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# Behavioral and Cognitive Aspects of Poor Peer Relations in Children

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**Abstract**

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Viewing peer relations as markers of children's adjustment, the present thesis examined the associations between disruptive behavior problems (i.e., symptoms of Attention Deficit Hyperactivity Disorder [ADHD] and aggression) and peer relations. A second aim was to examine how children's cognitive functioning and view of self and of their social standing are associated with their peer relations and interactions. Gender differences in the above relations were also examined. The findings indicate that although disruptive behaviors are related to poor peer relations, low levels of prosociality (Study I) and poor cognitive functioning (i.e., poor executive functioning; Study II) exacerbate children's peer problems. Further, overly positive perceptions of one's social acceptance and low global self-evaluations were both related to aggression within the peer group (Study III). As regards gender differences, high levels of symptoms of ADHD and poor executive functioning, had graver consequences for the peer acceptance of girls' than of boys' (Study I and Study II) indicating that these characteristics may not fit the cultural stereotype for girls. Results are discussed in terms of viewing poor peer relations as indicators of problematic adjustment, and also, in terms of assessing the particular significance that peer relations have for children's self-view and behavior within the peer group. Implications of the findings as regards the interactions between behavior, cognitions, and gender on children's peer relations are also discussed.

*Keywords:* peer relations, disruptive behaviors, prosociality, self-esteem, gender differences

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## List of papers

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### Errata

Diamantopoulou et al (2005), Table 4, p. 394.



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## Abbreviations

ADHD	Attention Deficit Hyperactivity Disorder
ADHD-C	ADHD, combined subtype
ADHD-HI	ADHD, predominantly hyperactive/impulsive subtype
ADHD-I	ADHD, predominantly inattentive type
CD	Conduct Disorder
EF	Executive Functioning
EFD	Executive Functioning Deficits
ODD	Oppositional Defiant Disorder
SIS	Social Impact Score
SPS	Social Preference Score
WM	Working Memory



# Introduction

Children spend a considerable portion of their lives with peers, that is, children of their own age. Being age-mates, peers share many of the events and experiences that occur in life and they thereby play a unique role in children's development. Furthermore, making a new friend, maintaining an existing friendship, and fitting into a peer group, are interpersonal tasks that require both complex thinking and behavioral skills. Hence, peers are not only valuable collaborators in exploring and understanding the world, they provide the context in which children acquire important skills they need to become fully functioning members of the society.

The present thesis sought to examine behavioral and cognitive problems associated with children's peer relations. Gender differences were also examined because girls and boys have been found to differ in the way they behave, think, and feel about their peer relations (for a comprehensive review see: Rose & Rudolph, 2006). The studies included in the present thesis examine experiences in the peer group and focus mainly on how children come to be liked or disliked by peers. All the studies included children in middle childhood insofar as during this particular age period children experience a growing need for peer acceptance and a heightened fear of peer rejection (Steinberg, 1986). Before introducing the three empirical studies included in this thesis, some important ideas and discoveries in the peer relations literature are reviewed.

## The study of peer relations in childhood

For more than eighty years, the study of peer relations has been an important genre of developmental psychology. From early on, researchers have differentiated between peer interactions and peer relations (Ladd, 2005). Peer interactions involve behavioral processes, such as sequences of physical or verbal exchanges that occur between friends or members of a peer group. Peer relations, in contrast, are defined through the specific features of children's peer-related interactions, thoughts, and feelings. Important indicators of peer relations include the type, nature, and duration of children's peer interactions. Further, peer relations are not just momentary encounters but instead, to be able to say that there exists a relation between two peers, children must pursue contact with each other and the resulting interactions must

continue over time. The emotions peers feel toward each other, such as affection, liking or disliking, also identify different types of peer relations.

Prominent aims in the study of peer relations have included the examination of children's behaviors among peers, the stability of peer relations during childhood and adolescence, defining different types of peer relations, and children's social roles within the peer group. It is broadly recognized that experiences with peers occur on multiple levels of social complexity, that is, either in dyads or in groups, and these experiences are in turn affected by characteristics of the individual (Bukowski & Adams, 2005; Ladd, 2005). Dyad experiences include friendships and pairs of enemies whereas group experiences refer to one's participation in a clique or a crowd. Individual characteristics include patterns of behavior, expectations, social cognitive skills, and also, one's developmental history. Hence, current research on peer relations aims to identify how peer relations' phenomena from these different levels of complexity are interrelated and how they function together in their relations to children's concurrent and future adjustment.

Through peer interactions children appear to acquire, maintain, and organize their social behaviors and cognitions (Asher & Coie, 1990; Magnusson & Cairns, 1996). Peer relations have been associated with individual differences in multiple forms of social behavior and social cognition (e.g., Brendgen, Vitaro, Turgeon, & Poulin, 2002; Dodge & Feldman, 1990; Guerra, Asher, & DeRosier, 2004; Kupersmidt, Coie, & Dodge, 1990). Substantial evidence suggests that children's specific behavioral orientations (e.g., aggressive-, withdrawn behavior) and peer relations contribute to the development of later psychological functioning and school adjustment (for reviews see: Ladd, 2005; Parker & Asher, 1987). Hence, the idea that forces acting within the child (e.g., the child's temperament) and outside the child (e.g., the influence of family and culture) affect children's development has provided a foundation for the scientific study of children's peer relations.

## Defining and measuring peer relations

An early goal of peer relations research was to develop techniques to identify children with problematic peer relations and to distinguish among children who have different types of relations or social roles within the peer group. Generally, this research aimed to solve largely descriptive questions rather than test hypotheses derived from theory. Out of this early research the construct *social status*, or *peer acceptance* emerged (see further below), that is, an index of the extent to which a child is broadly liked or accepted by members of his or her peer group. Several methodologies have been employed to distinguish between children who differ in peer acceptance. These include observations of children's peer interactions, teacher- parent- and peer ratings of children's peer relations, self-ratings of peer acceptance, and

the use of sociometric peer nominations (i.e., sociometry, see further below; Coie, Dodge, & Coppotelli, 1982; Coie & Dodge, 1983; Coie, Dodge, & Kupersmidt, 1990). Sociometry is the most widely used technique and is considered a reliable method of assessing peer relations insofar as peer acceptance based on peer nominations has been found to be relatively stable through elementary school (Brendgen, Vitaro, Bukowski, Doyle, & Markiewicz, 2001; Coie & Dodge, 1983).

Sociometry requires respondents to name, typically up to three, classmates who fit various criteria (Coie et al., 1982; Coie & Dodge, 1983). For instance, children may be asked to name peers they most/least like to play with or be with (i.e., positive and negative nominations) or peers who are aggressive or shy. The positive and negative nominations children receive are combined to create two social status dimensions: “Social Impact Score” (SIS) which is derived by summing the positive and negative nominations and “Social Preference Score” (SPS), which is derived by subtracting the number of negative nominations from the number of positive nominations. The SPS and the SIS are then standardized within classrooms or peer groups and used to classify children into one of five distinct peer status categories: *popular, rejected, neglected, controversial, and average*.

Popular children are those who receive many (one standard deviation above the group mean) positive nominations and few (less than the group’s mean) negative ones.<sup>1</sup> Rejected children are those who receive very few positive nominations (i.e., their SPS is less than -1.0) and many negative ones (i.e., their negative nominations score is more than 0). Neglected children are those who receive a low SIS (i.e., a score less than -1.0) and below average positive and negative nominations. Hence, these children tend to be ignored or overlooked by their classmates but they are not necessarily disliked in their peer group. Controversial children are those who receive above average positive and negative nominations (i.e., more than 0) and are therefore simultaneously well liked but also disliked in the peer group. Finally, average children are those who receive a moderate SPS and a near average SIS (i.e., one-half of a standard deviation above or below the group mean) and they are thereby not especially liked or disliked by the members of their peer group. Unclassified children are usually classified as average. As also implied by the use of the standard score procedure to classify children into these distinct five peer status groups, the majority of children are classified as average, approximately 15% of children are classified as popular or rejected, approximately 10% of children are classified as neglected, whereas

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<sup>1</sup> In the literature there is a distinction between “actual” popularity and “perceived” popularity. In the current thesis actual popularity was assessed, that is, the degree to which a child is liked by peers. Perceived popularity refers to popularity as a reputation among peers and is derived by sociometric nominations in which children respond to questions such as “How popular/well liked do you think that X is” (e.g., Luthar & McMahon, 1996; Parkhurst & Hopmeyer, 1998).

only a small portion of children are usually classified as controversial, that is approximately 4-6% (e.g., DeRosier & Thomas, 2003).

Over the past two decades, abundant support has been provided for the predictive and concurrent validity of the Coie and colleagues (1982) sociometric classification groups (e.g., Cillessen, Bukowski, & Haselager, 2000; DeRosier & Thomas, 2003). In a meta-analysis of over 100 studies it was shown that rejected and controversial children displayed the highest rates of aggression among all peer status groups whereas popular children demonstrated significantly higher levels of prosocial behavior compared with children in the other sociometric status groups (Newcomb, Bukowski, & Pattee, 1993). Further, popular children evidenced stronger cognitive abilities (e.g., intelligence, problem solving, and academic achievement) than the children in the average, rejected, and neglected sociometric status groups, whereas rejected children's cognitive abilities were significantly lower than those of the children in the other four sociometric status groups. Hence, children of different sociometric status groups have consistently been found to differ in patterns of behavior and cognitive abilities.

As implied by sociometry, children with poor peer relations are identified as those with either a low SPS or children who are classified as rejected, neglected, or controversial. In the current thesis, poor peer relations are operationalized either as a continuous measure of low peer acceptance or rejection (i.e., having a low SPS) or as a categorical measure of rejected peer status. The choice to examine low peer acceptance and peer rejection was based on two reasons. First, because peer rejection has been found to be a robust predictor of later maladjustment including conduct problems, poor school achievement, and delinquency (Coie & Dodge, 1983; Kupersmidt et al., 1990; Miller-Johnson, Coie, Maumary-Gremaud, & Bierman, 2002). Second, because in middle childhood rejected peer status has been found to be more stable across time than the other peer status classifications (Brendgen et al., 2001; Cillessen et al., 2000; Coie & Dodge, 1983). Hence, rejected children, compared to neglected or controversial children, are most likely to experience adjustment problems related to poor peer relations.

## Understanding whether and how peer relations are associated with children's concurrent adjustment

The phenomena examined in current research on peer relations take many forms and assigning them into categories is not an easy task. Nevertheless, Bukowski and Adams (2005) recently suggested that studies can be categorized according to the approach taken studying peer relations. According to this categorization, peer relations have been examined as *moderators, mediators, markers, meanings, and mechanisms*. Understanding how peer relations

contribute to children's later adjustment was beyond the scope of this thesis. Hence, mediating effects of peer relations on children's later adjustment, that is, whether peer relations mediate the associations between, for instance, behavioral attributes and later adjustment are not reviewed. Neither are moderating effects of peer relations on children's later adjustment reviewed, that is, whether for instance, poor peer relations worsen or not the outcome of behavioral attributes. Finally, mechanisms refer to actual processes that characterize a friendship relation which presumably account for the observed associations between measures of peer relations and outcomes. For instance, the relation between involvement with deviant peers in the 4<sup>th</sup> grade and antisocial behavior in the 12<sup>th</sup> grade has been found to be mediated by deviance training, that is, contingent positive reactions to rule breaking discussions, in the 8<sup>th</sup> grade (Patterson, Dishion, & Yoerger, 2000). Insofar as the present thesis examined experiences within the peer group and not within dyadic friendship relations, the literature on peer relations as mechanisms is not reviewed here. Instead, without making any claims on causal relations, this thesis examined peer relations in terms of *markers* and *meanings*.

Markers are defined as variables that index or represent a large phenomenon (Kupersmidt & Coie, 1990; Parker & Asher, 1987). According to this approach, poor peer relations are viewed as an indication of either concurrent adjustment problems or as an indication that problematic outcomes could follow. In this sense, poor peer relations are not necessarily viewed as a cause or a consequence of another event or variable. Instead, peer relations are simply seen as another correlate of children's maladaptive behavioral dispositions and they are not assumed to necessarily have any bearing on children's future maladjustment. In accordance with the approach examining peer relations as markers, the current thesis examined how behavior problems which are common for children in middle childhood are associated with poor peer relations.

The study of peer relations as meanings involves the assessment of the particular significance that peer relations in general have for individual children (Bukowski & Adams, 2005). Peer relations have been typically studied apart from children's experience of these relations and little is known about the specific value that children ascribe to these experiences. In the current thesis, the subjective meaning of peer relations was assessed by examining the associations between children's self-evaluations, behavioral problems, and peer relations. Furthermore, to examine whether deficient social understanding is related to poor peer relations, the association between patterns of cognitive functioning (i.e., executive functioning, see further below) and peer relations as well as the association between overestimations of ones' social acceptance (i.e., high- or disputed self-esteem, see further below) and children's behavior within the peer group were also examined.

In sum, approaches to the study of peer relations may take many forms. None of these approaches has been identified as the predominant one and

each of them has proven to be valuable as a means of studying peer relations. What the above approaches have in common is that they assume that both the way children behave or think about their peers and processes within the peer group influence peer relations.

### Peer relations as markers: Behavior problems and competence deficits related to poor peer relations

In the literature, behavior problems in childhood are broadly divided into externalizing and internalizing (e.g., Cicchetti & Toth, 1991). Externalizing behavior problems include behaviors that are primarily harmful and/or disruptive to others (i.e., externally oriented), whereas internalizing behavior problems are assumed to be primarily harmful for the individual (i.e., internally oriented). Hence, externalizing behavior problems include aggressive, oppositional, and defiant behaviors, whereas internalizing behavior problems include, for instance, sadness, somatic complaints, and anxiety.

Common clinical diagnoses in childhood encompassing developmentally inappropriate levels of externalizing behavior problems (i.e., disruptive behavior disorders) are Attention-Deficit/Hyperactivity Disorder (ADHD), Oppositional Defiant Disorder (ODD), and Conduct Disorder (CD). ADHD is characterized by persistent and developmentally inappropriate levels of inattention and/or hyperactivity and impulsivity (American Psychiatric Association [APA], 1994). Three different subtypes of ADHD are recognized in the DSM-IV (APA, 1994): ADHD combined type (ADHD-C) where both symptoms of hyperactivity/impulsivity and inattention are present, ADHD-predominantly hyperactive/impulsive type (ADHD-HI), and ADHD predominantly inattentive type (ADHD-I). CD is characterized by aggressive behaviors, disobedience, deceitfulness, and rule violations whereas ODD includes some of the behaviors also observed in CD (e.g., aggression and disobedience) although these behaviors are not as persistent or serious as in CD (APA, 1994). The difference between ODD and CD is that ODD is mainly characterized by disruptive interpersonal interactions while CD is characterized more by severe predatory or illegal behavior (Rutter & Sroufe, 2000). The current thesis examined primarily the association between externalizing behavior problems including symptoms of disruptive behavior disorders at non-clinical levels and peer relations. The association between prosociality and peer relations was also examined because prosociality has been identified as a key element in the development of positive peer relations.

**Prosocial behavior.** Children who often engage in friendly, cooperative, helpful, or other prosocial behaviors tend to be well liked or accepted by members of their peer group (Denham & Holt, 1993; Ladd, Price, & Hart, 1990; Mize & Ladd, 1990). It is well established in the literature that low

levels of prosocial behavior are associated with rejected peer status (for a review see Newcomb, Bukowski, & Pattee, 1993). High levels of prosocial behavior have been found to predict future social adjustment even beyond the effects of aggression (Crick, 1996), whereas the absence of prosocial behavior in kindergarten and not the presence of aggression has been found to predict peer rejection one year later (Vitaro, Gagnon, & Tremblay, 1990). Hence, prosociality appears to be an important concurrent and prospective correlate of positive peer relations.

**Disruptive behaviors.** Aggression in children is among the most studied disruptive behaviors. Differentiated subtypes of aggression have been identified. One distinction is made between overt and relational aggression. Overt aggression includes physical or verbal acts that aim to bring about external, often object-oriented consequences to others, whereas relational aggression includes acts such as rumor spreading and exclusion of children from the peer group which primarily aim to harm other's peer relations (e.g., Crick, 1995; Grotjeter & Crick, 1996). Findings suggest that children's early experiences with aggression may lead them to develop forms of social knowledge that may sustain or motivate acts of aggression which are intensified over time (Burks, Dodge, Price, & Laird, 1999).

A large number of studies have reported concurrent and longitudinal associations between aggression and poor peer relations. Compared to non-aggressive peers, overtly aggressive children have been found to be rejected by peers to a greater extent, to affiliate more often with other aggressive peers, and to have poorer social skills (e.g., Campbell, Spieker, Burchinal, & Poe, 2006; DeRosier, Kupersmidt, & Patterson, 1994; Hymel, Rubin, Rowden, & LeMare, 1990). Relational aggression has been associated with concurrent and future peer rejection (e.g., Crick, 1996; Crick, Ostrov, & Werner, 2006; Salmivally, Kaukiainen, & Lagerspetz, 2000). Hence, both types of aggression have been related to peer rejection and both types are assumed to serve similar social purposes, that is, achieving dominance or control over others.

As regards clinical diagnoses encompassing disruptive behaviors in childhood, both ADHD and CD have been found to be associated with concurrent peer rejection and affiliation with deviant peers and to predict poor peer relations including peer rejection and poor friendship stability in adolescence (e.g., Abikoff et al., 2004; Bagwell, Molina, Pelham, & Hoza, 2001; Blachman & Hinshaw, 2002; Maedgen & Carlson, 2000; Marshal, Molina, & Pelham, 2003; Parker, Rubin, Price, & DeRosier, 1995; Woodward & Fergusson, 1999). In line with viewing peer relations as markers, although measures of children's peer relations were regarded as subsequent measures of adjustment in the above studies, the associations between ADHD or CD and poor peer relations were not treated as evidence of causality. It should however be noted that the above studies were conducted on children diagnosed with ADHD or CD and less is known about whether

these findings generalize to children in community based samples who may display high- but not clinical levels of symptoms of these childhood disorders.

### Peer relations as meanings: Social understanding associated with poor peer relations

The hypothesis guiding work in the role of children's social understanding for their peer relations is that children who are deficient or deviant in the way that they process social information may have difficulties in behaving competently with peers. According to Dodge's and colleagues' influential model (e.g., Crick & Dodge, 1994; Dodge & Feldman, 1990) of social information processing, to react appropriately in social situations, social information processing needs to be processed in an orderly fashion: (1) the information has to be encoded accurately, (2) the encoded information needs to be represented correctly, (3) an interaction goal needs to be specified, (4) response alternatives need to be activated, (5) these response alternatives need to be evaluated and an optimal response needs to be chosen, and (6) the selected response has to be executed. Inaccurate information processing in any of these stages of social information processing is associated with poor social functioning. Inaccurate information processing may in turn activate or frustrate motivational systems that lead to emotional and behavioral disturbances (Hill, 2001). The present thesis examined problems with social understanding as regards deficits in encoding and interpreting social information. Deficits in encoding and in representing social information were assessed through broader patterns of cognitive functioning, (i.e., executive functioning, see further below), whereas deficits in interpreting social information were assessed through comparing children's self-evaluations of their peer acceptance with their actual (i.e., peer nominated) peer acceptance.

**Cognitive functioning and peer relations.** As stated previously, rejected children have been found to have significantly lower cognitive abilities than the other four sociometric groups (Newcomb et al., 1993). Low cognitive ability in middle childhood measured as poor verbal and non-verbal intelligence has been associated with aggression and CD (e.g., Cook, Greenberg, & Kusche, 1994; Huesman, Eron, Lefkowitz, & Walder, 1984; Lynam & Henry, 2001), which in turn have been associated with poor peer relations. However, in a study examining children's peer relations from kindergarten to first grade, the negative relations between low cognitive ability in kindergarten and peer relations in first grade were found to be mediated by children's problem behaviors (Bellanti & Bierman, 2000). Hence, children's behavior problems may account for the negative relation between intelligence and peer acceptance.

Executive functions have been defined as “a cluster of skills that are necessary for efficient and effective future-oriented behavior” (Welsh, 2002, p. 143), and they typically include abilities such as attention shifting, behavioral inhibition, planning, and working memory (Pennington & Ozonoff, 1996). Significant associations between poor executive functioning (EF) and antisocial behavior have been found among preschoolers characterized as “hard to manage” (Hughes, Dunn, & White, 1998; Hughes, White, Sharp, & Dunn, 2000). Furthermore, in an experimental task, inability to shift attention from negative to neutral or positive faces among kindergarten and first grade children, has been found to be related to poor social skills such as ability to share (Wilson, 2003). In one longitudinal examination of the relations between EF and social outcomes in school children it was found that children’s performance on EF tasks predicted teacher ratings of social competence two years later, independently of initial competence levels (Nigg, Quamma, Greenberg, & Kusche, 1999). In a second longitudinal examination of the associations between poor EF and antisocial behavior it was found that antisocial behavior in childhood and adolescence was related to poor EF at age 16-17 (Raine et al., 2005). The relation was not attributable to comorbid ADHD, child abuse, psychosocial adversity, or head injury. Consequently, children with poor executive functioning (EF) are expected to have particular problems dealing with their peers.

Although not explicitly indicated by the social information processing model (e.g., Dodge & Feldman, 1990), in the present thesis, poor EF was assumed to be involved in the first and second step of the model. The main reason why poor EF may be associated with these two steps of the model is that the mere definition of typical executive functions is strongly related to poor encoding and poor representation of information. For instance, behavioral inhibition, that is the ability to inhibit a prepotent response, interrupt an ongoing response, or preventing self-directed responses from the interference of competing events and responses, presupposes the ability to monitor incoming information and successfully regulate responses (Barkley, 1997). Further, working memory (verbal or non-verbal), that is, the ability to store and manipulate internally represented information in mind that will be used to control a subsequent response (Baddeley, 1992), underlies the power of individuals to retain mental representations of the behavior of others. Poor representation of social information has been found to be a robust predictor of aggression in children (for a meta-analysis see: De Castro, Veernan, Koops, Bosch, & Monshouwer, 2002). Consequently, EF can be assumed to be an underlying force that initiates and guides social information processing.

Children diagnosed with ADHD and undiagnosed children who display high levels of ADHD symptoms have consistently been found to perform poorly on EF tasks compared to controls (e.g., Castellanos, Sonuga-Barke, Milham, & Tannock, 2006; Willcutt, Doyle, Nigg, Faraone, & Pennington,

2005). As stated above, ADHD symptoms have been associated with peer rejection and low levels of social competence (e.g., Abikoff et al., 2004; Bagwell, et al., 2001; Blachman & Hinshaw, 2002). Further, both symptoms of ADHD and poor EF have been associated with poor school performance (e.g., Barry, Lyman, & Klinger, 2002; Bauermeister et al., 2005; Biederman et al., 2004). However, although both symptoms of ADHD and poor EF have been associated with poor peer relations and poor school performance, findings on interaction effects between symptoms of ADHD and EF on children's social and academic functioning are inconsistent. On the one hand, poor EF among adolescents with ADHD has been found to be predictive of poor social- and academic functioning (Clark, Prior, & Kinsella, 2002). On the other hand, in a study comparing children with ADHD and poor EF with children with ADHD and adequate EF, no group differences were found in parent ratings of social difficulties with peers at school although children with ADHD and poor EF performed worse at school (Biederman et al., 2004). Hence, less is known about possible combined effects of ADHD symptoms and EF on children's social outcomes.

**Children's self-perceptions and peer relations.** It has been proposed that children's appraisals of their competence with peers contribute to their sense of worth or self-esteem (Harter, 1988) and also, that the effect that adverse peer experiences have on children's well-being may be transmitted through children's self-beliefs (Ladd & Troop-Gordon, 2003). Children make inferences about themselves and about their own social characteristics based on their experiences and relations with peers. What are the links between children's peer relations and beliefs about themselves?

Poor peer relations in childhood, including peer rejection or neglect, have been associated with both unfavorable views of the self and with feelings of loneliness (e.g., Cassidy & Asher, 1992; Hymel et al., 1990; Ladd & Troop-Gordon, 2003). However, not all children experiencing poor peer relations report negative views of self or feelings of loneliness. For instance, aggressive-rejected children have been found to not report more feelings of loneliness compared to non-rejected peers insofar as they affiliate with other equally rejected children at school (Asher, Parkhurst, Hymel, & Williams, 1990). Further, aggressive children have been found to be insensitive to social cues reflecting peer dislike and may therefore not report more feelings of loneliness (Rudolph & Clark, 2001). Hence, whether poor peer relations influence children's view of self or of their peer acceptance in a negative way or not is unclear.

Findings on the relations between children's view of self or of their peer acceptance and their behavior within the peer group are inconclusive. One view suggests that aggression and antisocial behavior in children are an expression of children's low self-esteem (*low self-esteem hypothesis*; Donnellan, Trzesniewski, Robins, Fergusson & Horwood, 2002; Gjerde, Block, & Block, 1988). Other findings suggest that aggression and antisocial behavior

in children stem from a high self-esteem that is threatened or disputed by others (*disputed self-esteem hypothesis*; e.g., Baumeister, Bushman, & Campbell, 2000; Baumeister, Smart, & Boden, 1996; Bushman & Baumeister, 1998; Hymel, Bowker, & Woody, 1993). Finally, overly high self-perceived social acceptance compared to observers' ratings (e.g., teachers, parents, peers) has been associated with increased levels of peer-fighting at school, aggression, and symptoms of ADHD (e.g., Hoza, Pelham, Dobbs, Owens, & Pillow, 2002; Rudolph & Clark, 2001; Van Boxtel, De Castro, & Goossens, 2004). Consequently, the relations between children's view of self or of their peer relations and aggressive behavior within the peer group need further examination.

## Gender differences in peer relations

Before presenting some of the major issues concerned with gender differences in peer relations a terminological note is in order. For some decades, scientists have been preoccupied with the need to differentiate between sex and gender differences. Sex differences are assumed to have a biological origin whereas gender differences are assumed to have a socio-cultural origin. Because determining whether biological or socio-cultural factors account for the differences found between girls' and boys' peer relations is beyond the scope of this thesis, and also, because I do not view sex and gender as entirely separate constructs, the terms sex and gender are used interchangeably.

