies Of all approached teachers, one decided not to participate The participation rate in the sociometric assessment was high, exceeding 85% in all classrooms Only eight children in the 83 classrooms (from eight different classrooms) did not receive parental permission In some classrooms one or two children were absent because of illness on the day of testing

All involved parents agreed to the saliva collection procedure, 97 of the 118 children (54% boys, *M* = 9 3 years) successfully completed the salivary samples at home and school The children without successful salivary samples were excluded because they used potentially interfering medication (against ADHD, allergies, or asthma), felt ill during sampling, or returned sampling packages that were potentially thawed too long Seven parents refrained from cortisol sampling because of a lack of time The children who dropped out did not differ statistically from the included children on any relevant study variable All 97 children with cortisol data participated in the measures of rejection, friendship, and behavior problems

Overview of Data Collection

Data collection occurred in stages, within a 4-week period for each child First, parents received a questionnaire to assess child behavior problems, which they returned by mail Next, the children were visited at school two times During the first visit, sociometric data were collected in the classrooms of the 118 target children to identify their friendships and assess victimization and exclusion During the second school visit, within two weeks after the first, the target children and their best friend were taken into a separate room to fill out a questionnaire to assess the quality of their friendship Finally, within two weeks after the second school visit, saliva was collected from the target children on two consecutive school days

Measures and Procedures

Peer rejection experiences Sociometric data with unlimited nominations were collected during a 30-minute classroom session To help children complete the nomi-

nations, the names of all eligible classroom peers were written on the blackboard. There were two measures of children's peer rejection experiences. *Victimization* was measured by asking children to name peers in their classroom "who are often bullied or picked on by other children." *Exclusion* was measured by asking children to name peers "who are often excluded from peer activities." For both questions, nominations received were counted and standardized to z-scores within classrooms to control for differences in classroom size as is customary in sociometric research (Cillessen, 2009). The validity of peer nominations for victimization and exclusion has been demonstrated repeatedly (e.g., Gazelle & Druhen, 2009; Perry, Kusel, & Perry, 1988).

Friendship measures. There were two measures of friendship. First, *number of friends* was assessed as part of the classroom peer nominations. Children were asked "Who of your classmates are your friends?" (Bukowski, Hoza, & Boivin, 1994). They could nominate as many or as few friends as they wished, starting with their first best friend, second best friend, and so on. From these data, the number of reciprocal friendships in the classroom was computed. Second, *friendship quality* was assessed with the Friendship Quality Questionnaire (FQQ; Parker & Asher, 1993). The FQQ consists of 40 friendship qualities. Children rate how true each is of their best friendship on a 5-point scale (0 = not at all true; 4 =really true). Children were asked to complete the FQQ with reference to their very best friend as determined by the sociometric procedure. A child's best friend was the classmate who the child nominated as highest ranked among her or his top three best friends and who also nominated the child in her or his top three in return. If there was no top-three reciprocal friend, priority was given to the target child's next ranked friend who also nominated the target child as a friend (irrespective of rank order). If there was no reciprocal friend – which happened on only one occasion – the best friend was defined as the highest-ranked non-reciprocal friend of the target child.

Personalized versions of the FQQ were created with the name of the identified best friend embedded in each item to prevent that children would complete the questionnaire for an idealized friendship, or for a combination of different friendships (see Parker & Asher, 1993). Examples items are: "Susan and I loan each other things all the time", and "Susan and I tell each other secrets". The FQQ yields six subscales: companionship and recreation (α = .77), validation and caring (α = .80), help and guidance (α = .86), intimate exchange (α = .89), conflict and betrayal (reversed, α = .50), and conflict resolution (α = .70). A child's score on each subscale is the average of her or his ratings for the relevant items. Consistent with previous research (Parker & Asher, 1993), a total FQQ score was computed by averaging the subscale scores. Higher scores indicate higher friendship quality.

Behavior problems Parents (primary caregivers) completed the 113 item Dutch version of the Child Behavior Checklist for ages 6 to 18 (CBCL/6-18, Achenbach & Rescorla, 2000) The items include several problem behaviors rated on a three-point scale (0= not true, 1 = somewhat or sometimes true, 2 = often true), in eight behavioral domains Anxious/Depressed, Withdrawn, Somatic Complaints, Social Problems, Thought Problems, Attention Problems, Rule Breaking Behavior, and Aggressive Behavior In the present study the CBCL total problem score was used, which is obtained by summing scores across domains

Salivary cortisol Saliva samples were obtained on two consecutive school days (Monday and Tuesday) Five samples were taken on each day two at home in the morning (directly after awakening and 30 minutes later), two at school (at noon before lunch and in the afternoon before going home), and one at home in the evening before bedtime

The equipment needed for the salivary collection was sent in a postal package to the children's homes, a few days before the sample period The package consisted of a sampling booklet, digital watch, short parental questionnaire, and a "salivary kit," containing two plastic bags marked "Day 1" and "Day 2" Each bag enclosed five plastic devices with sterile absorbent cotton dental roles without any oral stimulants held inside (Salivettes, Sarstedt) All Salivettes were separately marked with the desired sampling times Children were trained to chew on the cotton rolls for at least one minute, until they were saturated with saliva They were asked not to eat or brush their teeth during a two-hour period before sampling Children were instructed to always directly record the exact times of sampling, determined by the provided digital watch Children and their parents were instructed to store the saliva samples in their home refrigerator The sampling booklet contained information on how to collect the saliva, questions about quality of sleep, and potential stressors or problems around sampling Parents completed the short questionnaire about children's leisure activities, use of medication, illness, or other noteworthy details during the sampling period

Salivary samples were sent to the Biochemisches Labor at the University of Trier, Germany, to be analyzed in duplicate using time-resolved fluorescence immunoassay (DELFIA, Dressendorfer, Kirschbaum, Rohde, Stahl, & Strasburger, 1992) The samples of each child were analyzed in the same assay batch to minimize variability If control samples showed cortisol values outside a defined range (+/- 2 SD) the whole batch was reanalyzed Cortisol was measured as nmol/l Samples with higher values than the highest standard (100 nmol/l) were diluted and re-analyzed The intra-assay coefficient of variation ranged from 4 0% and 6 7%, the inter-assay coefficients of variation ranged from 7 1% and 9 0% All values greater than 50 nmol/l were considered outliers (Nicolson, 2008) and reassigned a value of two standard deviations above the mean, as suggested by

Kertes and Gunnar (2004)

Cortisol Parameters

To estimate school levels of cortisol and the diurnal change in cortisol levels, data from both days of data collection were combined Combining aggregated cortisol data across days is recommended when examining individual characteristics in relation to cortisol levels (Adam & Gunnar, 2001, Nicolson, 2008) This was justified by the individual stability in cortisol levels Children's daily cortisol averages (mean of four saliva-samples) across the two days were positively correlated (r = 54, p < 001) Consistency of cortisol levels from Day 1 to Day 2 was indicated by significant correlations between each time point, r's = 57, 32, 32, and 44, all p's < 001, for morning, noon, afternoon, and bedtime, respectively

To examine the effects of exclusion and victimization on the level of cortisol at school, the area under the curve (AUC_{school}) was calculated as a measure of children's cortisol secretion during school hours AUC_{school} was calculated with the formula for AUC with respect to ground (see Pruessner, Kirschbaum, Meinlschmid, & Hellhammer, 2003) This measures the total amount of cortisol secretion during a specific time period, in this case, for the period from noon before lunch until going home in the afternoon Because this time period between children, cortisol secretion at school was divided by the time (in minutes) between the two samples AUC_{school} was computed for the majority of children who had data at both school times, 11 children missed one of both times and therefore did not have an AUC_{school} score The correlation of AUC_{school} between Day 1 and Day 2 was 34 (p < 001)

The effects of exclusion and victimization on the diurnal decline in cortisol were examined with Linear Mixed Models (LMM) in SPSS 15 Mixed models can estimate individual differences in the cortisol intercept (morning level) and slope (decline across the day) and allows for the inclusion of participants with incomplete data Mixed modeling of repeated cortisol assessments is recommended to estimate a typical pattern in a homogeneous population (see Van Ryzin, Chatman, Kryzer, Kertes, & Gunnar, 2008) Time was measured in hours and centered at 7 00 am Therefore, effects on the cortisol intercept (not of primary interest here) indicate effects on the early morning cortisol level Slope effects (of primary interest in these analyses) indicate effects on the hourly change of cortisol across the entire school day

3.3 Results

Preliminary Analyses

Because the distribution of raw cortisol values was somewhat skewed, they were

log transformed. All analyses were conducted with the log-transformed scores. Table 1 shows the descriptives and correlations of the study variables. Gender (dummy coded; girls = 1, boys = 0) was negatively related to problem behavior. Boys scored higher on the CBCL than girls. The positive correlation between gender and friendship quality indicates that girls rated their friendships higher in quality. Victimization and exclusion were moderately correlated. Neither was related to gender or behavior problems. Victimization and exclusion were uncorrelated with friendship quality. Exclusion was negatively associated with number of friends, and positively with AUC_{school}. Because both gender and CBCL were not correlated with cortisol level, there was no need to control for these variables in further analyses.

Table 1 *Intercorrelations and Descriptive Statistics of Study Variables*

	1	2	3.	4	5.	6	*M*	*SD*	Range
1 Gender							47	50	0-1
2. CBCL	- 23*						23 96	15 33	2-85
3. Victimization	- 03	00					02	1 02	-1.31 4.77
4. Exclusion	- 17	19	41*				02	1 04	-1 18- 4 64
5. Number of Friends	.03	- 16	- 17	-.36*			3 75	1 84	0-9
6 Friend Quality	31*	- 14	09	-.13	23*		3.90	60	2.13-4.98
7. AUC_{school}	- 15	15	- 11	.28*	- 13	-.12	1 61	51	.57-3 30

Note. * p < .05., 82 ≤ N ≤ 97.

Predicting School Cortisol Levels

To examine the effects of exclusion and victimization on AUC_{school}, and the moderating effects of friendship, two hierarchical regressions were run. In the first analysis, exclusion was entered in Step 1, the two friendship measures (number of friends and friendship quality) in Step 2, and the interactions of exclusion with the two friendship measures in Step 3. In the second analysis, victimization went into Step 1, the two friendship measures in Step 2, and the interactions of victimization with both friendship measures in Step 3. Table 2 shows the results.

The analysis of exclusion explained 19% of the variance in school cortisol level, $F(5, 85)$ = 5.37, p < .01. Significant incremental variance was added in Step 1 and Step 3. In Step 1, a significant positive effect of exclusion was found. Children who scored higher on exclusion also had higher cortisol levels at school. In Step 3, a significant interaction was found between number of friends and exclusion. That is, the association between exclusion and AUC_{school} was moderated by number of friendships. To examine the nature of this moderating effect, the association between exclusion and AUC_{school} was plotted at 0, 1, 2,

and 6 friendships. Zero, one, and two friendships were chosen because they are the lowest numbers possible and often considered important substantively in friendship research (see Hartup, 1996). Six was chosen because it represented the upper end of the distribution of classroom friendships (range 0-9) and slightly more than one standard deviation above the mean (5.6 friends). Exclusion was already a *z*-score. Therefore, -1 and +1 were chosen as low and high values representing the mean minus and plus one standard deviation consistent with Aiken and West (1991). Figure 1 shows the resulting graph. The slopes of the regression lines in Figure 1 indicate that the association between exclusion and cortisol was stronger as the number of friends increased (*b*'s = .23, .35, .47, and .94, for 0, 1, 2, and 6 friends, respectively).

The analysis of victimization explained 4% of the variance in school cortisol level and was not significant, $F(5, 85) = .74$, $p = .61$. None of the steps added significant incremental variance. There were no significant main effects of victimization or interactions with friendship.

Table 2 *Results from Hierarchical Regressions Predicting AUC$_{school}$ from Exclusion and Victimization*

Predictors	β	ΔR^2	Predictors	β	ΔR^2
Step 1		07*	Step 1		.01
Exclusion	40*		Victimization	- 12	
Step 2		01	Step 2		.03
Number of Friends	-.05		Number of Friends	-.10	
Friendship Quality	.07		Friendship Quality	-.12	
Step 3		11*	Step 3		01
Exclusion x N of Friends	36*		Victimization x N of Friends	10	
Exclusion x Friend Quality	16		Victimization x Friend Quality	-.03	
Total R^2		.19*	Total R^2		04

Note. * $p < 05$. $N = 86$.

Predicting Diurnal Decline of Cortisol

For both exclusion and victimization, a linear mixed model was run following the logic and framework of the multilevel model of change (Singer & Willett, 2003). A person-period data file was created in which all available time points were nested within each child. Cortisol, measured at the maximum of the five time points during the school day, was the dependent variable in this analysis. Both the intercept of cortisol, in this case centered at the first measurement point as is customary in cortisol studies, and the slope
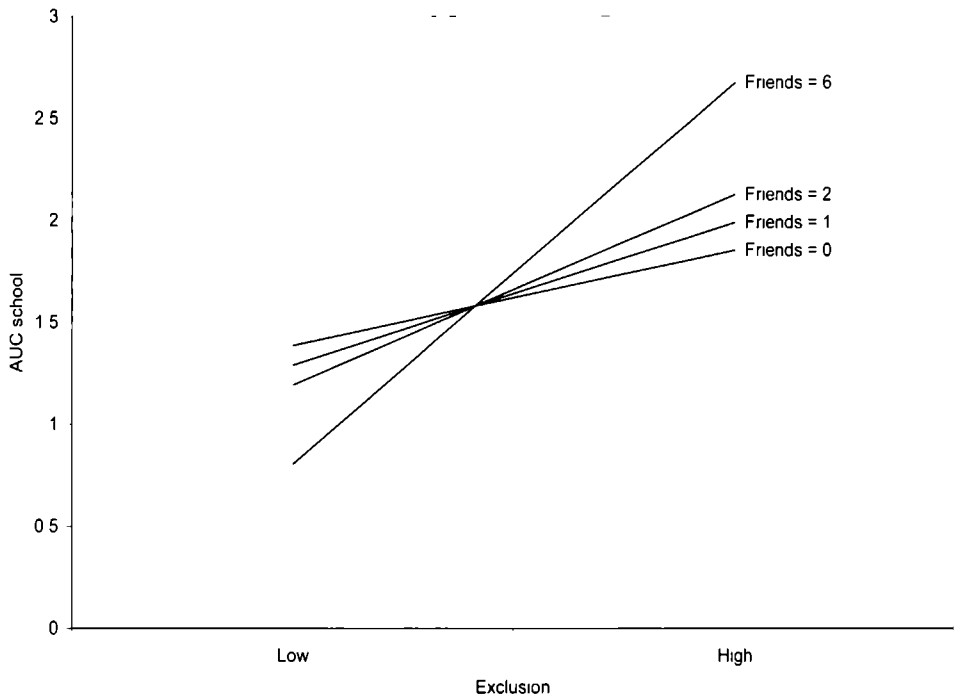
Figure 1 Interaction between peer exclusion and number of friends in the prediction of school cortisol level (AUC$_{school}$)

of cortisol during the school day, were estimated. The main focus of this analysis is on the estimated change in cortisol across the entire school day. Two mixed models were run, one for exclusion and one for victimization. In the model for exclusion, exclusion and the two friendship variables were time-invariant predictors. Their effects on the cortisol intercept and slope were estimated. To test moderation, the interactive effects of exclusion with both friendship variables on the intercept and slope were estimated as well. In the model for victimization, victimization and the two friendship variables were the time-invariant predictors, predicting both intercept and slope. Again, the interactive effects of victimization with both friendship variables on the intercept and slope were also estimated.

The results are summarized in Table 3. As can be seen in Table 3, exclusion had a significant negative effect on the intercept. Higher levels of exclusion were associated with lower levels of morning cortisol than normal. This effect of exclusion on the intercept was moderated by both friendship variables. Having more friends or a higher-quality friendship counteracted the reduction of morning cortisol that is associated with exclusion.

Table 3 *Results from Linear Mixed Models Predicting Diurnal Cortisol from Exclusion and Victimization*

Effects of Exclusion	B	SE	Effects of Victimization	B	SE
On Initial Status	15.82	1 09	On Initial Status	16.13	1.16
Exclusion	-5.01*	1 04	Victimization	-1 56	.96
Number of Friends	.00	.26	Number of Friends	-.31	.26
Friendship Quality	10	78	Friendship Quality	18	.81
Exclusion x N of Friends	1 34*	30	Victim x N of Friends	10	.22
Exclusion x Friend Quality	3.21*	1.00	Victim x Friend Quality	.75	.91
On Rate of Change	-1.28*	13	On Rate of Change	-1 30*	.14
Exclusion	43*	12	Victimization	13	12
Number of Friends	00	03	Number of Friends	03	.03
Friendship Quality	- 03	09	Friendship Quality	- 04	.10
Exclusion x N of Friends	-.11*	04	Victim. x N of Friends	-.01	.03
Exclusion x Friend Quality	- 29*	.12	Victim. x Friend Quality	-.07	11

Note. * $p < .05$

The rate of change was significant and negative, indicating the normal reduction of cortisol across the school day. Exclusion had a positive effect on the rate of change, indicating that excluded children had a less negative rate of change of cortisol across the day, or a flatter curve. Combined with the intercept results, this indicates that excluded children started lower in the morning, but also had a flatter curve across the day.

Importantly, the interaction of exclusion with both friendship variables on the rate of change was significant. Prototypical plots were again created to understand both interactions. Figure 2 displays the prototypical plot for the interaction between exclusion and number of friends. Figure 3 displays the interaction between exclusion and friendship quality. In both cases, low and high values of the predictor (exclusion) and moderators (number of friends and friendship quality) were set at $M \pm 1$ SD (Aiken & West, 1991; Singer & Willett, 2003). For number of friends, this corresponded with 1.9 friends ($M - 1$ SD) and 5.6 friends ($M + 1$ SD).

