

The Mediating Role of Aggressive Behaviour, Emotional and Behavioural Instability on the Association between ADHD Symptoms and Best Friend Conflicts

Giulia Zucchetti · Enrique Ortega ·
Ron H. J. Scholte · Emanuela Rabaglietti

Published online: 10 July 2014
© Springer Science+Business Media New York 2014

Abstract This study examined the direct association between Attention Deficit Hyperactivity Disorder (ADHD) symptoms (i.e. inattention and hyperactivity symptoms) and children's experience of best friend conflicts, and the mediating role of aggression, emotional and behavioural instability, exploring possible gender differences. The sample consisted of 334 children (52 % female; $M_{age}=9.38$, $SD=0.89$) attending primary schools in northwest Italy. ADHD symptoms were measured with a questionnaire completed by teachers whereas others variables were assessed a self-report questionnaire completed by the children. Analyses revealed that inattention and hyperactivity symptoms were differently associated with best friend conflicts according to gender. Among boys, only hyperactivity symptoms were associated with best friend conflicts whereas among girls only inattention symptoms contributed to best friend conflicts. Aggression and emotional and behavioural instability were found to mediate these associations for both genders. These findings suggest that to understand fully the association between ADHD symptoms and best friend conflicts it might be helpful to consider the different manifestations of that association by gender, whilst also considering behavioural and emotional dimensions of children's psychosocial adjustment.

Keywords ADHD symptoms · Best friend conflicts · Gender · Mediation

Introduction

In the last years, the identification and study of Attention Deficit Hyperactivity Disorder (ADHD) symptoms in children, especially during middle childhood, has

G. Zucchetti (✉) · E. Rabaglietti
Department of Psychology, University of Torino, Via Verdi 10, 10124 Torino, Italy
e-mail: giulia.zucchetti@unito.it

E. Ortega
Department of Health Science, California State University Dominguez Hills, Carson, CA, USA

R. H. J. Scholte
Behavioural Science Institute, Radboud University, Nijmegen, The Netherlands

increased considerably. One reason for the increased interest in ADHD symptoms is that the number of children diagnosed with ADHD has increased and the difficulties associated with this disorder are becoming well-established (Hoza 2007; Hoza et al. 2005). Nonetheless both under- and over-diagnosis remain a big problem in the international context (Cuffe et al. 2005). The absence of an adequate diagnostic protocol hampers the development of appropriate interventions in which might enable better developmental outcomes for these children in many different areas of life (at school, at home, with their peers). In Italy, the attitude towards diagnosis and treatment of children ADHD differs from that in America (Frazzetto et al. 2007). Italian clinicians have not typically conceptualized ADHD as a biological syndrome and nosological entity, more often classifying ADHD as a “personality disorder”, thus further complicating clinical attention and intervention. Moreover, the majority of Italian professionals do not make a definitive diagnosis of ADHD, although they usually verify the presence or absence symptoms among children.

Overall, prior work has demonstrated that children who suffer from ADHD symptoms but have not been formally diagnosed with ADHD report as many academic, social, emotional difficulties and other impairments as diagnosed children (Angold et al. 1999; Barry et al. 2002; Cornoldi et al. 2001; Polderman et al. 2010). Like children with a formal diagnosis of ADHD, children who suffer from ADHD symptoms are more disadvantaged than a matched group of peers (Abikoff et al. 2004; Bagwell et al. 2001; Frazier et al. 2007; Loe and Feldman 2007). For these reasons researchers have focused on the early identification of ADHD symptoms, investigating children with high levels of ADHD symptoms i.e. inattention (ADD symptoms) and behavioural hyperactivity (HYP symptoms) above the average level. Researchers have also examined the social and emotional impairments exclusively associated with ADHD symptomatology.