Gender differences in the structure of children's peer relations as well as in the way girls and boys think and feel about their peer relations are found from a very early age. Girls and boys interact with same-sex peers more frequently than with opposite-sex peers (e.g., Bukowski, Gauze, Hoza, Newcomb, 1993; Martin & Fabes, 2001). In a longitudinal examination of gender differences in school-age children's peer relations it was shown that, over time, boys developed larger and more interconnected peer networks (i.e., boys' friends became friends with each other) than girls who tended to have more extended dyadic interactions (Parker & Seal, 1996). Furthermore, pre-adolescent and adolescent girls have been found to become more anxious and depressed than boys when they experience stress in their close peer relations (e.g., Rudolph, 2002; Rudolph & Hammen, 1999). Finally, girls in middle childhood and adolescence, compared to boys, have been found to invest in relationships as a source of self-esteem to a greater extent and to feel greater concern about peers' evaluations (Maccoby, 1990; Cross & Madson, 1997). Hence, girls appear to engage more in close dyadic friendships and be more concerned about their peers' evaluations than boys.

Gender differences in behavioral style may also explain differences in the way girls and boys interact with their peers. For instance, girls have been

found to be more prosocial and slightly (i.e., small effect sizes) more shy than boys (for a comprehensive review see Else-Quest, Hyde, Goldsmith, & Van Hulle, 2006). Boys have been found to engage in more overt forms of aggression such as verbal and physical aggression whereas girls have been shown to be more relationally aggressive (e.g., Crick, 1995; Grotzinger & Crick, 1996). In line with these behavioral differences between the sexes girls' peer interactions have been found to be characterized by prosocial behavior to a greater degree than boys' interactions (for a review see: Rose & Rudolph, 2006). Finally, a recent study reported that overt verbal or physical aggression was more common in boys' peer relations than in girls' whereas girls were exposed more often to relational aggression by peers (Crick & Nelson, 2002).

Because there appear to be gender differences in girls' and boys' behavior within the peer group, researchers have been concerned with the social adjustment of children whose behavior is not typical for their gender. According to the gender appropriateness hypothesis (Kerr, Lambert, Stattin, & Klackenberg-Larsson, 1994), culturally defined stereotypes of masculinity and femininity set the rules for how boys and girls are expected to behave. When children do not comply with these cultural rules their behavior is perceived as gender inappropriate and is less tolerated. Consequently, gender-inappropriate behavior is expected to be related to problematic peer relations.

As regards disruptive behaviors, in line with the gender appropriateness hypothesis, overt aggression has been found to be less tolerated by peers when displayed by girls than by boys and overtly aggressive girls have been found to be rejected by peers to a greater extent than boys engaging in the same kind of behavior (Crick, 1997; Keenan, Loeber, & Green, 1999). Furthermore, among elementary school children diagnosed with ADHD, girls, compared to boys, tend to be rated by teachers as less popular among peers (Brown, Madan-Swain, & Baldwin, 1990). However, among preadolescents, relational aggression has been related to peer rejection in girls but not in boys (Salmivally et al., 2000). Hence, depending on children's gender, some forms of disruptive behaviors may predict peer rejection better than others and the significance of social behaviors that occur within the peer group appears to differ by gender.

## In sum: Unanswered questions in the peer relations literature

One of the drawbacks of the research on peer relations as markers is that studies have often presented a somewhat oversimplified picture of the associations between behavior problems and peer relations. In part, this is the

result of examining predominantly main effects and viewing children's behavioral propensities, including premorbid forms of later-emerging disorders, as the principal determinants of poor peer relations. However, there are two compelling reasons for investigating more complex models of the influence of behavior on children's peer relations.

First, a large number of studies suggest that various developmental problems tend to overlap or co-occur among children in both clinical and community based samples (e.g., Angold & Costello, 1993; Angold, Costello, Farmer, Burns, & Erkanli, 1999; Hinshaw, 2002; Keenan, Shaw, Walsh, Delliquadri, & Giovanelli, 1997; Weiss, Süsser, & Catron, 1998). Second, children's competencies may counterbalance their difficulties. For instance, although popular children tend to be less aggressive than rejected children, they are not less aggressive than average children (Newcomb et al., 1993). In this sense, aggressive behavior, when balanced by prosocial behavior, may be adaptive for some individuals and aggressive behavior does not necessarily need to be related to peer dislike for all children. Hence, behaviors that are viewed as problematic for some children may be adaptive for other children when combined with certain competencies. These findings stress the importance of examining additive and interactive effects of co-occurring behavior problems on children's psychosocial functioning taking however also into account their competencies.

A limitation of previous studies examining the relations between disruptive behaviors such as symptoms of ADHD and peer relations is that they are mostly conducted on clinical samples. However, developmental problems exist along a continuum of symptom severity where the higher extreme end of the continuum can be viewed as representing developmental disorders (El-Sayed, Larsson, Persson, Santosh, & Rydelius, 2003; Jensen et al., 2001; Newcorn et al., 2001). Besides, children who display symptoms of psychiatric disorders but do not fulfill diagnostic criteria for a specific disorder have been found to be equally impaired in terms of psychosocial functioning as diagnosed children are (Angold et al., 1999). Further, referral bias and high rates of co-occurring problems may affect outcomes of studies based on clinical samples (Goodman, Lahey, Fielding, & Dulcan, 1997). Hence, findings of studies on children diagnosed with disruptive behavior disorders need to be complemented by studies using community based samples.

In spite of its lengthy history, there are some unanswered questions in the literature examining peer relations as meanings, at least as regards the associations between disruptive behaviors and their relation to children's view of self. First, although children with ADHD are often rejected by peers, whether this is associated with a negative view of self is unclear. On the one hand, children with ADHD have been found to think poorly of themselves and display a low self-esteem and negative self-perceptions (e.g., Klassen, Miller, & Fine, 2004; Slomkowski, Klein, & Mannuzza, 1995; Treuting & Hinshaw, 2001). On the other hand, once comorbid internalizing problems

are taken into account, the self-evaluations of children with ADHD have not been found to differ from those of controls (Hoza, Pelham, Milich, Pillow, & McBride, 1993). Instead, children with ADHD have been found to overestimate their social acceptance despite peer rejection (Hoza et al., 2004; Ohan & Johnston, 2002). Hence, the relation between poor peer relations, symptoms of ADHD, and children's view of self need further examination.

Second, as also stated earlier, a much debated issue in the literature concerns the relation between aggression towards peers and self-esteem. Aggression and antisocial behavior in children have been associated with both a low- and an overly high self-esteem (e.g., Donnelan et al., 2002; Van Boxtel et al., 2004). These discrepant findings may however be caused by different conceptualizations of self-esteem. In the literature, global self-evaluations and evaluations of social acceptance are considered distinct concepts, the former being more related to an overall evaluation of how satisfied one is with how he/she is leading his/her life, while the latter is considered being related more to domain specific evaluations of competence (Harter, 1988). Whereas studies supporting the notion that low self-esteem is related to aggression in children have examined absolute levels of children's global self-evaluations compared to peers' levels (e.g., Donnelan et al., 2002), studies relating overly high self-esteem to aggression have examined children's overestimations of social acceptance compared to actual peer acceptance, that is, peer nominations or ratings (e.g., Van Boxtel et al., 2004). Further, previous studies have not controlled for the effects of internalizing problems and the positive association between low self-esteem and aggression may be attributed to the overall relation between externalizing and internalizing problems (Weiss & Catron, 1994; Weiss et al., 1998). Finally, insofar as children invest in peer relations as a source of self-esteem and children's view of self has been found to be largely influenced by peer experiences (e.g., Rudolph, Caldwell, & Conley, 2005), it is very likely that the associations between self-esteem and disruptive behaviors are influenced by children's peer relations. To date, there has been no systematic exploration of different conceptualizations of self-esteem and their relation to aggression.

Third, children's view of their peer relations has been found to be influenced by their cognitive abilities and by their behavioral characteristics (e.g., Hughes et al., 2000; Nigg et al., 1999). Although children with ADHD have consistently been found to be rejected by peers and to have deficits in cognitive abilities (i.e., poor EF), little examination has been conducted on the relations between symptoms of ADHD, EF, and children's peer relations. The findings of the few studies conducted on this issue are inconsistent as regards the interplay between symptoms of ADHD and EF regarding children's academic and social functioning.

Finally, gender differences are likely to be present in all the above relations insofar as boys and girls have been found to differ in the way they behave within the peer group and the way they perceive the importance of their

peer relations. At present, knowledge about the associations between behavioral problems, cognitive functioning, and peer relations, remains skewed towards boys. Girls have been especially neglected in the literature examining the relations between symptoms of ADHD, EF and peer relations. Of particular interest is the question of whether the gender-appropriateness hypothesis (Kerr et al., 1994) applies to symptoms of ADHD. In other words, because the clinical diagnosis of ADHD is up to four times more common in boys than in girls and also because the levels of ADHD symptoms in community based samples are higher for boys than for girls, (APA, 1994), the question that arises is whether girls high on ADHD symptoms are rejected by peers to a greater extent than male counterparts. Certainly, gender differences in peer relations are warranted further examination.

## Aims of the present thesis

To address some of the unanswered questions in the literature the present thesis examined, in two community based samples of children in middle childhood, issues concerned with viewing peer relations as markers and as meanings.

In terms of examining peer relations as markers, Study I aimed to examine whether the relation between symptoms of ADHD and poor peer acceptance would hold for control for other problems (i.e., aggression, internalizing problems, and low levels of prosocial behavior) known to be negatively related to peer acceptance.

In terms of examining peer relations as meanings, Study I examined children's view of self (i.e., global self-evaluations and self-perceptions of behavioral conduct) in relation to symptoms of ADHD taking also peer acceptance into account. Further, Study I aimed to examine main and interaction effects of symptoms of ADHD and of peer acceptance on children's self-evaluations.

Aiming to disentangle the interplay between children's behavioral characteristics and cognitive functioning on their peer relations, Study II examined the predictive relations between symptoms of ADHD and EF and peer acceptance. In this sense, peer relations were examined both as markers, insofar as the associations between symptoms of ADHD alone or in combination with poor EF and peer acceptance were assessed, and as meanings, insofar poor EF was viewed as an indicator of poor social understanding associated with poor peer acceptance. Because previous findings on the relations between symptoms of ADHD, EF, and school performance are limited, these relations were also examined in Study II.

Further, viewing peer relations as meanings, Study III examined the relations between different conceptualizations of self-esteem (i.e., both global self-evaluations and overestimations of social acceptance compared to peer

evaluations of social acceptance) and aggression. The aim of the study was to examine whether the way children view themselves and their peer relations is associated with their social behavior, that is, in particular, aggression within the peer group and at school.

Finally, gender differences were examined in all the above studies. Study I aimed to examine whether the gender appropriateness hypothesis would apply to symptoms of ADHD, that is, whether girls high on symptoms of ADHD would experience greater peer relation difficulties than equivalent boys insofar as symptoms of ADHD do not fit the female stereotype. In a related vein, Study II examined gender differences in the relations between symptoms of ADHD, EF, and social and school functioning. Study III aimed to examine whether the relation between children's view of self and aggressive behaviors would differ between girls and boys.

## The empirical studies

To enhance readability, only a brief description of the methods and statistics used in the present thesis is presented here. For a detailed description see the enclosed articles at the end of this book.

### Methods

#### Participants

Study I and Study III were based on a sample of twelve-year-old children ( $M = 12$  years and one month,  $SD = 4$  months; 50% girls) living in a mid-sized Swedish university town. Due to differences in the inclusion criteria in each study, 635 children participated in Study I whereas 652 children participated in Study III. Forty-four percent of the participants ( $n = 277$ , 47 % boys) were originally recruited for a larger longitudinal study investigating socio-emotional development in a population sample of children and the remaining participants were these children's current classmates. Participation rate was 94 % for Study I and 97% for Study III. Reasons for attrition were lack of parental consent (40 parents) or missing data in study variables.

Study II included 112 Swedish children (62 girls), who are part of a longitudinal study investigating the development of problem behaviors in children from age 5 to 10. The present sample was defined as those children remaining in the study at age 9½, who had data on the relevant variables, that is, 74 % of the original sample. In this study we included data from ages 8, 8½, and 9½. Reasons for attrition at the various stages of the study were that the family had moved and could not be reached, parents or children declined participation or did not consent to contacts with the child's school, and teacher questionnaires were not returned despite two reminders.

#### Procedure

We obtained teacher ratings of behavioral characteristics (e.g., symptoms of ADHD, aggressive behavior, internalizing problems) in all the three studies and teachers rated children's school functioning in Study II. Parents rated symptoms of ADHD in Study II.

Sociometric nomination questionnaires were administered in group session in the classrooms in all three studies. Prior to the administration of the sociometric nomination questionnaires and directly after they were collected, children were asked not to discuss their answers with their classmates. Children nominated up to three children in the class for each item and were asked to leave the question unanswered if none of their classmates fitted the description. Children could nominate classmates who were absent on the day of the data collection although these data were excluded from the analyses. Children could not nominate themselves.

Self-rating questionnaires were administered individually in studies I and III. To obtain measures of EF in Study II, children were seen individually in the department laboratory.

## Measures

### Peer relations

*Peer acceptance.* Measures of peer acceptance were obtained through sociometric nominations in all three studies according to the procedure based on the Coie and colleagues method (1982), described by Ladd (1999). *Social liking* was measured with one item (i.e., “nominate three children in the class whom you wish to be with”; *positive peer nominations*) and *social dislike* was measured with one item (i.e., “nominate three children in the class whom you do not wish to be with”; *negative peer nominations*). By combining the positive and negative peer nominations children’s *SPS* was calculated in all three studies, but in Study I we also composed measurements of children’s *SIS* and of *peer status* (see Introduction for a description of these measures). In all studies peer nominations were standardized within class and across gender (which also applies to peer nominations of prosocial behavior and aggressive behavior; see further below).

### Behavioral characteristics

*ADHD symptoms.* Teachers (Study I) and teachers and parents (Study II) rated ADHD symptoms on a scale based on the DSM-IV (APA, 1994) diagnostic criteria for ADHD (DuPaul, Power, Anastopoulos, & Reid, 1998). In Study II we composed an aggregated measure of ADHD symptoms as the mean of two summed scale scores, that is, the mean score of parent and teacher ratings of ADHD symptoms. Internal consistency for the scale measured as Cronbach’s alpha was .96 for Study I and .77 for Study II.

*Aggressive behavior.* In Study I and Study III teachers rated aggressive behavior on four items from the Child Behavior Questionnaire (CBQ; Rutter, Tizard, & Whitmore, 1970). Internal consistency was  $\alpha = .86$ . In both studies we also obtained peer nominations of physical aggression (“Nominate three children in the class who get into fights with others”, “Nominate three chil-

dren in the class who kick, push, and hit other children”). In Study I we composed an aggregated measure of aggressive behavior by deriving a mean score from the summed standardized teacher ratings of aggressive behavior and the standardized peer nominations of physical aggression. The correlation between teacher ratings of aggressive behavior and peer nominations of physical aggression was  $r(623) = .62, p < .01$ .

In Study II we obtained peer nominations of physical aggression (“Nominate three children in the class who often get into fights”) and of relational aggression (“Nominate three children in the class who spread rumors about others, “Nominate three children in the class who do not let others engage in games”). For the measure of relational aggression we derived a mean of the two items;  $\alpha = .58$ .

*Internalizing problems.* In Study I teachers rated internalizing problems on the CBQ (Rutter et al., 1970). Internal consistency for the scale was  $\alpha = .80$ .

*Prosocial behavior.* In Study I teachers rated children’s prosocial behavior in the school setting according to the Social Competence Inventory (SCI; Rydell, Hagekull, & Bohlin, 1997). In Study I we composed the measure of prosociality by deriving the mean of the summed scores of teacher ratings of prosocial behavior and of peers’ nominations of prosocial behaviors -see below;  $\alpha = .77$ .

Peer nominations of prosocial behavior were obtained in Studies I and III. In Study I, peers nominated “three children in the class who are helpful and nice to others” and “three children in the class who are good at cooperating”;  $\alpha = .84$ . In Study II children nominated “three children in the class who are nice and helpful to others”.

### **Cognitive functioning**

*Intelligence.* In Study II we assessed *intelligence* (IQ) by using the Block design subtest of the Wechsler Intelligence Scale for Children- 3<sup>rd</sup> edition (WISC-III; Wechsler, 1991). We used the total raw scores on this measure as a control variable in the analyses.

*Executive functioning (EF).* In Study II we measured EF with four different tasks that have been shown to be abnormal on children with ADHD. The selection of EF tasks was based on Barkley’s (1997) hybrid model of ADHD and represented the major components of the model, “inhibitory control”, “non-verbal working memory”, “verbal working memory”, and “reconstitution”, that is, the ability to decompose sequences of events or messages into their parts and manipulate these parts to reconstruct new events or messages. To provide a comprehensive measure of EF we composed an aggregated measure of *EF deficits* (EFD) in the manner of Biederman and colleagues (2004). For each executive functions’ measure we defined a threshold for adequate performance as a score obtained by 75 % of the sample. Performance on each executive functions’ measure was then dummy coded accord-

ing to this threshold as “0” for adequate performance and “1” for poor performance. Finally we composed a continuous measure of EFD ranging from 0 (adequate performance on all executive functions measures) to 4 (poor performance on all executive functions measures), by summing the dummy coded scores of all executive functions measures. Hence, the *higher the score* of EFD *the poorer* the performance. Seven children did not have data on one of the four EF tasks, and these children were coded as having 0 = adequate performance on the task in question, this being the most probable code.

### **Self-perceptions**

*Loneliness and social satisfaction.* To assess children’s perceptions of their peer relations in studies I and III we used sixteen items from the “Loneliness and Social Dissatisfaction Questionnaire for Young Children” (Cassidy & Asher, 1992). In Study I we used the mean score of items as a measure of *loneliness*, whereas in Study III we used the mean score of the *reversed* items as a measure of *social satisfaction*. Internal consistency measures as Cronbach’s alpha was .86.

*Global self-worth.* In Study I and Study III children rated global self-worth using an abbreviated, revised, Swedish version of the Self-perception Profile for Adolescents (SPPA; Harter, 1988). Internal consistency of the scale was  $\alpha = .82$ .

*Behavioral conduct.* Using the abbreviated Swedish version of the SPPA (Harter, 1988), children rated their behavioral conduct in Study I;  $\alpha = .58$ .

*Over- underestimations of social acceptance.* In Study III, to assess over- underestimations of social acceptance, we calculated *discrepancy scores* based on children’s SPS and self-ratings of social satisfaction (see above) for the rejected and average peer status groups only. As recommended by De Los Ryes and Kazdin (2004) discrepancy scores were based on the difference between children’s standardized (within class and across gender) ratings of loneliness and peers’ standardized nominations of peer acceptance (i.e., the SPS). Positive values equaled overestimations of social acceptance relative to peer ratings, whereas negative values equaled underestimations. We conceptualized *disputed self-esteem* as overestimations of social acceptance (i.e., positive discrepancy scores) combined with rejected peer status.

### **School functioning**

In Study II we composed an aggregated measure of *school performance* based on the mean score of teacher ratings of children’s performance in Swedish, Mathematics, and Social sciences;  $\alpha = .87$ . Teachers also reported whether children received any *special education* or not.

## Statistical analyses

To assess overall gender differences in the study variables two-tailed t-tests were conducted (gender was dummy coded in Studies I and III as 0 for boys and 1 for girls and as 0 for girls and 1 for boys in Study II). To assess relations between study variables Pearson's product moment correlation coefficients were calculated. To predict outcome variables from independent variables, one logistic regression analysis (Study I), and hierarchical regression analyses were conducted in which main and interaction effects were examined. Notice that although the word "predict" is used in the interpretation of results, only Study II was longitudinal.

Summary of all measures used in each of the studies.

<p><b>Study I</b>  <b>Behavioral characteristics</b>            ADHD symptoms (teacher ratings)            Aggressive behavior (teacher ratings and peer nominations of physical aggression)            Internalizing problems (teacher ratings)            Prosocial behavior (teacher ratings and peer nominations)</p> <p><b>Self-evaluations</b>            Feelings of loneliness            Global self-worth            Self-perceptions of behavioral conduct</p> <p><b>Peer acceptance/SPS and peer status</b> (peer nominations)</p>	<p><b>Study II</b>  <b>Behavioral characteristics</b>            ADHD symptoms (teacher and parent ratings)            Physical and relational aggression (peer nominations)            Prosocial behavior (peer nominations)</p> <p><b>Executive functioning</b> (laboratory measures)</p> <p><b>School functioning/school performance and special education needs</b> (teacher ratings)</p> <p><b>Peer acceptance/SPS</b> (peer nominations)</p>	<p><b>Study III</b>  <b>Behavioral characteristics</b>            Aggressive behavior (teacher ratings)            Physical aggression (peer nominations)</p> <p><b>Self-evaluations</b>            Global self-worth            Social satisfaction</p> <p><b>Peer acceptance/SPS</b> (peer nominations)</p> <p><b>Discrepancy scores:</b> Standardized difference between self-ratings of social satisfaction and children's Social Preference Score (SPS).</p>
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*Study I: ADHD symptoms and peer relations of children in a community sample: Examining associated problems, self-perceptions, and gender differences*

**Background and aims**

Despite the relatively large amount of evidence indicating that symptoms of ADHD are negatively related to peer acceptance in childhood (e.g., Abikoff et al., 2004; Bagwell et al., 2001), the literature is limited in several ways. First, findings on community based samples are limited. Second, previous studies have often failed to control for associated problems that may account for the negative relations found between symptoms of ADHD and peer acceptance. Third, in spite that peer rejection has been related to a negative view of the self and feelings of loneliness (e.g., Cassidy & Asher, 1992; Ladd & Troop-Gordon, 2003), previous studies have not examined possible interaction effects between symptoms of ADHD and peer acceptance on children's view of self. Finally, previous findings indicate that overt aggression is less tolerated by peers if exhibited by girls than by boys (e.g., Crick, 1997), but whether girls who display other disruptive behaviors such as high levels of ADHD symptoms are rejected by peers to a greater extent compared to male counterparts is not known.

Study I aimed to overcome the above limitations in the literature and examine mainly the following questions: What is the relation between symptoms of ADHD and peer acceptance when associated problems are taken into account? What is the link between symptoms of ADHD, peer acceptance, and children's view of self? Interaction effects between gender and symptoms of ADHD on children's peer acceptance were also examined. We expected, according to the gender appropriateness hypothesis (Kerr et al., 1994), that ADHD symptoms would be more strongly related to peer rejection in girls than in boys.

**Main results**

ADHD symptoms, aggressive behavior, and internalizing problems were all negatively related to peer acceptance;  $-.25 \leq rs \leq -.38, p < .01$ , whereas prosociality was positively related to peer acceptance;  $r = .56, p < .01$ .

Results of a hierarchical regression analysis indicated that gender, symptoms of ADHD, aggressive behavior, internalizing problems, and prosociality all predicted children's SPS (see Table 1). Further, we obtained a significant interaction effect between symptoms of ADHD and gender on children's peer acceptance (i.e., the SPS). Interpretation of the interaction effect indicated that girls' peer acceptance remained constant regardless of the

levels of ADHD symptoms they displayed, whereas, the higher levels of ADHD symptoms boys displayed the more accepted they were by peers.

Table 1<sup>2</sup>

*Results of Hierarchical Multiple Regression Analyses Examining Main and Interaction Effects of Gender, ADHD symptoms, Associated problems, and Prosociality in Children's Peer relations (N=622-635).*

	SPS		Loneliness	
	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$
Step 1	.43**		.11**	
Gender		-.22**		-.03
ADHD		.14*		-.18**
Aggressive behavior		-.27**		.03
Internalizing problems		-.23**		.28**
Prosociality		.51**		-.17**
Step 2	.01		.00	
ADHD				
X Gender		-.08*		-.03

Note: SPS = Social Preference Score; \*  $p < .05$ , \*\*  $p < .01$ .

However, results of a logistic regression analysis examining interaction effects of gender and symptoms of ADHD on peer status group classification (i.e., rejected or average peer status) indicated a significant effect. Peers tolerated symptoms of ADHD more in boys than in girls insofar as average boys' levels of symptoms of ADHD were higher than average girls',  $t = 6.60, p < .01$ .

ADHD symptoms and aggressive behavior were not related to feelings of loneliness;  $r_s \leq .05, ns$ . Results of the hierarchical regression analysis (see Table 1) indicated that the higher levels of ADHD symptoms children displayed, the less feelings of loneliness they reported, whereas aggressive behavior did not predict feelings of loneliness.

Further, symptoms of ADHD were not related to children's global self-worth;  $r = -.07, ns$ , but they were negatively related to children's self-perceptions of behavioral conduct;  $r = -.35, p < .01$ . Peer acceptance was

<sup>2</sup> Note that in Table 1 ADHD symptoms predicted high levels of peer acceptance (i.e., children's SPS) although we obtained a negative correlation between symptoms of ADHD and SPS. Following the procedure described by Cohen and Cohen (1983) we identified two negative suppressor variables, namely prosociality and aggressive behavior. These two variables freed the association between ADHD and SPS from irrelevant variance and altered the relation between ADHD and SPS.

positively related to both global self-worth and self-perceptions of behavioral conduct;  $r_s \geq .18, p < .01$ . However, although results of a hierarchical regression analysis (see Table 2) indicated that both symptoms of ADHD and children's SPS significantly predicted children's global self-worth and self-perceptions of behavioral conduct, we did not obtain an interaction effect between symptoms of ADHD and peer acceptance on the two self-view variables.

Table 2

*Results of Hierarchical Regression Analyses Examining Main and Interaction Effects of Gender, ADHD symptoms, and SPS on children's Self-Perceptions (N=622-635).*

	Global self-worth		Behavioral conduct	
	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$
Step 1	.06**		.13**	
Gender		-.17**		.02
ADHD		-.09*		-.31**
SPS		.14**		.12**
Step 2	.00		.00	
ADHD X SPS		.03		.01

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

### Conclusions

A major finding of Study I was that despite ADHD symptoms being negatively related to peer acceptance, they did not exclusively account for low peer acceptance. Instead, low levels of prosocial behavior and high levels of aggressive behavior and of internalizing problems were also strongly related to peer dislike.

Despite being more disliked by peers, children with high levels of ADHD symptoms did not report more feelings of loneliness. Although children's view of self was predicted by both symptoms of ADHD and by peer acceptance, our findings did not indicate that the relations between self-view and ADHD varied as a function of peer acceptance.

Finally, the findings were in line with the gender appropriateness hypothesis indicating that ADHD symptoms were less tolerated by peers when displayed by girls insofar as average boys' levels of ADHD symptoms were higher than average girls'. Further clarification of how children who display symptoms of ADHD or other disruptive behaviors perceive their peer relations and how they are influenced by peer relation difficulties is needed.

## *Study II: Impact of executive functioning and symptoms of attention deficit hyperactivity disorder on children's peer relations and school performance*

### **Background and aims**

Although main effects of both EF and ADHD symptoms on children's social and academic outcomes have been reported (e.g., Bagwell et al., 2001; Barry et al., 2002; Balchman & Hinshaw, 2002), only limited examination of interaction effects has been conducted. Furthermore, because referral bias can affect outcome (Goodman et al., 1997), findings from studies on clinically referred children with ADHD need to be complemented by studies using community based samples. Finally, because girls have been mostly neglected in the ADHD literature, we need to examine gender differences in the above relations.