As shown in Figure 2, the interaction between exclusion and number of friends on the rate of change was caused by a different slope for excluded children with few friends. Children who were excluded and had few friends had a flatter cortisol curve across the day than children who were excluded and had more friends or children who were not excluded.

Figure 3 shows that the interaction between exclusion and friendship quality on
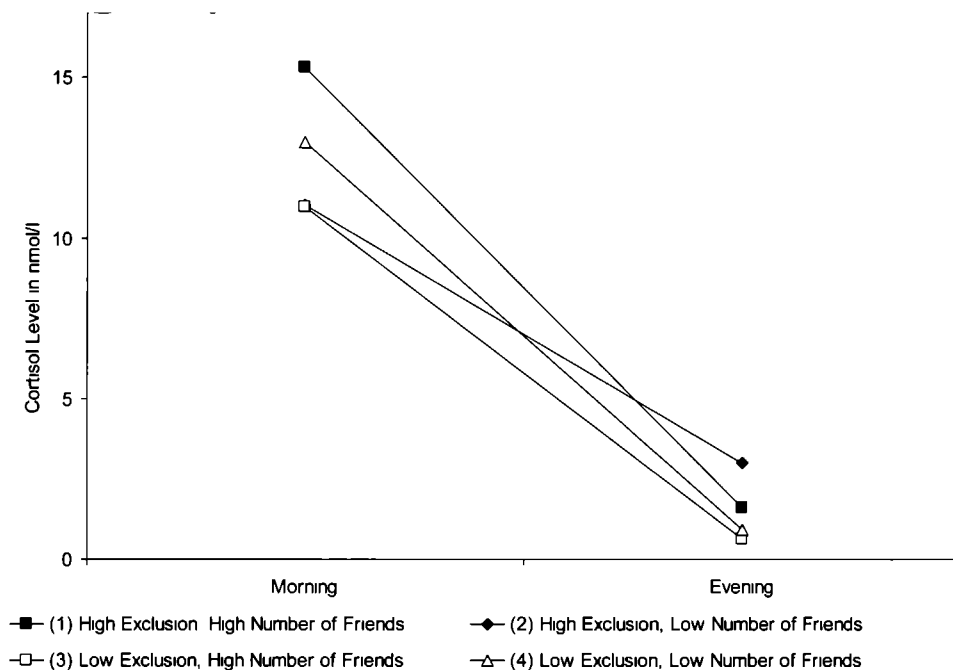
Figure 2 Interaction between peer exclusion and number of friends in the prediction of diurnal cortisol decline
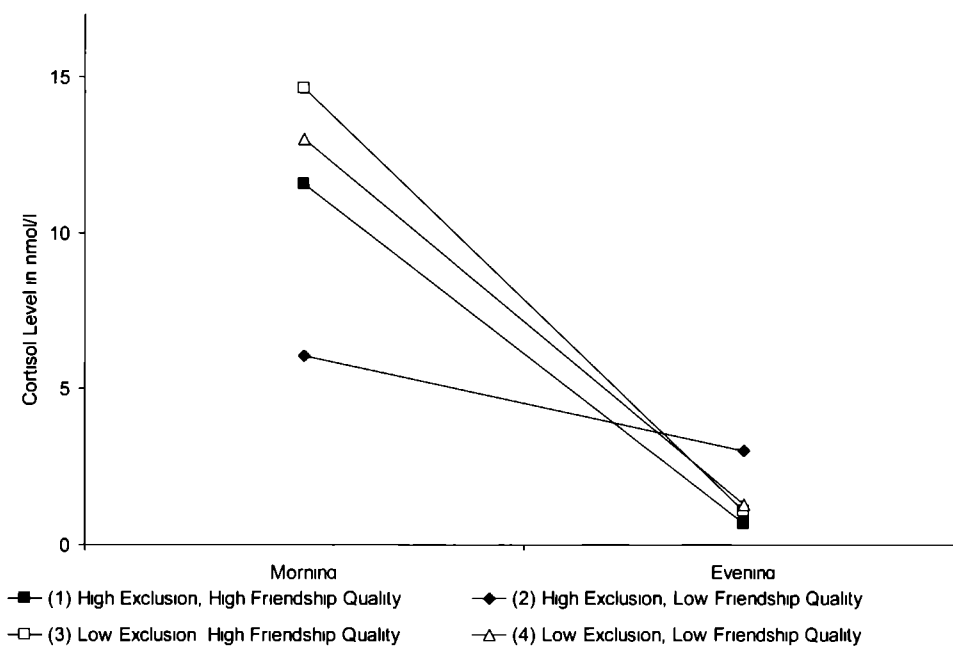

Figure 3 Interaction between peer exclusion and friendship quality in the prediction of diurnal cortisol decline

cortisol change was also caused by a different slope for excluded children with low quality friendships. This effect was even more pronounced than for the number of friends. Children who were excluded and had a low quality friendship had a much flatter cortisol curve across the school day than children who had higher quality friendships or were not excluded.

The analysis for victimization yielded a significant rate of change, representing the normal decline in cortisol during the day. No other effects were significant in this analysis.

3.4 Discussion

This study examined whether exclusion and victimization in the peer group predicted HPA activity in children, and whether these effects were moderated by friendships. As expected, exclusion predicted HPA activity. Children who were excluded by peers exhibited higher levels of cortisol at school. In addition, excluded children had a flatter diurnal cortisol curve, that is, a smaller decline in cortisol over the day. This was even more pronounced for excluded children with few friends or low quality friendships. Peer victimization was not directly associated with HPA activity. Together, the results demonstrate that although friends cannot completely eliminate the stress of exclusion at school, they do reduce the stress of exclusion.

The elevated level of cortisol at school and flattened diurnal curve of excluded children could indicate that exclusion is stressful. The fact that the same effects were not found for victimization may suggest that exclusion is more stressful than victimization. Why would this be the case? An answer may lie in the evolutionary function of social contact. Social contact has clear benefits for survival and social success. Evolutionary selection has favored the formation and maintenance of social bonds and the experience of distress when they are missing (Baumeister & Leary, 1995). This is in line with our finding that flattened cortisol curves were particularly evident in excluded children with few friends. Such curves point to HPA-system dysregulation as a result of chronic stress. Excluded children with few friends have less social contact than most of their peers– probably also after school. This may lead to levels of distress that are too high to cope with, eventually resulting in dysregulation of the HPA-system.

Peer victimization, in contrast, does not per definition include deprivation of social contact, and may therefore be less stressful than social exclusion by peers. In the only earlier study that examined peer victimization in relation to cortisol (Vaillancourt et al., 2007), lower levels of cortisol were found in bullied adolescents, which the authors interpreted as an indication of dysregulation of the stress system as a result of chronic stress. The fact

that we did not find a relation between victimization and flattened diurnal cortisol curves is not at odds with the findings of Vaillancourt and colleagues, given the younger age of our participants. It is possible that flattened diurnal curves emerge at a later age, after longer exposure to victimization. A longitudinal follow-up of the present sample could clarify this issue.

Another explanation for the difference in results between exclusion and victimization may have to do with their measurement by peer nominations. Nominations may better capture exclusion than children's victimization experiences. Who is excluded by the peer group can be observed easily by all group members, but victimization may often occur in dyads or small groups, and therefore be less easy to see for the rest of the peer group. Indeed, Perry et al. (1988) found that some children who report to be victims of bullying are not recognized as victims by their peers. Perhaps our results for victimization might have been stronger if the data had been supplemented with a self-report measure of victimization, and we would have examined cortisol levels of children who are not only nominated by peers as victims, but also reported high levels of peer victimization themselves.

The results showed that excluded children with more friendships had higher cortisol levels at school. This may seem counterintuitive, especially considering that these friendships did protect them from dysregulation of the HPA-system in general, as reflected in their diurnal cortisol curve. However, this finding may be explained by the characteristics of excluded children's friends. Friends are often similar (Haselager et al., 1998; Peters, Cillessen, Riksen-Walraven, & Haselager, in press). Excluded children's friends may also be excluded. This may take away the protective effect that they might have. A rejected friend may not protect against victimization or exclusion, but in fact enhance one's vulnerability. Two rejected children spending time together may be more inviting to bullies than one (Rubin, Wojslawowicz, Rose-Krasnor, Booth-LaForce, & Burgess, 2006). It is also possible that excluded friends co-ruminate about their problems, increasingly focus on their negative school experiences, and thereby exacerbate the stress they experience rather than alleviate it (see Oh, Rubin, Bowker, Booth-LaForce, Rose-Krasnor, & Laursen, 2008; Rose, 2002; Rubin et al., 2006).

It is remarkable that friendships had a positive effect on the decline of excluded children's cortisol curve over the full day, while they did not protect against increased cortisol levels during school hours. A possible explanation lies in the effect of excluded children's contacts with friends *after* school. Children who have friends are also likely to interact with them after school, and this may reduce excluded children's elevated school cortisol levels, resulting in a steeper decline of the cortisol curve across the day. That is, it may be more difficult for friends to counteract the effects of exclusion within the imme-

diate school context (when bullies and other peers doing the exclusion are present), but their supportive effect may be beneficial in the course of the entire day (outside of the presence of excluding peers). The relative supportive effects of friends within versus outside of school could be examined if reports of contacts with friends after school were available. Unfortunately, such reports were not available in this study.

Study Limitations

Although this study assumed that peer rejection causes stress that can be measured by cortisol in saliva, the causal direction of the relation between peer rejection and cortisol cannot be proven in this cross-sectional study. The possibility remains that elevated cortisol at school or dysregulated HPA activity precede peer exclusion. Such a causal direction has been suggested for the association between aggression and low cortisol. Underarousal of the physiological stress system is thought to urge children to stimulation seeking behavior (such as aggression) in order to elevate their arousal to comfortable levels (Susman, 2006). For excluded children, this would imply that high cortisol would cause them to act in ways that lead to rejection. Longitudinal cortisol data over longer time periods would be necessary to disentangle these possibilities.

Further, the identification of friendships was limited to the classroom. Other important friendships may have been missed as a result. For example, friendships from the neighborhood or leisure activities may also be important sources of social and emotional support, especially for children who experience difficulties in their peer group at school.

The current study measured cortisol on two regular school days. Future research may benefit from examining the association between peer rejection and HPA activity on other days, such as during weekends and holidays. This may yield additional insights into the associations among peer rejection, friendships, and stress responses. For example, if high cortisol in excluded children is the result of hostilities with peers at school, cortisol should be more normal at home.

The cortisol data were collected up to four weeks after the assessment of rejection and friendships. Despite this lag, we found meaningful correlations of rejection and friendship with cortisol. This suggests that the time lag was not a problem in our study. This also makes sense given the relative stability of rejection and friendships over several months in school at this age (e.g., Berndt & Hoyle, 1985; Bukowski & Newcomb, 1984; Sandstrom & Coie, 1999). Because of the time lag, our estimates of the association between rejection/friendship and cortisol may be conservative. Future studies with shorter time lags may yield stronger results.

Implications

This study showed that excluded children have enhanced levels of cortisol at school and relatively flat cortisol curves over the day. Previous studies have clearly shown that chronically high cortisol has negative effects on child development (Coe et al., 1988; Heffelfinger & Newcomer, 2001; Smider et al., 2002). Exclusion by itself also has numerous negative consequences (e.g., Baumeister & Leary, 1995; Buhs & Ladd, 2001; Buhs et al., 2006; Crick & Grotpeter, 1996; MacDonald et al., 2005; Twenge et al., 2001; Williams et al., 1996). The fact that high cortisol and exclusion are related may point to an important mechanism through which exclusion contributes to negative outcomes. Buhs and colleagues (2006) found that excluded children achieve poorly in elementary school. They suggested that exclusion may impair a child's ability to participate in classroom activities, which leads to low school achievement in the long term. The current study points to another mechanism that may be involved. Chronically high cortisol is related to decreased memory and learning performance (Heffelfinger & Newcomer, 2001). Therefore, low academic achievement of excluded children may be caused by increased cortisol levels associated with peer exclusion at school.

The current study shows that the stress of peer exclusion is reflected in children's physiological responses. Yet, friendships offer children provisions that are unique relative to general peer group influences (Ladd, Kochenderfer, & Coleman, 1997). Importantly, our study evidences a psychobiological mechanism that can explain how peer relations at the group level and the dyadic level can interact in their contribution to children's functioning.

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Chapter 4

Best Friends' Preference and Popularity: Associations with Aggression and Prosocial Behavior[3]

This study examined how children's aggression and prosocial behavior are related to the preference and popularity of their best friends. Participants were 1,953 fourth-graders (52.2% boys). Measures included peer nominations of friendship, peer status, overt and relational aggression, and prosocial behavior. A total of 334 reciprocal same-sex best friend dyads were identified. The Actor-Partner Interdependence Model (Kashy & Kenny, 1999) showed that best friends' peer status significantly predicted children's behavior. For boys, best friends' preference was negatively associated with overt aggression, while best friends' popularity was positively associated with overt aggression. For girls, best friends' popularity was positively related to both relational aggression and prosocial behavior. The model also revealed high similarity between friends in both preference and popularity. This study highlighted the distinction between two dimensions of peer status in the study of friendship and peer influence in middle childhood. It also demonstrated how individual, dyad, and group characteristics can be integrated in the study of children's social relationships.

4.1 Introduction

Extensive research has focused on the influence of friends on children's aggression (e.g., Cairns, Cairns, Neckerman, Gest, & Gariépy, 1988; Dishion, Andrews, & Crosby, 1995), and prosocial behavior (e.g., Barry & Wentzel, 2006). Whether children are affected positively or negatively by their friends depends on various characteristics of these friends. One characteristic that appears to be important is a friend's status in the peer group. Studies have shown that children are especially likely to imitate or be influenced by high-status peers (e.g., Abramovitch & Grusec, 1978; Bandura, Ross, & Ross, 1963, Allen, Porter & McFarland, 2006; Hawley, 1999; Nangle, Erdley, Newman, Mason, & Carpenter, 2003; Puckett, Aikins, & Cillessen, 2008).

In recent studies, two dimensions of peer status are often distinguished: social preference and perceived popularity. Socially preferred children are well liked by their

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peers, while perceived popular children are dominant, but not necessarily liked Distinct associations of behavior with both dimensions of status lead to the hypothesis that children may be affected differently by friends who are socially preferred than by friends who are perceived popular The overarching goal of this study was to examine this hypothesis

Preference and Popularity

In this study the constructs of social preference and perceived popularity are further referred to simply as *preference* and *popularity* Preference is the difference between peer nominations received for "liked most" and "liked least" (Coie, Dodge, & Coppotelli, 1982), and is a measure of peer acceptance or likeability Popularity is the difference between peer nominations received for "most popular" and "least popular" (Parkhurst & Hopmeyer, 1998), and is a measure of social impact or visibility in the peer group (Cillessen & Mayeux, 2004, Cillessen & Rose, 2005) Popularity and preference start to become different from one another by the middle of elementary school, but their distinction peaks in early adolescence between the ages of 10 and 14 (LaFontana & Cillessen, 2002)

Previous research has consistently shown that preference and popularity are differentially associated with behavior Both are positively associated with prosocial behavior, but the associations with aggression are in opposite directions while preference is negatively associated with aggression, popularity is positively associated with aggression (Cillessen & Mayeux, 2004, Farmer & Rodkin, 1996, Parkhurst & Hopmeyer, 1998, Rose, Swenson, & Waller, 2004) This difference in associations applies to measures of overt aggression as well as relational aggression (Rose et al , 2004) Overt aggression is direct physical and verbal aggression, while relational aggression refers to more subtle acts, such as excluding others and spreading rumors about them (e g , LaFontana & Cillessen, 2002, Rose et al , 2004) The correlation between popularity and aggression is further moderated by gender The positive association between overt aggression and popularity is stronger for boys than for girls, while the positive association between relational aggression and popularity is stronger for girls than for boys (Cillessen & Mayeux, 2004)

These studies show how peer status and behavior are related *within* the individual The same question can be asked at the level of the dyad Are peer status and behavior also related *between* individuals within dyads, for example in best friendships?

Friend's Impact on Behavior

The effects of friends on antisocial behavior have been studied frequently, especially in adolescence Peers can increase each other's deviancy or aggression (e g , Cairns et al , 1988, Mrug, Hoza & Bukowski, 2004, Werner & Crick, 2004), especially in friendships (Dishion, 2000, Dishion et al , 1995, Dishion, Spracklen, Andrews, & Patterson, 1996)

The effects of friends on prosocial behavior are also well-documented (e.g., Barry & Wentzel, 2006; Brendgen, Bowen, Rondeau, & Vitaro, 1999; Wentzel, Barry, & Caldwell, 2004). Having friends contributes to the development of prosocial skills. Having prosocial friends is even more beneficial. For example, Wentzel et al. (2004) found that prosocial behavior increased from grades 6 to 8 in children who had a friend who was more prosocial than they were, and decreased in children with a friend who was less prosocial.

A Friend's Peer Status

In addition to behavioral characteristics, the peer status of a friend (either preference or popularity) may also act on a child's behavior. Children's preference or popularity determines the impact they have in the peer group in general (and not only in their friendships). For instance, popular children are well-connected in their grade (Adler, Kless, & Adler, 1992; Rodkin, Farmer, Pearl, & Van Acker, 2000), and play a large role in determining the social norms of a group (Adler & Adler, 1998). Also, socially central children are carefully watched and emulated by their peers (Hawley, 1999).The same abilities that high status children have to affect peers in general may also be applied to their friendships.

In this process, both types of high status should be distinguished. The idea of being monitored by others and being socially dominant, is more fitting with the concept of perceived popularity than social preference (Cillessen & Rose, 2005). Therefore, we expected to observe stronger associations between a child and her of his popular friend, than between a child and her or his well-liked friend.