Many studies have suggested that ADHD symptoms can be associated with difficulties in peer relationships (Diamantopoulou et al. 2005, 2007). Children with ADHD symptoms were found to be rejected and neglected by peers (Abikoff et al. 2004; Bagwell et al. 2001; Blachman and Hinshaw 2002). ADHD symptoms have also been associated with low levels of social competence and poor school achievement (Biederman et al. 2004; Maedgen and Carlson 2000). ADHD symptoms are therefore assumed to be a salient factor in children’s friendships and social adjustment more generally. There are however unresolved methodological and theoretical issues in the literature on ADHD symptoms and peer relationships. Firstly, most research on peer relationships of children with ADHD symptoms has examined social isolation and peer rejection, assessed by peer nominations. Significantly less research has been dedicated to the close friendship experiences of children with ADHD symptoms. The majority of ADHD and close friendship studies in fact have concentrated on friendship quality in children with a formal diagnosis of ADHD (for a review of the peer relationship of ADHD children see Mikami 2010; Normand et al. 2007). Less is known about how inattention and hyperactivity symptoms can affect boys’ and girls’ ability to form a close friendship and the subsequent quality of these friendships. This is important; research has shown that quality of best friendships is more important to psychosocial adjustment than the quantity of friendships (e.g. Berndt 1982, 2002; Hartup and Stevens 1997).

Friendship quality encompasses both positive (e.g. companionship, security, support) and negative (e.g. conflict, dominance, rivalry) factors (Berndt 2002; Bukowski

et al. 1994; Furman 1996). Sometimes having a close best friend may alleviate the consequences of being rejected by one's peer group (Parker and Asher 1993), it may be also associated with important indicators of overall wellbeing (Newcomb and Bagwell 1995), and may provide protection and support against various kinds of socio-emotional problems, including acting as protective factor against peer victimization (Bollmer et al. 2005). Surprisingly, although positive indicators of friendship quality have received scientific attention, negative aspects - such as conflicts within the friendship - have been under-investigated. In the present study we investigated best friend conflicts. Best friend conflicts are episodes of conflict and disagreements within close friendships, perceived by the child, which may complicate the regular course of the friendship. Although conflict is considered a negative feature of a close friendship it does not mean that children are unwilling to work things out with their peers; if they were to learn specific communication strategies - for example problem solving, negotiation and perspective taking - they might be better able to resolve such disputes (Berndt and Keefe 1995; Ladd et al. 1996; Noakes and Rinaldi 2006).

Most previous studies which have found an association between children's ADHD symptoms and the quality of their friendships have not taken into account other possible mechanisms that could explain the quality of children's friendships. During middle childhood ADHD, symptoms seem to be associated with certain behavioural and emotional problems. In particular, empirical evidence shows that girls and boys with ADHD symptoms display high levels of aggression and a lack of emotional regulation (Maedgen and Carlson 2000; Wahlstedt et al. 2008; Zalecki and Hinshaw 2004). These social and emotional problems may undermine children's peer relationships and thus cause further psychosocial difficulties (Bagwell et al. 2001; Dodge and Coie 1987). Behavioural and emotional difficulties associated with ADHD may affect a child's ability to construct friendships. Children with ADHD symptoms may have difficulties connecting emotionally with a friend, taking the friend's perspective and establishing intimacy in friendship. In accordance with this hypothesis we explored specific dimensions of children's psychosocial adjustment, hypothesizing that aggression, and emotional and behavioural instability mediate the association between ADHD symptoms and conflicts with best friends. As children with ADHD symptoms are more likely to experience social, emotional and behavioural difficulties they may also be more likely to have friendships of low quality; specifically, high levels of aggression, and emotional and behavioural instability might increase best friend conflicts.

Specifically, the present study aimed to investigate the relationship between ADHD symptoms - considering ADD and HYP symptom separately - and children's perceptions of negative friendship qualities, focusing on possible gender differences. The existing literature (for a review see Gershon 2002) has underlined the importance of gender, especially with regard to differences in the balance between HYP and ADD symptoms. In comparison to ADHD boys, ADHD girls have fewer symptoms of inattention and hyperactivity problems; however girls are more likely than boys to display ADD symptoms rather than HYP symptoms. Although research has demonstrated that ADHD symptoms lead to some impairments in children's friendships for both genders, the existing literature on friendship quality in boys and girls who suffer from ADD and HYP symptoms is instead still sparse and ambiguous (see Mikami 2010). In view of the symptom differences between genders we predicted that ADD and HYP symptom dimensions would be differently related to best friend conflicts