Study II aimed to examine the relations between ADHD symptoms, EF, and social and school functioning in a community based sample taking also into account gender differences in the above relations. Using a short-term longitudinal design we examined whether high levels of ADHD symptoms and poor EF (defined as Executive Functioning Deficits; EFD) at the age of 8½ would predict social and academic outcomes in children one year later. To explore possible differential relations between the two ADHD dimensions and outcomes, separate analyses examining the relations between symptoms of hyperactivity/impulsivity and inattention and social and school functioning were conducted.

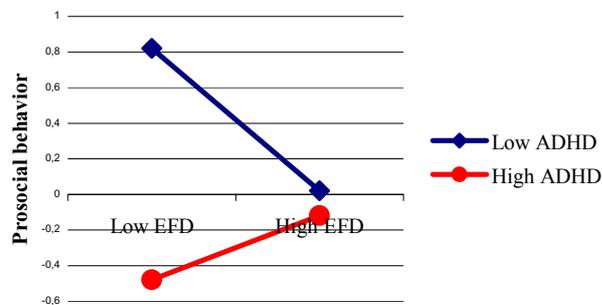
### **Main results**

Symptoms of ADHD were negatively predictive of children's SPS, prosocial behavior, and school performance;  $-.27 \leq rs \leq -.33$ ,  $p < .01$ , and they were positively predictive of peer nominations of physical-;  $r = .53$ ,  $p < .01$ , and of relational aggression;  $r = .30$ ,  $p < .01$ . EFD were negatively predictive of prosocial behavior and of school performance;  $-.26 \leq rs \leq -.27$ ,  $p < .01$ , and they were positively predictive of physical aggression;  $r = .26$ ,  $p < .01$ , and of special education needs;  $r = .36$ ,  $p < .01$ . In the separate analyses of the two ADHD dimensions, both hyperactivity/impulsivity and inattention symptoms predicted outcomes with one exception, that is, only symptoms of inattention were negatively related to school performance,  $r = .41$ ,  $p < .01$ .

We conducted a hierarchical regression analysis to examine main and interaction effects of gender, EFD, and ADHD symptoms, after control for intelligence, on children's peer relations and school functioning. The results indicated that whereas ADHD symptoms independently contributed to the prediction of children's SPS, physical and relational aggression, school performance, and special education, EFD significantly predicted only school performance, and special education. However, we obtained two interaction

effects between EFD and ADHD symptoms regarding peer nominations of prosocial behavior and of physical aggression. As illustrated in Figure 1a, low levels of EFD in combination with low, as opposed to high, levels of ADHD symptoms were associated with a higher number of peer nominations of prosocial behavior. For high levels of EFD peer nominations of prosocial behavior did not differ as a function of levels of ADHD symptoms. As illustrated in Figure 1b, for low levels of EFD, peer nominations of physical aggression did not differ as a function of levels of ADHD symptoms. However, for high levels of EFD, high levels of ADHD symptoms were associated with higher levels of physical aggression compared to low levels of ADHD symptoms.

1a)



1b)

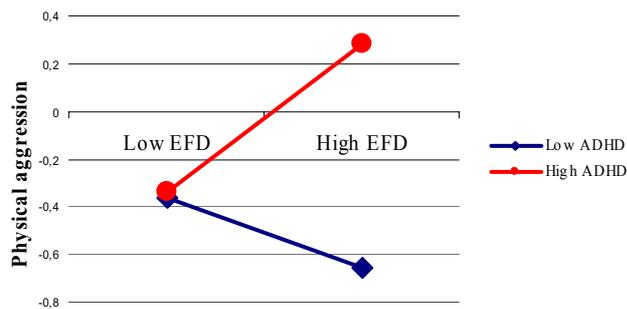


Figure 1. Interaction Effects between ADHD symptoms and Executive functioning deficits (EFD) on Peer nominations of Prosocial behavior (a) and of Physical aggression (b).

Results of analyses examining separate effects of symptoms of hyperactivity/impulsivity and of inattention on outcomes indicated that only symptoms of hyperactivity/impulsivity predicted peer nominations of relational aggression,  $\beta = .31, p < .01$ , whereas only symptoms of inattention predicted school performance,  $\beta = -.34, p < .01$ . The interaction effect between symptoms of ADHD and EFD regarding peer nominations of prosocial behavior described above was mainly carried by symptoms of inattention,  $\beta = .30, p < .01$ , and not by symptoms of hyperactivity/impulsivity,  $\beta = .24, ns$ . The interaction effect between symptoms of ADHD and EFD on peer nominations of physical aggression was mainly carried by symptoms of hyperactivity/impulsivity,  $\beta = .42, p < .01$ , and not by symptoms of inattention,  $\beta = .18, ns$ . Finally, symptoms of inattention and EFD interacted in predicting special education needs,  $\beta = .19, p < .05$ . When symptoms of inattention were low, special education needs did not differ as a function of levels of EFD. However, when symptoms of inattention were high, the higher the level of EFD, the higher the need for special education.

We obtained two interaction effects involving gender, one between EFD and gender with regard to children's SPS and one between ADHD and gender concerning physical aggression. For boys, high, as opposed to low levels of EFD were associated with a slightly higher SPS. For girls, high, as opposed to low levels of EFD, were associated with a lower SPS –see Figure 2. As regards the second interaction effect, for both boys and girls, high levels of ADHD symptoms were associated with higher levels of physical aggression. However, the relation between symptoms of ADHD and peer ratings of physical aggression was more apparent for boys than for girls.

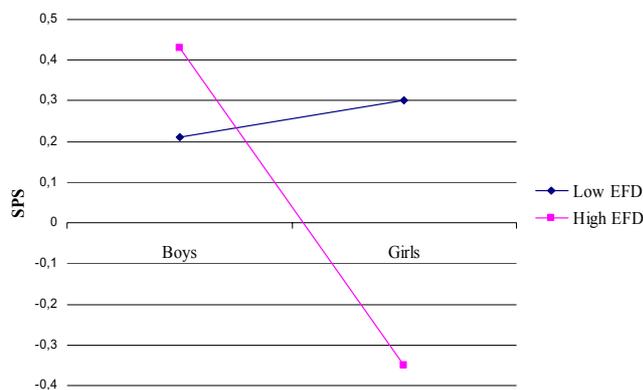


Figure 2. Interaction Effects between Gender and EFD on Children's Social Preference Score (SPS).

## **Conclusions**

A major finding of Study II was that ADHD symptoms independently predicted social as well as school functioning, whereas EFD independently predicted only school functioning. Furthermore, the independent effect of ADHD symptoms on school functioning indicated that ADHD symptoms alone may be good predictors of academic underachievement. However, EFD in interaction with high levels of ADHD symptoms, were important for some aspects of social functioning, that is, children's prosocial- and aggressive behavior. Separate analyses of the two ADHD dimensions revealed that it was mainly high levels of symptoms of inattention in combination with high levels of EFD that predicted low levels of prosocial behaviors, whereas it was high levels of symptoms of hyperactivity/impulsivity in combination with high levels of EFD that predicted high levels of physical aggression.

The results of Study II point to the fruitfulness of investigating independent and interactive long term effects of ADHD symptoms and EFD on adjustment. Further study of the effects of EFD on girls' social functioning is needed insofar as the findings of the present study indicated that EFD may have graver consequences for the peer acceptance of girls' than of boys'.

### *Study III: Can both low and high self-esteem be related to aggression in children?*

#### **Background and aims**

The relation between aggression and self-esteem in children is currently debated in the literature. According to one view, aggression and antisocial behavior are an expression of children's low self-esteem (*low self-esteem hypothesis*; e.g., Donnellan et al., 2005; Fergusson & Horwood, 2002). According to another view, aggression in children stems from a high self-esteem that is threatened or disputed by others (*disputed self-esteem hypothesis*; e.g., Baumeister et al., 2000; Hymel et al., 1993). How can both low and high self-esteem be related to aggression in children?

We identified two possible reasons for the discrepant findings in the literature, namely differences in the conceptualization of self-esteem, that is, global self-evaluations versus domain specific evaluations of social acceptance, and differences in the conceptualization of "high" and "low" self-esteem. Studies supporting the low self-esteem hypothesis have examined global self-evaluations defining a child's self-esteem as being high or low compared to other children's levels of self-esteem. Studies supporting the high self-esteem hypothesis have examined children's self-evaluations of competence compared to observers' ratings of the child's competence. Furthermore, previous findings indicating that low self-esteem is related to aggression have not controlled for effects of internalizing problems although an overall relation between externalizing and internalizing behavior problems has been reported (Weiss & Catron, 1994; Weiss et al., 1998).

Study III aimed to further our understanding of the link between aggression and self-esteem in children by examining the relations between different conceptualizations of self-esteem and aggression. Specifically, we examined the relations between teacher ratings and peer nominations of aggression, and global self-esteem, overestimations of social acceptance, and disputed self-esteem. We also examined gender differences in the above relations insofar as boys have been found to be more physically aggressive than girls (e.g., Crick, 1995).

#### **Main results**

Global self-worth was weakly but negatively related to peer and teacher ratings of aggression;  $-.10 \leq r_s \leq -.11$ ,  $p < .01$ . Discrepancy scores were positively related to peer ratings of physical aggression,  $r = .30$ ,  $p < .01$ , and to teacher ratings of aggressive behavior;  $r = .19$ ,  $p < .01$ . As seen in Table 3, results of a hierarchical regression analysis examining effects of global self-worth on aggression (Model 1), indicated that low levels of global self-worth were predictive of high levels of both peer and teacher ratings of aggression even after control for gender, internalizing problems, and peer acceptance

(i.e., children's SPS). However, results of a second hierarchical regression analysis examining effects of overestimations of social acceptance and of disputed self-esteem on aggression (see Table 3, Model 2), indicated that overestimations of social acceptance (i.e., discrepancy scores) were also predictive of high levels of peer and teacher ratings of aggression after control for gender and peer status.

Table 3

*Summary of Hierarchical Regression Analyses predicting Peer ratings of Physical Aggression and Teacher ratings of Aggressive behavior.*

	Peer ratings Physical aggression		Teacher ratings Aggressive behavior	
	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$
<b>Model 1</b>				
Step 1	.23**		.17**	
Gender		-.29**		-.26**
Internalizing Problems		-.10**		.19**
SPS		-.42**		-.18**
Step 2	.01*		.01*	
Global self-worth		-.07*		-.08**
<b>Step 3</b>				
Gender x Global self-worth	.00	.06	.00	.05
<b>Model 2</b>				
Step 1	.22**		.16**	
Gender		-.33**		-.31**
Peer status		-.17**		-.08**
Step 2	.10**		.10**	
Discrepancy score		.22**		.35**
<b>Step 3</b>				
3a. Discrepancy score x Peer status	.01*	-.12*	.01*	-.11*
3b. Discrepancy score x Gender	.01*	-.10*	.00	.04
3c. Peer status x Gender	.01*	.12*	.00	-.03
<b>Step 4</b>				
Gender x Peer status x Discrepancy score	.00	.09	.00	.07

Note: SPS = Social Preference Score; Peer status = Rejected and Average peer status; \*  $p < .05$ , \*\*  $p < .01$ .

Furthermore, we obtained a significant interaction effect between discrepancy scores and peer status regarding peer and teacher ratings of aggression. As indicated in Figure 3, among children low on discrepancy scores peer and teacher ratings of aggression did not differ as a function of peer status. However, among children high on discrepancy scores, rejected children were rated by both teachers and peers as being more aggressive than average children. Hence, disputed self-esteem was related to both teacher and peer ratings of aggression.

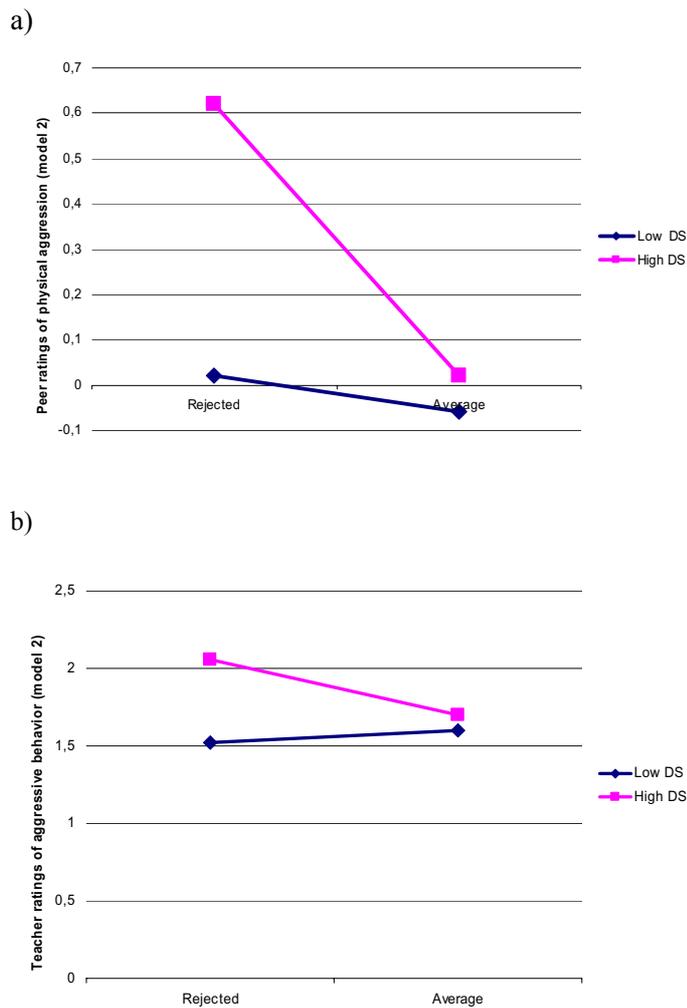


Figure 3. Illustration of Interaction Effects between Discrepancy Scores (DS) and Peer status on Peer ratings of Physical Aggression (a) and Teacher ratings of Aggressive behavior (b).

As regards gender differences, the significant interaction effects obtained (see Table 3) indicated that: a) girls' peer nominations of physical aggression did not differ as a function of discrepancy scores, whereas boys high on discrepancy scores were perceived by peers as more aggressive than boys low on discrepancy scores and b) girls' peer nominations of physical aggression did not differ as a function of peer status (i.e., rejected versus average peer status) whereas rejected boys were perceived by peers as more physically aggressive than average boys. Consequently, overestimations of peer acceptance were related to aggression only among boys, whereas behaviors other than physical aggression appeared to be related to peer rejection among girls.

### **Conclusions**

The major finding of Study III was that depending on how it is conceptualized, the self-esteem of aggressive children may appear as both high and low. Overestimations of social acceptance in general, disputed self-esteem, and low global self-worth were associated with high aggression levels. Further, what the present findings add to the literature is that low levels of global self-worth did not appear to be related to aggression only as a reflection of either poor peer acceptance or of internalizing problems. In terms of gender differences, overestimations of social acceptance appeared particularly troublesome for boys insofar as boys high on discrepancy scores were rated by peers as being more physically aggressive than boys who did not overestimate their social acceptance.

Insofar as there has been limited examination of the effects of both overestimations of social acceptance and of low global self-esteem on aggression, the results of this study must be regarded as preliminary. It should also be noted that low levels of global self-worth were only weakly related to aggression. However, the findings of this study point to the fruitfulness of investigating different conceptualizations of self-esteem to deepen the knowledge of how children's self views relate to social behavior.

## General discussion

The purpose of this chapter is to appraise some of the results that emerged in the present thesis. However, before undertaking this task, it is important to consider that social life is complex and it is influenced by far more factors than any study can fully investigate. Further, empirical findings can be fitted into a number of theoretical frameworks and more than one explanation may be valid, whereas to increase certainty of the interpretation of the findings, they need to hold across several samples and contexts. Hence, without claiming causal associations, this chapter makes suggestions for interpretations and implications of the empirical findings as well as suggestions for further research.

### Peer relations as markers and meanings

In line with viewing peer relations as markers, that is, as indicators of problematic adjustment, the present thesis examined the associations between behavior problems and peer relations. In line with viewing peer relations as meanings, the present thesis examined the particular significance that social understanding, measured as cognitive functioning and as self-evaluations of social functioning, has for children's peer relations.

### Behavioral and cognitive factors associated with poor peer relations

Two of the three studies included in this thesis examined how symptoms of ADHD are related to poor peer relations when either behavior problems associated with ADHD or poor EF are taken into account. An important question was whether results previously reported in studies of clinical populations of children with ADHD would generalize to community based samples. A second question was whether we would obtain additive and/or interactive effects of associated behavior problems and of poor EF on children's peer relations.

The findings of Study I indicated that even non-clinical levels of symptoms of ADHD were associated with poor peer relations. However, low levels of prosocial behavior were more strongly related to peer dislike com-

pared to high levels of ADHD symptoms indicating that lack of prosociality may be a more important correlate of peer dislike than symptoms of ADHD. Taking the above findings one step forward, the findings of Study II confirmed the association between symptoms of ADHD and poor peer acceptance but they also indicated that poor EF as well as poor EF in combination with high levels of ADHD symptoms had important implications for how children's social behavior is perceived by teachers and peers. One way to understand these findings is to consider how symptoms of ADHD and the behavioral manifestations of poor EF may be perceived by others.

For instance, during play activities, hyperactive/impulsive behavior or poor inhibition may be manifested as inability to wait one's turn whereas inattention or poor working memory may be perceived as unwillingness to follow instructions or rules for play activities. Hence, children who display ADHD symptoms and/or have poor EF may appear in the eyes of peers as unwilling to comply with social rules within the peer group. This behavior may also be perceived as lack of prosocial skills which could lead to conflict situations in which children's inability to accurately process social information can contribute to inappropriate responding to others' behavior. Further, a child who is unable to correctly apprehend all complex aspects of social situations, as in the case of poor reconstitution, or a child unable to verbally express feelings and thoughts, as in the case of poor verbal fluency, may misinterpret others' intentions and even choose to resolve conflict situations through aggression.

The separate analyses of the two ADHD dimensions on social outcomes conducted in Study II, give further nuances to the above picture. Hyperactivity/impulsivity symptoms in combination with poor EF were mainly related to peer nominations of aggressive behavior whereas symptoms of inattention in combination with poor EF were mainly related to low levels of prosocial behavior. Main effects of hyperactivity on aggressive behavior and of inattention on poor prosocial have been reported before (e.g., Bellanti & Bierman, 2000), but the above results are all the more interesting because both additive and interactive effects of ADHD symptoms and of poor EF were obtained. Hence, different aspects of ADHD symptoms were associated with different peer relations problems, whereas the association between poor EF and peer relations problems differed depending on how poor EF interacted with the two ADHD dimensions.

However, social competence, defined as "children's adaptive functioning in their social environment" (Rydell et al., 1997; p. 824) has been found to encompass, besides prosociality, behaviors related to "social initiative", that is, children's ability to be sociable with playmates and create peer activities. Hence, one of the reasons why symptoms of ADHD in Study I were positively related to peer acceptance could be that, once associated behavior problems were put aside, children high on hyperactivity were perceived as also being high on social initiative, actively seeking peer activities. Conse-

quently, hyperactive behavior may be adaptive for some, although not all, of children's peer interactions.

Taken together, the findings of Study I and Study II indicate that although ADHD symptoms per se appear to be associated with poor peer acceptance, associated behavior problems such as low levels of prosocial behavior as well as poor EF may exacerbate children's peer problems.

### How are peer relations associated with children's view of self and of their social behavior?

Insofar as peers play an important role in how children define their sense of self, the present thesis examined how children's view of self is associated with behavior problems visible within the peer group such as symptoms of ADHD. Another aim was to examine how children's view of self and of their peer relations is related to aggressive behavior.

In line with previous findings (e.g., Ladd & Troop-Gordon, 2003), the findings of Study I indicated that peer acceptance was related to positive self-evaluations. However, in Study I, although ADHD symptoms were related to peer rejection, they were not positively related to feelings of loneliness and peer acceptance combined with symptoms of ADHD did not predict negative self-evaluations. One interpretation of these findings is that children high on ADHD symptoms overestimated their peer acceptance and did not perceive themselves as rejected by peers.

To further examine the relation between disruptive behaviors and self-evaluations Study III examined the relations between self-evaluations and aggression. The findings indicated that depending on how self-esteem is operationalized, low-, high-, and disputed self-esteem can be related to aggression in children. It should however be noted that low self-esteem, compared to high- or disputed self-esteem was only weakly related to aggression. Nevertheless, the relation between low global self-worth and aggression did not appear to be a reflection of internalizing problems or peer acceptance and it significantly, although weakly, contributed to predicting aggression. How can these findings be interpreted?

In a recent review, Crocker and Park (2004) suggested that the importance of self-esteem lies more in the pursuit of self-esteem, that is, in what people do to achieve a high- and avoid a low self-esteem, than in whether self-esteem is high or low. They further provided evidence suggesting that people actively pursue self-esteem by attempting to validate or prove their abilities in domains in which their self-evaluations are invested. As noted earlier, children's view of self is largely influenced by peer experiences and children invest in peer relations as a source of self-esteem (e.g., Rudolph et al., 2005). In line with the suggestions by Crocker and Park the disputed- and the low self-esteem hypotheses can be interpreted in a similar way. To maintain a

high self-esteem children who have exaggerated self-evaluations may act aggressively towards those who dispute them. In a similar way, to boost their low self-esteem, children who evaluate themselves negatively may act aggressively towards peers as an attempt to regain dominance within the peer group and confirm the social role upon which they base their self-evaluations. A similar mechanism may also apply to the relation between overestimations of social acceptance in general and aggression.

It should however be noted that other possible explanations to why low- or high self-esteem may be related to disruptive behaviors in children have been suggested. Overestimations of social acceptance could for instance be an early sign of narcissism which has also been related to aggression (Campbell, Reeder, Sedikides, & Elliot, 2000; Kernis & Sun, 1994), whereas low self-esteem may be related to aggression though other theoretically relevant variables not assessed in the present thesis such as hostile attribution of intent or other aspects of poor social information processing. Furthermore, consistent with theories of social competence, children who accurately perceive how others view them are better able to modulate their behavior to maximize peer acceptance. Hence, inaccurate, that is, overly positive perceptions of one's social acceptance can be associated with aggression as a reflection of poor social skills. In sum, the findings of the present thesis confirm the importance of positive peer relations for children's view of self and provide evidence that children's way of viewing themselves and their peer relations is associated with their behavior within the peer group.

## What role does gender play in children's peer relations?

Girls and boys in middle childhood have been found to differ not only in how they behave within the peer group, but also in how they perceive the importance of their peer relations for their well-being. A major aim of the present thesis, as concerns the examination of gender differences in peer relations, was to examine how gender inappropriate behavior is associated with poor peer relations.

The findings of studies I and II suggested that symptoms of ADHD and poor EF had graver consequences for girls' than for boys' peer relations. Girls high on ADHD symptoms or EFD were less accepted by peers compared to equivalent boys. As noted earlier, previous findings report that girls are more prosocial and slightly shyer than boys (Else-Quest et al., 2006), whereas overt physical aggression has been found to be more common among boys (e.g., Grotspeter & Crick, 1996). Hence, girls compared to boys, are less expected to display externalizing behavior problems or low levels of prosocial behavior whereas withdrawn/inhibited behavior such as shyness is considered more normative for girls. Considering that ADHD symptoms and the behavioral manifestations of poor EF can be perceived as disruptive, the

findings of this thesis are in line with the gender appropriateness hypothesis. Symptoms of ADHD or poor EF appeared not to fit the cultural stereotype for girls. Apparently, behaviors such as listening when being spoken to, awaiting turn, and behaving prosocially, are more important for girls' than for boys' peer relations.

The finding that poor EF was related to more peer dislike in girls whereas it appeared to be related to more peer liking in boys, raises also the question of how EF may be associated with the development of different ways of thinking about peer relations in the two genders. Executive functioning may affect girls' and boys' perceptions, expectations, and interpretations of their experiences within the peer group in different ways. This, in turn, certainly affects their social interactions initiated either by themselves or by peers. Hence, one interpretation of the above findings could be that poor EF is not as strongly related to working models of peer relations in boys as in girls.

However, it should be noted that in Study I we obtained results not in line with the gender appropriateness hypothesis. After control for associated problems, boys' peer liking increased with higher levels of ADHD symptoms whereas girls' peer liking did not vary as a function of ADHD symptoms displayed. These findings should be interpreted with caution insofar as in actuality few children display only ADHD symptoms and no other associated externalizing or internalizing behavior problems (e.g., Manuzza, Klein, Abikoff, & Moulton, 2004). One interpretation of these findings could be that boys high on ADHD symptoms were also perceived as being high on social initiative which has been associated with high peer acceptance (Rydell et al., 1997). Apparently the behavior of girls high on ADHD symptoms was not perceived by peers in an equivalent way.

Insofar as girls have been found to define their self-view through peer relations to a greater extent than boys and be more preoccupied than boys with issues related to being accepted by the peer group (Maccoby, 1990; Cross & Madson, 1997), poor peer acceptance was expected to be more strongly related to girls' self-view than to boys'. The findings of the present thesis did not confirm this hypothesis. Instead, the results of Study III indicated that disputed self-esteem appeared to be in particular troublesome for boys insofar as boys who overestimated their social acceptance were rated by peers as more physically aggressive than boys who did not. However, because little is known of gender differences in the relation between self-esteem and aggression in children, these results should be considered preliminary and further research on this issue is needed.

Finally, a note should be made regarding gender differences in aggression. At age nine we obtained no gender differences in either physical- or relational aggression and the associations between the two types of aggression and behavioral and cognitive problems were the same for boys and girls (Study II). At age 12, boys were found to be more physically aggressive than girls (Study I and Study III). Possibly, gender differences in types of aggres-

sion change across age although we did not include a measure of relational aggression at age 12 to confirm this hypothesis. Nevertheless, previous studies examining gender differences in the prevalence and continuity of disruptive behaviors including aggression and symptoms of ODD or CD in middle childhood and adolescence, do not show a clear pattern of results. Some studies report a lower prevalence and continuity of disruptive behaviors in girls compared to boys (e.g., Bardone et al., 1998; Cohen et al., 1993; Loeber & Keenan, 1994). Other findings indicate no gender differences in oppositional and defiant behaviors (Lahey et al., 2000) whereas the stability of disruptive behaviors during childhood and adolescence has been found to be in some cases higher for girls (Keenan et al., 1999; Loeber, Burke, Lahey, Winters, & Zera, 2000). Hence, longitudinal studies examining gender differences in the development and stability of different types of aggression during childhood are in great need.