In this study we were interested in the impact of a friend's peer status on a child's behavior. We expected friends' *preference* to be positively associated with prosocial behavior and negatively with antisocial behavior, and we expected friends' *popularity* to be positively associated with both prosocial and antisocial behavior. We expected these processes to be associated more strongly with that the degree to which the dyad members are perceived as popular, then with that the degree to which they are well-liked in the peer group at large.

The Actor-Partner Interdependence Model

The associations between the peer status of friends and children's behavior was tested with the Actor-Partner Interdependence Model (APIM; Kashy & Kenny, 1999; Kenny, Kashy, & Cook, 2006). When two friends interact, their behavior is affected by their own characteristics (*actor effects*) and by their partner's characteristics (*partner effects*). In our application of the APIM, we expected to demonstrate that children's behavior is not only associated with their own status (actor effects), but also uniquely associated with the status of their friends (partner effects). Because the APIM is a structural equation model,

the paths are called predictive effects although our basic design is correlational.

There are several controls built into the APIM. First, actor and partner effects are estimated simultaneously so as to control for each other. For example, when estimating the effect of a friend's popularity on a child's relational aggression, the association between both children's own popularity and their own relational aggression is controlled for.

Second, the model controls for the initial behavioral similarity of the friends. Friends are often similar in behavior to begin with (Haselager, Hartup, van Lieshout, & Riksen-Walraven, 1998; Kupersmidt, DeRosier, & Patterson, 1995; Nangle, Erdley, Zeff, Stanchfield, & Gold, 2004; Rubin, Lynch, Coplan, Rose-Krasnor, & Booth, 1994), because children also select friends who are similar to themselves. Thus, to accurately estimate the effects of friends on each other's behaviors, the initial similarity between them was controlled.

Third, the APIM analysis also estimates and controls for the friends' initial similarity in preference and popularity. Few studies have addressed the degree to which friends are similar in social status. The studies that have addressed this issue have found inconsistent results. French, Jansen, Riansari, and Setiono (2003) found a moderate similarity for social preference between elementary-school age friends. Kupersmidt et al. (1995) found similarity only when both friends were high in social preference. Haselager et al. (1998) found no similarity in status between friends. Finally, in the only study to report friends' similarity in both preference and popularity, Rose, Swenson, and Carlson (2004) found that friends were more similar in popularity than in preference. One reason for the different findings between these studies may be that they used methods that did not control for dyadic dependence in similar ways. In the current study, we estimated friends' similarity in preference and popularity in the context of the APIM, and controlled for this similarity when estimating the actor and partner effects.

In summary, the goal of this study was to examine the association between friends' peer status and children's own behavior. It was hypothesized that children's behavior is uniquely associated with the preference and popularity of their best friends, in addition to their own status. It was expected that for both boys and girls the preference of their best friends was positively associated with their own prosocial behavior and negatively with their own overt and relational aggression. It was also expected that the popularity of boys' and girls' best friends is positively related to their own prosocial behavior. Finally, it was expected that the popularity of children's best friends would be positively related to overt aggression for boys and positively related to relational aggression for girls.

4.2 Method

Participants and Procedure

Participants were 1,953 children (52.5 % boys, M = 9.4 years, SD = .97) from 83 classrooms in 53 elementary schools in The Netherlands. These schools served lower-middle to middle-class families. The majority of the participants were Caucasian (83.4%); the ethnic minority children in the sample were Turkish (3.0%), Moroccan (2.0%), Surinamese (1.1%), from the Antilles (1.0%), or of other background (9.5%). Classrooms were recruited as part of the fifth measurement wave of the Nijmegen Longitudinal Study on Infant and Child Development (Van Bakel & Riksen-Walraven, 2002). Consent was obtained from parents and teachers following school policies. One teacher decided not to participate in the study; 18 teachers committed to the peer assessments only, because of limited classroom time for data collection. Eight children did not receive permission from their parents.

Data were collected during the 2006-2007 school year in a 30- to 60-minute classroom session that included a peer nomination part and a self report part. The sessions were administered by the lead investigator and three trained research assistants. Teachers were present during the data collection, but did not interfere.

Measures

The sociometric measure consisted of peer nominations measuring friendship, status, and behaviors. The classroom was the reference group. For each question, children could name as many or as few classmates as they wanted to a maximum of nine. To help children complete the nominations, a roster with the names of all classmates was written on the board.

Friendship. Children were asked to nominate the peers in their classroom who were their best friends, starting with their first best friend, second best friend, and so on, to a maximum of nine. The average number of friends named was 5.4 (SD = 2.7, range 0-9).

Social status. Four peer nominations were used to measure social status: "who do you like most?," "who do you like least?," "who is most popular?," and "who is least popular?" The number of choices received was counted for each question and standardized to z-scores within classrooms. Preference was computed as the difference between the standardized numbers of liked most and liked least votes received, again standardizing the resulting difference within classrooms (Coie et al., 1982). Popularity was computed as the difference between the standardized numbers of most popular and least popular nominations received, and again standardizing the resulting difference scores within classrooms.

Social behavior Two peer nominations measured prosocial behavior and overt aggression "cooperates with other kids," and "bullies other kids a lot " For both, choices received were counted and standardized within classrooms Relational aggression was measured with one self-report item Children rated on a 5-point scale "How often do you say mean things about others to your classmates" (1 = never, 5 = three or more times a week) Children indicated how often this behavior occurred in their classroom at school The question was part of the Olweus' (1986) bully/victim scale that was included in the data collection

Selection of Best Friend Dyads

Two children were considered friends if they named each other reciprocally as their top (number 1) best friend (out of the maximum possible of 9) This yielded 350 best friend pairs Of these, 176 included two boys, 158 two girls, and 16 one boy and one girl Because the number of cross-sex dyads was small, only same-sex dyads were considered Thus, the final number of friendship dyads for this study was 334 (176 male, 158 female)

Independent *t*-tests revealed no significant differences on any of the study variables between the 668 children used in the analyses and the children who did not meet the best friendship criterion The dyads were indistinguishable by definition, that is, the two friends had equal roles in each dyad (Kenny et al , 2006) The dyads were also unique and independent, no child occurred in more than one dyad In preparing the data for analysis, children were randomly assigned to a Friend 1 and a Friend 2 position, by always listing the child with the lowest participant id number as Friend 1 Because participant numbers were randomly assigned to children at the beginning of the study, we can be assured that the Friend 1 and Friend 2 assignments were random

4.3 Results

Preliminary Analyses

Table 1 presents the means and standard deviations of the main study variables by gender Gender differences were tested using *t*-tests Girls scored significantly higher than boys on preference (Cohen's *d* = 22) and prosocial behavior (*d* = 24) Boys scored significantly higher than girls on overt aggression (*d* = 75) There were no gender differences for popularity or relational aggression

Table 1 also presents the correlations between the main study variables by gender Almost all correlations were reliably different from zero The correlation between preference and popularity was 61 for girls and 56 for boys Thus, for both genders each status construct explained about one third of the variance in the other These correlations confirm that preference and popularity are not redundant, but that there is overlap that should be controlled, as was done in the APIM analyses (see below)

Table 1 Intercorrelations, Means, and Standard Deviations of Main Study Variables for Girls (n = 926) and Boys (n = 1027)

	1	2.	3.	4.	5.	M (SD) Boys	M (SD) Girls
1. Preference		61**	58**	-.32**	- 04	- 10 (1 02)	11 (92)
2. Popularity	.56**		.55**	-.02	.12**	- 01 (1 01)	01 (94)
3. Prosocial Behavior	56**	.48**		-.18**	.01	- 11 (0 95)	.12 (1.00)
4 Overt Aggression	- 45**	.13**	- 21**		25**	30 (1 15)	- 34 (0.56)
5. Relational Aggression	- 11**	04	- 04	20**		1.83 (0 99)	1 63 (0 83)

Note ** $p <$ 01. Girls above the diagonal, boys below the diagonal. Correlations underlined were significantly different by gender, $p <$ 05 in the Fisher's r-to-Z test for independent correlations Means for preference, prosocial behavior, and overt aggression differed significantly by gender at $p < .01$

Overt aggression and prosocial behavior were negatively correlated, and overt aggression and relational aggression were positively correlated. Prosocial behavior correlated positively and about equally with preference and popularity. Overt aggression correlated negatively with preference, but positively with popularity for boys and not significantly for girls. Relational aggression correlated negatively with preference for boys and positively with popularity for girls. These correlations confirm that preference and popularity have distinct associations with social behavior in the age group of this study. The correlations in Table 1 were compared by gender using Fisher's r-to-Z tests for independent correlations. Two correlations differed by gender. The negative correlation of overt aggression with preference, and the positive correlation of overt aggression with popularity, were both stronger for boys than for girls.

Actor and Partner Effects of Status on Behavior

To determine the effects of status on behavior in children's friendships, we used the Actor-Partner Interdependence Model (Kashy & Kenny, 1999). Figure 1 shows the model that was tested. The actor effects are the arrows from each child's status (preference or popularity) to her or his own behavior. The partner effects are the arrows from each child's status to their friend's behavior. All models were run with AMOS 7 (Arbuckle, 2006).

Because members of friendship dyads are interchangeable, several restrictions were placed on the APIM parameters. Specifically, equality constraints were imposed on the actor effects, partner effects, predictor means and variances, and outcome intercepts and residual variances (see Figure 1). As a consequence of these constraints, the model also provides the *predictor intraclass covariances* of preference and popularity and the *residual intraclass covariances* of the outcome behaviors.

Initial Model Check

As suggested by Olsen and Kenny (2006), an independent model was compared first to a saturated model to determine if the APIM improved model fit The fully independent model is a null model that only estimates means and variances of the observed variables while setting the actor effects, partner effects, and covariances to zero To apply this model to interchangeable dyads, degrees of freedom and fit indices were adjusted as recommended by Olsen and Kenny The fit of the I-NULL ("interchangeable null") model for the 334 dyads was $\chi^2(55) = 619.03$ This model was then compared to an I-SAT ("interchangeable saturated") APIM model In this model, actor effects, partner effects, and covariances were estimated equally across dyad members. The APIM model fitted the data well, $\chi^2(33) = 41\,86$, $p > 05$, and significantly better than the null model, $\Delta\chi^2(22) = 577\,17$, $p < .001$

Examination of Moderation by Gender

Because the initial model check was successful, the actual model was then run as shown in Figure 1. To examine the role of gender, this model was run as a two-group model with gender as the grouping variable. The model was run first without constraints between gender (fully unconstrained model) The fit of this model was good, $\chi^2(66) = 90.63$, RMSEA = .035, CFI = .976 This model was then compared to the same two-group model in which 27 parameters were set equal between boys and girls (fully constrained model): two covariances between the exogenous status measures, two predictor means, two predictor variances, six actor effects, six partner effects, three outcome means, three outcome disturbances, and three covariances between measures of behavior This model assumed no moderation by gender for any estimate and had poor fit, $\chi^2(93) = 330\,12$, RMSEA = .093, CFI = 769 The reduction in fit was significant, $\Delta\chi^2(27) = 239\,49$, $p < 001$ Thus, there was moderation by gender.

To determine the sources of gender moderation, the unconstrained model served as the base for several comparisons First, the means and variances of the exogenous variables (preference and popularity) were constrained by gender. This significantly worsened model fit, compared to the unconstrained model, $\Delta\chi^2(4) = 10.14$, $p < .05$

Second, the means of the endogenous variables (prosocial behavior, overt aggression, relational aggression) were constrained by gender This also worsened model fit, $\Delta\chi^2(3) = 74\,32$, $p < .001$ Third, constraining the three residual variances worsened fit, $\Delta\chi^2(3) = 92\,53$, $p < 001$ Because model fit worsened in each case, all means and variances were left free by gender The covariances between the exogenous variables and between the residuals were also allowed to vary by gender Thus, all means, variances, and covariances could vary by gender
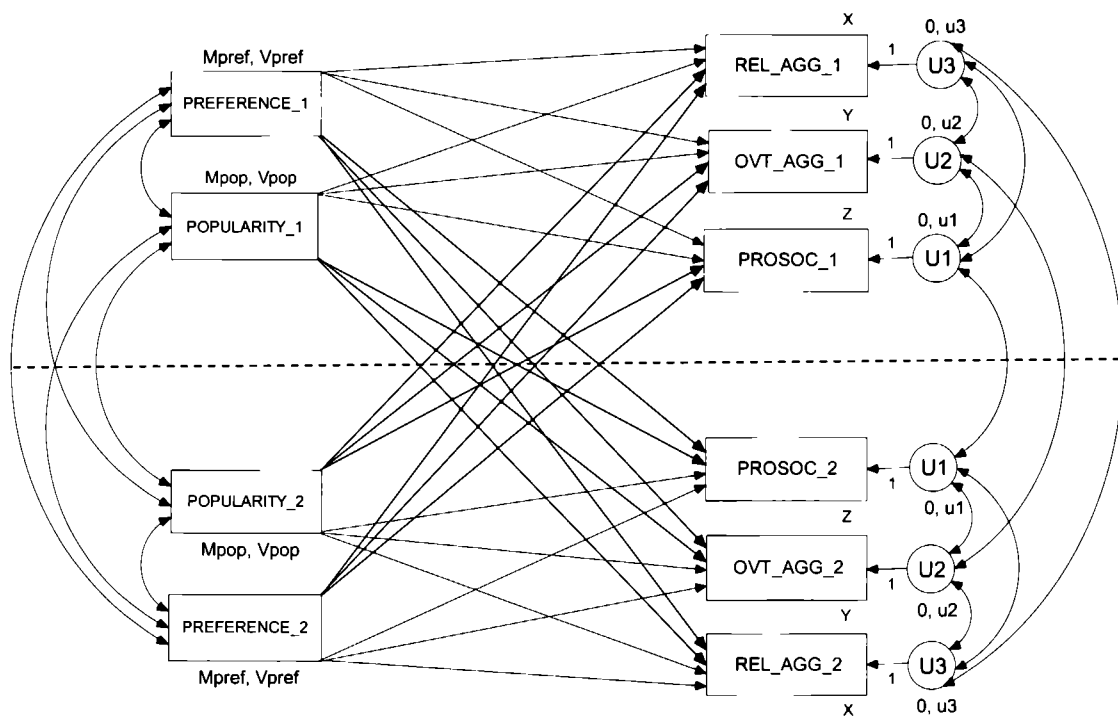
Figure 1 Illustration of the Actor-Partner Interdependence Model predicting prosocial behavior, and overt and relational aggression in friendship dyads

Note. Above the dotted line = peer status and behaviors Child 1, Under the dotted line = peer status and behaviors Child 2. All parameters are constrained to be equal for Friend 1 and Friend 2. Arrows that do not cross the dotted line = actor effects; Arrows that cross the dotted line = partner effects, Mpop, Mpref = predictor means; Vpref, Vpop = predictor variances; X, Y, Z = outcome intercepts (mean), U1, U2, U3 = outcome disturbances; u1, u2, u3 = disturbance variances; left curved arrows = predictors intraclass covariances; right curved arrow = residual intraclass covariances PREFERENCE_1 = preference Friend 1; POPULARITY_1 = popularity Friend 1; REL_AGG_1 = relational aggression Friend 1, OVT_AGG_1 = overt aggression Friend 1, PROSOC_1 = prosocial behavior Friend 1. The same variables for Friend 2 are indicated with the extension _2

Moderation by gender was then tested for the 12 actor and partner effects by constraining each by gender one by one and determining if this lead to a significant reduction in model fit compared to the base model. Because this is a model comparison with one degree of freedom in each case, a χ^2 increase of 3.84 or more indicated a significant reduction of model fit and meant that the effect should be left free by gender. If the increase of χ^2 was less than 3.84, the path was set equal by gender. These 12 tests indicated that six effects were moderated by gender: the actor and partner effects of preference

and popularity on overt aggression, and the partner effects of popularity on prosocial behavior and relational aggression The remaining six paths were not moderated and set equal by gender In sum, six of the 12 paths were left to vary across gender, resulting in a final model with 72 degrees of freedom (66 of the fully unconstrained model + 6 for the unmoderated paths)

Final Model Results

The fit of the final model was excellent, $\chi^2(72)$ = 95 34, RSMEA = 031, CFI = 976 For boys, the actor and partner effects explained 35% of the variance in prosocial behavior, 39% for overt aggression, and 21% for relational aggression For girls, variance explained was 32% for prosocial behavior, 80% for overt aggression, and 51% for relational aggression

The predictor intraclass correlations (ICCs) in the final model were 54 and 58 for girls, and 34 and 45 for boys, for preference and popularity, respectively This indicates substantial dyadic similarity between friends for both dimensions Similarity in preference was significantly higher for girls than for boys, comparing the ICCs following Kenny et al (2006) The ICCs for the residuals were 29 and 40 for prosocial behavior, 24 and 41 for overt aggression, and 04 and - 04 for relational aggression, for boys and girls respectively A negative residual ICC implies a larger within-dyad residual variance than between dyads

The standardized actor and partner effects are shown in Table 2 All actor effects were significant The pattern of the unique associations of preference and popularity with behavior was consistent with previous studies Preference and popularity identically and positively predicted children's own prosocial behavior, but oppositely predicted aggression preference negatively predicted overt and relational aggression, whereas popularity positively predicted both forms of aggression The negative actor effect of preference on overt aggression, and the positive actor effect of popularity on overt aggression, were both stronger for boys than for girls There were no gender differences in the actor effects of preference and popularity on prosocial behavior and relational aggression

Four significant partner effects were found at least one for each behavior (see Table 2) The effects varied by gender For boys, the preference of their best friend predicted less overt aggression (β = - 13), whereas the popularity of their best friend predicted more overt aggression (β = 14) The status of boys' friends did not influence their prosocial behavior or relational aggression For girls, the popularity of their best friend predicted both more prosocial behavior and more relational aggression (β's = 15 and 12, respectively) However, the preference of their friends did not predict their prosocial behavior or aggression

Table 2 Standardized Actor and Partner Effects Estimated with the Final Actor-Partner Interdependence Model

	Actor Effects				Partner Effects			
	Preference		Popularity		Preference		Popularity	
	Boys	Girls	Boys	Girls	Boys	Girls	Boys	Girls
Prosocial Behavior	45**	45**	28**	28**	.00	.00	.01	.14*
Overt aggression	-.71**	-.25**	52**	.15**	-.15**	-.02	.14**	-.01
Relational aggression	-.19**	-.19**	.13**	13**	-.02	-.02	-.07	.12*

Note Model fit. χ^2 = 109,63 (76), *RSMEA* = 032, *CFI* = 979 Regression coefficients underlined were allowed to vary across gender. * $p < 05$; ** $p < 01$

4.4 Discussion

This study demonstrated that children's behavior is related, not only to their own status, but also to the status of their friend. Unique associations were found for preference and popularity. For boys, a friend's preference negatively predicted overt aggression, but the friend's popularity positively predicted overt aggression. For girls, a best friend's popularity positively predicted relational aggression and prosocial behavior. This study also demonstrated that best friends are not only similar in behavior, but also in preference and popularity. That is, children have friendships with peers who are similar to themselves in status. The results confirmed that preference and popularity are not only different constructs in the peer group at large; they also contribute uniquely to dyadic friendship processes.