among boys and girls. Additionally we tested whether the association between ADD and HYP symptoms and best friend conflicts was affected by specific behavioural and emotional dimensions of psychosocial adjustment, namely aggressive behaviour and emotional and behavioural instability, in boys and girls. We expected that high levels of aggression and emotional and behavioural instability would account for the relationship between ADHD symptoms and best friend conflicts in both genders. The findings of this study could inform development of preventive interventions. Italy is a country with a low prevalence of children with ADHD symptoms (Faraone et al. 2003; Skounti et al. 2007) and Italian professionals have interpreted ADHD symptoms as a developmental disorder situated within a socio-environmental framework (for a review see Frazzetto et al. 2007). Given this perspective on ADHD, dimensions of children's psychosocial adjustment which mediate the relationship between ADHD symptoms and best friend conflicts could provide targets for clinical intervention. Identifying such mediating factors is therefore of considerable importance, and may contribute to the development of interventions aimed at improving the psychosocial adjustment of children with ADHD symptoms, including the quality of their friendships.

Method

Procedure

This study was conducted in primary schools in the northwest of Italy. The sample initially comprised 334 children attending the second, third and fourth grades in these schools. Our study was approved by the Ethical Committee of the University of Turin. Parents provided active consent for their children to participate in accordance with Italian law and the Ethical Code of the Professional Psychologist Association in Italy; the children also agreed to participate. Children completed a questionnaire, which was administered during classroom time by trained research staff (two post-doctoral researchers and two PhD students in developmental psychology). The administration of the child's questionnaires lasted approximately 1 hour. During this time the teacher (who spends many hours with that class) completed a questionnaire giving his or her assessment of the presence of ADHD symptoms in each child. Completion of the teacher's questionnaire took about 15 min. We did not offer any incentive for participation in the study. No family refused to participate.

Participants

The participants were 334 children (48 % boys, 52 % girls) who were 8 to 10 years old ($M=9.38$; $SD=0.89$) attending the second (30 %), third (53 %) and fourth (17 %) grades of primary schools in urban and suburban areas of northern Italy. The participants were representative of the population of children attending primary school in this part of Italy. Our sample was comparable to the general Italian population (ISTAT [National Institute of Statistics], 2012). Ninety-three percent of the children were born in the same region, 5 % in other Italian regions and 2 % abroad. Ninety-one percent of the children had two Italian parents, 7 % had two non-Italian parents and 2 % were from mixed families; 80 % of the children lived with both married parents. In terms of

parental education 20 % of the parents had completed basic school, 40 % had finished high school, 20 % had some vocational specialization and 20 % had graduated from university. Ninety-four percent of the parents completed the questionnaire about socio-demographic information and returned it to school the following week in a sealed envelope. We did not find any difference in the study variables between the children whose parents completed the parental questionnaire and those whose parents did not. The parental questionnaires were completed by mothers (70 %), fathers (10 %), or both parents (20 %).

Measures

ADHD Symptoms To measure ADHD symptoms we used the ADHD Rating Scale for Teachers (SDAI) in an Italian version developed and validated by Marzocchi and Cornoldi (2000). The SDAI Scale was designed for use in screening, not for clinical diagnosis, and includes 18 items based on the eighteen-item list of ADHD symptoms in the fourth edition of the *Diagnostic and Statistic Manual of Mental Disorders* (American Psychological Association 2000). Half the items relate to inattention (ADD subscale) e.g. ‘*Has difficulty sustaining attention in tasks or play activities*’ and half relate to hyperactivity (HYP subscale) e.g. ‘*Is on the go or acts as if driven by a motor*’. The questionnaire was administered to teachers who were asked to assess the frequency of the appearance of the given behaviours, using a four-point Likert scale ranging from 0 to 3, where 0 = *child never shows this behaviour*; 1 = *child sometimes shows this behaviour*; 2 = *child often shows this behaviour*; 3 = *child very often shows this behaviour*. A higher score indicates that the given behaviour occurs more frequently. Cronbach’s α for the ADD and HYP subscales was 0.94 and 0.93 respectively.