## Clinical implications

The ability to initiate and maintain positive peer relations in childhood is an important developmental achievement. However, few children are referred to clinics because of peer relation problems although, depending on age, 30% to 70% of clinically referred children have serious problems with their peer relations (Parker et al., 1995). The evidence at hand indicates that poor peer relations are significant markers of poor adjustment and should be considered as causes for clinical referral.

The most common treatment for ADHD is pharmacological (Mash & Barkley, 2006). Pharmacological treatments mainly aim to ameliorate the behavioral and cognitive dysfunctions in ADHD and, as indicated by the findings of the present thesis, this may not necessarily improve these children's social functioning. Unless children are able to engage in prosocial behaviors their chances of functioning adequately within the peer group are largely diminished. Hence, improving children's ability to share, cooperate, and act helpfully towards peers, is an important precursor for ADHD children's social development.

An implication of the findings on the relation between overestimations of social acceptance and aggression is that lack of awareness of peer dislike could make children be less motivated to attempt to correct their own behavior. This may in turn lead them to repeat the maladaptive interactions that originally may have caused them to be disliked by peers. However, whether treatment aiming at reducing disruptive behaviors and improving children's peer relations should focus either on improving children's awareness of their social standing or on improving their social skills to enhance their peer acceptance and decrease their aggressive behavior, is unclear.

As regards exaggerated self-esteem, previous studies have shown that once positive feedback is provided to children with ADHD who overestimate their social acceptance, they tend to relax their self-protective bolstering and give more accurate evaluations of their social acceptance (Diener & Milich, 1997; Ohan & Johnston, 2002). These findings indicate that environmental factors can be altered to adjust children's self-perceptions to more realistic levels which may in turn motivate them to alter their social behaviors. On the other hand, as regards low self-esteem, there exists to date little evidence indicating that the things children do to increase their self-esteem and thereby their perceived inclusion in the peer group actually increases their popularity or decreases their levels of aggression. On the contrary, the present and previous findings indicate that, possibly, children's attempts to boost or preserve their self-esteem are related to aggression. Hence, insofar as aggressive children may have both a low global self-esteem and overestimate their competencies, the most promising way to address aggression in children appears to be improving children's social skills and not their self-esteem.

## Strengths and limitations

Certain strengths and limitations of the present thesis warrant mention. Major strengths include the examination of community samples so that results can be generalized to the broader population of children displaying disruptive behaviors, the assessment of a broad aspect of behavioral problems common for children in middle childhood, and the examination of gender differences which have been neglected in the literature. Further, the use of multiple informants and multiple methods to obtain measures of children's behavior and cognitive functioning increased the reliability of the findings.

Several limitations should also be noted, especially because they suggest directions for future research. First, in Studies I and III relational aggression, which is considered more common among girls, was not assessed although gender differences in the relations between peer acceptance and aggression were examined. Second, the use of an aggregated EFD measure in Study II may have seemed quite arbitrary although it allowed comparisons with previous studies and provided a comprehensive measure of EF. However, a more broad examination of EF is warranted in future studies insofar as we assessed few executive functions and each of them was assessed with only one measure. Third, only peer relations within the classroom were assessed in the studies although children, especially those who are aggressive and/or rejected by peers, may also affiliate with children outside the classroom. However, in a study of a Swedish sample of children aged 10 to 18, it was found that the majority of children reported that the peers they affiliated with most of the time were peers who they met at school and with whom they

spent time together both at school and during their free time (Kiesner, Kerr, & Stattin, 2004). Although classmates appear to be the most important peers for children in middle childhood, future studies need to assess children's peer relations outside the classroom as well.

## Concluding remarks and suggestions for further study

In sum, the present findings indicate that peer relations are important markers of adjustment through their associations with disruptive behaviors and with poor cognitive functioning. Children's self-view appears to be associated with their peer relations, and also, with their behavior within the peer group insofar as low global self-evaluations and overestimations of social acceptance were related to aggression towards peers. Finally, as regards gender differences, the findings of this thesis indicated that symptoms of ADHD and poor EF may be in particular troublesome for girls' peer relations, possibly because they are perceived as gender inappropriate characteristics. The present findings give however rise to new questions which future studies need to address.

First, apart from examining behaviors and cognitions associated with poor peer relations, future studies need to address the role of emotions within specific social contexts for children's social behavior. Specific emotions may underlie differing behavioral propensities such as seeking contact with or avoiding peers. Children's ability to control or regulate powerful emotions such as extreme anger or sadness (i.e., emotional regulation), and also their ability to control behaviors that may be motivated by these emotions such as aggression, impulsiveness, or withdrawal, certainly play an important role in the process of relationship formation and maintenance. It is therefore necessary to estimate the extent to which emotion accounts for the variation of children's social competence. Children's ability to express their own emotions and accurately interpret their peers' emotions is certainly also strongly related to the development of their social competence.

Second, because poor EF has been related to poor social functioning (e.g., Hughes et al., 1998; 2000; Wilson, 2003), future studies need to examine more specifically which executive functions are related to which stages of social information processing. In the present thesis, according to the social information processing model (Dodge & Feldman, 1990), poor EF was assumed to be related to deficient encoding or deficient representation of social information. However, poor EF is also likely to be involved in other stages of the social information processing model insofar as both regulatory and reactive systems are involved in balancing social behavior. For instance, poor behavioral inhibition is likely to be associated with poor ability to execute optimal responses (i.e., step 6) insofar as it is associated with poor ability to inhibit a dominant response in order to perform a subdominant re-

sponse. Poor ability to evaluate response alternatives and choose an optimal response (i.e., step 5) is likely to be associated with poor planning abilities or inability to shift attention from evaluating one response to evaluating an alternative response. Hence, studies associating EF with the different stages of social information processing are in need.

Recent findings indicate that working memory, which is an important component of EF and often deficient in children with ADHD, can be trained and improved, which in turn appears to have a positive impact on children's behavior (e.g., decrease in ADHD symptoms severity; Klingberg et al., 2005). Although it is still unclear which executive functions may be associated with poor peer relations, a complimentary question that future intervention studies need to examine is whether improving certain executive functions has a positive effect on children's peer relations.

Third, although the findings of Study III indicate that it is possible to reconcile the opposing theories regarding the association between self-esteem and aggression in the literature, the question that still remains unanswered is: how important is self-esteem? After all, in the present thesis, self-esteem, compared to prosociality and peer acceptance, did not predict much of children's behavior. As Crocker and Park (2004) have argued, future studies need to shift focus from level of self-esteem to the pursuit of self-esteem.

Fourth, what future studies need to answer is for which individual children do poor peer relations have negative consequences later on in life. Not all children experiencing poor peer relations during childhood develop psychosocial problems in adulthood (Ladd, 2005). Employing person oriented analyses and longitudinal designs which examine which combinations of children's behavioral, cognitive, and emotional characteristics are related to poor peer relations and social adjustment may cast some light on this matter.

Fifth, current evidence supports the conclusion that girls and boys grow up in distinct peer cultures and develop different peer interaction styles consistent with their gender. An implication of these findings is that girls and boys develop different ways of thinking about their peer relations which in turn may affect their perceptions, expectations, and interpretations of their peer relations as well as their responses to social success or failure. Insofar as knowledge about children's peer relations remains skewed towards boys, much remains to be learned about which behaviors promote positive peer relations for the two genders and whether girls and boys are differentially affected by adverse peer experiences.

Finally, for the peer relations literature to move forward, cross-disciplinary studies that encompass domains such as emotionality, brain neurology, gender, and culture are in need. Or, in other words, more complex theoretical frameworks that take into account not only parts of children's social interactions but entail more holistic approaches of human functioning are needed to enable us understand children's peer relations.



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## ADHD symptoms and peer relations of children in a community sample: Examining associated problems, self-perceptions, and gender differences

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This study examined children's peer relations in relation to gender, symptoms of attention-deficit/hyperactivity disorder (ADHD), associated behaviour problems, prosociality, and self-perceptions, in a community sample. Six hundred and thirty-five 12-year-old children (314 girls) provided peer nominations and rated feelings of loneliness and self-perceptions regarding global self-worth and behavioural conduct. We obtained teacher ratings of ADHD symptoms, conduct and internalising problems, and prosociality. ADHD symptoms, conduct problems, internalising problems, and low levels of prosociality were all related to higher levels of peer dislike. Despite ADHD symptoms being related to more peer dislike, children with high levels of ADHD symptoms did not report more feelings of loneliness. The self-perceptions of children with high levels of ADHD were not related to peer dislike. Although high levels of ADHD symptoms were not related to peer dislike in girls, peers tolerated higher levels of ADHD symptoms among boys than among girls, providing support for the "gender appropriateness hypothesis" regarding the impact and influence of ADHD symptomatology upon the peer relations of children within a community sample.

### Introduction

A child's ability to make friends and to function successfully in a peer group are viewed as important indicators of social competence and are robust predictors of adjustment later in life. Peer relation difficulties such as peer rejection have been found to be fairly stable and to predict future social maladjustment, conduct problems, and delinquency (Coie & Dodge, 1983; Kupersmidt, Coie, & Dodge, 1990; Miller-Johnson, Coie, Maumary-Gremaud, Bierman, & the Conduct Problems Prevention Research Group, 2002). Rejected children tend to have unfavourable views of themselves and experience greater feelings of loneliness and social dissatisfaction compared with nonrejected children (Cassidy & Asher, 1992; Ladd & Troop-Gordon, 2003). Children with attention-deficit/hyperactivity disorder (ADHD) are often rejected by peers and therefore their poor peer relations have been a major concern of investigators.

ADHD is one of the most common disruptive behaviour disorders of childhood, affecting mostly boys. Prevalence estimates vary from 2–14% of school-aged children, (Gaub & Carlson, 1997; Jensen, et al., 1995; Kadesjö & Gillberg, 2001; Nolan, Volpe, Gadow, & Sprafkin, 1999). Children with ADHD show chronic difficulties in the ability to sustain attention in tasks or play activities, to wait for their turn, and to sit still and learn at school. ADHD is a heterogenic disorder and children may display different combinations of ADHD symptoms, psychiatric comorbidity, and associated behaviour problems (e.g., Barkley, 1998; Mannuzza, Klein, Abikoff, &

Moulton, 2004; Scahill et al., 1999). Impairments in the peer relations of children with ADHD include peer rejection or neglect and poor friendship stability (Abikoff et al., 2004; Bagwell, Molina, Pelham, & Hoza, 2001; Blachman & Hinshaw, 2002; Greene, Biederman, Faraone, Sienna, & Garcia-Jetton, 1997; Hinshaw & Melnick, 1995; Maedgen & Carlson, 2000; Sukhodolsky et al., 2004). Moreover, children with ADHD have been found to be more likely to affiliate with deviant peers, which has been identified as a risk factor for substance use in adolescence (Marshall, Molina, & Pelham, 2003). Current treatment programmes for ADHD (both psychological and pharmacological) seem to have only a limited impact on the peer relation difficulties of children with ADHD (Abikoff et al., 2004; Arnold et al., 2004; Bagwell et al., 2001; Buhmester, Whalen, Henker, MacDonald, & Hinshaw, 1992; Pelham et al., 2001). However, recently it has been proposed that interventions targeting the dyadic friendships of children with ADHD may be more effective in improving their peer relationships (Hoza, Mrug, Pelham, Greiner, & Gnagy, 2003). Although several studies examining the link between ADHD and peer relations exist, many questions remain unanswered.

One unanswered question concerns the effects of gender in the peer relations of children with ADHD. ADHD is more common among boys than girls; reported sex ratios range from 3:1 in epidemiological studies to 6:1 in clinic-referred samples (Gaub & Carlson, 1997; Nolan et al., 1999). Girls with ADHD have been found to be less affected in terms of symptom severity and psychiatric comorbidity (Biederman et al., 2002;

Gershon, 2002; Silverthorn, Frick, Kuper, & Ott, 1996). Thus, the literature on ADHD has focused mostly on boys and there is limited information on the peer relation difficulties of ADHD girls. So far, studies of girls' peer relations report that girls with ADHD, compared with control girls, anticipate more negative peer responses (Thurber, Heller, & Hinshaw, 2002) and they display poor friendship stability and higher levels of conflict and relational aggression (Blachman & Hinshaw, 2002). In addition, girls with disruptive disorders, including ADHD, have been found to receive higher peer dislike scores from peers, compared with their male counterparts (Carlson, Tamm, & Gaub, 1997). Although the existing studies yield important information about the peer relations of girls with ADHD, there is only limited information about the underlying mechanisms of potential gender differences in the peer relations of children with ADHD.

According to the gender appropriateness hypothesis (Kerr, Lambert, Stattin, & Klackenberg-Larsson, 1994), culturally defined stereotypes of masculinity and femininity set the rules for how boys and girls are expected to behave. When children do not comply with these cultural rules their behaviour is perceived as gender inappropriate and is less well tolerated. Overt aggression, for instance, is a behaviour that peers may tolerate better in boys. Girls who are overtly aggressive are more rejected by peers than boys that engage in the same kind of behaviour (Crick, 1997; Keenan, Loeber, & Greene, 1999). Hyperactivity may be another behaviour that does not fit the feminine stereotype, making girls with ADHD stand out—particularly when compared to same-sex peers—and to experience greater difficulties in peer relations compared with male counterparts. Also, for the same reasons, aggression could be less well tolerated by peers in girls with ADHD than in boys with ADHD. Although studies examining gender differences in the peer relations of children with ADHD already exist (e.g., Carlson et al., 1997; Greene et al., 2001; Hinshaw, 2002), to our knowledge no studies have so far examined the gender appropriateness hypothesis in relation to ADHD and peer relations.

Another unanswered question regards the application of results of studies on clinically referred children with ADHD to the general population of girls with ADHD. Considering that girls are more likely than boys to display the inattentive type of ADHD rather than the hyperactive/impulsive type of ADHD, they may be significantly under-diagnosed and under-represented in these studies (Barkley, 1998). It has been proposed that ADHD should be regarded as a continuum, with clinical cases representing the upper end (El-Sayed, Larsson, Persson, Santosh, & Rydelius, 2003; Levy, Hay, McStephen, Wood, & Waldman, 1997; Schrimsher, Billingsley, Jackson, & Moore, 2002). Hence, using community-based samples and considering ADHD as a continuum, one could ensure more reliable gender comparisons. Besides, when studying the peer relation difficulties of children with ADHD longitudinally, peer rejection forecasted social rejection in adolescence regardless of whether or not ADHD symptoms continued with sufficient intensity to warrant diagnosis (Bagwell et al., 2001). These results indicate that the negative outcomes of ADHD symptomatology may be present even when diagnostic criteria are not fulfilled and that subthreshold ADHD can be as disabling as diagnosed ADHD.

There is a growing consensus that the presence of associated behaviour problems and internalising symptoms worsen the peer relations of children with ADHD (Greene et

al., 2001; Hinshaw, 2002; Zalecki & Hinshaw, 2004). Low cognitive ability and inattention have been found to predict poor peer relations from kindergarten to first grade, whereas in the same study, behaviour problems partially mediated the relation between inattention and peer dislike (Bellanti & Bierman, 2000). However, investigators have not fully examined how prosocial behaviour (i.e., the child's ability to engage in positive social interactions; Rydell, Hagekull, & Bohlin, 1997) may be linked to the peer relations of children with ADHD. It is well established in the literature that low levels of prosocial behaviour as well as high levels of aggression are associated with rejected peer status (for a review see Newcomb, Bukowski, & Pattee, 1993), whereas high rates of prosocial behaviour in children are linked to future social adjustment (Crick, 1996). In addition, poor peer relations, indicating low social skills, have been found to be related to poor social problem solving and to social information deficits in children with ADHD (Milch-Reich, Campbell, Pelham, Connelly, & Geva, 1999). Further, boys with ADHD with poor social skills have been found to be more likely to develop conduct disorder (CD) and substance use disorders in adolescence (Greene et al., 1997). Again, not much information exists on the impact of prosocial behaviour upon the peer relations of girls with ADHD, but low levels of prosocial behaviour in childhood has been found to predict CD in adolescent girls (Côté, Tremblay, Nagin, Zoccolillo, & Vitaro, 2002). Thus, prosocial behaviour may be a significant predictor of future social and emotional adjustment for both girls and boys with ADHD.

Last, to understand children's social functioning one must understand not only the child's social experiences, but also their interpretations of those experiences. Although it is well known that peer rejection leads to feelings of loneliness among children in general, not much is known about how negative social experiences affect the self-perceptions of children with ADHD. A person's self-perceptions are based on how others view them, and this has a direct impact on one's global regard for the self (Harter, 1988). On the one hand, children with ADHD have been found to think poorly of themselves and display low self-esteem and negative self-perceptions (e.g., Klassen, Miller, & Fine, 2004; Slomkowski, Klein, & Mannuzza, 1995; Treuting & Hinshaw, 2001). On the other hand, children with ADHD tend to overestimate their social performance and social acceptance compared to peer evaluations (e.g., Hoza et al., 2004; Ohan & Johnston, 2002). Thus, it is unclear how ADHD symptoms affect the self-perceptions of children when they are disliked by peers and whether children with ADHD are aware of how peers view them.

In sum, the literature on gender differences in the peer relations of children with ADHD is both limited and inconsistent. It is unclear how ADHD symptoms, associated behaviour problems, and low levels of prosocial behaviour affect the peer relations of boys and girls. Studies of ADHD on community-based samples in which children display the full range of symptoms are needed. Further, it is unclear whether children with ADHD are aware of how peers view them and whether the awareness of being disliked by peers is related to poor self-perceptions.

Apart from the issues already mentioned, there are also some methodological flaws of previous studies that need to be addressed. First, studies using samples of wide age range are difficult to interpret (e.g., 6–13 years in the study of Silverthorn

et al., 1996; 6–17 in the study of Biederman et al., 2002). From longitudinal studies of boys with ADHD it seems that hyperactivity/impulsivity symptoms tend to decline with age whereas inattention problems more often remain (Hart, Lahey, Loeber, Applegate, & Frick, 1995; Lahey et al., 1994; Nolan, et al., 1999). Although hyperactivity tends to increase as children enter elementary school, it gradually appears to decline after 2 years (Brendgen, Vitaro, Bukowski, Doyle, & Markiewicz, 2001). In addition, aggression, oppositionality, and hyperactivity have been found to decrease among boys from age 6 through age 12 years (Nagin & Tremblay, 1999), and in both girls and boys, antisocial behaviour has been found to decrease from age 6 through age 12 (Brendgen et al., 2001). When samples have been of wide age range and a proportion of children have already proceeded to adolescence, while others are still in middle childhood, results are difficult to interpret given that children were probably displaying different levels of ADHD symptoms. The burden of associated problems also differs according to age. After the age of 9 years, for example, girls with ADHD are more likely than younger ADHD girls to display higher levels of internalising problems (Kato, Nichols, Kerivan, & Huffman, 2001). These results stress the importance of studying ADHD in age-homogenous samples since the determinants of peer relations may be different for children of different ages.

Second, the need to take into account developmental aspects brings about another methodological problem, that of how to assess the peer relations of children reliably. Most studies assessing the social functioning of children with ADHD have not included sociometric ratings (e.g., Bagwell et al., 2001; Biederman et al., 2002; Greene et al., 2001). As children grow older and spend less time under the supervision of adults, teachers and parents may not be valid reporters of children's social relations. Peer nominations are a valid way of assessing peer relations since the actors themselves are asked to evaluate the behaviour and likeability of their social partners. In addition, social preference, when based on peer nominations, has been found to be relatively stable through elementary school (Brendgen et al., 2001).

### This study

We aimed to examine the relation between ADHD symptoms and peer relations of children considering associated problems and prosociality as potential influencing factors. We aimed to overcome the limitations of previous studies by first examining gender differences in an age-homogenous community-based sample, which would prevent moderating the effects of age. We chose to study preadolescents for two reasons: (1) because in the beginning of adolescence the ability to make and keep friends becomes highly salient (Harter, 1988), and (2) because we expected that by this age, the behavioural problems would be of a persistent character. Almost half of the children who display ADHD symptoms in the pre- and early elementary school years outgrow these problems in middle childhood (Barkley, 1998). Second, by including measures of prosociality we aimed to examine the effects of factors not previously studied, at least not in a community-based sample. Third, by using peer relation measures (i.e., peer nominations), self-reports, and composite measures from teacher and peer ratings, we aimed to enhance the validity of measures. More specifically, we aimed to examine (1) how the

results of previous studies on the peer relation difficulties of clinically referred children with ADHD would hold for a community-based sample, (2) how ADHD symptoms, associated problems, and prosociality are related to children's peer relations and their perceptions of their peer relations, (3) whether we could find evidence for the gender appropriateness hypothesis, expecting girls to have greater peer relation difficulties compared with male counterparts on the grounds that their ADHD symptoms would be less well tolerated by peers, and (4) how ADHD symptoms and peer dislike are related to children's self-perceptions, and whether peer dislike is related to self-perceptions regardless of levels of ADHD symptoms.

## Method

### Participants

This study included 635 children aged 12 years ( $M = 12$  years 1 month,  $SD = 4$  months; 50% girls) living in a mid-sized Swedish university town. Of the participants, 44% ( $n = 277$ , 47% boys) were originally recruited for a larger longitudinal study investigating socio-emotional development in a population sample of children. At age 7–8 years, ( $M = 7$  years 6 months,  $SD = 3$  months) we recruited 526 children, that is, 40% of the town's 1st-grade pupils enrolled in 37 school classes. Thirteen more parents were approached but withheld permission; thus, the participation rate was 97.5%. We selected the school classes so that all the town's school districts would be represented (i.e., districts covering urban and suburban areas and predominantly working-class as well as predominantly middle-class districts). At age 12 years, 410 children participated in a follow-up. The remaining children had moved from the area and could not be reached and a few parents did not grant permission to participate. There were no differences at the start of the study between the children who remained and those who dropped out with regard to gender,  $\chi^2(1, 526) = 3.77$ , *ns*, externalising or internalising problems, attention problems, or prosocial behaviour,  $ts < 1.15$ , *ns*. Of the 410 children, we included in this study the 277 who had complete data from all three sources with regard to the variables of interest; i.e., had at least 80% of the items of each measure of teacher, peer, and self-ratings. The remaining children of the present sample were these children's current classmates who also had complete data according to the same principles of inclusion as for the 410 children who participated in the follow-up ( $n = 358$ , 54% boys). The children in the longitudinal study had changed classes since Grade 1, and new children had joined the original classes. Since the assessment of peer relations required data from classmates, we decided to include all new children in the measurements. In all, we approached 675 parents but 40 withheld permission for their children to participate; thus, the participation rate was 94%. There was no significant gender difference between the children recruited in 1st and in 6th grade,  $\chi^2(1, 635) = 3.37$ , *ns*. The participants attended 23 different schools (30 different school classes), again representing all the town's school districts.

### Procedure

After consent from parents, we collected teacher ratings, self-reports, and sociometric nominations during the spring

semester of Grade six. Teachers received, depending on how many ratings they provided, a book-token worth at least €15 (for rating 10 to 15 children) to a maximum of €60 (for providing ratings for more than 30 children).

Either the second author or the school's psychologist, who was trained in the procedure, administered self-reports and sociometric nomination questionnaires in the classrooms. They informed the children that participation was voluntary and that all data were strictly confidential. Sociometric nominations and self-reports did not differ according to who administered the questionnaires,  $t_s < 0.73$ , *ns*.

## Measures

### DEPENDENT VARIABLES

**Social preference.** We studied children's peer relations by using a peer nominations questionnaire consisting of seven items, and followed the procedure described by Ladd (1999). We measured social liking with one item ("nominate three children in the class who you wish to be with"), and one item measured social disliking ("nominate three children in the class who you do not wish to be with"). We standardised items across gender within each class. We derived a *social preference score* (SPS) by subtracting the number of nominations on the social disliking item from the number of nominations on the social liking item. Thus, children that received many negative nominations had either a low SPS or a negative one. We also derived a *social impact* (SI) score by summing the positive and negative nominations. We used SI to compose the measurement of peer status (see further below). Peer nominations were collected for 635 children. SPS was in general used as a dependent variable except for the case of examining how peer dislike was related to children's self-perceptions (see further below: Data analytic plan).

**Peer status.** Based on children's answers on the peer nominations questionnaire we composed a measurement of *peer status* and divided children into peer status groups according to the Coie and Dodge (1983) procedure. We chose the Coie and Dodge taxonomic procedure mainly because, (1) we wanted to access active peer rejection and not just obtain a measure of popularity/unpopularity, and (2) peer rejection measured by this procedure has been found to be fairly stable (e.g., Kupersmidt et al., 1990; Miller-Johnson et al., 2002). The five peer status groups were the following: (1) *popular*, that is, children who received a SPS greater than 1.0, and received a peer liking score greater than 0 and also 0 peer disliking scores; (2) *rejected*, that is, children who received a SPS less than -1.0 and received a peer liking score less than 0, and a peer disliking score greater than 0; (3) *neglected*, that is, children who received a SI score less than -1.0 and received a peer liking score less than 0, and a peer disliking score less than 0; (4) *controversial*, that is, children who received a SI score greater than 1.0 and received a peer liking score greater than 0, and a peer disliking score greater than 0; and (5) *average* children, who received a SPS between -0.5 and 0.5 and a SI score between -0.5 and 0.5. This last group also included children not otherwise classified.

**Loneliness.** To assess children's perceptions of their peer relations we used 16 items from the 'Loneliness and Social Dissatisfaction Questionnaire for Young Children' (Cassidy &

Asher, 1992). We chose the items so that they would provide a separate measure of *loneliness* (e.g. "It is easy for me to make new friends at school"—reversed, "I feel alone at school"). The response format was from 1 = does not apply at all, to 4 = applies very well,  $\alpha = .86$ . A total of 630 children provided reports of loneliness.

**Self-perceptions.** Children rated self-perceptions using an abbreviated, revised, Swedish version of the Self-perception Profile for Adolescents (SPPA; Harter, 1988). Ratings ranged from 1 = *does not apply at all*, to 4 = *applies very well*. Children rated *global self-worth* (5 items; e.g., "I am happy with myself most of the time"; "I like the person I am";  $\alpha = .82$ ), and *behavioral conduct* (5 items; e.g., "I usually act the way I am supposed to"; "I usually do the right thing";  $\alpha = .58$ ).