Peer Status and Behavior in Friendships

Actor effects are within-person effects of status on behavior; partner effects are between-person effects of the relationship (friendship) on the dyad members (friends). Our APIM analyses indicated larger individual than dyadic effects. This is not surprising; within-person correlations have an advantage of shared source variance and are usually larger than between-person correlations. This makes significant partner effects even more impressive, even though they may be relatively small, because they occurred despite the larger and overshadowing within-person correlations. Furthermore, because partner effects are the dyadic effects that are the main focus of substantive interest in studies such as the current one, even small effects are salient (Neyer, 2002).

The APIM results confirmed that children's behavior is not only related to their own status, but also to that of their friends. It was expected that a best friend's preference would be negatively associated with overt and relational aggression, and a best friend's

popularity positively with both forms of aggression. Indeed, for boys, a friend's preference was negatively related to overt aggression, while the friends' popularity was positively related to overt aggression. This was only found for overt aggression and not for relational aggression. It is possible that boys seek out high-status friends to bully others with, as a way to maintain or enhance their own status (Rose et al., 2004). In contrast, a well-liked friend seems to deter boys from being overtly aggressive. These partner effects were found only for boys, perhaps because overt aggression is more negatively correlated with preference and more positively with popularity for boys than for girls.

Researchers have suggested that girls maintain their popularity by using relational aggression against selected peers (e.g., Cillessen & Mayeux, 2004). Our findings suggest that this may be a dyadic process rather than an individual tendency. For girls, a friend's popularity was positively associated with relational aggression. This finding supports what Cillessen, Jiang, West, and Laszkowski (2005) suggested, namely that girls use relational aggression to forge coalitions with others to enlarge their network centrality. Such successful dyadic coalitions, however, also seem to promote mutual cooperation. The friendship dyad may be protective against others, but also a training ground for prosocial skills. Indeed, a friend's popularity was positively associated with prosocial behavior for girls. Thus, while popularity is often associated with aggression (Cillessen & Mayeux, 2004), friendships between popular girls can also be beneficial.

In the middle childhood sample of this study, popular boys were overtly aggressive, while popular girls relied on relational aggression. This distinction is typically found at older ages. The fact that it was found in fourth grade suggests that these effects of friends on each other are not unique to adolescence, but more universal across a wider age range.

Another gender related finding was that the preference of girls' friends was not related to any of the measured behaviors. This suggests that for girls it does not matter how well-liked their friends are in the peer group at large, as long as they like each other. Another explanation could be that these effects would have been found for other constructs that were not included, such as victimization. For example, Fox and Boulton (2006) showed that the relation between social skill problems and peer victimization was moderated by the preference of children's best friends (see also Hodges, Boivin, Vitaro, & Bukowski, 1999). Research has also shown that girls' friendships focus more on security, help and guidance, validation and caring, and intimacy exchange (e.g., Bukowski, Gauze, Hoza, & Newcomb, 1993) than boys' friendships. Thus, having a generally likeable (preferred) friend may serve as a protective factor against peer victimization for girls, while for boys this protective function appears to consist of the reduction of overt aggression.

Friends' Similarity in Peer Status

Another interesting APIM result regarded the correlation between the predictors, or the degree to which two friends are similar in popularity of preference. Friends were substantially similar in both ways. Apparently, the similarity-attraction hypothesis (Byrne, 1971) of friendship formation also applies to peer status. Well-liked children tend to be friends with each other, and so do popular children. Previous studies have shown that aggressive or prosocial children form friendships (Poulin & Boivin, 2000, Zarbatany, 2007), the current study showed that this also applies to status. Preferred children can choose who they want their friends to be, and therefore can choose peers who are the most interpersonally attractive to them. Thus, they will select the other most preferred peers in the group. Popular children might be interesting as friends because they are influential and dominant. They are especially interesting to each other, because they can help each other enhance or maintain their own status. A coalition of two popular children reinforces both their positions in the group. For example, when two popular children bully a third, they give bystanders a clear signal not to challenge them in the peer group. This may also explain why friends share the same targets for aggression (Card & Hodges, 2006). Two popular friends may not necessarily like each other all that much, but form a powerful coalition that benefits their own status.

Friendship similarity in preference was higher for girls than for boys. This may be due to the fact that girls are ahead of boys developmentally and therefore focus on peers and their position in the peer group at an earlier age. Another explanation can be found in Rose and Rudolph's (2006) review of gender differences in children's peer relationships. They stated that girls' relational style is orientated more towards interpersonal engage-ment than boys', and that therefore are more concerned about the status of relationships and about peer evaluations than boys are. This will make girls more aware of their friends' status than boys.

Being similar in popularity and preference seems to be important in friendships, according to the high intraclass covariances for both measures. This may not only reflect selective affiliation among high status peers, but also the affiliations among low status peers. The latter may be due to the 'limited shopping' phenomenon, that is, the idea that unpopular or rejected peers have no one else to choose from than each other (Patterson, Reid, & Dishion, 1992), or an active selection because having a friend who shares one's own fate has benefits for self-views and adjustment (Ellis & Zarbatany, 2007).

It is important to emphasize further that similarity not only occurs because child-ren select similar peers to be their friends, but also because friends influence each other to become more similar over time. In some ways, this study suggests that similarity in aggression is due to similarity in status (at least for boys and overt aggression). Thus,

friends may be similar in aggression because they first find each other based on similar roles in the peer group, and then start to act aggressively together

Limitations and Directions for Future Research

An important comment regards the causality The APIM is a predictive model, the model assumes that social status predicts behavior, not the reverse This assumption is grounded in longitudinal research showing that children's antisocial behavior increases after they achieve high status, presumably to protect their reputation or gain even more status (Cillessen & Mayeux, 2004, Rose et al , 2004, Sandstrom & Cillessen, 2006) We assumed that this causal direction applies not only to antisocial behavior, but also to prosocial behavior Of course behavior also predicts status, but our theoretical focus was on how children's behavior is affected by the status of their friends in the peer group at large

Behavior was primarily measured with peer nominations, which yield global measures of behavior rather than observations of detailed behavioral processes Including observations of actual interactions in friendship dyads would be an important next step in this line of research, because it will further explore the underlying mechanisms of influence between friends Dishion et al (1996), for example, studied friend's influence on antisocial behavior by observing videotaped conversations of adolescent boys and their friends It appeared that discussions of deviancy between friends served as basic training for aggression and thereby exacerbated adolescent social maladjustment The occurrence of these processes may vary depending on the status of these boys in the peer group at large

A final suggestion for future research is to examine the impact of status similarity on the partner effects Do friends who are more similar to each other in status have more influence on each other than friends who are less similar? Similar questions can be asked of the quality, stability, and duration of friendships Developmental theory would predict that partner effects are larger in more stable, longer lasting, and higher quality friendships The APIM provides a framework to examine such new questions in the study of relationships, not only in children or adolescents, but in different types of dyadic relationships across the life span

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Chapter 5

The Psychobiology of Peer Relations: Popularity, Aggression, and Diurnal Cortisol[4]

This study examined the moderating role of popularity in the association between aggression and activity of the hypothalamic pituitary adrenocortical (HPA) system, as reflected in diurnal cortisol patterns Participants were 97 fourth-grade children (54% boys) Aggression was assessed by peers, teachers, and the children themselves Sociometric measures yielded scores for popularity Salivary cortisol was collected four times daily on each of two consecutive school days Growth curve modeling showed that aggression was related to low morning cortisol in highly popular children but not in unpopular children Regarding the shape of the diurnal curve, a flattened curve was found for aggressive popular girls, but not for aggressive popular boys This study contributes to our understanding of how behavioral, psychological, and biological processes interact in the study of children's social behavior and peer relations in general, and in the association between aggression and cortisol in particular

5.1 Introduction

In middle childhood, significant developments take place in the social lives of children One such development is the increasing role of peers Another is the emergence of individual differences in aggression and antisocial behavior, often related to peer group processes As documented in numerous studies, aggression and peer relations are related in important ways (Coie & Dodge, 1998) A relatively recent focus in this area of research is the role of aggression in high status or popularity (see, for a review, Cillessen & Mayeux, 2007)

An important trend in recent research on social development is a focus on psychobiological correlates (de Haan & Gunnar, 2009) Although much work has been done on the psychobiology of caregiver-child interactions, relatively little is known about the psychobiology of relationships and interactions between peers The current study contributes to the growing body of psychobiological research by examining children's cortisol patterns across the school day in relation to popularity and aggression in the peer group

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The HPA-System and Cortisol

The hypothalamic-pituitary-adrenocortical (HPA) system is responsible for the release of cortisol, a hormone that can be reliably measured from saliva. Human beings need a basic level of cortisol for normal, non-stressed activity. Under common circumstances, human cortisol follows a diurnal rhythm (e.g. Anders, 1982). This consists of high levels in the early morning, followed by a sharp decrease throughout the morning and a more gradual decline across the rest of the day and into the evening (Kirschbaum & Hellhammer, 1989).

The psychobiological function of the HPA-system is adaptation to the daily challenges of life to maintain a stable condition, or homeostasis (Sapolsky, 2004). A normal diurnal rhythm can be expected in normally developing children, who adequately cope with daily hassles (Smider, Essex, Kalin, Buss, Klein, Davidson, & Goldsmith, 2002). In contrast, children who have problems to adapt successfully may show diurnal cortisol patterns that are atypical in level (higher or lower than usual) or in slope (flatter or steeper than usual).

Aggression and Cortisol

Activity of the HPA-system has often been linked to aggression (e.g., Klimes-Dougan, Hastings, Granger, Usher, & Zahn-Waxler, 2001; Shirtcliff, Granger, Booth, & Johnson, 2005; Shoal, Giancola, & Kirillova, 2003; Tennes & Kreye, 1985). However, these studies have yielded mixed results (see Alink, Van IJzendoorn, Bakermans-Kranenburg, Mesman, Juffer, & Koot, 2008). Several studies have found that aggression is associated with lower diurnal levels of cortisol than usual. For example, Shirtcliff and colleagues (2005) and Shoal and colleagues (2003) found negative associations between aggression and morning cortisol. When morning levels are lower, less change is possible during the day. Indeed, less change in cortisol from morning to evening, or a relatively flat diurnal curve, has also been related to aggression (Cicchetti & Rogosch, 2001; Murray-Close, Han, Cicchetti, Crick, & Rogosch, 2008). These findings are often explained by theories suggesting that physiological under-arousal contributes to the development of aggression. The idea is that children with low cortisol are looking for excitement that they may find in aggressing against others. Under-arousal would urge children to stimulation or sensation seeking behavior, to attain higher, more optimal, and comfortable levels of arousal (Raine, 2002; Susman, 2006; Zuckerman & Neeb, 1979). Aggression might serve this function.

In contrast, other studies have found that aggression is associated with higher levels of cortisol than usual (Gunnar, Tout, de Haan, Pierce, & Stansbury, 1997; Hart, Burock, London, Atkins, & Bonilla-Santiago, 2005; Van Bokhoven, Van Goozen, Van Engeland, Schaal, Arseneault, & Seguin, 2005). Finally, some studies have found no association be-

tween aggression and cortisol (Klimes-Dougan et al., 2001; Scerbo & Kolko, 1994).

How can these contradictory findings be explained? Researchers have argued that they might be due to several moderator variables, specifically, age, maltreatment, and type of aggression. With respect to age, Alink and colleagues (2008) found a positive association between cortisol and aggression in preschool children, but a negative association in elementary school children. Regarding maltreatment, Cicchetti and Rogosch (2001) found low morning cortisol for aggressive children in a non-maltreated sample, but not in a maltreated sample. Regarding type of aggression, Murray-Close et al. (2008) found a negative association of cortisol with relational aggression but not with physical aggression. Others have found low cortisol in proactive-aggressive children, but high cortisol in reactive-aggressive children (Hubbard, Smithmyer, Ramsden, Parker, Flanagan, Dearing, Relyea, & Simons, 2002; Lopez-Duran, Olson, Hajal, Felt, & Vazquez, 2009).

In the current study, another potential moderator of the aggression-cortisol link was examined: status in the peer group. Numerous studies have shown that there are two types of aggressive children in the peer group: high-status aggressors and low-status aggressors (see Cillessen & Mayeux, 2007). This difference may be important for understanding the aggression-cortisol association, and may eventually help to clarify the variable results from previous research. Cortisol levels and cortisol curves may be different for aggressive children who are high in peer group status than for those who are low.

Status and Aggression

Animal studies on social dominance view aggression as an adaptive process. Aggressive primates are powerful and at the top of the social hierarchy; their aggression enables them to attain and control resources (e.g., Krebs & Davies, 1997). In the world of animals, aggression is usually related with high status and dominance in the peer group.

In the world of children, aggression occurs at both the low and high ends of the status continuum. On the one hand, aggression occurs among unpopular children who are disliked and rejected by their peers (Coie & Dodge, 1998). Their behavior is not appreciated in the peer group. On the other hand, aggression also occurs among popular children (e.g., Cillessen & Mayeux, 2004). High popularity does not necessarily imply liking and acceptance, but is an index of social impact and dominance in the peer group (Parkhurst & Hopmeyer, 1998). Popular children use aggression in functional and strategic ways, presumably to defend or enhance their position in the peer group and to get what they want (Hawley, 2003; Mayeux & Cillessen, 2008). Aggression used in unskillful ways leads to rejection, but aggression used in skillful ways can lead to high status and popularity (Cillessen & Mayeux, 2004; Rodkin, Farmer, Pearl, & Van Acker, 2000; Rose, Swenson, & Waller, 2004).

Popularity and the Aggression-Cortisol Link

The differences in the use of aggression by popular and unpopular children may be related to differences in HPA activity Aggression may have a different relationship with HPA activity when it is used by a high-status child then when it is used by a low-status child For different reasons, it can be hypothesized that high status aggressive children have lower levels of cortisol than low status aggressive children

The first explanation may have something to do with other characteristics of popularity A specific characteristic that comes to mind is sensation seeking Previous research has shown that popularity is correlated with sensation seeking (Lease, Kennedy, & Axelrod, 2002) A characteristic of sensation seekers is that they have habitually low levels of arousal, and that they seek thrills to elevate their arousal (e g Zuckerman, 1994) Popular children who are aggressive may behave like such sensation seekers They may also have habitually low levels of arousal (indicated by low basal levels of cortisol) and use aggression to enhance their arousal If this is the case, the aggression of popular children is an artifact of their low basal levels of arousal and cortisol

The second explanation focuses on how popular and unpopular children may differ in the degree to which using aggression is stressful to them It is assumed that high-status popular children often initiate aggression to gain or maintain resources (Hawley, 2003) This is not unlike a process taking place in animals For example, in a study with wild baboons, Sapolsky, Alberts, and Altmann (1997) found lower cortisol levels in aggressive dominant animals than in aggressive subordinate animals The researchers suggested that this reflects a psychological advantage of dominant animals Because they initiate most of the aggression in the peer group they know its onset and can control and predict its course Subordinate animals do not have this advantage, and therefore aggressive encounters are more stressful to them Stansburry and Gunnar (1994) suggested a similar process in children They argued that being in control in social situations affords the maintenance of low cortisol levels It is known that controllability makes situations less stressful (e g , Dickerson & Kemeny, 2004) Therefore, high status children who initiate and control aggression may find it less stressful than low status children who have to respond to it

Both reasons may explain why high status aggressive children have lower levels of cortisol than low status aggression children either because they are sensation seekers with low arousal levels to begin with, or because they are initiators or aggression rather than respondents and therefore have a sense of control Both reasons led to the hypothesis that popular children who are aggressive will exhibit lower levels of cortisol than unpopular children who are aggressive

The Present Study

This study examined the link between aggression and the pattern of cortisol across the school day, as moderated by children's level of popularity. We examined two parameters of the diurnal cortisol curve: the intercept (level) and the slope (shape). We expected to find lower cortisol levels among aggressive children who are high in status than among aggressive children who are low in status.

Regarding the slope of the diurnal cortisol curve, Cicchetti and Rogosch (2001) found that aggression was related to a flatter curve over the day for maltreated children. They explained the blunted curve for these children by their often existing comorbid problems. Murray-Close et al. (2008) found that relational aggression (e.g., gossiping, spreading rumors, social exclusion) was associated with a blunted diurnal change in cortisol. They suggested that this relatively flat diurnal pattern was due to low morning levels of cortisol that remained low throughout the day. Because we expected to find relatively low cortisol levels for popular aggressive children, we also expected them to exhibit a flatter diurnal curve than other children.