Aggressive Behaviour To measure aggressive behaviour, child participants completed a fifteen-item Likert scale ranging from 1 (*almost never*) to 3 (*many times*) based on the number of times they had engaged in each of the listed behaviours e.g. non-play fighting, kicking, punching, teasing others or hurting others during the last year. An Italian version of this scale with good internal consistency (Cronbach’s $\alpha=0.86$) was developed and validated by Caprara and Pastorelli (1993). The scale was used as in previous studies (Caprara et al. 1997; Pastorelli et al. 1997) as a general indicator of the behaviours of interest. A higher score indicates higher frequency of a given behaviour.

Emotional and Behavioural Instability To measure emotional and behavioural instability, participants completed a seventeen-item Likert scale with response ranging from 1 (*almost never*) to 3 (*many times*). Items included ‘I shout, I interrupt someone when he/she is talking’, ‘I play noisy games’, ‘I disturb someone’, ‘I do not stay quiet’, ‘I play dangerous games’, ‘I cry frequently’. The Italian version of this scale was developed and validated by Caprara and Pastorelli (1993). The scale was used as in previous studies (Caprara et al. 1997; Pastorelli et al. 1997) as a general indicator of the behaviours of interest. Internal consistency, measured by Cronbach’s alpha, was 0.75. A higher score indicates a higher frequency of a given behaviour.

Best Friend Conflicts To measure best friend conflicts we used the Italian version, validated by Fonzi and colleagues (1996), of the Conflict Scale of the Friendship Quality Scale originally developed by Bukowski and colleagues (1994); it has

Cronbach's $\alpha=0.66$ and consists of 4 items, with responses on a four-point Likert scale ranged from 1 (*not at all*) to 4 (*very much*), and assesses feelings about frequent fighting, being angry even after the fight is over, disagreeing about many things, and reciprocal teasing of one's best friend. A higher score indicates a higher frequency of a given behaviour.

Statistical Analyses

Baron and Kenny's method was used to test whether putative mediating factors - aggressive behaviour and emotional and behavioural instability - affected the association between ADD and HYP symptom dimensions (predictors) and best friend conflicts (outcome) (Baron and Kenny 1986; MacKinnon and Dwyer 1993). In a preliminary analysis we checked whether the main predictors were associated with the outcome. Next the mediators were examined separately in two parallel models. A series of linear regression models were run, entering the predictors (ADD and HYP symptoms) in the first step, and the selected mediators (aggressive behaviour, emotional and behavioural instability) in the next step. Finally, Sobel tests were conducted to determine the statistical significance of mediation effects (Preacher and Leonardelli 2009).

Results

Descriptive Results

Descriptive statistics and correlations for all the study variables are presented in Tables 1 and 2 respectively. Boys were found to have more ADD ($t[330]=4.53$; $p<0.01$) and HYP ($t[330]=2.24$; $p<0.05$) symptoms than girls. Means for aggressive behaviour and emotional and behavioural instability appeared to be significantly higher for boys than girls ($t[330]=2.502$; $p<0.05$ and $t[330]=4.148$; $p<0.05$ respectively; see Table 1). Correlation scores indicated that the outcome (best friend conflicts) was differently associated with the predictors (ADD and HYP symptoms) according to gender. For boys best friend conflicts were associated with HYP symptoms but not ADD symptoms, whereas for girls best friend conflicts were associated with ADD but not HYP symptoms (Table 2). A precondition for testing mediation (Baron and Kenny 1986) is a main effect of the predictor variable on the outcome variable, as this main effect differed according to gender we decided to test the mediation models separately for boys and girls.