### INDEPENDENT VARIABLES

**Gender.** Gender was dummy coded as 0 for boys and 1 for girls.

**ADHD symptoms.** Teachers rated ADHD symptoms on a scale based on the DSM-IV (American Psychiatric Association, 1994) diagnostic criteria for ADHD (DuPaul, Power, Anastopoulos, & Reid, 1998). The scale contains 18 items measuring inattention (9 items; e.g., "Has difficulty sustaining attention in tasks or play activities"), hyperactivity (6 items; e.g., "Is on the go or acts as if driven by a motor"), and impulsivity (3 items; e.g., "Blurts out answers before questions have been completed"). In this study ratings were made on a scale ranging from 0 to 2, where, 0 = *symptom never present*, 1 = *symptom sometimes present*, and 2 = *symptom present*. Internal consistency, measured as Cronbach's alpha, was .96. We instructed teachers to provide ratings based on the child's overall behaviour during the past academic year.

**Aggressive behaviour.** We composed the measure of *aggressive behaviour* by aggregating the standardised scores of teacher-rated aggressive behaviour and the standardised scores of peers' nominations for aggressive behaviours from the peer nominations questionnaire ( $\alpha = .81$ ).

Teachers rated aggressive behaviour on the Child Behavior Questionnaire (CBQ; Rutter, Tizard, & Whitmore, 1970). Ratings ranged from 1 = *does not apply at all*, to 5 = *applies very well*. Aggressive behaviour was measured with four items ("Frequently fights with other children"; "Irritable, is quick to fly off the handle"; "Bullies other children"; "Often destroys other's belongings";  $\alpha = .86$ ). For aggressive behaviours, peers nominated "three children in the class who get into fights with others", and "three children in the class who kick, push, and hit other children";  $\alpha = .79$ . The correlation between teachers' and peers' ratings of children's aggressive behaviour was  $r(623) = .62$ ,  $p < .01$ .

**Internalising problems.** Teachers rated *internalising problems* on the Child Behavior Questionnaire (CBQ; Rutter et al., 1970). Ratings ranged from 1 = *does not apply at all*, to 5 = *applies very well*. Ratings of internalising problems were collected for 622 children. Internalising problems were measured with five items (e.g., "Often worried"; "Often appears miserable";  $\alpha = .80$ ).

**Prosociality.** We composed the measure of prosociality by deriving the mean score of teacher-rated prosocial behaviour

and the mean score of peers' nominations of prosocial behaviours ( $\alpha = .77$ ).

Teachers rated children's *prosocial behaviour* in the school setting according to the Social Competence Inventory (SCI; Rydell et al., 1997). The SCI has been derived through factor analyses and it has been validated against observations and peer ratings in a Swedish sample (Rydell et al., 1997). The SCI contains two subscales; the Prosocial Orientation Scale (POS) and the Social Initiative Scale (SIS). In this study we used only the POS, as the social initiative of children was not included in our research questions and we did not consider social initiative to be a problematic behaviour for children with high levels of ADHD symptoms. Ratings ranged from 1 = *does not apply at all* to 5 = *applies very well*. The POS includes 17 items ( $\alpha = .97$ ), and measures the child's ability to engage in positive social interactions (e.g., "Has capacity for generosity towards peers," "Has capacity to sympathise with peers"). In four other samples of Swedish schoolchildren, the average mean for prosocial behaviour was 3.46 and the average standard deviation was 0.75 (Rydell, Hagekull, & Bohlin, 2000, 2004). In the present sample the average mean for prosocial behaviour was 3.40 and the average standard deviation was 0.96.

For prosocial behaviours, peers nominated "three children in the class who are helpful and nice to others" and "three children in the class who are good at cooperating";  $\alpha = .84$ . Children's nominations of prosocial behaviours and teacher ratings of prosocial behaviours correlated significantly;  $r_s \geq .44$ ,  $p < .01$ .

#### SCALE CONSTRUCTION.

We constructed the ADHD symptom scale by summing the scores for individual items. All the other scales were constructed as the mean score of items.

#### DATA ANALYTIC PLAN

*Preliminary analyses.* We conducted a multivariate analysis of variance (MANOVA) to assess overall gender differences in symptoms of ADHD, peer relations, associated problems, and self-perceptions, followed by analyses of variance (ANOVAs) in case the MANOVA was significant.

*Main analyses.* First, we used Pearson's product-moment correlation coefficients to study the relation between all the study variables. To further examine our research questions we conducted a series of regression analyses examining main and interaction effects. In the case of a significant interaction effect we followed the procedure described by Cohen and Cohen (1983) to interpret the findings. Predictor variables were all centred before entering the regression analyses.

To examine how ADHD symptoms, associated problems, and prosociality were related to children's peer relations and their perceptions of their peer relations we conducted two hierarchical regression analyses using SPS and feelings of loneliness as dependent variables. In the first step we entered gender, ADHD symptoms, prosociality, and associated problems as predictor variables. In the second step, to examine the gender appropriateness hypothesis, we entered the interaction between ADHD symptoms and gender as a predictor variable. We further examined the gender appropriateness hypothesis by conducting a logistic regression analysis to determine whether there were gender differences in peer status classification (this

was the dependent variable) depending on levels of ADHD symptoms. Predictor variables were gender, ADHD symptoms, and the interaction between them. Because we were interested in examining poor peer relations, the popular and controversial peer status groups were excluded from our analyses. Hence, the dependent variable was the rejected (1), neglected (2), and average (3) peer status groups.

To examine how ADHD symptoms and peer dislike were related to children's self-perceptions we conducted two hierarchical regression analyses using global self-worth and behavioural conduct as dependent variables. In the first step we entered gender, ADHD symptoms, and the SPS as predictor variables. In the second step we entered the interaction between the SPS and ADHD symptoms as predictor variables to examine whether peer dislike would particularly influence the self-perceptions of children with high levels of ADHD symptoms.

## Results

### *Preliminary analyses*

The MANOVA was significant, indicating overall gender differences, Pillai's trace = 0.26,  $F(8, 609) = 26.90$ ,  $p < .01$ . As seen in Table 1, we obtained large effect sizes regarding gender differences in ADHD symptoms, aggressive behaviour, and prosociality. Boys had more ADHD symptoms, more aggressive behaviour, and behaved less prosocially. Girls had more positive self-perceptions regarding behavioural conduct but less positive self-perceptions regarding global self-worth, and had fewer internalising problems. The effect sizes of these latter comparisons were, however, small.

### *Main analyses*

*How do gender, ADHD symptoms, associated problems, and prosociality relate to children's peer relations?* Based on previous findings, we expected high levels of ADHD symptoms, aggression, and internalising problems, and low levels of prosociality to be negatively related to social preference. In addition, we expected that children high on ADHD symptoms and associated problems, and low on prosociality to be lonelier and to receive lower scores of social preference. Finally we expected, in line with the gender appropriateness hypothesis (Kerr et al., 1994), social preference to vary as a function of ADHD symptoms and gender, and for boys high on ADHD symptoms to receive a higher SPS than equivalent girls.

As seen in Table 2, we obtained several significant correlations between study variables. Of interest are the relations between predictor variables and dependent variables (see results of regression analyses further below) and also the relations between ADHD symptoms and associated problems. We obtained significant correlations between SPS and ADHD symptoms, associated problems, and prosociality. Interestingly, despite the negative relation between ADHD symptoms and SPS, and SPS and feelings of loneliness, loneliness was not significantly related to ADHD symptoms, indicating that children with high levels of ADHD symptoms did not perceive their peer relations as more negative.

Regarding social preference, results of the hierarchical regression analysis (see Table 3) showed that the model explained 43% of the variance in SPS and it was statistically

**Table 1**

Descriptive statistics for all study variables; means (*M*) and standard deviations (*SD*) by gender, results of *t*-tests and effect sizes (*d*) of gender comparisons

Variable	Boys ( <i>n</i> = 313–321) <i>M</i> ( <i>SD</i> )	Girls ( <i>n</i> = 309–314) <i>M</i> ( <i>SD</i> )	<i>F</i>	<i>d</i>
ADHD symptoms	9.46 (10.00)	3.36 (5.88)	89.11**	.74
Peer relations				
SPS	0.01 (0.98)	0.00 (0.95)	0.12	.01
Loneliness	1.64 (0.40)	1.58 (0.37)	2.45	.15
Associated problems				
Aggressive behaviour	0.24 (1.10)	–0.24 (0.46)	49.97**	.57
Internalising problems	1.79 (0.88)	1.60 (0.73)	8.85**	.24
Prosociality	–0.25 (0.72)	0.17 (0.81)	70.21**	.55
Self-perceptions				
Global self-worth	3.49 (0.50)	3.34 (0.58)	12.54**	.28
Behavioural conduct	3.09 (0.49)	3.21 (0.46)	10.35**	.25

SPS = Social preference score. \*\*  $p < .01$ .

**Table 2**

Pearson's product-moment correlation coefficients for all study variables for all children ( $N = 622$ – $635$ )

	1	2	3	4	5	6	7	8
1. ADHD	–	–.25**	.02	.47**	.37**	–.48**	–.07	–.35**
2. SPS		–	–.34**	–.38**	–.36**	.56**	.18**	.20**
3. Loneliness			–	.05	.28**	–.20**	–.41**	–.28**
4. Aggressive behaviour				–	.10*	–.40**	–.08*	–.36**
5. Internalising problems					–	–.36**	–.15**	–.15**
6. Prosociality						–	.09*	.31**
7. Global self-worth							–	.47**
8. Behavioural conduct								–

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

significant,  $F(5, 616) = 98.47$ ,  $p < .01$ . All predictor variables had significant main effects and we also obtained a significant interaction effect between levels of ADHD symptoms and gender. Interpretation of  $\beta$  estimates indicated that boys obtained a higher SPS compared with girls, that aggressive behaviour and internalising problems were negatively related to SPS, and that prosociality was positively related to SPS. Curiously, ADHD symptoms were positively related to SPS although ADHD correlated negatively with SPS (see Table 2). We followed the procedure described by Cohen and Cohen (1983) and identified two negative suppressor variables, namely prosociality and aggressive behaviour, which freed the association between ADHD and SPS from irrelevant variance. As illustrated in Figure 1, when aggressive behaviour, internalising problems, and prosociality were controlled for, peer liking did not appear to vary as a function of levels of ADHD symptoms displayed for girls, whereas for boys, the higher levels of ADHD symptoms they displayed, the more peers liked them.

Regarding children's perceptions of their peer relations, the regression model explained 10% of the variance in feelings of loneliness and it was statistically significant,  $F(5, 612) = 15.41$ ,  $p < .01$ . ADHD symptoms, internalising problems, and prosociality had significant main effects on the explained variance of loneliness (see Table 3). The more internalising problems children had and the less prosocially they behaved, the lonelier they felt. Again, the results indicated a suppressor

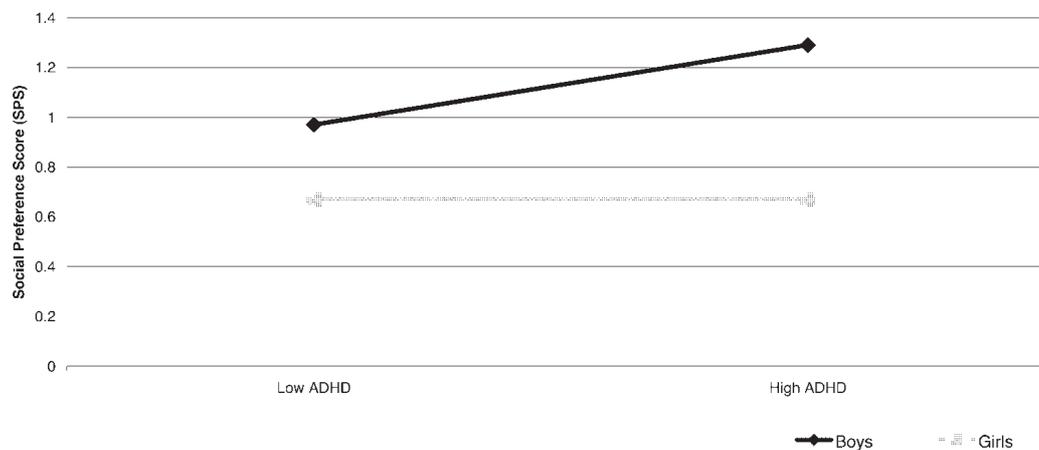
variable. Although there was no bivariate association between ADHD symptoms and feelings of loneliness (see Table 2), prosociality freed the relation between ADHD symptoms and feelings of loneliness from irrelevant variance. We obtained no significant interaction effect, indicating no gender differences in the relation of ADHD symptoms and feelings of loneliness.

**Table 3**

Results of hierarchical multiple regression analyses examining main and interaction effects of gender, ADHD symptoms, associated problems, and prosociality in children's peer relations ( $N = 622$ – $635$ )

	SPS		Loneliness	
	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$
Step 1	.43**		.11**	
Gender		–.22**		–.03
ADHD symptoms		.14*		–.18**
Aggressive behaviour		–.27**		.03
Internalising problems		–.23**		.28**
Prosociality		.51**		–.17**
Step 2	.01		.00	
Interaction ADHD × Gender		–.08*		–.03

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



**Figure 1.** Illustration of interaction effect of gender and ADHD symptoms in children's social preference score (SPS).

**Table 4**

Results of logistic regression analysis examining main and interaction effects of gender and ADHD symptoms in peer status group classification for all children ( $N = 622-635$ )

Variable	Peer status group Rejected /Neglected/Average	
	Estimate	Wald $\chi^2$
Gender	0.22	.09
ADHD symptoms	0.02	2.20
Interaction ADHD $\times$ Gender	0.10**	11.07

\*\*  $p < .01$ .

*Are there gender differences in the extent to which ADHD symptoms predict peer status?* According to the gender appropriateness hypothesis (Kerr, et al., 1994) we expected peer status to vary as a function of gender and ADHD symptoms; ADHD symptoms being less tolerated by peers when displayed by girls.

Results of the logistic regression analysis (see Table 4) revealed that the model was significant, Wald  $\chi^2(3, 419) = 22.44, p < .01$ , and that the predictors correctly classified 58% of the children. To interpret the significant interaction effect we calculated means of ADHD symptoms, separately for girls and boys, in the three different peer status groups. As seen in Figure 2, rejected boys displayed the most ADHD symptoms, whereas neglected girls displayed the fewest ADHD symptoms. Boys in the average peer status group displayed significantly higher levels of ADHD symptoms than girls in the same group,  $t(1, 129) = 6.60, p < .01$ , indicating that peers tolerated ADHD symptoms much more when displayed by boys.

*How are peer dislike and ADHD symptoms related to children's self-perceptions?* Based on our review of the literature, we expected peer dislike and high levels of ADHD symptoms to be negatively related to children's self-perceptions.

As seen in Table 5, gender, ADHD symptoms, and SPS had a significant main effect on the explained variance of global self-worth. The model was statistically significant,  $F(3, 631) =$

**Table 5**

Results of hierarchical regression analyses examining main and interaction effects of gender, ADHD symptoms, and SPS on children's self-perceptions ( $N = 622-635$ )

	Global self-worth		Behavioural conduct	
	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$
Step 1	.06**		.13**	
Gender		-.17**		.02
ADHD symptoms		-.09*		-.31**
SPS		.15**		.12**
Step 2	.00		.00	
Interaction ADHD $\times$ SPS		.03		.01

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

13.53,  $p < .01$ . We obtained no interaction effect, which indicated that the relation between global self-worth and SPS was the same for children with high and low levels of ADHD symptoms. Regarding self-perceptions of behavioural conduct, ADHD symptoms and SPS had a significant main effect on the explained variance of behavioural conduct. The model was statistically significant,  $F(3, 631) = 33.88, p < .01$ . Again, we obtained no interaction effect indicating that the relation between self-perceptions of behavioural conduct and SPS was the same irrespective of levels of ADHD symptoms.

## Discussion

A major finding of this study was that despite ADHD symptoms being related to a low SPS, they did not account for it exclusively. Instead, low levels of prosocial behaviour and high levels of aggressive behaviour and internalising problems were also strongly related to peer dislike. Despite being more disliked by peers, children with high levels of ADHD symptoms did not report more feelings of loneliness. ADHD symptoms were related to more peer dislike and more negative self-perceptions of behavioural conduct and these relations

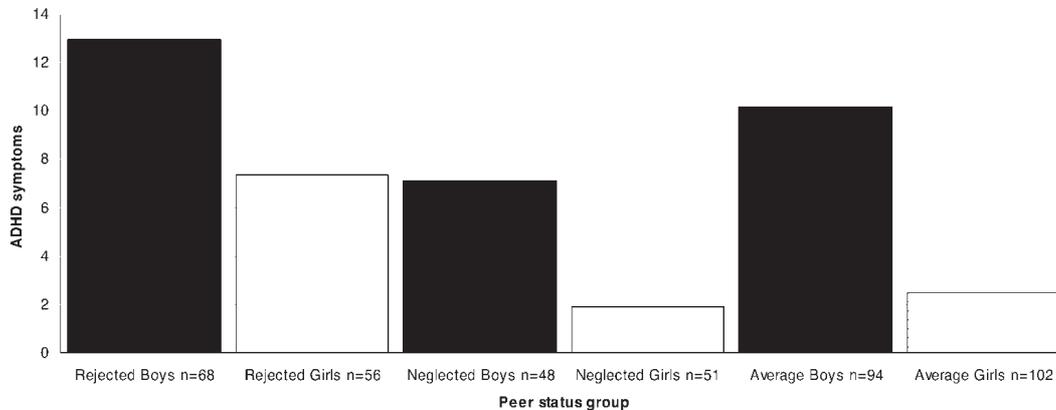


Figure 2. Levels of ADHD symptoms of boys and girls according to peer status group.

were the same for children with low and high levels of ADHD symptoms. Regarding gender differences, results are partly in line with the gender appropriateness hypothesis, indicating that ADHD symptoms were less tolerated by peers when displayed by girls.

Consistent with previous findings of clinically referred children (e.g., Gaub & Carlson, 1997; Greene et al., 2001; Hinshaw, 2002; Sharp et al., 1999; Treuting & Hinshaw, 2001), ADHD symptoms were positively related to peer dislike and more negative self-perceptions of behavioural conduct. In other words, the children in this study appeared to be impaired by ADHD symptoms similarly to the way that clinically referred children are. It has previously been reported that children and adolescents who do not meet diagnostic criteria for any well-defined disorder, but who display subthreshold symptomatology, can be equally as psychologically impaired as diagnosed children (Angold, Costello, Farmer, Burns, & Erkanli, 1999). The results of this study are in line with this notion. However, to some extent, ADHD symptoms appeared to be positively related to peer liking, as indicated by the results of the regression analyses. A possible explanation of these results is that children with elevated levels of ADHD are also high in initiative, a trait that has been associated with high peer acceptance (Rydell et al., 1997).

Interestingly, despite ADHD symptoms being related to more negative peer relations, ADHD symptoms were not related to feelings of loneliness. A possible explanation of these results could be that children with high levels of ADHD symptoms affiliated with children outside the classroom who displayed similar disruptive behaviour problems. Aggressive rejected children, for instance, have been found to affiliate often with other aggressive children in school, so they tend to have more friends than one would expect (Asher, Parkhurst, Hymel, & Williams, 1990). A second explanation could be that children overestimated their peer relations, as clinically referred children with ADHD have been found to do (e.g., Hoza et al., 2002; Ohan & Johnston, 2002). Last, it is possible that children with high levels of ADHD symptoms were not sensitive to specific social cues indicating peer rejection or neglect. It has previously been suggested that poor peer relations may be related to symptoms of inattention (Bellanti & Bierman, 2000) and social information deficits (Milch-Reich

et al., 1999). Moreover, aggressive children have been found to be insensitive to social cues reflecting peer dislike (Rudolph & Clark, 2001), whereas aggression and depression have been found to entail poor peer acceptance (Brendgen, Vitaro, Turgeon, & Poulin, 2002; McGrath & Repetti, 2002). Possibly, in this study, children with high levels of ADHD symptoms and/or high levels of aggressive and internalising symptoms ignored or distorted social feedback indicating peer dislike. However, the relation between self-perceptions of behavioural conduct and peer dislike was the same irrespective of levels of ADHD symptoms. The latter result indicates that, in this study, children with high levels of ADHD symptoms did not completely distort social information indicating peer dislike and that their self-perceptions were in fact related to the way that peers viewed them.

What this study adds to the literature is that we examined how prosociality and aggressive behaviour, as defined by both teacher and peer ratings, affected the relation between ADHD symptoms and peer dislike. Given the high comorbidity between ADHD and CD, it is important to examine how other behaviour problems are associated with the problematic peer relations of children displaying symptoms of ADHD. Moreover, by interpreting findings through the gender appropriateness hypothesis (Kerr et al., 1994), this study contributes to a better understanding of gender differences in ADHD.

After controlling for the effects of aggression, internalising problems, and prosociality, girls' peer liking did not vary as a function of levels of ADHD symptoms displayed, whereas for boys, peer liking increased with higher levels of ADHD symptoms. A plausible interpretation of these findings is that ADHD symptoms did not violate the feminine stereotype, thus, these findings do not support the gender appropriateness hypothesis (Kerr et al., 1994). However, this analysis provided a picture of "pure" relations between ADHD symptoms and social preference when associated problems were controlled for. In actuality, few children with high levels of ADHD symptoms do not display comorbid internalising and externalising problems (e.g., Manuzza et al., 2004; Scahill et al., 1999). Hence, these findings should be interpreted with caution, as the child who peers meet behaves in a way that reflects both ADHD symptoms and associated problems. As stated above, a possible reason why social preference increased

for boys with higher levels of ADHD symptoms could be that these boys were also high in initiative, which has been associated with high peer acceptance (Rydell et al., 1997).

As regards gender differences in the relation between ADHD symptoms and peer status, results are in line with the gender appropriateness hypothesis (Kerr et al., 1994). Moderate levels of ADHD symptoms were tolerated by peers when displayed by boys but not when displayed by girls, as boys in the average peer status group had significantly higher levels of ADHD symptoms than girls. In this sense, ADHD symptoms did not appear to fit the feminine stereotype, making girls experience greater peer relation difficulties than boys who displayed the same type of behaviour. In other words, even low levels of ADHD symptoms could lead to significantly worse outcomes in girls compared with boys, at least as regards peer status.

### Limitations

Certain limitations of this study must be noted. First, we used only teacher ratings of ADHD symptoms. We had no information about the age of onset of symptoms or about symptomatology across situations (e.g., at home, during play, etc.). Moreover, we had no information as to whether clinically referred children with ADHD were included in the sample, or if they were medicated for their ADHD. However, teacher ratings of ADHD symptoms with the scale we used have had good predictive validity and have distinguished children with ADHD from those without this disorder equally as well as parent ratings or a combination of parent and teacher ratings (DuPaul, et al., 1998). Besides that, the aim of this study was to examine ADHD symptoms in the general population and not to categorise children into clinical groups. Our interest was to examine how peers perceived the problematic behaviour of children with high levels of ADHD and whether we could find gender differences in the levels of ADHD symptoms that peers tolerated in girls and boys.

Second, we did not assess relational aggression, that is, aggression that aims to harm the social relations of others, which is believed to be more common among girls and especially among rejected girls (Crick, 1996; Crick & Grotpeter, 1995). On the other hand, we aimed to examine gender inappropriate behaviour and chose therefore to study effects of overt aggression among hyperactive girls. Third, we cannot fully compare our results with previous studies on ADHD and comorbidity since the constructs of internalising problems and aggressive behaviour can only be described as associated problems given that children did not reach clinical levels on these measures.

Fourth, we need to recognise that children's social preferences may have been modified by teachers' affective responses to target children's (i.e., children with high levels of ADHD symptoms) off-task and noncompliant behaviour in the classroom. It has previously been shown that children's social preferences are, to some degree, affected by teachers' responses toward children with behaviour problems (White & Jones, 2000).

### Conclusion

This study demonstrated that although high levels of ADHD symptoms were not related to less peer liking among girls, girls' peer status was equally impaired, if not more, as boys' despite

displaying lower levels of ADHD symptoms. It has previously been suggested that diagnostic criteria for ADHD should be adjusted to gender differences and lowered for girls (Barkley, 1998). This study stresses the importance of continuing to examine gender differences in ADHD longitudinally, so as to determine whether lower ADHD symptom severity in girls leads to the same outcomes later in life as in boys, and whether clinical cutoffs should in that case be lowered for girls.

A clinical implication of this study concerns the focus of treatment of children with ADHD. It has previously been suggested that a reason why current treatment programmes have only a limited impact on the peer relation difficulties of children with ADHD could be that more attention needs to be given to specific social skills that are related to both friendship development and maintenance (Blachman & Hinshaw, 2002). Although this study did not examine friendships, results are in line with the Blachman and Hinshaw study, stressing the importance of further examining the development of prosociality and other social skills in children with ADHD and treating specific social skills deficits that may account for much of their peer relation difficulties. Moreover, assessing self-perceptions would also enhance our understanding of how children with ADHD perceive their peer relations, whether they are aware of their peer relation difficulties, and, finally, whether poor peer relations are related to a negative view of the self among children with ADHD. A further clarification of how children with ADHD perceive their peer relations and how cognitive and social skills deficits are related to poor peer relations appears necessary to enable the design of specific interventions that target and remediate the problematic and adverse peer relations of children with ADHD.

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Paper II





Impact of EF and ADHD on peer relations and school performance

RUNNING HEAD: IMPACT OF EF AND ADHD ON PEER RELATIONS AND SCHOOL PERFORMANCE

Impact of Executive Functioning and Symptoms of Attention Deficit Hyperactivity Disorder on Children's Peer Relations and School Performance

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## Impact of EF and ADHD on peer relations and school performance

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## Impact of EF and ADHD on peer relations and school performance

### Abstract

This study examined the predictive relations from symptoms of Attention-deficit/hyperactivity disorder (ADHD) and executive functioning (EF) to social and school functioning in 112 (62 girls) school children. High levels of teacher and parent ratings of ADHD symptoms at the ages of 8 - 8½ years, and poor EF measured at the age of 8½, were associated with poor social functioning measured by peer nominations and poor teacher ratings of school functioning at the age of 9½. ADHD symptoms independently predicted social and school functioning, whereas EF independently predicted only school functioning. Interaction effects between ADHD and EF and between EF and gender were found: At high levels of symptoms of inattention, the poorer the EF, the greater the need for special education. At high levels of symptoms of hyperactivity/impulsivity, the poorer the EF, the higher the levels of physical aggression. Girls with poor EF were less accepted by peers than equivalent boys.

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### Impact of Executive Functioning and Symptoms of Attention Deficit Hyperactivity Disorder on Children's Peer Relations and School Performance

This study examined additive and interactive effects of symptoms of Attention-deficit/hyperactivity disorder (ADHD) and executive functioning on children's peer relations and school performance in a community based sample.