Finally, gender may play a role in the association between aggression and cortisol. Previous studies have reported gender differences in the association between aggression and cortisol (Shirtcliff et al., 2005; Smider et al., 2002). There are also gender differences in the kinds of aggression that popular children use. For example, relational aggression is more common in popular girls, whereas physical aggression is more common in popular boys (e.g., Crick & Grotpeter, 1995). In line with previous findings of gender differences in the links between aggression, popularity, and cortisol, we expected the moderating role of popularity to be different for boys and girls. This was also an exploratory analysis; no specific prediction was made.

5.2 Method

Participants

Participants were part of the Nijmegen Longitudinal Study on Infant and Child Development (Van Bakel & Riksen-Walraven, 2002). This study began in 1998 with a community sample of 129 15-month-old children from various socioeconomic backgrounds. In the current study, 118 children (63 boys and 55 girls) of the original sample participated at age nine (*M* age = 9.27 years, *SD* = .20 years). These children attended 83 classrooms in 53 elementary schools. Ninety-five percent of the children came from two-parent families. The age of the primary caregiver ranged from 30 to 55 years; their mean level of education was 5.10 (*SD* = 1.07) on a scale from 1 (elementary school) to 7 (college degree or more). The percent of children with an ethnic minority background (for whom

at least one parent was born outside The Netherlands) was 10 4%

Consent for the data collection was obtained from parents and teachers following school policies The parents of all 118 children agreed to the saliva collection procedure in advance Of these, 97 children (52 boys and 45 girls) completed the salivary samples at home and at school Their mean age was 9 32 years (*SD* = 17) for boys and 9 26 years (*SD* = 23) for girls The remaining 21 children did not provide usable saliva samples for various reasons seven were excluded because they used potentially interfering medication (against ADHD, allergies, or asthma), three felt ill during sampling, four returned sampling packages that might have thawed too long, and in seven cases, the parents found them-selves lacking the time to complete the cortisol samples, even though they had agreed to complete them The 21 children without cortisol data did not differ significantly from the 97 children with cortisol data on the aggression and popularity variables

Procedure and Measures

The data were collected between September 2006 and July 2007 The data for each child were always collected within a 2-month period Peer-, self-, and teacher-report data were collected in the classroom Peer- and self reports were collected by the lead investigator and a trained research assistant in the classrooms during a 30- to 60-minute session Teachers were present during this part of the data collection, but did not inter-fere The cortisol data were collected at home and at school

Popularity Popularity was assessed with peer nominations To help children complete them, the names of all peers in the classroom were written on the board Child-ren were asked to write down the classmates they considered the most popular and the least popular Unlimited nominations were used, allowing both same- and other-sex nom-inations Nominations received were counted for both questions for all children and stan-dardized to z-scores within classrooms to control for differences in classroom size The popularity score was then computed by taking the difference between the standardized number of most popular and least popular votes received, and again standardizing the resulting difference score within classrooms This is a standard procedure for the compu-tation of popularity scores from classroom sociometric data (see Cillessen, 2009)

Aggression To gain a complete picture of children's aggression at school, three sources of information were used peers, teachers, and the children themselves The peer score for aggression came from three peer nominations that were also in the sociometric test As part of the test, children completed three unlimited peer nominations for class-mates who bully, start fights, and are disruptive Nominations received for these questions were counted, standardized within classrooms, and then averaged to one peer aggression score Cronbach's α across the three peer nomination scores was 92

The teacher score for aggression came from the 18 items of the aggressive and rule breaking behaviors subscales of the Teacher Report Form Ages 6 to 18 (Achenbach & Rescorla, 2000). Teachers completed the Dutch version of this form for the target children. In this measure, a teacher rates on a scale from 0 to 2 how much a child engages in each of a number of behaviors. The teacher aggression score was the average of the 18 aggression and rule breaking items (Cronbach's α= .87).

The self-report score for aggression came from the five items of Olweus' (1986) self-report measure of bullying behavior. In this measure, children rated how often they aggress against classmates on a 5-point scale (e.g., "How often do you hit, kick or push your classmates at school," 1 = never, 5 = three or more times a week). The self-score for aggression was the average of these five ratings (Cronbach's α = .83).

The peer score for aggression was already standardized within classrooms. The teacher and self scores were then also standardized to z-scores within classrooms. The internal consistency of these three scores was high (Cronbach's α = .76), so that they were averaged to the final aggression score.

Salivary cortisol. Within four weeks after the sociometric procedure, salivary cortisol was collected five times a day on two consecutive school days (Monday and Tuesday), using plastic devices with sterile absorbent cotton dental rolls without any oral stimulants held inside (Salivettes, Sarstedt). Saliva samples were obtained two times in the morning (directly after awakening, between 6.30 and 7.30 am, and 30 minutes after awakening, between 7.00 and 8.00 am), one time at noon (before lunch, between 11.30 am and 1.00 pm), one time in the afternoon (directly after school, between 2.30 and 4.30 pm), and one time in the evening (before going to bed, between 7.30 and 10.00 pm).

A few days before the sampling period, children received a package with a "salivary kit," a sampling booklet, a digital watch, and a short questionnaire for their parents. The salivary kit contained two plastic bags marked "Day 1" and "Day 2." Each bag enclosed five Salivettes, marked with the desired sampling times. Children were instructed to chew on the cotton rolls for at least one minute, until they were saturated with saliva. They were asked not to eat or brush their teeth two hours before sampling. Children and their parents were asked to store the saliva samples in their home refrigerator. The sampling booklet contained information on how to collect the saliva, questions about quality of sleep, and potential stressors or problems around sampling. Children recorded the exact sampling times, using the digital watch. Parents completed the short questionnaire about their child's leisure activities, use of medication, illness, or other noteworthy details during the sampling period.

The salivary samples were analyzed in the Biochemisches Labor at the University of Trier, Germany. Salivary samples were analyzed by time-resolved fluorescence immu-

noassay (DELFIA, Dressendorfer, Kirschbaum, Rohde, Stahl, & Strasburger, 1992) The samples of each child were analyzed in the same assay batch to minimize variability To maximize validity, duplicate assays were performed for each saliva sample Cortisol was measured as nmol/l cortisol in saliva If control samples showed cortisol values outside a defined range (+/- 2 SD) the whole batch was re-analyzed The lower detection limit was < 01 nmol/l and the upper detection limit >100 nmol/l Samples with values outside this range were diluted and re-analyzed The intra-assay coefficient of variation (CV) was between 4 0% and 6 7%, the corresponding inter-assay CV was between 7 1% and 9 0%

Cortisol values greater than 50 nmol/l were considered outliers (Nicolson, 2008) and reassigned a value of two standard deviations above the mean, as suggested by Kertes and Gunnar (2004) In the present study, the cortisol slope across the day was calculated (by growth curve analyses) without including the cortisol awakening response (CAR) The CAR is a rapid increase in cortisol during the first 30 to 40 minutes after awakening, and is thought to be regulated by biological processes that are distinct from the cortisol pattern over the rest of the day (Clow, Thorn, Evans, & Hucklebridge, 2004) Because participants often have difficulties taking the second morning sample exactly 30 to 40 minutes after awakening (Kudielka, Broderick, & Kirschbaum, 2003), and because the CAR was not the topic of this study, the second sample was kept out of the analyses

For 91 of the 97 children who provided saliva, all eight samples (four for each day) were usable The remaining six children provided seven usable samples The unusable samples were from Day 2 (one morning, one noon, two afternoon, and two evening)

Composite scores Combining cortisol data across days is recommended when examining the association with trait level characteristics (Adam & Gunnar, 2001) Therefore, overall morning, noon, afternoon, and bedtime levels were computed by taking the average of each time across both days The correlations between the two days were 57, 32, 32, and 44, for the four times, respectively (all p's < 001) The correlation of daily cortisol, averaged across times was 54 (p < 001) between Day 1 and Day 2

5.3 Results

Preliminary Analyses

Table 1 includes the means and standard deviations for aggression, popularity, and the four composite cortisol scores As expected, the mean of cortisol in the sample decreased across the four times The variability of cortisol also decreased over the day A t-test for gender differences for each variable showed an effect for aggression boys scored significantly higher than girls (Cohen's d = 85)

Table 1 Correlations and Descriptive Statistics for Main Study Variables by Gender

	1	2	3	4	5	6.	Boys (*N* = 52) M	SD	Girls (*N* = 45) M	SD
1 Aggression		-.22	-.16	.12	.47**	.27	.19	.90	- 38	.31
2 Popularity	43**		.15	-.00	-.11	- 15	- 06	.87	06	89
3. Cortisol Morning	28	.33*		.43**	.21	.08	16.26	5.50	18.09	6.97
4 Cortisol Noon	- 18	- 23	-.04		45**	.33*	5.20	1.96	4 68	1 77
5. Cortisol. Afternoon	30	.22	.18	.45**		.17	3.41	1.18	3 30	1.30
6. Cortisol Evening	08	.07	.16	15	.15		1 33	.67	1.36	63

Note * *p* < 05, ** *p* < .01 Correlations for girls are above the diagonal, correlations for boys below the diagonal Correlations underlined were significantly different by gender in a Fisher's *r*-to-*Z* test Means underlined were significantly different by gender in a *t*-test Means for salivary cortisol are in nmol/l.

Table 1 also includes the correlations among the study variables by gender. For boys, aggression correlated positively with popularity, and popularity correlated with morning cortisol. For girls, aggression correlated positively with afternoon cortisol. For both genders, the two cortisol samples at school (noon and afternoon) correlated positively with each other. For girls, noon cortisol also correlated with morning and evening levels.

The correlations in Table 1 were compared by gender using Fisher's *r*-to-*Z* tests. The underlined correlations differed by gender. The associations of aggression with popularity and morning cortisol were stronger for boys than for girls. The correlation between morning and noon cortisol was stronger for girls than for boys.

Growth Curve Modeling

The aim of the study was to examine the role of popularity in the association between aggression and cortisol. Towards this end, growth curve modeling was conducted on the composite cortisol trajectory over the day as recommended when a typical pattern in a homogeneous population is estimated (Van Ryzin, Chatman, Kryzer, Kertes, & Gunnar, 2008). The analyses were run with the mixed models procedure in SPSS 15.0, and serve two purposes: to estimate the average trajectory in the sample, and to predict individual differences in the trajectory from aggression, popularity, and gender.

Growth curve modeling requires normally distributed variables (Singer & Willett, 2003). Because the raw cortisol scores were somewhat skewed, they were log10 transformed. This resulted in a more normal distribution. Because these new values are small, they were arbitrarily multiplied by 100 to facilitate the description of the growth curve estimates. The means and standard deviations of the new scores were 121.57 (17.49) in

the morning, 74 36 (13 59) at noon, 61 55 (11 29) in the afternoon, and 34 96 (11 03) before bedtime These transformed variables were then used in the growth curve models

Growth curve modeling also requires that time is centered at a fixed point Therefore, the exact sample times the children had recorded were centered at 7 00 am, making hours since 7 00 am the measure of time Consequently, all effects on the intercept are effects on children's early morning cortisol Effects on the slope are effects on the hourly change in cortisol from morning to evening on an average school day

Estimated Diurnal Cortisol Pattern

First, an unconditional growth model was run to estimate the sample average and change in cortisol, without any predictors other than time Because diurnal cortisol is typically high in the morning, followed by a rapid decline in the hours after waking and a more gradual decline during the rest of the day, both linear and quadratic change was examined

The estimate of the sample intercept at 7 00 am was 131 90 (SD = 2 45, $p <$ 001) This was followed by a significant negative linear trend of -12 13 per hour (SD = 64, $p <$ 001), as well as a positive quadratic trend of 38 (SD = 04, $p <$ 001) Together, this indicates that across the 97 children on average, cortisol was highest in the morning, followed by a linear hourly decline that slightly leveled off until bedtime

Predicting Individual Differences in Diurnal Cortisol

Second, a theoretical model was run in which aggression, popularity, and gender were added as predictors of the intercepts and slopes The two-way interactions between these predictors and their three-way interaction were also included The results of this model are shown in Table 2 Moderator effects are significant interactions of the predictors on the intercept or slope

The unconditional model had confirmed the overall quadratic trend of cortisol over the day The predictors aggression, popularity, and gender, had significant effects on the intercept and on linear change, but not on quadratic change Therefore, the effects of aggression, popularity, and gender on the quadratic term are not shown in Table 2

Effects on the intercept There was a significant aggression by popularity interaction on the intercept (Table 2) This is consistent with the expected moderator effect To illustrate this effect, the cortisol intercept was estimated for prototypical high and low levels of the predictors (Singer & Willett, 2003) Standardized scores of 1 5 and -1 5 were used to represent high and low values of aggression and popularity This yielded intercepts of 101 38 when aggression and popularity are high, 144 13 when aggression is high but popularity low, 151 12 when aggression is low but popularity high, and 120 04 when

aggression and popularity are low. These values already indicate that the association between aggression and cortisol at the beginning of the school day varies substantially depending on children's status in the peer group. Although this effect was not further qualified by gender, there was a significant aggression by popularity by gender effect on the slope. The aggression by popularity effect on the intercept is best understood further by considering it in concert with this aggression by popularity by gender effect on the slope in the next section.

Effects on change. Table 2 shows that the effects of aggression and gender on linear change were significant, as well as the three two-way interactions. These effects were further qualified by a significant three-way interaction between aggression, popularity, and gender. To illustrate these results, prototypical plots were created for high and low levels of popularity, qualified by aggression and gender. These plots are shown in Figure 1 for children with high levels of popularity and in Figure 2 for children with low levels of popularity. Standardized scores of 1.5 and -1.5 were used to represent high and low levels of aggression and popularity.

Table 2 Prediction of Diurnal Cortisol Trajectories from Gender, Aggression, and Popularity

Effect		Parameter	Estimate	SE
Intercept	γ0	Intercept	125 74***	4 17
	γ1	Gender (0 = girls, 1 = boys)	7 45	4.37
	γ2	Aggression	-9 35	6.61
	γ3	Popularity	-5.00	3.31
	γ4	Aggression X Gender	11.03	6 98
	γ5	Popularity X Gender	6 64	4.11
	γ6	Aggression X Popularity	-13 31*	5.74
	γ7	Aggression X Popularity X Gender	11 10	5 97
Slope· Linear	γ8	Linear slope scaling factor	-11 10***	72
	γ9	Gender	-1.01*	39
	γ10	Aggression	1 79**	37
	γ12	Popularity	59	32
	γ13	Aggression X Gender	-1 91**	63
	γ14	Popularity X Gender	-.79*	39
	γ15	Aggression X Popularity	1 82***	55
	γ16	Aggression X Popularity X Gender	-1 65**	56
Slope· Quadratic	γ17	Quadratic scaling factor	37***	04

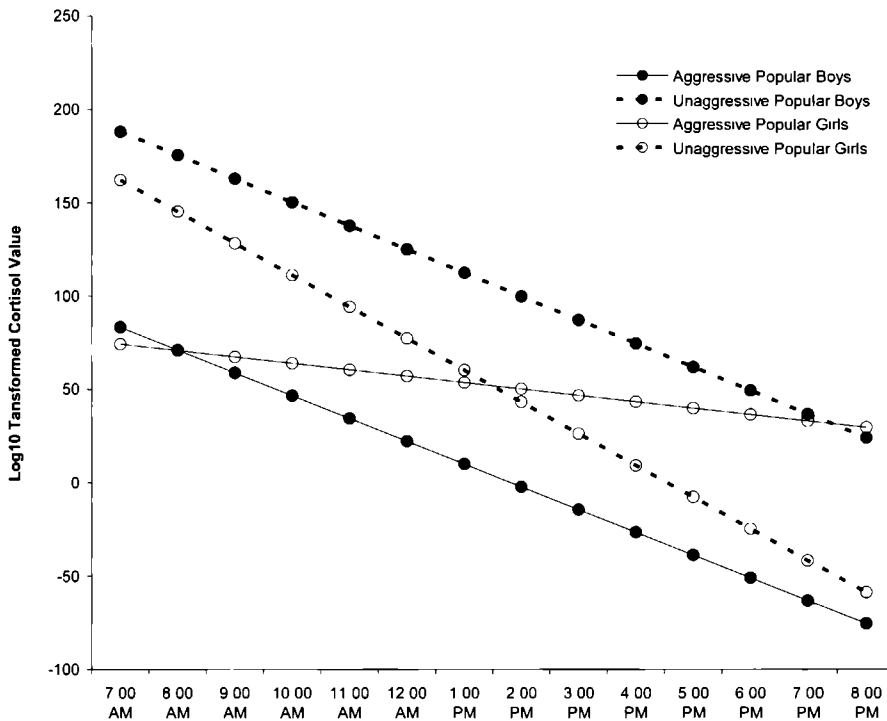*Note * p < 05, ** p < .01; ***p < .001*

Figure 1 Effects of gender and aggression on the diurnal cortisol trajectories of popular children
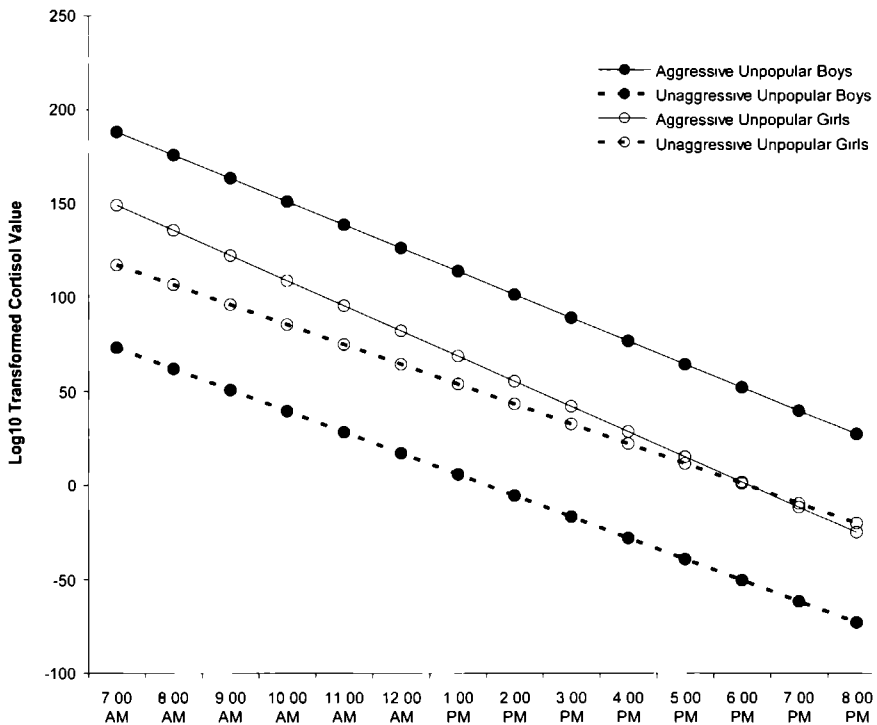

Figure 2 Effects of gender and aggression on the diurnal cortisol trajectories of unpopular children

As can be seen in Figure 1, aggression was associated with lower cortisol at the beginning of the day for *popular* boys and for popular girls. However, in terms of the rate of change, clear gender differences occur. While aggressive and unaggressive boys displayed about the same decrease over the day, aggressive and unaggressive popular girls had very different rates of decline during the school day. The results for popular girls are represented by the inner two lines in Figure 2. Popular girls who are not aggressive showed high morning cortisol followed by a steep decline over the day. In contrast, aggressive popular girls showed low morning levels and a relatively flat diurnal curve, suggesting that their levels of cortisol do not show the normatively expected decline.