Mediator Effects on the Association Between HYP Symptoms and Best Friend Conflicts Among Boys

Results indicated that high HYP symptom scores were significantly associated with a high probability of reporting best friend conflicts, controlling for age ($B=0.074$; $p<0.01$; Table 3). The precondition of mediation, namely that HYP symptom scores were significantly associated with our mediator factors, was fulfilled: HYP symptoms were positively associated with aggressive behaviour ($B=0.35$; $p<0.05$) and emotional

Table 1 Descriptive statistic for all study variables

Variable	Boys Mean (SD)	Girls Mean (SD)	t
Best friend conflicts	6.9 (2.6)	6.7 (2.6)	0.697
ADD	7.5** (6.6)	5.9 (6.3)	4.532**
HYP	5.8* (5.9)	3.2 (4.6)	2.241*
Aggressive behaviour	22.8* (4.9)	20.2 (3.4)	2.502*
Emotional/Behavioural instability	25.4* (6.2)	23.3 (5.3)	4.148*

$N=334$

* $p < 0.05$

** $p < 0.01$

and behavioural instability ($B=0.21$; $p < 0.05$). In the first mediation model, when the aggressive behaviour variable was added into the analyses, HYP symptoms scores were no longer associated with best friend conflicts ($B=0.016$; $p > 0.05$), controlling for age (Table 3). A Sobel test revealed that the inclusion of aggressive behaviour fully mediated the association between HYP symptoms scores and best friend conflicts ($z=2.25$; $p < 0.01$).

The second mediation model showed that when emotional and behavioural instability (the putative mediator) was added to the equation HYP symptoms scores were no longer associated with the outcome (best friend conflicts) ($B=0.044$; $p > 0.05$), controlling for age (Table 4). Again, the Sobel test indicated that emotional and behavioural instability fully mediated the relationship between HYP symptoms scores and best friend conflicts ($z=2.20$; $p < 0.01$).

Mediator Effects on the Association Between ADD Symptoms and Best Friend Conflicts Among Girls

Results indicated that high ADD symptoms scores were significantly associated with a high probability of reporting best friend conflicts, controlling for age ($B=0.082$;

Table 2 Correlations among variables for girls (below the diagonal) and for boys (above the diagonal)

Variable	1	2	3	4	5
1. Best friend conflicts	–	0.10	0.17**	0.41**	0.21**
2. ADD	0.20**	–	0.76**	0.24**	0.15
3. HYP	0.13	0.69**	–	0.33**	0.25**
4. Aggressive behaviour	0.23**	0.15*	0.18*	–	0.57**
5. Emotional/Behavioural instability	0.14*	0.15*	0.17*	0.56**	–

$N=334$

* $p < 0.05$

** $p < 0.01$

Table 3 Unstandardized regression coefficients (controlling for age) of best friend conflicts (outcome), HYP (predictor), aggressive behaviour (mediator) among boys

Variable	B	SE β	β
Step 1			
HYP	0.074	0.035	0.169**
R ²	0.022		
F	4.508*		
Step 2			
HYP	0.016	0.034	0.037
Aggressive behaviour	0.214	0.041	0.404**
R ²	0.163		
F	16.116**		
ΔR^2	0.141		
ΔF	11.608		

$N=161$

* $p < 0.05$

** $p < 0.01$

Step 1: $R^2 = 0.022$, $p < 0.05$; Step 2: $\Delta R^2 = 0.141$, $p < 0.001$

$p < 0.01$; Table 5). The precondition of mediation, that ADD symptoms scores were significantly associated with our mediator factors, was fulfilled: ADD symptoms scores were positively associated with aggressive behaviour ($B=0.23$; $p < 0.01$) and emotional

Table 4 Unstandardized regression coefficients (controlling for age) of best friend conflicts (outcome), HYP (predictor), emotional/behavioural instability (mediator) among boys

Variable	B	SE β	β
Step 1			
HYP	0.074	0.035	0.169**
R ²	0.022		
F	4.508*		
Step 2			
HYP	0.044	0.039	0.095
Emotional/Behavioural instability	0.079	0.035	0.187*
R ²	0.040		
F	4.094**		
ΔR^2	0.018		
ΔF	0.414		

$N=161$

* $p < 0.05$

** $p < 0.01$

Step 1: $R^2 = 0.022$, $p < 0.05$; Step 2: $\Delta R^2 = 0.018$, $p < 0.01$

and behavioural instability ($B=0.14$; $p<0.05$). In the first mediation model, when the aggressive behaviour variable was added into the analyses, there was a decrease in the coefficient of the predictor (ADD symptoms) and the outcome (best friend conflicts) ($B=0.068$; $p<0.05$), controlling for age (Table 5). A Sobel test revealed that the inclusion of aggressive behaviour partially mediated the association between HYP symptoms scores and best friend conflicts ($z=2.15$; $p<0.05$).