The behavior of children with Attention-deficit/hyperactivity disorder (ADHD) is characterized by persistent and developmentally inappropriate levels of inattention and/or hyperactivity and impulsivity (American Psychiatric Association [APA], 1994). However, the impairments associated with the disorder extend beyond these central symptoms to poor social and academic functioning. ADHD symptoms have been associated with peer rejection and low levels of social competence (e.g., Abikoff et al., 2004; Bagwell, Molina, Pelham, & Hoza, 2001; Blachman & Hinshaw, 2002; Maedgen & Carlson, 2000) as well as poor school achievement (e.g., Barry, Lyman, & Klinger, 2002; Bauermeister, et al., 2005; Biederman et al., 2004; Frick et al., 1991; Hechtman et al., 2004; Hinshaw, 1992; Latimer et al., 2003). Neuropsychological measures administered to children with ADHD indicate problems in higher cognitive abilities referred to as executive functions (for reviews see Nigg, 2001; Sergeant, Geurts, & Oosterlaan, 2002). Executive functions have been defined as "a cluster of skills that are necessary for efficient and effective future-oriented behavior" (Welsh, 2002, p. 143), and they typically include abilities such as response inhibition, planning, and working memory (Pennington & Ozonoff, 1996). Weaknesses in executive functioning (EF) have been related to ADHD symptoms in studies of both clinical and community based samples (Castellanos, Sonuga-Barke, Milham, & Tannock, 2006; Willcutt, Doyle, Nigg, Faraone, & Pennington, 2005). However, few studies have examined the combined effects of ADHD symptoms and EF in relation to social and academic outcomes in children.

In a longitudinal study on the relations between EF and social outcomes in school children it was found that children's performance on EF tasks predicted their social competence two years later, independently of initial competence levels (Nigg, Quamma, Greenberg, & Kusche, 1999). In a study of adolescents with and without ADHD, poor EF was found to be predictive of poor social functioning (Clark, Prior, & Kinsella, 2002). In addition, poor EF in adolescents has been found to be related to physical aggression even after control for ADHD symptoms and IQ (Séguin, Boulerice, Harden, Tremblay, & Pihl, 1999). Finally, studies of children and adults with ADHD and/or Conduct Disorder (CD) have reported associations between poor EF and poor social functioning and between poor EF and aggressive behavior (Giancola, Mezzich, & Tarter, 1998; Lueger & Gill, 1990; Moffitt, 1993). However, one recent study on children with ADHD, suggested that poor EF in children with ADHD was associated with poor academic achievement but not with poor social functioning (Biederman et al., 2004). Children with ADHD and poor EF, compared with children with ADHD and adequate EF, were found to be more at risk for grade retention and decreased academic achievement. However, these two groups of children did not differ in parent ratings of social difficulties with peers at school or with siblings (Biederman et al., 2004). These findings give rise to new questions.

Although previous studies have examined additive effects of EF and ADHD symptoms on academic achievement, only limited examination of possible interaction effects of EF and ADHD symptoms has been conducted. In the study by Biederman and colleagues (2004), children with ADHD and poor EF performed more poorly on academic achievement tests (i.e. reading, writing, and mathematics) than children with ADHD and adequate EF. The results also indicated that poor EF in controls was unrelated to academic achievement, indicating an interaction effect although the interaction was not explicitly tested. In a study by Barry and colleagues (2002), it was found that although ADHD symptoms and poor EF had additive effects on general underachievement, severity of ADHD symptoms was a better predictor of reading and writing than were measures of EF. However, interaction effects of ADHD symptoms and EF were not examined. Furthermore, children with ADHD have been found to perform poorly on EF tasks despite average academic achievement (Muir-Broadbent, Rosenstein, Medina, & Soderberg, 2002), and impaired academic achievement has been associated with ADHD despite almost average (i.e., within the lower average range) performance on EF tasks measuring inhibition and vigilance (Bauermeister et al., 2005). Thus, how ADHD symptoms interact with EF in their relation to academic achievement in children is a question that needs further investigation.

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The majority of previous studies on the relations between EF, symptoms of ADHD, and social and academic functioning have been conducted on children diagnosed with ADHD (e.g., Clark et al., 2002; Biederman et al., 2004; Frick et al., 1991). Because referral bias can affect outcome (e.g., Goodman, Lahey, Fielding, & Dulcan, 1997), findings from studies on clinically referred children with ADHD should be complemented by studies using community based samples to clarify the relations between ADHD symptoms, EF, and social and academic outcomes. Also, children who display symptoms of psychiatric disorders but do not fulfill diagnostic criteria for a specific disorder have been found to be equally impaired in terms of psychosocial functioning as diagnosed children (Angold, Costello, Farmer, Burns, & Erkanli, 1999).

Most of the literature on ADHD is based on studies conducted on boys and few studies have included a sufficient number of girls to perform gender comparisons (Gaub & Carlson, 1997; Gershon, 2002). Recent findings indicate that girls with ADHD display impairments in EF similar to that reported in boys with ADHD (e.g., Castellanos et al., 2000; Hinshaw, Carte, Sami, Treuting, & Zupan, 2002; Nigg, Blaskey, Huang-Pollock, & Rappley, 2002; Seidman et al., 2005; Sami, Carte, Hinshaw, & Zupan, 2003), although two studies have reported greater EF impairments in boys than in girls with ADHD (Newcorn et al., 2001; Rucklidge & Tannock, 2001). Regarding gender differences in academic outcomes, previous studies on referred children with ADHD report that boys with ADHD are more likely than girls with ADHD to have a learning disability and to manifest problems both in school and in their spare time (e.g., poor school achievement, low grades and poor peer acceptance; Biederman et al., 2002; Biederman, Faraone, & Monuteaux, 2002; Graetz, Sawyer, & Baghurst, 2005). However, in a recent study of children who fulfilled criteria for ADHD, but did not have a clinical ADHD diagnosis, boys and girls with high symptom levels showed similar levels of cognitive, psychosocial, and school functioning indicating that gender differences in the correlates of ADHD may be caused by referral biases (Biederman et al., 2005). Finally, as regards gender differences in the relation between ADHD symptoms and social functioning, we have previously found that high levels of ADHD symptoms are related to higher levels of peer dislike in girls than in boys (Diamantopoulou, Henricsson, & Rydell, 2005). Hence, it seems imperative to examine gender differences in the interplay between ADHD symptoms and EF and their relations to social and academic functioning in children.

In sum, although both EF and ADHD symptoms have been found to be predictive of children's social and academic outcomes, to our knowledge, only limited examination of interaction effects of ADHD symptoms and EF on social and academic outcomes has been conducted. Furthermore, findings of previous studies on clinically referred children with ADHD need to be complemented by studies of community based samples. We ought to examine gender differences in the above mentioned relations, as girls have been mostly neglected in the ADHD literature.

The aim of this study was to examine the predictive relations from ADHD symptoms and EF to social and academic functioning in a community based sample. Using a short-term longitudinal design, we examined whether high levels of ADHD symptoms and poor EF at the age of 8½ would predict social and academic outcomes in children one year later. These relations were studied in terms of both independent and interactive effects. Based on prior studies, we expected high levels of ADHD symptoms and poor EF to be associated with poor academic and social functioning. In line with the Biederman and colleagues study (2004), we also expected an interaction effect regarding academic outcomes insofar as poor EF would be particularly impairing at high levels of ADHD. As regards possible interaction effects between ADHD symptoms and EF on children's social functioning previous studies were limited and did not allow clear hypotheses.

As an addition to the main analyses, we also examined gender differences in the relations between ADHD symptoms and EF, and social and academic functioning as this question still remains unanswered. Finally, the three clinical subtypes of ADHD (ADHD-primarily inattentive, ADHD-primarily hyperactive/impulsive, and ADHD-combined) are well established ADHD types in clinical practice (APA, 1994) and have been found to differ from each other on academic achievement and peer relations. In a review of the differences between the ADHD subtypes it was found that children with the inattentive type perform worse on measures of academic achievement compared with children with the hyperactive/impulsive type, and children with the combined and hyperactive/impulsive types have been found to be more likely to be rejected by peers than children with the inattentive type (Milich, Balentine, & Lyman, 2001). However, these studies were based on clinically diagnosed

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children with ADHD and little is known of whether these results hold for community based samples. Therefore, we examined the relations between symptoms of inattention and of hyperactivity/impulsivity and social and school functioning separately. These additional analyses were of an exploratory nature.

### Method

#### *Participants*

The present study included 112 Swedish children (62 girls), who are part of a longitudinal study investigating the development of problem behaviors in children from age 5 to 10. The children lived in and in the vicinity of a Swedish university town, thus representing children from both urban and rural areas. The present sample was defined as those children remaining in the study at age 9½, who also had data on ADHD symptoms and EF from age 8-8½, comprising 74 % of the original sample. At the age of 5 we used a national population based register, which includes all residents, to contact parents of 705 five-year-old children (70% of a sample of 1000 5-year old children). From this sample, we recruited a sub-sample of 151 children for the longitudinal project. Two children with mental retardation were subsequently excluded (see Berlin & Bohlin, 2002, for a closer description of the recruitment of the sample). Parental education was high, as might be expected in a university town. Only 3% of the mothers and 7% of the fathers had the 9-year compulsory school as their only schooling, 24% of the mothers and 17% of the fathers had vocational training, 24% of the mothers and 25% of the fathers had completed secondary school (12 years of schooling), and 53% of the mothers and 51% of the fathers held a college or university degree.

We have followed this sample and collected data of psychological testing and/or behavioral ratings from age 5 to age 9½. In this study we included data from ages 8, 8½, and 9½. Reasons for attrition at the various stages of the study were that the family had moved and could not be reached, parents or children declined participation or did not consent to contacts with the child's school, and teacher questionnaires were not returned despite two reminders. The children included in the present study did not differ significantly in hyperactivity or ADHD symptoms from the original sample of 151 children at the age of 5, or from the 132 children in the sample who took part in data collections at ages 8-8½,  $t_s \leq -.76$ , *ns*. Furthermore, there were no significant differences between the children included in this study and the population sample of 705 children as regards gender, mothers' or father's educational level,  $\chi^2 \leq 1.65$ , *ns*.

#### *Procedure*

We collected teacher ratings and parent ratings of ADHD symptoms at the ages of 8 and 8½ respectively. We collected data of executive functioning (EF; see Measures) at the age of 8½. At the age of 9½, after consent from parents, we visited the children at school and collected teacher ratings of social and academic functioning and peer nominations. All children attended mainstream school-classes (64 different classes). As a compensation for their participation, teachers received a voucher for a book worth 5 euros for each questionnaire they filled out (i.e. for each child they rated) and children received a toy worth approximately 3 euros each time they participated.

#### *Measures*

##### Predictor variables

*ADHD symptoms.* Teachers and parents rated ADHD symptoms on a scale based on the DSM-IV (APA, 1994) diagnostic criteria for ADHD (DuPaul, Power, Anastopoulos, & Reid, 1998). The scale contains 18 items measuring inattention (9 items), hyperactivity (6 items) and impulsivity (3 items). According to the DSM-IV, hyperactivity and impulsivity belong to the same dimension. In this study, ratings were made on a scale ranging from 0 to 2, with ascending numbers indicating symptoms being often present and we used the summed score of items. We composed an aggregated measure of ADHD symptoms as the mean of the two summed scale scores, that is, the mean score of parent and teacher ratings of ADHD symptoms. Internal consistency, measured as Cronbach's alpha was  $\alpha=.77$ . In the same manner we composed an aggregated measure of symptoms of inattention;  $\alpha=.71$ , and of symptoms of hyperactivity/impulsivity,  $\alpha=.81$ .

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*Executive functioning (EF).* We measured EF with four different tasks (see below). These tasks will only be presented briefly as they have already been described in detail in previous publications (see Berlin & Bohlin, 2002; Berlin, Bohlin, & Rydell, 2003). We chose commonly used EF tasks that have been shown to differentiate children with ADHD from controls. The selection of EF tasks was based on Barkley's (1997) hybrid model of ADHD and represented the major components of the model, "inhibitory control" (Stroop-like task), "non-verbal working memory", "verbal working memory", and "reconstitution" (verbal fluency task).

We measured children's inhibitory ability by using a Stroop-like task. In this task, children were presented with four different pairs of pictures, where the pictures in each pair were each other's opposites (day-night, boy-girl, up-down, large-small). After making sure that the child understood what each picture represented, we instructed the child to say the opposite as fast as possible every time a picture was presented on the computer screen (e.g., to say "boy" every time a girl was presented). During the first part of the task, the child was presented with each picture three times in random order, but the pairs were not mixed (i.e., the first six pictures were either a boy or a girl, the next six pictures were either large or small, etc). During the second part of the task, the instructions were the same and each picture was presented three times but the eight pictures were presented in a totally random order. Each picture was presented for 1500 ms in the first part of the task and for 1000 ms in the second part, followed by a response time of 1500 ms and a waiting period of 1500 ms before the next picture was presented. We registered two different types of errors; uncorrected errors (naming the picture instead of saying the opposite), and corrected errors (naming the picture, or starting to name the picture, and then correcting oneself). As the number of corrected errors children made and the number of not corrected errors were highly correlated  $r(112) = .93, p < .01$ ; we used the mean of the summed scores of corrected and uncorrected errors as a measure of *executive disinhibition*.

As a measure of *non-verbal working memory (Non-verbal WM)* we used an adapted version of a task originally developed by Park, Holzman, and Goldman-Rakic (1995). In this task, children were first presented with an airplane somewhere on a computer screen, they thereafter performed a distraction task, and finally they were instructed to indicate where on the screen (out of 8 different locations indicated by clouds) they had seen the airplane in the beginning of the task (see Berlin et al., 2003 for more detailed information). As distraction the children performed a Go/no go task in which they should respond each time an orange lion appeared on the screen (25% of the trials) and refrain from responding whenever a green frog appeared on the screen (75% of the trials). Children completed eight trials of this task. On each trial, the airplane was shown on the screen for 500 ms, the distraction task lasted for 1200 ms (12 distraction tasks), and every trial ended with the clouds being on the screen for 10 seconds. As all children performed the distraction task almost perfectly, we used the number of correct answers on the primary task (i.e., ability to remember the location of the airplane) as a measure of *non-verbal (spatial) working memory*.

We measured *verbal working memory (Verbal WM)* using the backward order condition of the Digit span subtest of the Swedish version of the WISC-III (Wechsler, 1991). We used the total number of correct answers (raw scores) as a measure of Verbal WM. The possible range of raw scores for the backward order condition of the Digit span subtest of the WISC-III is 0 to 14.

Finally, we measured *verbal fluency* by using the Controlled Oral Word Association Test (COWAT; Gaddes & Crockett, 1975). COWAT is a verbal fluency test that requires the participants to rapidly and effectively assemble units of language to create a verbal response. We gave children two different semantic categories (animals and things to eat) and two phonological categories (the letters F and A) and asked them to provide as many different words as possible for each category within one minute. We used an aggregated measure of the number of words of all four categories (i.e., two semantic and two phonological) as a measure of verbal fluency;  $\alpha = .70$ .

To provide a comprehensive measure of EF we composed an aggregated measure of *EF deficits (EFD)* in the manner of Biederman and colleagues (2004). For each measure of EF we defined a threshold for adequate performance as a score obtained by 75 % of the children. Performance on each executive function measure was then dummy coded according to this threshold as "0" for adequate performance and "1" for poor performance. On each EF measure, children scoring below the threshold for adequate performance deviated approximately -1 SD from the mean. Finally, we composed a continuous measure of EFD ranging from 0 (adequate performance on all executive

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functions measures) to 4 (poor performance on all executive functions measures), by summing the dummy coded scores of all executive functions measures. Hence, the higher the score of EFD the poorer the performance. Seven children did not have data on one of the four EF tasks, and these children were coded as having 0 = adequate performance on the task in question, this being the most probable code.

*Intelligence.* We assessed non-verbal *intelligence* (IQ) by using the Block design subtest of the Swedish version of the WISC-III (Wechsler, 1991). The Block design subtest is considered to be a highly reliable measure of general intelligence and it has been shown to correlate highly with full scale IQ ( $r = .93$ ; Groth-Marnat, 1997). We used the total raw score on this measure as a control variable in the analyses. The possible range of raw scores for the Block design subtest of the WISC-III is 0 to 69. None of the children in the sample performed below the 80<sup>th</sup> percentile on the Block design subtest.

### Outcome variables

*Social Functioning.* We measured social functioning by peer nominations that were provided by 1291 children, that is, the participants of this study and their current class-mates. Due to practical reasons, (e.g., some children had moved from the area and could not be reached) peer nominations were obtained for 101 children.

For all the measures of social functioning derived by peer nominations, we standardized items across gender within each class. We measured peer rated social functioning by using a peer nominations questionnaire consisting of 7 items, and followed the procedure described by Ladd (1999). First, we measured social liking with one item (i.e., “nominate three children in the class who you wish to be with”) and social disliking with one item (i.e., “nominate three children in the class who you do not wish to be with”). The correlation between the social liking and social disliking item was  $r(101) = -.35, p < .01$ . We derived a *Social Preference Score* (SPS) by subtracting the number of nominations on the social disliking item from the number of nominations on the social liking item. Thus, children who received many negative nominations and few positive nominations had either a low SPS or a negative one. Assessment of peer relations through peer nominations is a widely used method in the developmental literature and social preference based on peer nominations, has been found to be relatively stable through elementary school (Brendgen, Vitaro, Bukowski, Doyle, & Markiewicz, 2001).

As previous studies (e.g., Crick, 1996; Crick & Grotpeter, 1995) report gender differences in types of aggression; physical aggression being more common among boys, whereas relational aggression being more common among girls, we obtained measures of both types of aggression. As a measure of *physical aggression* peers were asked to “nominate three children in the class who often get into fights”. As a measure of *relational aggression* peers were asked to “nominate three children in the class who spread rumors about others”, and, “nominate three children in the class that do not let others engage in games”;  $\alpha = .58$  for the two items. There was a moderate positive correlation between physical and relational aggression  $r(101) = .45, p < .01$ . Lastly, as a measure of *prosocial behavior* children were asked to “nominate three children in the class who are nice and helpful to others”.

*School functioning.* Teachers rated children’s *school performance* in Swedish, Mathematics, and Social Sciences, on five point scales, with ascending numbers indicating better performance (i.e., 1 = performance much under average, 2 = performance under average, 3 = average performance, 4 = above average performance, 5 = much above average performance). We used the mean score of these three subjects to obtain a measure of school performance;  $\alpha = .87$ . Teacher evaluations of performance in Swedish and Math have been found to correlate highly with results on national tests in these two subjects in a Swedish sample of 87 12-year olds ( $r_s \geq .82, p < .001$ ; Henricsson & Rydell, in press), indicating that teachers are valid reporters of children’s performance at school. Lastly, teachers reported whether children received any *special education* (dummy coded as 1) or not (dummy coded as 0). Special education was also used as a control variable (see below; Statistical analyses).

### Statistical analyses

In the preliminary analyses we computed Pearson product moment correlations between all predictor variables and between IQ and all outcome variables, to ascertain their relations. We examined gender differences in all study variables by conducting two-tailed t-tests.

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In the main analyses we computed Pearson product moment correlations to examine the relations between predictor and outcome variables, controlling for effects of intelligence. To examine main and interaction effects of gender, symptoms of ADHD and EFD on outcome variables, we conducted a series of hierarchical regression analyses. In these analyses we entered IQ, gender, EFD, and ADHD in a first step. In a second step we entered the interaction term between EFD and ADHD symptoms. To assess gender effects we also studied the interaction between gender and ADHD and gender and EFD. These two interaction effects were investigated in separate analyses. Finally, in a third step, we entered the three-way interaction term between gender, symptoms of ADHD, and EFD (in these analyses both the interactions between gender and ADHD symptoms and between gender and EFD were included in the second step). We centered all predictor variables before entering them into the analyses. Significant interaction effects were interpreted following the procedure described by Cohen and Cohen (1983), which is commonly used in the regression literature, e.g., demonstrating the levels at -1 SD and +1 SD of the interacting variables.

In addition to these analyses, we performed similar analyses –although excluding interactions with gender- on inattention and hyperactivity/impulsivity separately, to explore possible differential relations between these two ADHD dimensions and outcomes. Only results that demonstrate different relations (i.e., significant relations between one but not the other of the ADHD dimensions and a specific outcome) will be reported. Finally, to control for effects of possible learning disabilities, we reran all regressions with control for special education. We report these results only if they prove different from the results of the first regressions.

## Results

### *Preliminary analyses*

For descriptive data for all study variables see Table 1. ADHD symptoms (the whole scale and symptoms of inattention and of hyperactivity/impulsivity separately) were positively related to EFD,  $r \geq .30, p < .01$ , but they were not related to IQ,  $-.14 \leq r \leq -.06, ns$ . Symptoms of inattention were positively correlated with symptoms of hyperactivity/impulsivity,  $r(112) = .70, p < .01$ . IQ was negatively related to EFD,  $r(112) = -.33, p < .01$ , and to special education,  $r(112) = -.33, p < .01$ . Furthermore, IQ was positively related to prosocial behavior,  $r(101) = .18, p < .01$ , and to school performance,  $r(112) = .36, p < .01$ , but not to physical or relational aggression,  $r(101) = -.19$  and  $r(101) = -.09, p < .01$ , respectively. The correlations between IQ and predictor and outcome variables indicated that we needed to control for effects of IQ in the main analyses. The only gender difference we obtained was that boys had higher levels of EFD than girls,  $t = -3.04, p < .01$ .

### *Main analyses*

*What are the relations between symptoms of ADHD, EFD, and social and school functioning?* Symptoms of ADHD were negatively predictive of children's SPS,  $r(112) = -.30, p < .01$ , prosocial behavior,  $r(112) = -.27, p < .01$ , and school performance,  $r(112) = -.33, p < .01$ , and they were positively predictive of peer nominations of physical aggression,  $r(112) = .53, p < .01$ , and of relational aggression,  $r(112) = -.30, p < .01$ , and also, of special education needs,  $r(112) = .52, p < .01$ . In separate analyses of inattention and hyperactivity/impulsivity, both dimensions significantly predicted the outcomes, with one exception, that is, only inattention was negatively related to school performance,  $r(101) = -.41, p < .01$ , but for hyperactivity/impulsivity the relation just missed significance  $r(101) = -.19, p = .06$ .

EFD was negatively predictive of peer nominations of prosocial behavior,  $r(101) = -.26, p < .01$  and of school performance,  $r(101) = -.27, p < .01$ . EFD was positively predictive of peer nominations of physical aggression,  $r(101) = .26, p < .01$ , and special education,  $r(101) = .36, p < .01$ . The correlations between EFD and children's SPS and between EFD and peer nominations of relational aggression were not significant,  $-.15 \leq r \leq .18, ns$ .

*Do symptoms of ADHD and EFD contribute independently and do they interact in predicting children's social and school functioning?* As seen in Table 2, after control for gender and IQ, ADHD symptoms contributed significantly in predicting all outcome variables except for prosocial behavior. After control for gender, IQ, and ADHD symptoms, EFD contributed significantly only in predicting school performance and special education needs. In one case the control for special education altered

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results and neither symptoms of ADHD nor EFD significantly predicted school performance,  $-.16 \leq \beta_s \leq -.10$ , *ns*.

There were two significant interaction effects between ADHD symptoms and EFD regarding children's prosocial behavior and physical aggression. As illustrated in Figure 1a, low levels of EFD in combination with low, as opposed to high, levels of ADHD symptoms were associated with higher peer nominations of prosocial behavior. For high levels of EFD peer nominations of prosocial behavior did not differ as a function of levels of ADHD symptoms. As illustrated in Figure 1b, for low levels of EFD, peer nominations of physical aggression did not differ as a function of levels of ADHD symptoms. However, for high levels of EFD, high levels of ADHD symptoms were associated with higher levels of physical aggression compared to low levels of ADHD symptoms.

In the separate analyses on inattention and hyperactivity/impulsivity, there were differences as regards main effects in two cases. Symptoms of hyperactivity/impulsivity but not inattention contributed significantly in predicting relational aggression,  $\beta = .31$ ,  $p < .05$ , and only symptoms of inattention contributed significantly in predicting school performance,  $\beta = -.34$ ,  $p < .05$ . There were also interaction effects only between inattention and EFD or between hyperactivity/impulsivity and EFD. The interaction effect between symptoms of ADHD and EFD regarding peer nominations of prosocial behavior described above, was mainly carried by symptoms of inattention,  $\beta = .30$ ,  $p < .01$ , (see Figure 1a) and not by symptoms of hyperactivity/impulsivity,  $\beta = .24$ , *ns*. The interaction effect between symptoms of ADHD and EFD regarding peer nominations of physical aggression was mainly carried by symptoms of hyperactivity/impulsivity,  $\beta = .42$ ,  $p < .01$ , (see Figure 1b) and not by symptoms of inattention,  $\beta = .18$ , *ns*. Finally, there was an interaction effect between symptoms of inattention and EFD regarding special education needs,  $\beta = .19$ ,  $p < .05$ , that did not appear in the analyses on the total ADHD scale. As seen in Figure 1c, special education needs did not differ as a function of levels of EFD when symptoms of inattention were low. However, at high levels of symptoms of inattention, the higher the level of EFD, the greater was the need for special education.

*Are there gender differences in the predictive relations between ADHD symptoms and EFD and later social and school functioning?* As shown in Table 2, we obtained two interaction effects involving gender, one between EFD and gender with regard to children's SPS and one between ADHD and gender concerning physical aggression. For boys, high levels of EFD were associated with more peer acceptance (i.e., a higher SPS) than low levels of EFD. The opposite was true for girls, high levels of EFD, as opposed to low levels of EFD, were associated with lower peer acceptance –see Figure 3a. For both boys and girls, high levels of ADHD symptoms were associated with higher levels of physical aggression. However, the relation between symptoms of ADHD and peer nominations of physical aggression was more apparent for boys than for girls – see Figure 3b. Three-way interaction effects between gender, EFD, and ADHD symptoms were not significant,  $(-0.08 \leq \beta_s \leq .02)$ , *ns* and these results are therefore not reported in Table 2.

## Discussion

A major finding of this study was that although ADHD symptoms and EFD were related to poor social and academic functioning, ADHD symptoms independently predicted social as well as school functioning, whereas EFD independently predicted only school functioning. These effects were independent of IQ. There were effects of EFD in interaction with ADHD symptoms on several outcome variables. There were also interactions with gender. High levels of ADHD symptoms were associated with high levels of physical aggression primarily for boys, whereas high levels of EFD had a negative impact on peer acceptance only for girls.