As can be seen in Figure 2, aggression did not have effects on linear change for *unpopular* boys and girls. The decrease in cortisol across the school day is the same in each of the four prototypical plots. However, Figure 2 does show the clear cross-over interaction between aggression and the level (intercept) of cortisol during the school day. The effect of aggression on cortisol is reversed, depending on children's aggression. High-aggressive unpopular children show high levels of cortisol. Low-aggressive unpopular children show low levels of cortisol.

5.4 Discussion

Previous studies have yielded contradictory findings for the association between aggression and cortisol in children (Alink et al., 2008). The current study shows that these contradictory findings may be due to the fact that the association between aggression and cortisol varies as a function of children's social standing in the peer group.

Status as a Moderator of the Association Between Aggression and Cortisol

As expected, in popular children, higher levels of aggression were associated with lower diurnal levels of cortisol. In unpopular children the reverse was found, that is, higher levels of aggression were associated with higher diurnal levels of cortisol. Also the shape of the diurnal cortisol curve for popular children was moderated by aggression, popular aggressive children showed flatter cortisol patterns than popular unaggressive children. These results elaborate on the idea that the combination of aggression and popularity may be associated with a unique pattern of psychobiological characteristics.

The Moderating Role of Gender

The shape of the cortisol curve over the day further depended on gender. In particular, popular aggressive girls had low levels of cortisol in the morning and a relatively flat decline in cortisol levels during the day. Thus, our analyses demonstrated that for aggressive girls, popularity not only predicted low intercepts, but also flat slopes over the

day. Aggressive popular boys also showed low morning cortisol levels, but these were followed by a decline over the day that was similar to the decline found in other boys. Given the sample size of this study, we have to be somewhat careful in interpreting the three way interaction. However, it is interesting to question why the link between aggression, popularity, and the cortisol slope might be different for boys and girls? One explanation may be found in the kinds of aggression that popular boys and girls use: girls rely more on relational aggression, whereas boys rely more on physical aggression (e.g., Crick & Grotpeter, 1995). Murray-Close and colleagues (2008) found that relational aggression in middle childhood is related to low morning cortisol and a flat diurnal curve. This was not found for physical aggression. If the popular girls in our sample relied predominantly on relational aggression, this would account perfectly for the flat curves found for them.

Another explanation could be found in two facts about the degree to which the association between aggression and cortisol is "trait-like" (depending on the person) versus "state-like" (depending on the situation). First, morning cortisol is more strongly influenced by stable individual differences, whereas levels later in the day are more strongly influenced by the context (Kirschbaum, Steyer, Eid, Patalla, Schwenkmezger, & Hellhammer, 1990). Second, aggression is more strongly related to stable individual differences of HPA activity for boys and to context specific activity for girls (Shirtcliff et al., 2005; Taylor, Klein, Lewis, Gruenewald, Gurung, & Updegraff, 2000). Together, these findings could explain that aggressive popular boys' cortisol is low in the morning and remains low over the day, regardless of what happens at school. For aggressive popular girls, however, cortisol would be more sensitive to situational effects during the school day. This could mean that their cortisol would not reduce as much as for other children, and as a result their curve would be flatter.

Another possibility is that aggressive popular girls experience more negative consequences of their negative peer encounters than aggressive popular boys. This explanation is supported by research on gender normative behavior (e.g., Blakemore, 2003). Because aggression is less gender normative for girls than boys, it may place girls at risk for intolerance and negativity from others, leading to elevated stress during the day. Also, gender non-normative behavior is related to psychological maladjustment (e.g., depression, loneliness) (Crick, 1997). This, in turn, is associated with relatively flat diurnal cortisol curves (Foreman & Goodyer, 1988; Hart, Gunnar, & Cicchetti, 1996; Ryan & Dahl, 1993). This association is particularly strong for girls (Klimes-Dougan et al., 2001). Thus, even though aggression seems common among high status children, it may be less appropriate for girls, causing a more negative treatment and subsequent adjustment problems, associated with flat diurnal cortisol patterns.

Popularity, a Benefit or a Cost?

The normative diurnal pattern of high early morning levels and a progressive decline over the day, can be expected for normally developing children (Smider et al., 2002). Children who have problems in adapting to the daily challenges of life may show divergent cortisol patterns with relatively high or low levels, and flatter or steeper curves. The atypical diurnal cortisol patterns that we found in aggressive popular children may therefore imply that a high status in the peer group may not be as a desirable as it seems to be.

Low levels of HPA activity may indicate a maladaptive response to a demanding social environment (DeVries, 2002). However, there is no strict consensus in the literature about what specific levels of cortisol imply a risk for negative health consequences. Sapolsky (1997) reported an inverse u-shaped association between HPA activity and adaptation. According to this pattern, extremely high or extremely low levels of cortisol are a risk to health or well-being, while mild to moderate levels support adaptive cognitive and behavioral functioning. The fact that highly aggressive popular boys show relatively low cortisol levels may be a sign of adaptation, unless these levels drop below a certain cut-off point.

High levels of cortisol, as found for nonaggressive popular boys and aggressive unpopular boys, may also reflect a risk as well as a benefit. While long-term exposure to high cortisol can have negative consequences (McEwen, 2000; Sapolsky, 1997), high cortisol can also enable children to respond adequately to environmental demands, and thus indicate adaptation (DeVries, 2002). Caution is needed when drawing conclusions about the costs or benefits of the cortisol pattern observed in association with aggression and popularity.

There seems to be more consensus about the cost of a blunted change in cortisol over the day. Gunnar and Vasquez (2001) stated that too little change in diurnal cortisol is a sign of dysregulation of the HPA-system, resulting from chronic exposure to stress. If regulation of the HPA-system is adequate, long-term exposure to high cortisol is minimized via a negative feedback mechanism, whereby cortisol shuts down its own release. Chronic elevations in response to stressors may overstrain the elasticity of the system, leading to low cortisol levels and little change over the day (Heim, Ehlert, & Hellhammer, 2000). Dysregulation of the HPA-system has been related to the development of behavior problems in adolescence (e.g., Klimes-Dougan et al., 2001). If it is true that aggressive popular girls have social and psychological problems that in turn induce low and flat cortisol levels, those girls are at risk for further problems. Our results imply a dark side to social power in the peer group for girls, but only when they are also aggressive. Nonaggressive popular girls seemed to benefit from their status. They showed the most typical diurnal cortisol pattern.

Limitations and Directions for Future Research

The current study used measures of cortisol collected on two normal school days The collection of cortisol data during a school day places demands on children, their parents (for the assessments at home), and their teachers (for the school assessments) This is a challenging process Therefore, it is not uncommon to collect cortisol data on just one or a small number of school days Yet, one direction for future research is to extend the collection of cortisol data across more school days This would then make it possible to examine trends in cortisol patterns across an entire school week, for example

The extension of data collection on the association between popularity and diurnal cortisol could also include other days than school days, such as weekends or holidays Data on the association between peer status and cortisol on non-school days can yield further important information about the underlying trait and state mechanisms, and further elucidate the ways in which they are more state-like (depending on the context of the school, or more trait-like (depending in the individual child) For example, if low levels of cortisol among aggressive popular children result from their stimulation seeking nature (a trait-like explanation), one would expect to replicate those findings at home But if these low levels result mainly from their interactions in the peer group, one would expect their cortisol to be different on weekends and holidays (or at least on days with fewer peer interactions)

Another way to extend research on the associations among peer status, aggression, and cortisol, would be to consider different forms of aggression Peer relations researchers have made important distinctions between various forms of aggression, such as overt versus relational (Crick & Grotpeter, 1995) or proactive versus reactive (Dodge & Coie, 1987) Something is already known about the differential associations of these forms of aggression with measures of peer status (e g Price & Dodge, 1989, Prinstein & Cillessen, 2003) Also, different forms of aggression are found to have different associations with underlying psychobiological characteristics (Hubbard et al , 2002, Lopez-Duran et al , 2009) An important direction for future research is to further explore the psychobiological correlates of different kinds of aggression in the peer context

Because the measures of aggression, popularity and cortisol were obtained concurrently, the results should be interpreted with caution regarding causality For example, while aggression and popularity may influence cortisol patterns, at the same time individual differences in cortisol patterns may contribute to the development and/or maintenance of aggression and popular status The design of the current study did not allow us to disentangle these processes Longitudinal data on diurnal cortisol patterns in association with child characteristics such as status and popularity would enable researchers to determine the direction of these effects This is another important goal for future research

Finally, it should be recognized that the current study examined aggression in a normative sample of school children, within whom a "normal" range of aggression occurred The results from this study cannot be generalized immediately to extremely aggressive children who may score within a clinical range Comparable studies in clinical samples are needed Yet, the current data begin to illustrate the psychobiological component of peer status and aggression that may ultimately be able to shed light in similar processes in clinical samples That information can then be used or taking into account in prevention and intervention efforts with children who are aggressive in the clinical range As such, the results from this study may then contribute to the ultimate important goal of reducing aggression in the peer group in both normative and clinical samples

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Chapter 6

Summary, Conclusions and General Discussion

6.1 Summary of the research project

One of the most salient developmental tasks of middle childhood is the formation of close mutual friendship relationships (e.g., Sroufe, Egeland, & Carlson, 1999). Whereas many prior studies on peer relations in middle childhood have mainly focused on the effects of peer group status (e.g., acceptance and rejection), it is now recognized that friendships and peer group status capture distinct aspects of the peer system, and independently contribute to children's concurrent and future adjustment and well-being (Bagwell, Newcomb, & Bukowski, 1998; Parker & Asher, 1993). Studying the developmental significance of friendship requires distinguishing between number of friends, friendship quality, and the characteristics of the friends (Hartup, 1996). The current thesis aims to better understand the nature and developmental significance of children's friendships by including each of these different aspects of children's friendships in addition to their peer group status (Hartup, 1996).

The present thesis concerns the fifth measurement wave of the Nijmegen Longitudinal Study, which started in 1998 with a community sample of 129 families and their 15-month-old children (see, e.g., Smeekens, Riksen-Walraven, & Van Bakel, 2007a; Van Bakel & Riksen-Walraven, 2002). The fifth measurement wave was conducted when the study children were 9 years old and 118 of the original sample families agreed to participate again. On the one hand, the fifth wave focused on friendship as an outcome of early experiences in the context of the early parent-child relationship. On the other hand, the fifth wave data collection addressed the possible effects of friendships on children's behavior and functioning in the current peer group.

Different types of data were collected to achieve these goals: (1) parent and teacher ratings of children's internalizing and externalizing behavior problems; (2) peer nominations to assess the number of children's reciprocal friendships and the identity of their best friend in the classroom; (3) peer nominations to assess children and their friend's status, overt aggression, and prosocial behavior; (4) self-report ratings of relational aggression and of the quality of children's best friendships; (5) video observations of the quality of children's behavior while interacting with their best friend; and, finally (6) saliva samples to assess children's cortisol levels as a measure of psychobiological stress.

This thesis includes four empirical studies that examine children's friendships in the context of parent and peer relations, and their associations with psychobiological

functioning Below, the results of the four studies are briefly summarized, followed by general conclusions and a general discussion

Study 1

The first study (presented in *Chapter 2*) focused on the parent-child relationship as a predictor of middle childhood friendship In addition to data from the present measurement wave at age 9, this longitudinal study also used data from two earlier measurement waves, that is, at 15 months and at 5 years, to predict the quality of children's best friendships in middle childhood

The aim of this study was to examine the associations between the quality of the parent-child relationship at 15 months and the quality of children's best friendships at age 9 Specifically, we tested whether two aspects of the parent-child relationship would independently contribute to friendship quality, attachment security and the quality of parental behavior at 15 months Prior research has often focused primarily on attachment security as a predictor of children's later social relationships (see, e g , Kerns, 1996) However, the quality of parenting may also contribute to the development of certain competencies that promote success in social relationships We therefore hypothesized that both attachment security and parenting quality would uniquely predict friendship

In addition, we tested the degree to which the potential association between the parent-child relationship and friendship was moderated by children's competencies in different domains at preschool age These competencies came from three specific domains that have been proposed to be not only related to the parent-child relationship, but to also contribute to children's relationships with peers The first regarded the cognitive domain (attachment representation of the parent), the second the behavioral domain (peer competence), and the third the personality domain (ego-resiliency) We hypothesized that the association between the early parent-child relationship and middle childhood friendships was mediated by those three developmental competencies measured at preschool age

The study hypotheses were tested using a multiple mediation model (Preacher & Hayes, 2004, 2008) Within a multiple mediation model different mediators can be simultaneously tested while controlling for the effects of the others As expected, the results showed that early attachment security and parenting quality independently predicted later friendship quality Also consistent with our hypotheses, the association between parenting quality and friendship was mediated by children's peer competence and ego-resiliency at age 5 Attachment security was directly related to friendship and this association was not mediated by any of the preschool variables Together, the findings shed new light on how early parent-child interaction affects later dyadic relationships

Study 2

The second study (*Chapter 3*) focused on the developmental significance of friendship by relating it to psychobiological stress as a measure of children's adjustment. Stressful events can activate the hypothalamic-pituitary-adrenocortical (HPA) system, which is responsible for the release of the "stress hormone" cortisol. Normally, cortisol production follows a diurnal curve with the highest level shortly after wake-up followed by a progressive decline during the day (Kirschbaum & Hellhammer, 1989). Short-lived increases of cortisol are adaptive because they help an individual to cope with momentary experienced stress, but chronically high levels of cortisol can have negative consequences and even lead to dysregulation of the HPA-system itself. This latter may result in flattened diurnal cortisol curves, which, in turn, are associated with future health and adjustment problems (Gunnar & Vazquez, 2001).

Social rejection has been related to increased cortisol levels (e.g., Blackhart, Eckel & Tice, 2007; Gunnar, Tout, De Haan, Pierce, & Stansbury, 1997; Vaillancourt, Duku, Decantanzaro, Macmillan, Muir, & Schmidt, 2007). Social support, in contrast, reduces stress (Gunnar & Donzella, 2002; Uchino, Cacioppo, & Kiecolt-Glaser, 1996). The first aim of Study 2 was to examine whether different forms of peer rejection are related to increased cortisol in middle childhood. Two indicators of peer rejection were included; exclusion and victimization as reported by classmates. The second goal of the study was to discover possible beneficial effects of friendship in the rejection-cortisol link, by examining whether friendship quality and number of friends moderated the association between rejection and cortisol.

Salivary cortisol was collected five times daily on two school days. Both the level of cortisol at school and the shape of the diurnal curve were determined. As expected, peer exclusion was related to HPA-system activity; excluded children had higher cortisol levels at school. Excluded children also showed flattened diurnal cortisol curves (suggesting HPA-system dysregulation), but only if they had relatively few friends or low quality friendships in class. Interestingly, peer victimization was not related to cortisol.

These findings showed that being excluded by peers at school may be a meaningful stressor in children's lives, as reflected in their physiological responses. This study also provides evidence for a psychobiological mechanism that can explain how peer relations at the group level and the dyadic level can interact in their contribution to developmental outcomes.

Study 3

The third study (*Chapter 4*) also aimed at the interaction between peer relations at the dyadic level and group level, by examining the extent to which characteristics of a

friend may affect a child's social behavior as rated by classmates In Study 3 we hypothesized that a friend's status in the peer group may determine their behavioral influence In this study, two forms of peer group status were distinguished social preference and perceived popularity Socially preferred children are well liked by their peers, while perceived popular children are dominant, but not necessarily liked Previous research has shown that social preference and perceived popularity are both positively associated with prosocial behavior, but the associations with aggression are in opposite directions while social preference is negatively associated with aggression, perceived popularity is positively associated with aggression (e g , Cillessen & Mayeux, 2004, Parkhurst & Hopmeyer, 1998) Because of the distinct associations between behavior and both forms of peer status, we hypothesized that children might be affected differently by a highly socially preferred friend than by a highly perceived popular friend The goal of this study was to examine how a aggression and prosocial behavior are affected by a best friend's peer status

A large sample (334 reciprocal same-sex best friend dyads) could be studied to examine this hypothesis, because we could use sociometric data on all children who participated in the classroom nomination procedures, thus also the study children's classmates Measures included peer nominations of friendship, likeability, popularity, overt and relational aggression, and prosocial behavior The effect of best friend status on behavior was tested with an extended version of the Actor-Partner Interdependence Model (APIM, Kashy & Kenny, 1999, Kenny, Kashy, & Cook, 2006), one of the leading techniques in current research on dyadic relationships The APIM is a structural equation model that can independently measure two effects the actor effect, or the effect of a child's status on his or her own behavior (while controlling for the effect of the friend), and the partner effect, or the effect of the friend's status on the child's behavior (while controlling for the effect of the child's own status)

As expected, aggressive and prosocial behavior were not only related to children's own status (actor effects), but also to the status of their friend (partner effects) Unique associations were found for social preference and perceived popularity For boys, best friends' social preference was negatively associated with overt aggression, while best friends' perceived popularity was positively associated with overt aggression For girls, best friends' perceived popularity was positively associated with both relational aggression and prosocial behavior Best friends' social preference for girls was not related to their behavior The model also revealed another interesting issue regarding the status of children's best friends Some prior studies have shown that friends are often similar in social preference Our results added to the literature that friends are not only similar in social preference but also in perceived popularity In summary, this study highlighted the importance of distinguishing between two constructs of peer status in the study of friend-

ship and peer influence as early as in middle childhood. It also demonstrated how individual and group characteristics can be integrated in the study of children's friendships.