The second mediation model showed that when emotional and behavioural instability (mediator) was added to the model there was a decrease in the coefficient of the predictor (ADD symptoms) and the outcome (best friend conflicts) ($B=0.029$; $p<0.05$) controlling for age (Table 6). Again, the Sobel test indicated that emotional and behavioural instability partially mediated the relationship between ADHD symptoms scores and best friend conflicts ($z=2.18$; $p<0.05$).

Conclusions

This study examined the association between ADHD symptoms (i.e. ADD and HYP symptoms) and children's best friend conflicts, investigating the possible mediating role of behavioural and emotional dimensions of children's psychosocial adjustment, and also considering potential gender differences. The study has added to existing research on friendship quality in the peer relationships of girls and boys with ADD and HYP symptoms, issues which have thus far received little attention. The study has highlighted how the association between specific social and behavioural dimensions - namely aggressive behaviour and emotional and behavioural instability - and ADD and HYP symptoms helps to explain the presence of peer-related socio-behavioural impairments amongst these children.

Table 5 Unstandardized regression coefficients (controlling for age) of best friend conflicts (outcome), ADD (predictor), aggressive behaviour (mediator) among girls

Variable	B	SE β	β
Step 1			
ADD	0.082	0.031	0.196**
R ²	0.033		
F	6.820*		
Step 2			
ADD	0.068	0.031	0.164*
Aggressive behaviour	0.166	0.061	0.204**
R ²	0.067		
F	7.131**		
ΔR^2	0.34		
ΔF	0.311		

$N=173$

* $p<0.05$

** $p<0.01$

Step 1: $R^2=0.033$, $p<0.01$; Step 2: $\Delta R^2=0.34$, $p<0.001$

Table 6 Unstandardized regression coefficients (controlling for age) of best friend conflicts (outcome), ADD Symptoms (predictor), emotional/behavioural instability (mediator) among girls

Variable	B	SE β	β
Step 1			
ADD	0.082	0.031	0.196**
R ²	0.033		
F	6.820*		
Step 2			
ADD	0.029	0.014	0.117*
Emotional/Behavioural instability	0.064	0.025	0.143*
R ²	0.041		
F	7.780**		
ΔR^2	0.008		
ΔF	0.96		

N = 173

* $p < 0.05$

** $p < 0.01$

*** $p < 0.001$

Step 1: $R^2 = 0.033$, $p < 0.01$; Step 2: $\Delta R^2 = 0.008$, $p < 0.01$

Overall, our results confirm the gendered manifestation of ADHD symptomatology: girls had lower levels of ADD and HYP symptoms than boys. However our study highlighted gender differences in the relationship between these symptoms and best friend conflicts. In boys, best friend conflicts were related to the presence of HYP symptoms but not ADD symptoms, whereas in girls best friend conflicts were associated only with ADD symptoms. This latter result is not surprising; it is consistent with a previous study of ADHD girls' friendships (Blachman and Hinshaw 2002). This study demonstrated that inattentive girls tend to report fewer friendships and less stable peer relationships. Our study extends these results by providing evidence that girls who suffer from ADD symptoms also experience best friend conflicts. A possible explanation for this is that the presence of ADD symptoms is bound up with social withdrawal and disinterest, behaviours which - especially in girls - are responsible for less positive friendship engagement and more peer disagreements (Wheeler and Carlson 1994). Our results in boys seems are also consistent with the existing literature suggesting that impairments in boys' friendships relate primarily to the level of hyperactivity, which is often linked to disruptive and impulsive behaviour. HYP symptoms, which mainly affect boys, increase the likelihood of disagreement and conflicts between friends. Extending previous research which concentrated on general social functioning and peer status (Abikoff et al. 2004; Bagwell et al. 2001; Diamantopoulou et al. 2005, 2007), our findings suggest that boys and girls who suffer from HYP and ADD symptoms respectively, reported high levels of negative friendship qualities, specifically, a high level of best friend conflicts. ADD and HYP symptoms are therefore not only a risk factor for isolation and rejection by peers; they are also a risk factor for jeopardizing close friendships, because they are associated with a higher incidence of conflicts and disagreement between friends. If children do not learn strategies to resolve peer

conflicts they could be at significant risk for certain developmental problems e.g. poor school achievement; anxiety (Berndt 2002).