In line with previous findings based on clinical samples (e.g., Abikoff et al., 2002; Bagwell et al., 2001; Bauermeister et al., 2005), ADHD symptoms (both symptoms of inattention and of hyperactivity/impulsivity) predicted poor social functioning. These effects were also shown to be independent of IQ and EFD. Furthermore, in this study, ADHD symptoms were related to poor social functioning as measured by peer nominations, which strengthens conclusions from previous studies that have relied only on teacher or parent ratings of peer acceptance (e.g., Bagwell, et al., 2001; Biederman, et al., 2002). As social preference based on peer nominations should be very reliable sources of peer acceptance compared to information from adults, and social preference has been found to be relatively stable through elementary school (Brendgen et al., 2001), our findings add further

evidence to the conclusion that high levels of ADHD symptoms are related to poor social outcomes in children.

As regards EFD, high levels of EFD were associated with low levels of prosocial behavior and high levels of physical aggression, but EFD did not independently predict any of the social functioning measures in the regressions controlling for IQ and ADHD symptoms. These findings are in line with the study by Biederman and colleagues (2004) indicating that EFD may be more related to academic than to social outcomes in children with high levels of ADHD symptoms. It should however be noted that a possible reason why ADHD symptoms were more closely related to social functioning than EFD were, is that subjective ratings of ADHD symptoms according to the DSM diagnostic criteria encompass mostly behaviors likely to occur in social contexts and do not include ratings of cognitive functioning. Still, EFD in interaction with ADHD symptoms were important for some aspects of social functioning. Low levels of EFD in combination with low levels of ADHD symptoms were associated with high levels of prosocial behavior, although at high levels of EFD, prosocial behavior did not differ as a function of levels of ADHD symptoms. Finally, separate analyses of the two ADHD dimensions showed that this interaction effect was mainly carried by symptoms of inattention which indicates that interaction effects between EFD and symptoms of inattention and of hyperactivity/impulsivity should be examined separately.

In line with the findings by Biederman et al. (2004) we obtained both additive and interactive effects of EFD and ADHD symptoms on school performance variables. As regards additive effects, the findings of this study as well as previous findings document that ADHD symptoms and poor EF are both associated with poor school functioning (e.g., Barry et al., 2002; Biederman et al., 2004; Bauermeister et al., 2005). The independent effect of ADHD symptoms are in line with prior studies (Barry et al., 2002; Biederman et al., 2004) indicating that ADHD symptoms alone may be good predictors of academic underachievement. The separate analyses of inattention and hyperactivity/impulsivity gave further nuances to this picture. After control for IQ and EFD, symptoms of inattention predicted both school performance and special education needs, but symptoms of hyperactivity/impulsivity only predicted special education needs. Speculatively, these results indicate that the special education needs related to hyperactivity/impulsivity were motivated by misbehavior in the classroom more than by learning difficulties. As regards interactive effects, high levels of inattention together with high levels of EFD predicted higher levels of special education needs. Thus, and in line with the Biederman et al (2004) study, high EFD may exacerbate the school situation for children with high levels of ADHD symptoms.

Regarding gender differences, we obtained an interaction effect of EFD and gender indicating that EFD has graver consequences for the peer acceptance of girls than of boys. In daily life, EFD may manifest itself as low impulse control, inability to plan, to follow through and to abide by the rules of games and social interactions. Because boys in general had higher levels of EFD, the interaction effect between gender and EFD on SPS indicates that the behavioral manifestation of EFD may be more accepted in boys. Finally, in line with findings of children with clinically diagnosed ADHD, showing that boys with ADHD engage in more externalizing behaviors than girls (e.g., Abikoff et al., 2002), we also obtained significant interactions of symptoms of ADHD and gender to the effect that for boys but not girls, high levels of ADHD symptoms were associated with much physical aggression.

*Limitations.* A few limitations of the present study should be noted. First, we did not assess reading problems which may have influenced children's performance on the verbal-fluency task, and which in turn may have influenced the relation between EFD and school performance. We recommend that future studies control for possible contamination effects of comorbid conditions, such as reading problems, on EF tasks, to better assess the relations between EFD and school performance. Second, the number of laboratory measures of EF was limited. A recommendation to future studies would thus be to incorporate more measures, as well as multiple measures of the same construct of EF. Although our use of cut-offs to define EFD may have appeared arbitrary, by doing so we managed to compose a comprehensive measure of EFD which also allowed us to compare our findings with those of previous studies conducted on clinically diagnosed children with ADHD.

Third, we did not include an objective measure of academic achievement (e.g., achievement tests). Our measure of school performance was based on teacher ratings. However, teachers have been found to be valid reporters of children's school performance as their evaluations of children's

## Impact of EF and ADHD on peer relations and school performance

academic achievement have been found to correlate highly with objective test results (Henricsson & Rydell, in press).

Finally, although we used an aggregated measure of ADHD symptoms that is, teacher- and parent ratings at ages 8 and 8½ respectively, it is possible that the fact that teachers rated both ADHD symptoms and school performance contributed to the strength of the correlation between the two variables.

*Conclusions.* The findings of this study confirm that poor social- and school functioning are associated with symptoms of ADHD and with poor EF. As peer relation difficulties have been found to be fairly stable and to predict future social maladjustment, conduct problems, and delinquency (e.g., Coie & Dodge, 1983; Kupersmidt, Coie, & Dodge, 1990; Miller-Johnson et al., 2002), it is important to incorporate interventions in treatment that target and remediate the problematic peer relations of children with ADHD. In addition, because EFD as well as ADHD symptoms were related to social functioning in the eyes of peers, the results indicate that it is of importance to incorporate EF in clinical assessments of children with ADHD, not only as a diagnostic tool as is often done today (e.g., EF assessments with the NEPSY; Korkman, Kirk, & Kemp, 1998) but also to better predict these children's social outcomes.

Furthermore, our findings indicate that girls and boys displaying somewhat elevated levels of EFD may be equally impaired in the academic domain, but girls with EFD seem to be more impaired in their social functioning in terms of being more disliked by peers than equivalent boys. Interestingly, we obtained these results despite the fact that boys had higher levels of EFD and that boys with high levels of ADHD symptoms were perceived by peers as more physically aggressive than were comparable girls.

In sum, this study demonstrates that results regarding ADHD, EF and social and academic functioning formerly found in clinical samples hold for a community based sample. Further, our results point to the fruitfulness of investigating relations between ADHD, EFD and outcomes separately for boys and girls as well as separately for the two ADHD dimensions. Finally, our results stress the importance of examining the long term implications of EFD and ADHD symptoms.

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Table 1  
*Descriptive Statistics for All Study Variables (N = 101-112).*

	M (SD)	Min	Max
<b>Predictor variables</b>			
Symptoms of Inattention	3.10 (3.37)	0.00	13.00
Symptoms of Hyperactivity/Impulsivity	2.33 (3.25)	0.00	15.00
ADHD symptoms	5.44 (6.11)	0.00	28.00
EFD	0.96 (0.96)	0.00	4.00
IQ†	31.52 (9.90)	6.00	44.00
<b>Outcome variables</b>			
SPS	0.20 (0.98)	-2.83	1.99
Prosocial behavior	0.15 (1.04)	-1.53	3.36
Physical aggression	-0.19 (0.79)	-0.95	3.52
Relational aggression	-0.10 (0.72)	-1.12	2.70
School performance	3.69 (0.82)	1.00	5.00
Special education (% receiving)	19.64		

Note: EFD = Executive Functioning Deficits; †IQ was used only as a control variable; SPS = Social Preference Score.

Impact of EF and ADHD on peer relations and school performance

Table 2  
Results of Hierarchical Regression Analyses Examining Main and Interaction Effects (x) of Gender, Executive Functioning Deficits (EFD), and ADHD symptoms (ADHD) on Children's Social and School functioning (N= 101-112).

	SPS		Prosocial behavior		Physical aggression		Relational aggression		School performance		Special education	
	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$
Step 1	.15**		.16**		.32**		.11*		.27**		.35**	
IQ		.10		.16		-.13		-.01		.25**		-.22**
Gender		.20		-.10		.10		-.10		.05		-.02
EFD		-.06		-.16		.04		.10		-.24**		.20*
ADHD		-.30**		-.19		.49**		.28**		-.25**		.40**
Step 2												
2a. EFD x ADHD	.01	.11	.06*	.30*	.06**	.31**	.00	.05	.00	.06	.01	.08
2b. EFD x Gender	.05*	.22*	.01	.09	.01	-.09	.01	-.10	.00	.05	.00	.04
2c. ADHD x Gender	.03	.18	.01	.12	.09**	.33**	.00	.04	.01	-.07	.00	-.03

Note: SPS = Social Preference Score; \* p < .05; \*\* p < .05.

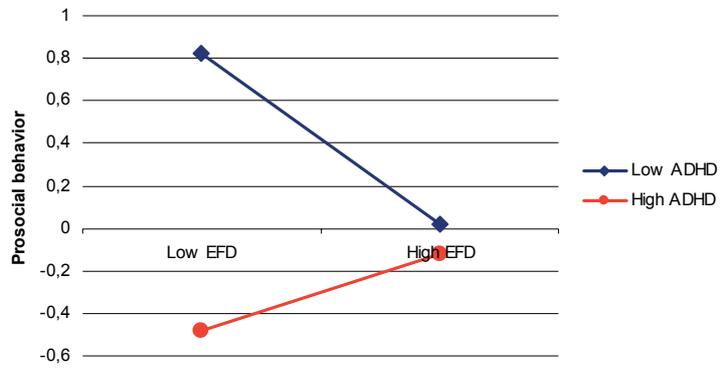
## Impact of EF and ADHD on peer relations and school performance

### Figure 1

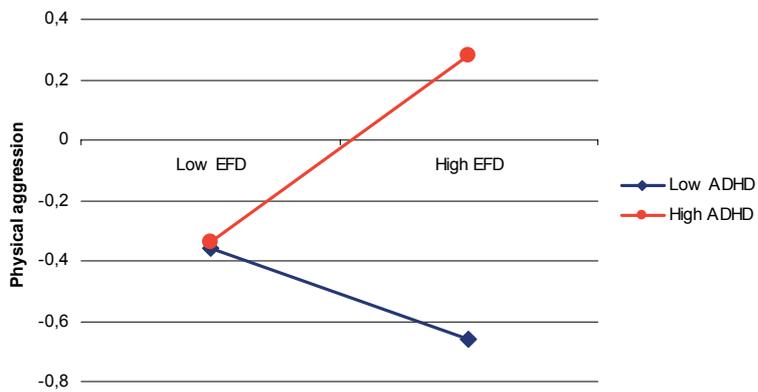
*Interaction Effects between ADHD symptoms and Executive functioning deficits (EFD) on Peer nominations of Prosocial behavior (1a) and of Physical aggression (1b) and between symptoms of Inattention and EFD on Special Education Needs (1c).*

### Impact of EF and ADHD on peer relations and school performance

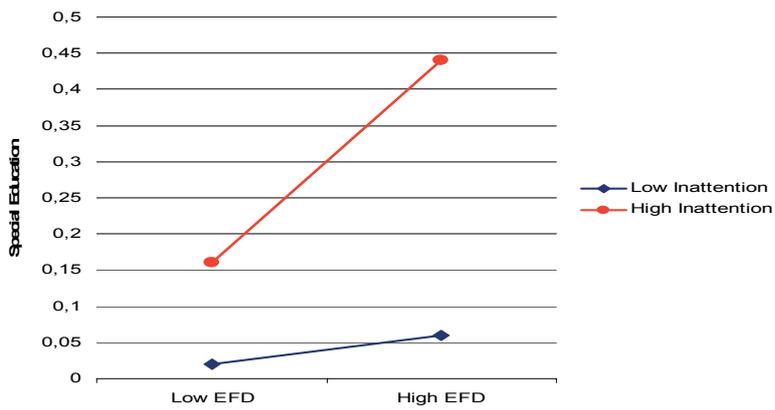
1a)



1b)



1c)



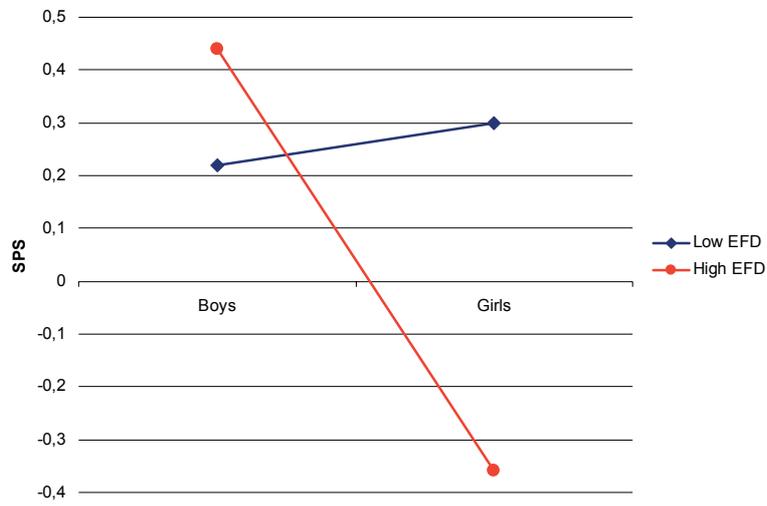
Impact of EF and ADHD on peer relations and school performance

Figure 2

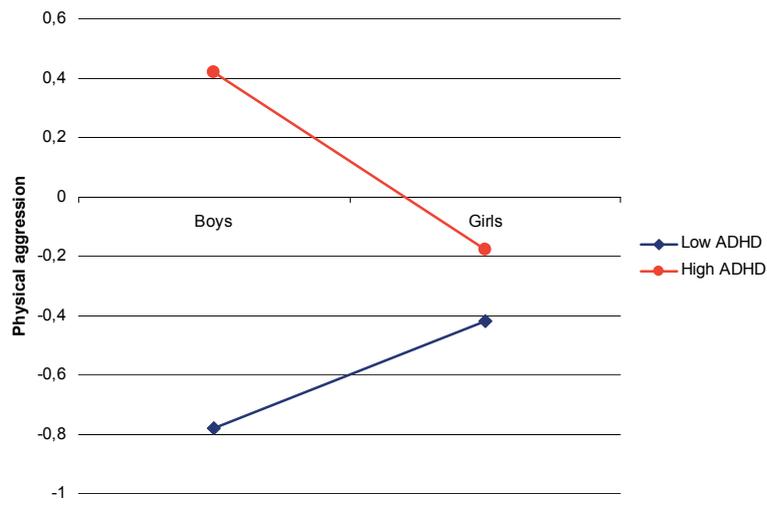
*Interaction Effects between Gender and EFD on Children's Social Preference Score (SPS; 2a) and between Gender and ADHD symptoms on Peer nominations of Physical aggression (2b).*

## Impact of EF and ADHD on peer relations and school performance

2a)



2b)



Paper III





RUNNING HEAD: SELF-ESTEEM AND AGGRESSION IN CHILDREN

Can both Low and High Self-esteem be related to Aggression in Children?

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## Self-esteem and aggression in children

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## Self-esteem and aggression in children

### Abstract

This study examined the opposing hypotheses that either low- or exaggerated but disputed self-esteem is related to aggression in 652 twelve-year-old school children. Children provided peer nominations of social acceptance and of physical aggression, self-ratings of global self-worth and of social satisfaction. Teachers rated aggressive behavior and internalizing problems. Exaggerated but disputed self-esteem was conceptualized as discrepancies between self- and peer nominations of social satisfaction and of social acceptance respectively, in combination with peer rejection. The main results showed that both low levels of global self-worth and exaggerated but disputed self-esteem were related to aggression. The findings indicated that, depending on how self-esteem is conceptualized, aggressive children may appear to have both a low and a high self-esteem. Regarding gender differences, exaggerated self-esteem was more strongly related to aggression in boys than in girls.

Key words: Self-esteem, aggression, gender differences, children.

Can both Low and High Self-esteem be related to Aggression in Children?

The relation between aggression and self-esteem in children has received renewed attention during the past decade and is currently debated. One view suggests that aggression and antisocial behavior in children are an expression of children's low self-esteem (*low self-esteem hypothesis*; Donnellan, Trzesniewski, Robins, Moffitt, & Caspi, 2005; Fergusson & Horwood, 2002; Gjerde, Block, & Block, 1988). On the other side, researchers argue that aggression in children stems from a high self-esteem that is threatened or disputed by others (*disputed self-esteem hypothesis*; e.g., Baumeister, Bushman, & Campbell, 2000; Baumeister, Smart, & Boden, 1996; Bushman & Baumeister, 1998; Hymel, Bowker, & Woody, 1993). Given the theoretical attention surrounding this issue as well as its clinical implications, the present study was designed to further our understanding of the link between aggression and self-esteem in children. Specifically, we examined the relations between different conceptualizations of self-esteem and aggression also taking into account internalizing problems, peer relations, and gender differences.

How can both low and high self-esteem be related to aggression in children? We suggest two possible reasons. First, the definition of "high" and "low" self-esteem has varied in different studies. Whereas a child's absolute levels of self-esteem can be "high" or "low" when compared to peers' self-esteem, a child's self-esteem can also be "high" or "low" relative to observers' (e.g., peers') ratings of the child's behavior and competencies. The latter definition refers to a child's over- or underestimations of behavior and competencies relative to observers' ratings.

Second, the conceptualization of self-esteem has varied in the literature. Self-esteem has been conceptualized either as global self-evaluations reflecting how satisfied one is with how one is leading one's life, or as domain specific evaluations of behavior or competence (Harter, 1988). Studies providing support for the low self-esteem hypothesis have examined absolute levels of global self-esteem (Donnellan et al., 2005; Fergusson & Horwood, 2002), whereas studies providing support for the disputed self-esteem hypothesis have examined overestimations of social acceptance, i.e., overestimations of domain specific evaluations of competence (e.g., Rudolph & Clark, 2001; Van Boxtel, De Castro, & Goossens, 2004). Hence, depending on whether absolute levels of global self-evaluations or relative evaluations of social acceptance have been examined, both low and high levels of self-esteem have been related to aggression in children. To date, no studies have examined in the same sample the relations between aggression and different definitions of "high" and "low" levels of self-esteem conceptualized as absolute or relative levels of self-evaluations.

Why should low global self-esteem be related to aggression? First, low global self-esteem has been found to correlate highly with depression (for a review see Harter, 1999) and it may be viewed as a reflection of children's internalizing problems. It has been suggested that aggression and depression may be linked to each other due to the more overall relation between externalizing and internalizing problems in children (Weiss & Catron, 1994; Weiss, Süsner, & Catron, 1998). However, previous studies supporting the notion that low self-esteem is related to aggression (Donnellan et al., 2005; Fergusson & Horwood, 2002) have not controlled for effects of internalizing problems.

Second, low global self-esteem may be a reflection of children's poor peer relations. Contemporary developmental theories suggest that children's self-esteem emerges from an internalization of the views of significant others (Cole et al., 2001; Harter, 1999). As children enter middle childhood (i.e., around the age of 7), the peer group plays an increasingly large role in influencing children's cognitions and behavior and the influence of peer approval is therefore critical during this time (Harris, 1995; Patterson, Kupersmidt, & Griesler, 1990; Rudolph, Caldwell, & Conley, 2005). Negative peer experiences such as peer rejection have been associated with both unfavorable views of the self and with aggression (Cassidy & Asher, 1992; Guerra, Asher, & DeRosier, 2004; Ladd & Troop-Gordon, 2003). Although low global self-esteem has been related to aggression even after control for self-ratings of poor peer relations (Donnellan et al., 2005), the effects of actual peer rejection on the relation between self-esteem and aggression remain to be examined.

However, according to the disputed self-esteem hypothesis, children make an active choice as to whether they accept or reject peers' appraisals of their own behavior and competencies. Hence, if children's high self-evaluations of behavior and competencies are not concordant with peers' evaluations, children may act aggressively towards those who dispute their high evaluations (Baumeister et al., 1996; 2000). If, for instance, children hold a high self-esteem regarding their social

acceptance despite actual peer rejection, to maintain their high self-evaluations they may choose to behave aggressively towards those who dispute them. Conversely, aggression and peer rejection are expected to interact in predicting overestimations of social acceptance. Aggressive-rejected children are expected to overestimate their social acceptance more than non-aggressive children who are not rejected by peers or rejected non-aggressive children.

In line with the disputed self-esteem hypothesis, aggressive-unpopular or aggressive-rejected children have been found to overestimate their social acceptance more than non-aggressive average children, aggressive-accepted children, and rejected-non aggressive children (Hymel et al., 1993; Rudolph & Clark, 2001; Zakriski & Coie, 1996). Furthermore, only among rejected children have overestimations of social acceptance been related to aggression (Van Boxtel et al., 2004). However, in this latter study, rejected children were compared with children differing in levels of aggression and sociability as comparison children belonged to all other peer status groups (e.g., popular, neglected). This complicates matters as, for instance, both popular and average children have been found to differ from rejected children in levels of aggression and sociability (for a meta-analytic review see: Newcomb, Bukowski, & Pattee, 1993). In addition, although peer rejection and overestimations of social acceptance interacted in predicting aggression, this interaction was not interpreted. Hence, whether rejected children who overestimate their social acceptance behave more aggressively than average children who also overestimate their social acceptance remains to be examined.

In sum, two contradicting hypotheses regarding the link between self-esteem and aggression in children have been proposed. The *low self-esteem hypothesis* proposes that low global self-esteem is related to children's acts of aggression and antisocial behavior. The *disputed self-esteem hypothesis* proposes that exaggerated, in relation to observers' ratings, self-esteem regarding social acceptance, is related to children's acts of aggression only when children's exaggerated self-esteem is disputed by others (e.g., as in the case of peer rejection). Previous findings report contradicting results regarding the relations between self-esteem and aggression possibly due to different measurements of self-esteem levels (i.e., high/low self-esteem in comparison to peers' self-esteem versus overestimations of competencies compared to peer ratings), or due to different conceptualizations of self-esteem (i.e., global self-evaluations versus self-evaluations of social acceptance).

### This study

This study aimed to disentangle conflicting findings concerning the relation between self-esteem and children's acts of aggression measured by teacher ratings and peer nominations, incorporating several novel aspects: First, we examined the relation between aggression and different conceptualizations of self-esteem previously used in the literature but never investigated in the same study, thus combining two views on self-esteem holding sample characteristics constant. We conceptualized self-esteem as global self-worth, and also, as discrepancies between self-ratings of social acceptance and social acceptance measured by peer nominations (i.e., discrepancy scores where positive values indicated overestimations of social acceptance). Second, to examine whether the association between low self-esteem and aggression is a reflection of the relation between internalizing and externalizing problems or of children's poor peer relations, we controlled for the effects of internalizing problems and of peer acceptance when examining the relation between low global self-esteem and aggression. Third, previous studies report that boys in general are more physically aggressive than girls (e.g., Coie & Dodge, 1998; Maughan, Rowe, Messer, Goodman, & Meltzer, 2004; Scourfield, John, Martin, & McGuffin, 2004), and therefore we also examined gender differences in all the above relations.

To provide support for the low self-esteem hypothesis, low levels of global self-worth should be associated with high levels of peer and teacher ratings of aggression. In case global self-worth was a reflection of children's internalizing problems or negative peer relations, we expected that global self-worth would not predict aggression after control for internalizing problems and for peer rejection. To provide support for the disputed self-esteem hypothesis, discrepancy scores should be positively related to peer and teacher ratings of aggression for rejected children only. In the absence of previous findings regarding interaction effects of gender and self-esteem and interaction effects of gender, peer rejection and overestimations of social acceptance on aggression, these analyses were exploratory.

We wanted to overcome some methodological limitations of previous research regarding the link between overestimations of social acceptance and aggression in children. To assess discrepancy scores, we used the standardized difference- and not the residual difference scores between informants' ratings as used in previous studies (e.g., Van Boxtel et al., 2004). It has been shown that when subjective ratings are used and no informant can be viewed as the "gold standard" by which another informant's ratings can be interpreted as representing absolute over- or underestimations, it is preferable to use the standardized difference between informants' ratings (De Los Reyes & Kazdin, 2004). Finally, we examined the disputed self-esteem hypothesis, that is, the effects of peer rejection on the relation between overestimations of social acceptance and aggression, by comparing rejected children with children of average peer status. Excluding children of popular, neglected, and controversial peer status in these analyses made results easier to interpret as children of these different peer status groups have been found to differ in levels of aggression and sociability.

### Method

As the recruitment of the sample, the procedure, and all the measures used have been described in detail in previous publications (see Diamantopoulou, Henricsson, & Rydell, 2005; Henricsson & Rydell, 2006) they are only presented briefly here.

#### *Participants and procedure*

Participants were 652 twelve-year-old children ( $M = 12$  years and one month,  $SD = 4$  months; 330 boys) recruited from 30 classrooms in 23 elementary schools in a mid-sized Swedish university town. After consent from parents, we collected teacher ratings, self-reports, and sociometric nominations during the spring semester of grade six. Children of this age were selected because after the age of 9 to 10, peer social status and especially rejected status, appears to be relatively stable (Coie & Dodge, 1983). Children were informed that participation was voluntary and that all data were strictly confidential.

#### *Measures*

##### Independent variables

*Peer relations.* We used sociometric nomination questionnaires to examine children's peer relations in accordance with the standard method described by Ladd (1999). For all the measures of social functioning derived by peer nominations, we standardized items across gender within each class. Children were asked to nominate up to three children in the class that they liked and disliked the most. We derived a *Social Preference Score* (SPS) by subtracting the number of nominations on the social disliking item from the number of nominations on the social liking item. Thus, children who received many negative nominations had either a low SPS or a negative one. We also derived a *Social Impact Score* (SIS) score by summing the positive and negative nominations. We used SPS and SIS to compose the measurement of peer status and we also used SPS to compute the discrepancy scores (see further below).

To assess *peer rejection* we composed a measurement of *peer status* based on children's answers on the sociometric nominations questionnaire and divided children into peer status groups according to the Coie and Dodge (1983) procedure. In the analyses regarding the effects of peer rejection on the link between overestimations of social acceptance and aggression (see Statistical analyses) we compared the rejected ( $n = 128$ ) with the average ( $n = 203$ ) children excluding children in the popular, neglected, and controversial peer status groups.

*Global self-worth.* To assess children's global self-evaluations we used a revised, Swedish version of Harter's Self-perception Profile for Adolescents (SPPA; Harter, 1988). The revised version of the SPPA does not include the original format of the items that describe two children with opposite characteristics on each item. Instead, children made ratings on a 4-point scale with ascending numbers indicating more positive self-perceptions (scale range: 1 = does not apply at all; 2 = does not apply very well; 3 = applies quite well; 4 = applies very well). Both positive and negative statements of self-perceptions were used, as in the original format of the SPPA, to minimize social desirability effects. The revised version has previously been administered to a Scandinavian sample, where the

factorial design of the original instrument was replicated, and reliability, convergent validity and discriminant validity were the same or better than for the original version of the instrument (Wichstrøm, 1995). Children rated their global self-worth on the five items of the scale (e.g., “I am happy with myself most of the time”; “I like the person I am”;  $\alpha = 0.82$ ).