Study 4

The final study (*Chapter 5*) further elaborated on the behavioral correlates of peer status by focusing on the association between aggression and perceived popularity. Aggression is not only related to perceived popularity, but also, as documented in numerous studies, to psychobiological functioning. However, research on the link between aggression and cortisol in children and adolescents has yielded contradictory results (Alink, Van IJzendoorn, Bakermans-Kranenburg, Mesman, Juffer, & Koot, 2008). Study 4 suggested that these mixed findings may result from the fact that the peer context in which aggressive behavior is expressed was not included in prior studies. We expected that children's peer status plays a role in whether aggression is correlated with high or low levels of cortisol. Specifically, we suggested that aggressive popular children will exhibit lower levels of cortisol than aggressive unpopular children for two reasons. First, perceived popular children have an urge to sensation seeking behavior, a personality characteristic that is known to be related to low levels of cortisol (Susman, 2006). Second, popular aggressors are often the initiators of aggression and therefore able to use this behavior in a controlled manner. It is known that being in control in social situations affords the maintenance of low cortisol levels (e.g., Dickerson & Kemeny, 2004).

Cortisol is released by the hypothalamic-pituitary-adrenocortical (HPA) system and normally follows a clear diurnal curve, with high levels in the early morning, followed by a decline across the day (Kirschbaum & Hellhammer, 1989). However, children who have (had) problems to adapt successfully may show diurnal cortisol patterns that are atypical in level (higher or lower than usual) or in slope (flatter or steeper than usual) (Smider, Essex, Kalin, Buss, Klein, Davidson, & Goldsmith, 2002). In the current project, salivary cortisol was collected five times daily on two school days, and we determined both the school level of cortisol and the shape of the diurnal curve. Aggression was rated by peers, teachers, and the children themselves. Sociometric measures yielded scores for perceived popularity. Growth curve models showed that, as expected, aggression was associated with lower levels of cortisol in perceived popular children. In unpopular children, however, aggression was associated with higher levels of cortisol. In predicting the shape of the diurnal curve, perceived popularity interacted with gender. Aggressive perceived popular girls showed a relatively flat diurnal curve in comparison to other girls. Aggressive perceived popular boys showed a decline over the day that was similar to the decline found in other boys. These results elaborated on the idea that the construct of perceived popularity may be associated with a unique pattern of psychobiological charac-

teristics This study also demonstrated how children's psychobiological adjustment is integrated into both individual and group levels aspects of their social lives

6.2 Main Conclusions

In this section, the outcomes of the four studies are summarized by a number of main conclusions regarding friendships in middle childhood The conclusions are grouped according to the different developmental issues to which friendship was primarily related in the separate studies, namely the parent-child relationship, peer group functioning, and psychobiological functioning

1 Parents play an important role in children's social lives by affecting the quality of later close friendship relationships, in particular
   - A secure parent-child attachment relationship and high-quality parenting behavior independently contribute to higher friendship quality in middle childhood
   - The association between high-quality parental behavior in infancy and high-quality friendships in middle childhood is mediated by higher levels of peer competence and ego-resiliency at preschool age

2 Peer group status, friendships and individual behavior are distinct but interrelated aspects of the peer system in middle childhood
   - Being liked (social preference) and being popular (perceived popularity) are already distinct constructs of peer status at age nine, and should be distinguished when studying behavioral influence in friendship dyads
   - The social preference and perceived popularity of a child's best friend affect the child's aggression and prosocial behavior in the peer group
   - Children are similar to their best friend in social preference and perceived popularity

3 Physiological stress and HPA-system functioning partly explain the link between peer relations and adjustment
   - Being excluded by peers elicits physiological stress in nine-year-old children, as evidenced by increased levels of cortisol at school and flattened diurnal cortisol curves
   - More and higher quality friendships can protect children against negative effects of peer exclusion on diurnal cortisol regulation
   - Children's popularity in the peer group should be taken into account when examining the association between aggression and diurnal cortisol levels

6.3 General Discussion

The present thesis yielded novel insights on middle childhood friendships, how they are embedded in the parent and peer context, and how they are associated with psychobiological functioning. This was done by using a comprehensive longitudinal data-set, recent theories of peer group status, and advanced analytical methods Together, the separate studies provided new and interesting findings regarding the nature and importance of the aspects of children's friendships defined by Hartup (1996), friendship number, quality, and characteristics. Individual differences in each of these aspects appear to have significant implications for social, behavioral, and psychobiological functioning. In the following, comments on the main conclusions of the thesis will be presented as well as limitations and directions for future research

One of the main findings of this thesis was that high-quality early relationships with parents play a significant role in children's development by fostering the establishment of high quality friendships. This is in line with Sroufe et al 's (1999, p 242) statement that "the quality of peer experiences is dependent on foundations laid down in the parent-child caregiving system." It remains unclear, however, whether this association between earlier and later developmental outcomes can be causally interpreted. It is widely assumed (e g., Block, 1993, Sroufe, 1979) that children show coherence in individual development from infancy to adulthood, but this does not imply that the continuity of close relationships that we found reflects a causal pathway A healthy adaptation to subsequent developmental tasks may, for instance, also be explained by genetically based (e g., temperamental) characteristics that foster successful negotiation of developmental issues in general. Future longitudinal studies about individual development should include measures of such (innate) child characteristics in order to be able to unfold the issue of causality.

Caution is also needed when causally interpreting the association between HPA-system functioning and children's peer relations and social behavior, by concluding that physiological stress partly explains the association between children's peer relations and later developmental outcomes This conclusion is based on the assumption that children's position in the peer group affects their functioning of the HPA-system. However, because peer status and cortisol were assessed concurrently, it is unclear whether peer status influences cortisol patterns, or whether individual differences in cortisol patterns contribute to the development and/or maintenance of children's peer status There is also research evidence in favor of the latter possibility, Lopez-Duran, Olson, Hajal, Felt, and Vazquez (2009), for example, found that reactive aggression is associated with higher cortisol reactions in 7-year-old children. And because aggressive behavior in general is a major predictor of peer rejection (Loeber & Hay, 1997), this may mean that in some children

high cortisol levels may precede rejection by peers. Longitudinal studies with repeated assessments of diurnal cortisol patterns in association with peer status may provide more insight in the causal direction of the association between peer status and cortisol patterns.

Another interesting finding was that while friendship is related to children's individual behavior and peer group status, it also offers its own unique provisions for adjustment. The current project demonstrates how individual, dyad, and group characteristics are integrated in the study of children's friendships. First, by forming friendships with particular peers children choose a context of influence on their individual behavioral characteristics. For instance, friendships with certain peers make them more or less prosocial and aggressive (Study 3), or less influenced by stressful peer experiences (Study 2). Second, because friends affect each others' social behavior, befriending particular peers also affects children's status in the peer group at large.

A next point concerns the developmental significance of friendships. Although the current study shows that children are influenced by peers, the question remains whether this influence is equally strong for all children. Downey, Lebolt, Rincon, and Freitas (1998) found that children differ considerably in their responses to peer rejection. Children who are highly sensitive to rejection also showed the most negative developmental outcomes. Deater-Deckard (2001) stated that children vary significantly in their attitudes towards the importance of peer relations, and may therefore be differently influenced by particular peer experiences. Future researchers may address this issue by examining whether children's self-reported judgments about the importance of friendships and other peer relations moderate the association between children's peer experience and developmental outcomes.

Another causal attribution in our theoretical framework regards the hypothesized negative implications of chronic psychobiological stress for children's future health and psychological development. It should be noted that the biological significance of chronically high cortisol levels and dysregulated (e.g., flattened) diurnal cortisol curves remains unclear. Although associations between high cortisol levels and (mental) health problems are often mentioned, and flattened cortisol curves have been reported in various disorders and at risk groups (e.g., Cicchetti & Rogosch, 2001; Gunnar & Vazquez, 2001; Klimes-Dougan, Hastings, Granger, Usher, & Zahn-Waxler, 2001; Van Goozen, Fairchild, Snoek, & Harold, 2007), longitudinal studies on these relationships are rather scarce, and mostly focused on psychological functioning (Goodyer, Park, & Herbert, 2001; Shirtcliff & Essex, 2008; Smider et al., 2002). Longitudinal studies relating childhood cortisol measures to later developmental and health outcomes are essential to understand whether and how HPA-system functioning may contribute to the development of certain psychological adjustment problems or somatic diseases.

The present studies yielded interesting new findings regarding friendships in middle childhood in the context of parents and peers. Several study limitations have been addressed in the discussion sections of the four empirical studies. The main limitations of the thesis as a whole should also be summarized here. A first limitation is the relatively small size of our study sample. The sample size was large enough to adequately examine the study questions, but prevented us to test more complex models of influence, including multiple moderator and mediator variable, and to more thoroughly explore the role of gender in some of the separate studies. Another limitation regards the assumption of causality in the separate studies, particularly in the case of concurrently assessed variables. The measures of friendship, peer status and cortisol, for example, were collected in the same period of time; thus one should be cautious to draw conclusions about the direction of effects, especially regarding processes that take place within the complexity of the peer system. A final limitation is that the identification of friendships was limited to the classroom. An interesting issue for future research is to also examine friendships in peer settings outside of the classroom, for example in the neighborhood or in organized after-school activities such as sports teams, scouting organizations, and child care programs. Newcomb and Bagwell (1995) already suggested in a review on peer relations that although much is known about friendships in school settings, the nature and functions of friendships may be different outside the school context.

In conclusion, the current thesis advances the field of friendship research by demonstrating that parents significantly influence children's later friendships and that both friendships and peer group functioning are related to activity of the HPA-system. In combination, these findings may mean that the parent-child relationship alters a child's biological functioning, not only directly, as shown previously (e.g., Smeekens, Riksen-Walraven, & Van Bakel, 2007b; Smeekens, Riksen-Walraven, Van Bakel, & de Weerth, in press), but also indirectly through its influence on relationships with peers. These findings are exciting because they move the field closer to understanding the interactions among parenting, peer influences, and psychobiological processes in children's behavioral development.

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Chapter 7

Nederlandse Samenvatting en Conclusies

7.1 Samenvatting van het onderzoeksproject

Een van de belangrijkste ontwikkelingstaken van kinderen in de leeftijd tussen zes en twaalf jaar (in het Engels "middle childhood") is het vormen van intieme en hechte relaties met leeftijdsgenoten (zie bijv Sroufe, Egeland, & Carlson, 1999) Er is al veel onderzoek gedaan naar relaties met leeftijdsgenoten op groepsniveau, bijvoorbeeld naar de mate waarin kinderen binnen hun schoolklas worden geaccepteerd of verworpen Tegenwoordig weten we dat naast relaties op groepsniveau, ook relaties op dyadisch niveau (bijv vriendschappen) een onafhankelijke bijdrage leveren aan het welbevinden en functioneren van kinderen (Bagwell, Newcomb, & Bukowski, 1998, Parker & Asher, 1993) Het doel van dit proefschrift is om meer inzicht te verkrijgen in het ontstaan en het belang van vriendschappen in de kindertijd Daarbij wordt onderscheid gemaakt tussen drie aspecten van vriendschap het *aantal* vrienden dat een kind heeft, de *kwaliteit* van vriendschap en de *eigenschappen* van de vrienden (Hartup, 1996)

Dit proefschrift is gebaseerd op de vijfde meetronde van de Nijmegen Longitudinale Studie Deze studie is in 1998 gestart met een representatieve steekproef van 129 gezinnen met een vijftien maanden oude baby (zie bijv Smeekens, Riksen-Walraven, & Van Bakel, 2007a, Van Bakel & Riksen-Walraven, 2002) Aan de vijfde meetronde, die werd uitgevoerd toen de kinderen negen jaar oud waren, namen 118 gezinnen uit de oorspronkelijke steekproef deel Deze meetronde richtte zich op vriendschappen vanuit twee verschillende gezichtspunten enerzijds werd vriendschap onderzocht als een uitkomst van vroege ervaringen in de ouder-kind relatie, anderzijds werden de mogelijke effecten van vriendschap op het huidige gedrag en sociaal functioneren onder de loep genomen Er werden verschillende soorten gegevens verzameld (1) beoordelingen door ouder en leerkracht van internaliserend en externaliserend probleemgedrag van de kinderen, (2) nominaties door klasgenoten om het aantal wederkerige vrienden en de eigenschappen van de vrienden van de kinderen uit het longitudinale onderzoek te identificeren, (3) nominaties door klasgenoten om de positie in de groep en de mate van prosociaal en agressief gedrag te meten van zowel de kinderen uit het onderzoek als van hun vrienden, (4) zelfrapportage door de kinderen over relationele agressie en over de kwaliteit van hun beste vriendschap, (5) video-opnamen van de interactie tussen elk kind en zijn of haar beste vriend om de kwaliteit van de vriendschap te beoordelen, en tenslotte (6) speekselmonsters om het cortisol-niveau te bepalen als maat voor psychobiologische stress bij de kinderen

Dit proefschrift omvat vier empirische studies waarin vriendschappen zijn bestudeerd in de context van drie verschillende thema's: de ouder-kind relatie, het sociaal functioneren met leeftijdsgenoten in de groep en psychobiologische stress. Hierna volgt een korte samenvatting van de vier aparte studies en worden de voornaamste conclusies nog eens op een rijtje gezet

Studie 1

De eerste studie (*Hoofdstuk 2*) betreft een onderzoek naar de vroege ouder-kind relatie als voorspeller van de kwaliteit van vriendschap op latere leeftijd. Om vriendschapskwaliteit bij de nu negenjarige kinderen uit ons onderzoek te voorspellen werd gebruik gemaakt van de gegevens van de huidige meetronde op negen jaar, evenals van eerder verzamelde data op de leeftijd van vijftien maanden en vijf jaar.

Het doel van deze studie was om de samenhang tussen de kwaliteit van de vroege ouder-kind relatie en de kwaliteit van de beste vriendschap van het kind op negenjarige leeftijd te bestuderen. Hierbij werden twee aspecten van de ouder-kind relatie onderscheiden, beide gemeten toen de kinderen vijftien maanden oud waren: de kwaliteit van de ouder-kind gehechtheidsrelatie en de kwaliteit van het gedrag van de ouder in de omgang met het kind. Eerder onderzoek heeft zich doorgaans alleen gericht op de gehechtheidsrelatie als voorspeller van later sociaal functioneren (zie bijv. Kerns, 1996), terwijl verwacht kan worden dat ook de kwaliteit van oudergedrag een bijdrage levert aan de sociale ontwikkeling. Van beide aspecten van de ouder-kind relatie werd daarom verwacht dat ze een onafhankelijke rol zouden spelen in het voorspellen van vriendschapskwaliteit op latere leeftijd.

Daarnaast hebben we gekeken of het verband tussen de vroege ouder-kind relatie en latere vriendschappen misschien verklaard zou kunnen worden door bepaalde competenties die de kinderen mede in de context van de vroege ouder-kind relatie ontwikkelen. Daarbij is gekeken naar verschillende competenties waarvan in eerder onderzoek is uitgewezen dat ze samenhangen met zowel de ouder-kind relatie als met relaties met leeftijdsgenoten. Het ging hierbij om cognitieve competenties ("gehechtheidrepresentaties" die het kind heeft m.b.t. de ouder), competenties op gedragsniveau (sociale competentie) en een persoonlijkheidskenmerk (ego-veerkracht). We verwachtten dat de samenhang tussen de vroege ouder-kind relatie en latere vriendschappen mede zou worden verklaard (gemedieerd) door deze competenties zoals die gemeten zijn op vijfjarige leeftijd.

Bovenstaande hypothese is getoetst met behulp van een meervoudig mediatie model (Preacher & Hayes, 2004, 2008). Met een meervoudig mediatie model kan het effect van verschillende mediatoren tegelijkertijd worden getoetst, waarbij er gecontro-

leerd wordt voor de effecten van de andere mediatoren in het model. Zoals verwacht lieten de resultaten van het onderzoek zien dat de kwaliteit van de ouder-kind gehechtheid en van oudergedrag op vijftien maanden beide onafhankelijk van elkaar vriendschapskwaliteit op negenjarige leeftijd voorspellen. Daarnaast kwam naar voren dat de invloed van de kwaliteit van oudergedrag op vriendschapskwaliteit werd gemedieerd door sociale competentie en ego-veerkracht van het kind op vijfjarige leeftijd. De vroege gehechtheid bleek alleen een direct effect op vriendschap te hebben en dus niet te worden gemedieerd door een of meer van de drie variabelen op vijfjarige leeftijd. Samengevat werpen de bevindingen van deze studie een nieuw licht op de complexe relatie tussen ervaringen die kinderen in hun eerste levensjaren in de relatie met hun ouders opdoen en de kwaliteit van hun latere dyadische relaties met leeftijdsgenoten.

Studie 2

De tweede studie (*Hoofdstuk 3*) was gericht op het belang van vriendschap voor het functioneren van kinderen, zoals vastgesteld aan de hand van de psychobiologische stress die zij tijdens schooldagen ervaren. Stressvolle gebeurtenissen kunnen het hypothalamus-hypofyse-bijnier systeem (in het Engels "hypothalamic-pituitary-adrenocortical" of HPA-systeem) activeren. Dit systeem is verantwoordelijk voor het vrijkomen van het 'stresshormoon' cortisol. De hoeveelheid vrijgekomen cortisol is gemakkelijk meetbaar in speeksel. Normaal gesproken volgt de cortisolproductie een dagcurve met kort na ontwaken de hoogste waarden, gevolgd door een geleidelijke afname gedurende de dag (Kirschbaum & Hellhammer, 1989). Tijdens de dag is de curve onder invloed van omgevingsfactoren wel onderhevig aan bepaalde schommelingen in cortisolniveau. Kortdurende verhogingen van cortisol zijn doorgaans functioneel, omdat ze een individu helpen om te gaan met kortdurende stressvolle gebeurtenissen. Echter, een langdurig verhoogd cortisolniveau kan negatieve gevolgen hebben en kan ook leiden tot dysregulatie van het HPA-systeem zelf. Deze dysregulatie kan resulteren in vlakke cortisolcurves gedurende de dag, hetgeen, blijkens eerder onderzoek, geassocieerd is met diverse gezondheidsproblemen (Gunnar & Vazquez, 2001).

Eerdere studies hebben uitgewezen dat *sociale afwijzing* over het algemeen samengaat met verhoogde cortisolwaarden (bijv. Blackhart, Eckel, & Tice, 2007; Gunnar, Tout, De Haan, Pierce, & Stansbury, 1997; Vaillancourt, Duku, Decantanzaro, Macmillan, Muir, & Schmidt, 2007). Andere studies hebben laten zien dat *sociale steun* daarentegen eerder stressverlagend lijkt te werken (Gunnar & Donzella, 2002; Uchino, Cacioppo, & Kiecolt-Glaser, 1996). In *Studie 2* is onderzocht of sociale afwijzing door klasgenoten is gerelateerd aan cortisol en of vriendschap een rol speelt binnen deze relatie. Hiervoor is gekeken naar twee vormen van sociale afwijzing, namelijk naar *gepest* worden (actieve

afwijzing) en naar *uitgesloten* worden (passieve afwijzing) Zowel gepest worden als uitge-
sloten worden werd gemeten aan de hand van nominaties door klasgenoten Daarnaast
werd gekeken of de kwaliteit van vriendschap en het aantal vrienden dat een kind heeft
een beschermende (modererende) rol kan spelen in de relatie tussen deze twee vormen
van sociale afwijzing enerzijds en de cortisolwaarden van het kind op schooldagen ander-
zijds

Om de cortisolwaarden van de kinderen uit het onderzoek te bepalen werd op
twee opeenvolgende schooldagen vijf keer per dag speeksel verzameld Hiermee kon
achteraf zowel het niveau van cortisol op school als de vorm van de cortisolcurve over de
dag worden bepaald Zoals verwacht was sociale uitsluiting gerelateerd aan activiteit van
het HPA-systeem, kinderen die werden uitgesloten hadden hogere cortisolwaarden op
school dan kinderen die niet werden uitgesloten Tevens bleken uitgesloten kinderen een
vlakkere cortisolcurve over de dag te hebben, hetgeen zou kunnen wijzen op dysregulatie
van het HPA-systeem Dit gold echter alleen voor uitgesloten kinderen met relatief weinig
vrienden en/of een lage kwaliteit van vriendschap Het lijkt er dus op dat vriendschap
inderdaad een beschermende rol kan hebben in de relatie tussen uitsluiting en cortisol Er
werd in deze studie geen samenhang gevonden tussen gepest worden en cortisol

Onze bevindingen tonen aan dat uitsluiting door klasgenoten een belangrijke
vorm van stress kan zijn in het leven van kinderen, zich uitend in meetbare fysiologische
reacties, en dat vriendschap hierbij een belangrijke rol speelt Deze studie laat hiermee
zien dat de gezamenlijke bijdrage van relaties met leeftijdsgenoten op groeps- en dyadisch
niveau aan de ontwikkeling van kinderen, mogelijk verklaard kan worden aan de hand van
een psychobiologisch mechanisme

Studie 3

De derde studie (*Hoofdstuk 4*) had eveneens als doel om te bestuderen hoe rela-
ties met leeftijdsgenoten op groeps- en dyadisch niveau met elkaar samenhangen In deze
studie werd bekeken in welke mate sociaal gedrag van kinderen wordt beïnvloed door de
sociale status van hun beste vriend in de klas Hierbij werden twee vormen van status
onderscheiden *sociale preferentie* en *populariteit* Sociale preferentie is een dimensie van
acceptatie door leeftijdsgenoten en wordt meestal vastgesteld door aan leeftijdgenoten te
vragen wie zij het meest en minst aardig vinden in hun groep Populariteit is een dimensie
van sociale zichtbaarheid, "impact", of prestige in de peer groep (in plaats van aardigheid)
en wordt meestal vastgesteld door aan leerlingen te vragen wie zij het meest en minst
populair vinden in hun groep In eerder onderzoek is sociale preferentie of acceptatie vaak
benoemd als "sociometrische populariteit" terwijl populariteit vaak benoemd is als "waar-
genomen populariteit" (Parkhurst & Hopmeyer, 1998) In dit manuscript worden de ter-

men preferentie (of acceptatie) en populariteit gebruikt voor beide dimensies van hoge status in de peer groep, consistent met recente aanbevelingen voor een heldere en consistentie terminologie in onderzoek naar populariteit bij kinderen en adolescenten (Cillessen & Marks, 2011) Sociaal geprefereerde kinderen worden aardig gevonden door hun leeftijdsgenoten, terwijl populaire kinderen weliswaar dominant aanwezig zijn in de groep, maar niet noodzakelijk ook aardig worden gevonden Eerder onderzoek heeft aangetoond dat zowel sociale preferentie als populariteit positief zijn geassocieerd met prosociaal gedrag, maar dat de associaties met agressie tegengesteld van richting zijn terwijl sociale preferentie negatief is geassocieerd met agressie, is populariteit hiermee juist positief geassocieerd (zie bijv Cillessen & Mayeux, 2004, Parkhurst & Hopmeyer, 1998) Vanwege deze verschillende associaties veronderstelden we dat kinderen misschien anders worden beïnvloed door een hoog sociaal geprefereerde vriend dan door een hoog populaire vriend Het doel van deze studie was om te onderzoeken in welke mate agressief en prosociaal gedrag worden beïnvloed door de sociale status van de beste vriend

Om deze vraag te beantwoorden is gebruik gemaakt van gegevens over 334 "beste" vriendenparen, we hadden de beschikking over zoveel vriendenparen omdat we in de klassen niet alleen sociometrische gegevens verzameld hadden over de kinderen in onze longitudinale studie, maar ook over hun klasgenoten De volgende gegevens zijn aan de hand van de sociometrische procedure in de klas verzameld de mate van sociale preferentie, populariteit, prosociaal gedrag (bijv helpen, samenwerken), en openlijke en relationele agressie (bijv vechten en uitsluiten) Het effect van de status van de beste vriend op sociaal gedrag werd getest met een uitgebreide versie van het Actor-Partner Interdependence Model (APIM, Kashy & Kenny, 1999, Kenny, Kashy, & Cook, 2006), momenteel een van de belangrijkste technieken in onderzoek naar dyadische relaties Het APIM is een zogenaamd *structural equation model* waarmee twee effecten tegelijkertijd kunnen worden onderzocht namelijk het *actor effect,* ofwel het effect van de eigen status van een kind op zijn of haar eigen gedrag, en het *partner effect*, ofwel het effect van status van de beste vriend op het gedrag van een kind

Zoals verwacht bleken agressief en prosociaal gedrag niet alleen beïnvloed te worden door de eigen sociale status (actor effecten), maar ook door de status van de beste vriend (partner effecten) Hierbij werden unieke effecten gevonden voor beide vormen van sociale status (sociale preferentie en populariteit) Voor jongens was de sociale preferentie van hun beste vriend negatief geassocieerd met openlijke agressie, terwijl de populariteit van hun beste vriend juist positief geassocieerd was met deze vorm van agressie Voor meisjes was de populariteit van hun beste vriendin positief geassocieerd met zowel relationele agressie als met prosociaal gedrag De sociale preferentie van hun beste vriendin bleek niet gerelateerd te zijn aan hun gedrag

Het model toonde ook nog een andere interessante bevinding met betrekking tot de sociale status van beste vriendenparen. Waar eerdere studies alleen hadden aangetoond dat vrienden vaak op elkaar lijken in hun mate van sociale preferentie, lieten de resultaten uit onze studie voor het eerst zien dat dit ook geldt voor de mate van populariteit. Kortom, deze studie heeft uitgewezen dat het belangrijk is om in onderzoeken naar invloeden binnen vriendschappen op deze leeftijd twee vormen van sociale status te onderscheiden. De studie heeft ook laten zien hoe eigenschappen op individueel niveau (gedrag) en op groepsniveau (sociale status) kunnen worden geïntegreerd in het onderzoek naar vriendschap.

Studie 4

In de laatste studie (*Hoofdstuk 5*) is de relatie tussen gedrag en sociale status verder uitgediept door te focussen op de samenhang tussen agressie en populariteit. Behalve dat agressie is gerelateerd aan populariteit, hangt zij ook samen met het psychobiologisch functioneren van kinderen, zoals gedocumenteerd in talloze studies. Echter, eerder onderzoek naar het verband tussen agressie en cortisol bij kinderen en adolescenten heeft tot nu toe tegenstrijdige resultaten opgeleverd (Alink, Van IJzendoorn, Bakermans-Kranenburg, Mesman, Juffer, & Koot, 2008) In *Studie 4* wordt gesuggereerd dat deze tegenstrijdige bevindingen wellicht een gevolg zijn van het feit dat er in eerdere studies geen rekening is gehouden met de sociale context waarin agressief gedrag plaatsvindt We verwachtten dat de sociale status van kinderen bepalend zou kunnen zijn voor de correlatie tussen agressie en cortisol Concreet gezegd verwachtten we dat populaire agressieve kinderen over het algemeen lagere cortisolniveaus zouden hebben dan niet-populaire agressieve kinderen. De reden hiervoor was tweeledig Op de eerste plaats hebben populaire kinderen een relatief grote drang tot sensatie-zoeken ("sensation-seeking"), een persoonskenmerk waarvan bekend is dat het gerelateerd is aan lage niveaus van cortisol (Susman, 2006) Op de tweede plaats nemen populaire agressieve kinderen vaak het initiatief tot agressie en zijn daardoor beter in staat om dit gedrag op een gecontroleerde manier te gebruiken Het is bekend dat een gevoel van controle een belangrijke rol speelt bij (het behoud van) lage cortisol niveaus (bijv Dickerson & Kemeny, 2004)

Zoals tevens vermeld in *Studie 3*, wordt cortisol afgescheiden door het hypothalamic-pituitary-adrenocortical (HPA) systeem Het cortisolniveau volgt onder normale omstandigheden een duidelijke dagcurve, met een relatief hoog niveau in de ochtend, gevolgd door een daling gedurende de rest van de dag (Kirschbaum & Hellhammer, 1989) Echter, kinderen met ontwikkelingsproblemen of kinderen die moeite hebben om zich aan te passen aan de eisen die hun omgeving stelt, laten vaak een atypisch cortisolpatroon

zien, met hogere of juist lagere niveaus dan normaal en/of een steilere of vlakkere curve dan normaal (Smider, Essex, Kalin, Buss, Klein, Davidson, & Goldsmith, 2002).

In dit onderzoeksproject werd op twee schooldagen vijf keer per dag speeksel verzameld bij de kinderen om zowel het cortisolniveau op school als de vorm van de cortisolcurve over de dag te kunnen bepalen. Als maat voor agressie werd gebruik gemaakt van oordelen van klasgenoten, leerkrachten en van de kinderen zelf. Met een geavanceerde statistische methode werd aan de hand van groeicurve modellen aangetoond dat, zoals verwacht, agressie bij populaire kinderen was geassocieerd met relatief lage cortisolniveaus. Bij impopulaire kinderen was agressie juist geassocieerd met relatief hoge cortisolniveaus. Wat betreft de vorm van de dagcurve van cortisol bleken er verschillen te bestaan tussen populaire jongens en populaire meisjes (interactie tussen populariteit en geslacht). Agressieve populaire meisjes bleken een vlakkere cortisolcurve te hebben dan andere meisjes, terwijl bij agressieve populaire jongens de daling over de dag wel vergelijkbaar was met die van andere jongens. De resultaten van deze studie suggereren dat populariteit samenhangt met een uniek patroon van psychobiologische kenmerken. Tevens laat deze studie zien hoe het psychobiologisch functioneren van kinderen op zowel individueel als groepsniveau is geïntegreerd in hun sociale leven.

7.2 Conclusies

Uit de resultaten van de verschillende studies komt een aantal belangrijke conclusies naar voren ten aanzien van vriendschappen in de kindertijd. De conclusies zijn hieronder gegroepeerd rond drie thema's in de context waarvan vriendschap in de afzonderlijke studies is onderzocht, namelijk: de ouder-kind relatie, het sociaal functioneren in de groep en het psychobiologisch functioneren.

1. Ouders spelen een belangrijke rol in het sociale leven van kinderen doordat zij de kwaliteit van vriendschappen op latere leeftijd beïnvloeden. Uit dit onderzoek is namelijk het volgende gebleken:
    *   De kwaliteit van de ouder-kind gehechtheidsrelatie en van het oudergedrag in de eerste levensjaren dragen onafhankelijk van elkaar bij aan de kwaliteit van vriendschappen van kinderen op latere leeftijd.
    *   De positieve invloed die oudergedrag op jonge leeftijd heeft op de kwaliteit van vriendschappen op latere leeftijd wordt gemedieerd door de sociale competentie en ego-veerkracht van kinderen op vijfjarige leeftijd.

2   Het sociale systeem van leeftijdsgenoten in de kindertijd bestaat uit drie wezenlijk verschillende maar onderling nauw met elkaar samenhangende aspecten· individueel gedrag, vriendschappen en status in de groep Gebleken is namelijk·

- Sociale preferentie en populariteit zijn reeds van elkaar te onderscheiden op negenjarige leeftijd.
- Het is van belang dit onderscheid te maken bij het bestuderen van gedragsbeïnvloeding binnen vriendschapsparen
- De mate waarin een kind op groepsniveau agressief en prosociaal gedrag laat zien wordt beïnvloed door de sociale preferentie en populariteit van zijn of haar beste vriend.
- Vrienden lijken sterk op elkaar wat betreft hun positie in de groep; dit geldt zowel voor sociale preferentie als voor populariteit

3.   Het verband tussen relaties met leeftijdsgenoten en het functioneren van kinderen is deels te verklaren vanuit fysiologische stress en de werking van het HPA-systeem Meer in concreto:

- Uitgesloten worden door leeftijdsgenoten levert bij negenjarige kinderen meetbare fysiologische stress op, zoals blijkt uit verhoogde niveaus van cortisol op school en relatief vlakke cortisolcurves gedurende de schooldag
- Het hebben van (hoge kwaliteit) vriendschappen kan kinderen beschermen tegen de negatieve effecten van sociale uitsluiting op de werking van hun HPA-systeem
- Bij het onderzoeken van de relatie tussen agressie en de cortisolcurve van kinderen dient rekening te worden gehouden met hun populariteit

Tot besluit, deze dissertatie heeft een aantal nieuwe en interessante bevindingen opgeleverd met betrekking tot onderzoek naar vriendschappen in de basisschoolperiode. Ons onderzoek heeft aangetoond dat de vroege ouder-kind relatie een aanzienlijke invloed uitoefent op de kwaliteit van vriendschap op latere leeftijd Daarnaast is naar voren gekomen dat vriendschap is gerelateerd aan het functioneren van het HPA-systeem. Wanneer we deze bevindingen samen interpreteren, kan voorzichtig worden geconcludeerd dat de vroege ouder-kind relatie het latere biologische functioneren van kinderen en daarmee op lange termijn zelfs hun gezondheid kan beïnvloeden Deze invloed lijkt daarmee niet alleen direct plaats te vinden, zoals aangetoond in andere onderzoeken (bijv Smeekens, Riksen-Walraven, & van Bakel, 2007b, Smeekens, Riksen-Walraven, Van Bakel, & de Weerth, in press), maar ook indirect via de invloed die ouders hebben op de vriendschappen van hun kinderen

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Curriculum Vitae

Ellen Peters was born in Nieuwstadt, The Netherlands, on December 20, 1978. After completing secondary school (Sint Oelbert Gymnasium, Oosterhout, Noord Brabant) in 1996, she studied Psychology at the Radboud Universiteit Nijmegen where she obtained her master's degree in clinical psychology in 2003. From 2003 to 2006 she worked as a research assistant at the University Medical Center St. Radboud in Nijmegen on research on lifestyle interventions in cardiovascular patients. In 2006 she started as a junior researcher at the Behavioural Science Institute (BSI) at the Radboud Universiteit Nijmegen. Until the end of 2009 she worked on her PhD project focusing on friendships in middle childhood. This project concerned the fifth measurement wave of the Nijmegen Longitudinal Study, which started in 1998. The aim of this project was to gain more insight into the nature and developmental significance of children's friendships and to examine the developmental roots of individual differences in friendship. In January 2010, Ellen started post-doctoral training to become a licensed clinical psychologist at RINO Zuid Eindhoven, stationed at the Viecuri Medical Center for Noord Limburg in Venlo.