*Discrepancy scores.* To assess overestimations of social acceptance we calculated discrepancy scores based on peer nominations of children’s actual peer acceptance (i.e., SPS see above) and children’s self-perceptions of social satisfaction. We measured children’s *social satisfaction* with sixteen reversed items from the “Loneliness and Social Dissatisfaction Questionnaire for Young Children” (e.g., “It is easy for me to make new friends at school”-reversed, “I feel alone at school”; Cassidy & Asher, 1992). The response format was from 1 = does not apply at all, to 4 = applies very well;  $\alpha = 0.87$ . We calculated discrepancy scores between children’s social satisfaction and peer nominations of children’s social acceptance, i.e., the SPS. As recommended by De Los Ryes and Kazdin (2004) discrepancy scores were based on the difference between children’s and peers’ standardized ratings of social satisfaction and of peer acceptance respectively (for rejected and average peer status groups only). Positive values equaled overestimations of social acceptance relative to peer nominations, whereas negative values equaled underestimations.

*Internalizing problems.* We used internalizing problems only as a control variable. Teachers rated internalizing problems on five items from the Child Behavior Questionnaire (e.g., “Often worried”, “Often appears miserable”; Rutter, Tizard, & Whitmore, 1970). Ratings ranged from 1 = does not apply at all, to 5 = applies very well;  $\alpha = .79$ . We used the mean score of items as a measure of internalizing problems.

#### Dependent variables

*Peer nominations of physical aggression.* In the sociometric nominations (see above), peers nominated “three children in the class who get into fights with others”, and “three children in the class who kick, push, and hit other children”;  $\alpha = .81$ . We chose to collect peer nominations on these two aggressive behaviors as they are the most frequently used in the literature (Ladd, 1999), and by limiting the number of nominations to three, which is the common procedure in sociometrics, we tried to ascertain that the most typically aggressive children would be nominated.

*Teacher ratings of aggressive behavior.* Teachers rated aggressive behavior on four items of the Child Behavior Questionnaire (e.g., “Frequently fights with other children”; “Irritable, is quick to fly off the handle”; Rutter et al., 1970). Ratings ranged from 1 = does not apply at all, to 5 = applies very well;  $\alpha = 0.87$ ). Teacher ratings of aggressive behavior and peer nominations of physical aggression correlated significantly,  $r(652) = .63, p < .01$ .

#### Statistical analyses

In the *preliminary analyses* we conducted two-tailed *t*-tests to examine gender differences in all study variables for all children and calculated Pearson Product Moment Correlations between all variables.

In the *main analyses*, to examine the relation between self-esteem and aggression we conducted two hierarchical regression analyses. For both analyses, dependent variables were peer nominations of physical aggression and teacher ratings of aggressive behavior. We centered all the predictor variables (for the whole sample and for the rejected and average peer status groups for the first and second hierarchical regression analysis respectively) before entering them into the analyses. We multiplied the centered predictors to obtain interaction terms. In case of a significant interaction effect we followed the procedure described by Aiken and West (1991) to interpret results.

In the first analysis (Model 1) we aimed to examine whether global self-worth would significantly predict aggression after control for gender, internalizing problems, and peer acceptance, and also, whether we would obtain gender differences in the relation between global self-worth and aggression. Hence, predictors were gender, internalizing problems, and the SPS in the first step, global self-worth in the second step, and the two-way interaction between gender and global self-worth in the third step. The first analysis was based on the total sample of the 652 children.

In the second analysis (Model 2) we aimed to examine whether discrepancy scores would predict aggression for the rejected children only and whether we would obtain gender differences in the relation between overestimations of social acceptance, peer rejection, and

aggression. Therefore, only the rejected and average children were included in this analysis (331 children). We entered in the first step gender and peer status (dummy coded as 0 for rejected and 1 for average peer status group) as predictor variables. In the second step we entered discrepancy scores as predictor variables. In the third step we entered as predictor variables the two-way interaction term of either, a) discrepancy scores and peer status, or, b) of gender and discrepancy scores, or c) gender and peer status. In the final fourth step we entered the three-way interaction of gender, peer status, and discrepancy scores as a predictor variable.

## Results

### *Preliminary analyses*

Descriptive statistics for all study variables and results of gender comparisons are shown in Table 1. Results of the preliminary analyses indicated that boys compared to girls were perceived by peers as being more physically aggressive. According to teacher ratings, boys compared to girls behaved more aggressively and displayed higher levels of internalizing problems. Girls reported lower levels of global self-worth than boys did, but we obtained no gender differences in discrepancy scores. Boys and girls did not differ in peer status classification;  $\chi^2(4, 651) = 2.11, ns$ .

Insert Table 1 about here

In Table 2, correlations between all variables are presented. The correlation between teacher and peer assessments of aggression was substantial indicating that aggression ratings from these two sources of information are fairly reliable. Further, the two aggression variables and internalizing problems were significantly positively related.

Insert Table 2 about here

### *Main analyses*

To provide support for the low self-esteem hypothesis we expected low levels of global self-worth to be related to high levels of aggression. To provide support for the disputed self-esteem hypothesis we expected that, for rejected children only, high levels of overestimations of social acceptance would be related to high levels of aggression. As shown in Table 2, the bivariate correlations revealed, in line with the low self-esteem hypothesis, that global self-worth was weakly and negatively related to peer nominations of aggression and to teacher ratings of aggressive behavior. Discrepancy scores were positively related to peer nominations of physical aggression and to teacher ratings of aggression.

In terms of predicting aggression from self-esteem, results of the first hierarchical regression analysis (see Table 3, Model 1) showed that global self-worth independently predicted both variables of aggression even after control for the effects of gender, of internalizing problems, and of social acceptance. However, global self-worth explained the variance of the two aggression variables only to a small extent. All independent variables made significant independent contributions to the explained variance of both peer nominations of physical aggression and of teacher ratings of aggressive behavior.

Insert Table 3 about here

Curiously, high levels of internalizing problems predicted high levels of teacher ratings of aggressive behavior but low levels of peer nominations of physical aggression, although, as mentioned above, internalizing problems correlated positively with both the aggression variables (see Table 2). This discrepancy between bivariate and multivariate analyses indicates the working of at least one suppressor variable, i.e., variables that enhance the effect of other variables by suppressing variance that is irrelevant to the prediction of the outcome variable (Tabachnik & Fidell, 2001). We followed the procedure described by Cohen and Cohen (1983) and identified two suppressor variables, namely gender and SPS. Thus, although not primarily a focus of this study, this analysis demonstrated

a negative relation between internalizing problems and peer nominations of physical aggression when the effects of gender and peer acceptance were statistically controlled for.

Results of the second hierarchical regression analysis (see Table 3, Model 2) showed that discrepancy scores independently predicted both aggression variables after control for effects of gender and of peer status. Further, as predicted according to the disputed self-esteem hypothesis, we obtained two interaction effects between discrepancy scores and peer rejection regarding peer nominations of physical aggression and teacher ratings of aggressive behavior. It should however be noted that in both cases the interaction between discrepancy scores and peer rejection explained a small portion of variance of the two aggression variables. The interaction effects are illustrated in Figures 1 and 2. To interpret the interactions we plotted simple regression lines of overestimations of social acceptance on peer nominations of physical aggression and on teacher ratings of aggressive behavior, separately for rejected and average children controlling for gender. For rejected children, overestimations of social acceptance significantly predicted aggression,  $\beta = .30, p < .01, t = 3.93, p < .01$ , and  $\beta = .31, p < .01, t = 3.70, p < .01$ , for peer nominations of physical aggression and for teacher ratings of aggressive behavior respectively. For children of average peer status no effect of overestimations of social acceptance was found either for peer or teacher ratings of aggression,  $.06 \leq \beta \leq .07, ns$ . Hence, children who overestimated their social acceptance and whose social acceptance was disputed by peers (i.e., they were rejected by peers) were rated as more aggressive than rejected and average children who did not overestimate their social acceptance and average children who overestimated their social acceptance.

Insert Figures 1 and 2 about here

In sum, comparison of the two regression analyses indicated that both models explained equal portions of variance in peer and teacher ratings of aggression. The findings supported the low self-esteem hypothesis but global self-worth did not contribute much to the explained variance of the two aggression variables. The findings also supported the disputed self-esteem hypothesis as among children who overestimated their social acceptance, rejected children were perceived by both teachers and peers as being more aggressive than average children. However, there was also a general effect of overestimations of social acceptance as overestimations significantly predicted teacher and peer nominations of aggression even after control for gender and peer status. This raised the question whether low global self-worth and overestimations of social acceptance would give independent contributions and whether they would interact in the prediction of aggression. Thus, we conducted an additional hierarchical regression analysis on the whole sample. The two control variables, gender and internalizing problems (social acceptance was not used as a control variable because it served as one term in the overestimation variable), were entered in a first step together with global self-worth and overestimations of social acceptance. The interaction term between global self-worth and overestimations was entered in a second step. We centered all the predictor variables before entering them into the analysis. The findings revealed that low global self-worth significantly predicted peer nominations of physical aggression ( $\beta = -.13, p < .05$ ) and teacher ratings of aggressive behavior ( $\beta = -.14, p < .05$ ), as did overestimations of social acceptance ( $\beta = .40, p < .01$ , and  $\beta = .26, p < .01$  respectively for peer nominations of physical aggression and teacher ratings of aggressive behavior). The  $\beta$  estimates indicated that overestimations of social acceptance seemed to have a larger effect on predicting the two aggression variables compared to low global self-worth. The two-way interaction effect between global self-worth and overestimations of social acceptance did not contribute in predicting the two aggression variables ( $\beta \leq -.07, ns$ ).

#### *Gender differences*

As indicated by the results of the two hierarchical regression analyses (see Table 2), gender independently predicted the two aggression variables in both models.

Results of the first analysis (Model 1) indicated no gender differences in the relation between global self-worth and aggression as we obtained no interaction effect between gender and global self-worth regarding peer and teacher ratings of aggression.

Results of the second hierarchical regression analysis (Model 2) revealed that gender and discrepancy scores and also, gender and peer status, interacted in predicting peer nominations of physical aggression. To interpret the first interaction we plotted simple regression lines of

overestimations of social acceptance on peer nominations of physical aggression separately for girls and boys controlling for effects of peer status. For both genders, overestimations of social acceptance significantly predicted peer nominations of physical aggression,  $\beta = .28, t = 3.24, p < .01$ , and  $\beta = .23, t = 2.94, p < .01$  for girls and boys respectively. Hence, in addition to boys being generally more aggressive than girls, the significant interaction effect indicated that boys who highly overestimated their social acceptance were perceived by peers as more physically aggressive than boys with low levels of overestimation, which also was the case for girls although the effect on aggression of level of discrepancy scores was less for girls. As seen in Figure 3, the slope of the regression line was steeper for boys than for girls.

To interpret the second interaction effect we plotted simple regression lines of peer status on peer nominations of physical aggression controlling for effects of overestimations of social acceptance separately for girls and boys. For boys, peer status significantly predicted ratings of physical aggression,  $\beta = -.22, t = -2.80, p < .01$  while no effects of peer status on peer nominations of physical aggression was found for girls,  $\beta = -.14, t = -1.72, ns$ . Hence, as illustrated in Figure 4, rejected boys were perceived by peers as more physically aggressive than boys of average peer status whereas peer nominations of physical aggression did not differ as a function of peer status for girls. Finally, three way interaction effects of gender, peer status, and self-esteem were not significant.

Insert Figures 3 and 4 about here

#### Discussion

In this study, two hypotheses concerning the relations between self-esteem and aggression were examined; the low self-esteem hypothesis suggesting that low self-esteem is associated with acts of aggression and the disputed self-esteem hypothesis suggesting that aggressive behavior is related to exaggerated, in relation to observers' ratings, levels of self-esteem combined with less favorable judgments by others. Both hypotheses received support from the findings. In line with the low self-esteem hypothesis, low levels of global self-worth were related to high levels of aggression (i.e., both peer nominations of physical aggression and teacher ratings of aggressive behavior). In line with the disputed self-esteem hypothesis, among rejected, but not among average children, high levels of overestimations of social acceptance were related to high levels of aggression. In terms of gender differences, boys high on overestimations of social acceptance were rated by peers as being more physically aggressive than equivalent girls.

As regards low global self-worth and aggression, what the present findings add to the literature is that low levels of global self-worth did not appear to be related to aggression only as a reflection of either poor peer acceptance or of internalizing problems although both these two latter variables contributed to predicting aggression. Furthermore, the findings directly address aggression, which is also a novel finding as previous studies have investigated the broad spectrum of externalizing problems in relation to self-worth (e.g., Donnellan et al., 2005). A possible interpretation of these results could be that low global self-worth is associated with high levels of negative emotionality which in turn is related to aggression (Rydell, Berlin, & Bohlin, 2003). However, we should note that the relations between global self-worth and peer and teacher ratings of aggression were weak and that low global self-worth played a small role in predicting aggression compared to male gender and low peer acceptance.

Although not a focus of this study, the finding that gender and peer acceptance acted as suppressors in the relation between internalizing problems and physical aggression needs some comment. The suppressor analysis provided a picture of "pure" relations between internalizing problems and peer nominations of physical aggression when gender and peer acceptance were controlled for, indicating that aggression and internalizing problems are negatively related. In actuality when peers rate a child's levels of physical aggression their ratings are not free from their perceptions of the child's gender or social status. Hence, these findings should be interpreted with caution.

This study complements previous findings on the relation between disputed self-esteem and aggression. Unlike prior studies (e.g., Van Boxtel et al., 2004) we excluded children of popular, neglected and controversial peer status from the analyses and contrasted rejected children with average children. We believe that this strategy affords a fairly robust base for conclusion as it gives a distinct

picture of children with disputed versus not disputed self-esteem – for instance including neglected and controversial children in the comparison group could be including children with disputed self-esteem. However, as demonstrated in the regressions, overestimations of social acceptance significantly predicted aggression regardless of peer status. Previous studies have reported similar findings as exaggerated self-perceptions of one's social functioning relative to peer nominations have been associated with externalizing problems in children including physical and relational aggression, antisocial behavior, and symptoms of hyperactivity/inattention (Brendgen, Vitaro, Turgeon, Poulin, & Wanner, 2004; David & Kistner, 2000; Hughes, Cavell, & Grossman, 1997; Pardini, Barry, Barth, & Lochman, 2006). Hence, overestimations of social acceptance stood forward as a significant correlate of aggression and this effect was particularly strong for children whose rejected peer status indicated disputed self-esteem.

Why are overestimations of social acceptance linked to aggression in children?

Although resolving this issue is beyond the scope of this study, one possible explanation may have to do with poor social information processing. Poor social information processing has been found to be characteristic of aggressive children (e.g., Dodge, 1993; Dodge & Price, 1994; for a meta-analytic review see: Orobio de Castro, Veerman, Koops, Bosch, & Monshouwer, 2002). Hence, aggressive children may appear to be overestimating their social acceptance due to poor ability to interpret social cues and apprehend their social standing. We suggest that future studies examine whether poor social information processing mediates the relation between overestimations of social acceptance and aggression in children.

In terms of gender differences, the relations between overestimation of social acceptance and physical aggression in the eyes of peers was particularly strong for boys. In contrast, gender did not affect the relations between global self-worth and aggression. These findings have not previously been reported in the self-esteem literature. Although David and Kistner (2000) examined interaction effects between gender and overestimations of social acceptance for both physical and relational aggression (i.e., aggression that aims to harm others' social relations) the latter considered more common among girls, they did not report any significant results. Thus, overestimations may be a particularly strong force behind boys' aggression, while low self-worth seemingly has similar effects for boys and girls. However, because little is known about gender differences in the relation between self-esteem and aggression in children, our results should be considered preliminary. Furthermore, although, as indicated by the findings of David and Kistner (2000) the inclusion of relational aggression in examinations of aggression, self-esteem, and peer rejection may not yield any significant gender differences, we suggest that future studies conduct such examinations as knowledge in this area is limited.

In the present study, we examined children's social acceptance only within the classroom. However, aggressive children have been found to affiliate with other aggressive children who do not necessarily attend the same class (Asher, Parkhurst, Hymel, & Williams, 1990) which may explain why they appear to overestimate their social acceptance (e.g., Brendgen, Vitaro, & Bukowski, 2000; Fergusson, Swain-Campbell, & Horwood, 2002). Because such a mechanism may be present in the relation between overestimations of social acceptance and aggression, future studies should also examine children's peer relations outside the classroom.

The findings of the present study also raise new questions. First, it is clear that longitudinal studies are needed to help establish the direction of the associations between aggression and self-esteem. For instance, how does engaging in aggressive acts influence children's self-views over time and how do overestimations of competence and behavior influence children's aggressive behavior over time? Second, the findings of the present study demonstrated that children who overestimated their social acceptance and received feedback which was at odds with their self-views (i.e., peer rejection) were seen as particularly aggressive. As a result, future research should investigate what other possible types of discrepant feedback contribute to aggressive behavior. Further, an asset of the present study was that two aspects of self-esteem were investigated in one sample. The regression analyses, particularly the additional regression analysis that pitted low global self-worth against overestimations of social acceptance, indicated that overestimations had a larger impact on aggression than had low self-esteem but that the combination of low self-esteem and high levels of overestimations did not increase aggression. These results must be regarded as preliminary,

## Self-esteem and aggression in children

but they point to the fruitfulness of investigating different conceptualizations of self-esteem in order to deepen the knowledge of how children's self views relate to social behavior.

In sum, overestimations of social acceptance in general, disputed self-esteem and low global self worth were associated with high aggression levels. Hence, depending on how self-esteem is operationalized, the self-esteem of aggressive children may appear as both high and low. The present findings have implications regarding intervention programs for aggressive children. Insofar as positive effects of intervention studies aiming to either increase or reduce aggressive children's self-esteem to improve their social acceptance are lacking, approaches targeting self-esteem are not recommended. A more fruitful approach seems to be improving aggressive-rejected children's social skills as positive long-term effects of such interventions have been reported, including decreases in levels of aggression over time and increased peer liking (DeRosier, 2004; Fraser et al., 2005).

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Table 1

*Descriptive Data for All Study Variables for Girls (n = 322) and Boys (n = 330) and Gender Comparisons.*

	M (SD)		<i>t</i>	<i>d</i>
	Girls	Boys		
Self-ratings				
Social Satisfaction†	3.41 (0.37)	3.35 (0.41)	-1.97	0.15
Global self-worth	3.34 (0.59)	3.48 (0.51)	3.18**	0.25
Peer nominations				
Physical aggression	-0.24 (0.46)	0.24 (1.11)	7.40**	0.56
Social Preference Score†	0.00 (0.95)	0.00 (1.00)	0.98	0.00
Teacher ratings				
Aggressive behavior	1.37 (0.67)	1.87 (1.01)	7.40**	0.58
Internalizing problems	1.61 (0.73)	1.79 (0.87)	2.84**	0.22
Discrepancy scores	0.08 (1.08)	-0.07 (1.23)	1.77	0.13

Note: †Social Satisfaction and Social Preference Score (SPS) were used to derive the Discrepancy scores;  
 \*\* $p < .01$ .

Table 2  
*Correlations between Study variables for All Children (N = 652).*

	1.	2.	3.	4.	5.	6.	7.
1. Social satisfaction	-	.39**	-.04	.34**	-.03	-.30**	.58**
2. Global self-worth		-	-.10**	.19**	-.11**	-.15**	.18**
3. Peer nominations of physical aggression			-	-.38**	.63**	.08*	.30**
4. SPS				-	-.25**	-.35**	-.57**
5. Teacher ratings of aggressive behavior					-	.28**	.19**
6. Internalizing problems						-	.04
7. Discrepancy scores							-

Note: SPS = Social Preference Score; \*  $p < .05$ , \*\*  $p < .01$ .

Table 3  
*Summary of Hierarchical Regression Analyses Predicting Peer nominations of Physical Aggression and Teacher ratings of Aggressive Behavior.*

	Peer nominations of Physical Aggression		Teacher ratings of Aggressive behavior	
	$\Delta R^2$	$\beta$	$\Delta R^2$	$\beta$
Model 1				
Step 1	.23**		.17**	
Gender		-.29**		-.26**
Internalizing problems		-.10**		.19**
SPS		-.42**		-.18**
Step 2				
Global self-worth	.01*	-.07*	.01*	-.08*
Step 3				
Gender x Global self-worth	.00	.06	.00	.05
Model 2				
Step 1	.22**		.16**	
Gender		-.33**		-.31**
Peer status		-.17**		-.08*
Step 2				
Discrepancy score	.10**	.22**	.10**	.35*
Step 3				
3a. Discrepancy score x Peer status	.01*	-.12*	.01*	-.11*
3b. Gender x Discrepancy score	.01*	-.10*	.00	.04
3c. Gender x Peer status	.01*	.12*	.00	-.03
Step 4				
Gender x Peer status x Discrepancy score	.00	.09	.00	.07

Note: SPS = Social Preference Score; Peer status = Rejected and Average peer status; \*  $p < .05$ , \*\*  $p < .01$ .

Figure 1  
*Illustration of Interaction Effects between Discrepancy Scores (DS) and Peer status on Peer nominations of Physical Aggression (Model 2).*

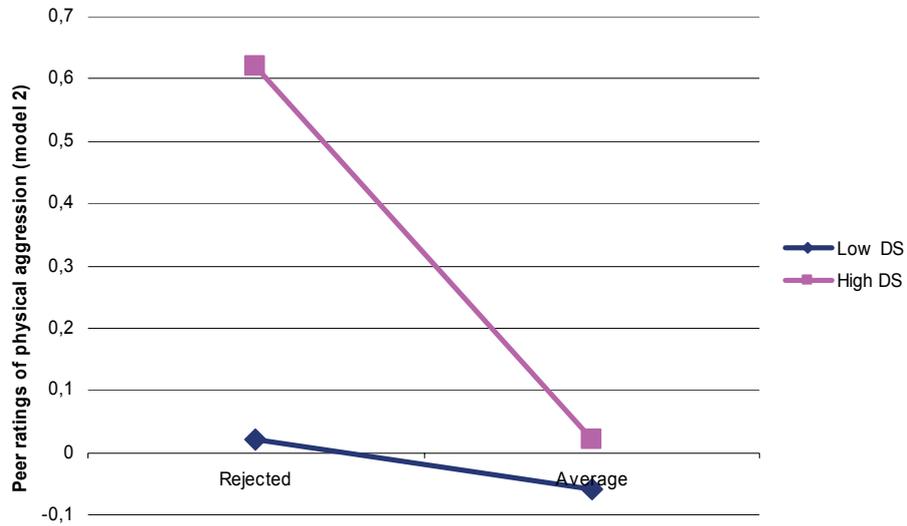


Figure 2  
*Illustration of Interaction Effects between Discrepancy Scores (DS) and Peer status on Teacher ratings of Aggressive behavior (Model 2).*

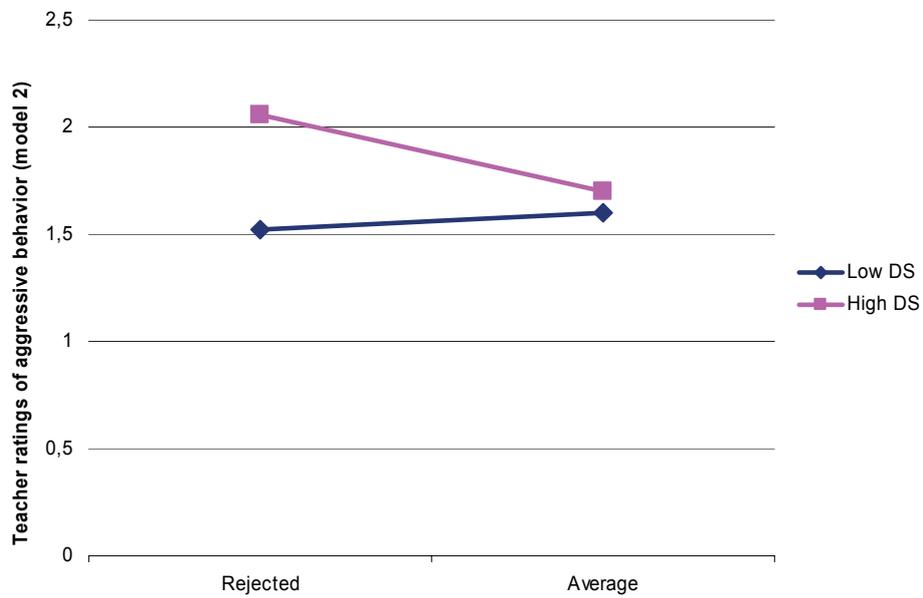


Figure 3  
*Illustration of Interaction Effects between Gender and Discrepancy scores on Peer nominations of Physical aggression (Model 2).*

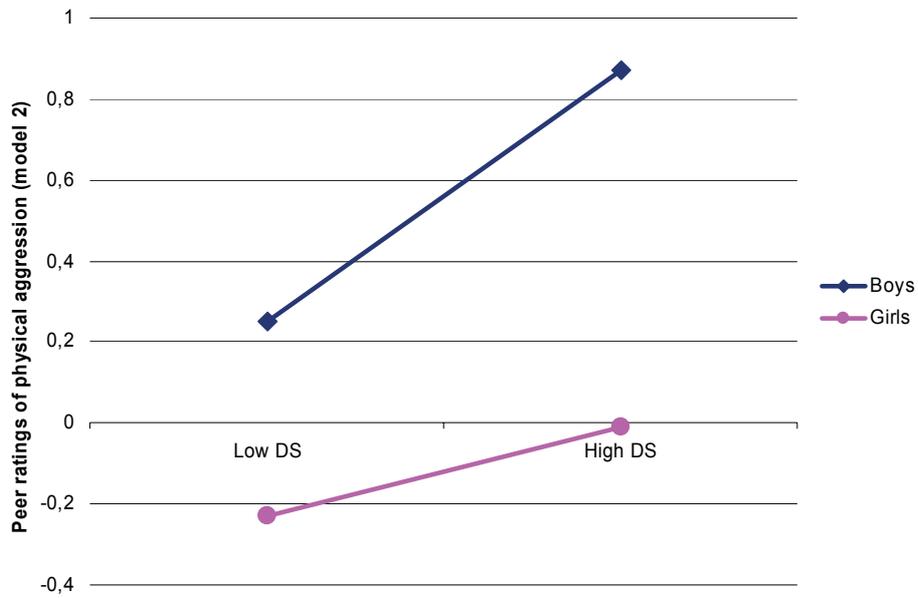


Figure 4  
*Illustration of Interaction Effect between Gender and Peer Status on Peer nominations of Physical aggression (Model 2).*