Our findings also revealed that the association between ADD and HYP symptoms and best friend conflicts was mediated by aggressive behaviour, and emotional and behavioural instability in both boys and girls. In other words, certain dimensions of children's psychosocial adjustment are important factors in understanding the peer-related socio-behavioural impairments of children who suffer from ADHD symptoms. Together with our first result on the association between ADHD symptoms and conflict in close friendship, this seems to provide additional evidence of the behavioural and emotional deficits of children with ADHD symptoms. Perhaps these children perceive more conflicts with the best friend as they experience aggressive behaviour and a lack of behavioural and emotional stability. Thus the association between ADHD symptoms and best friend conflicts simply becomes apparent in how high children with ADHD symptoms perceive their behavioural and emotional difficulties. A possible explanation for this finding (Bagwell et al. 2001; Barkley 1997; Hoza et al. 2005) is that these children often show poor behavioural control, emotional instability and aggressive behaviours when compared with their developmentally typical peers. These kinds of behaviours are likely to interfere with the skills needed to establish and consolidate a close and secure friendship and could subsequently increase the likelihood of conflict episodes and disputes between friends. This process can also be explained in terms of the social information processing model that was used recently to explain the social problems experienced by children with ADHD (King et al. 2009). This model suggests that aggressive behaviour is due to an impairment in children's social cognitive processes (e.g. encoding social cues, evaluation and response decisions); aggression in impulsive and hyperactive children is thus explained in terms of biases in the cognitive processing of ambiguous social information and situations. Children who are more aggressive and display a higher level of ADHD symptoms also tend to have the most severe peer relationship difficulties, displaying inappropriate behaviour with peers (Dodge and Coie 1987; Bagwell et al. 2001). The best friend conflicts experienced by children in our study who suffered from ADHD symptoms and emotional and behavioural difficulties may have been a manifestation of their deficient processing of social information, but this hypothesis should be tested by investigating explicitly the social information processing abilities of children with ADHD symptoms. Establishing which ADHD symptoms are associated with impairments in peer relationships, describing the processes underlying this association in terms of psychosocial impairments and exploring potential gender differences is a subject for future studies.

Some limitations of the present study must be emphasized. The study used a cross-sectional design which precluded the investigation of long-term patterns in peer relationships and causal inferences. It may be that, rather than aggression and emotional and behavioural instability affecting conflict within friendships, experiencing this kind of conflict may affect the emotional and behavioural stability of children. The next step in this line of research is to investigate the associations we have uncovered over a longer period of time. We relied on teachers' ratings of the children's ADHD symptoms and so we had no information about the age at symptom onset or about the symptomatology across contexts e.g. at home etc. Using a combination of parents' and teachers' assessment of ADHD symptoms might offer the most practical assessment for clinical intervention programmes.

Moreover, it should be noted the nature speculative of our results about the role of aggressive behaviour, emotional and behavioural instability on the association between ADHD symptoms and best friend conflicts. Our results in fact cannot be adopted to individuals in countries where a formal diagnosis of ADHD is provided by medical professionals, because the present study refers only to children who suffer from ADHD symptomatology reported by teachers. Future researches could investigate if our results can be applied also to children into clinical and medical groups. The present results must therefore be interpreted with caution, as the measures relied on teachers' perceptions of hyperactivity and inattention children symptoms. Furthermore, the use of only child's self-report questionnaire (about friendship quality, aggression, emotional and behavioural instability) should be noted as a shortcoming of our research. Although other studies underlined that school-aged children are able to provide reliable information about their friendship and behaviour (Ladd et al. 1996; Riley 2004), responses may be affected by virtue of children immaturity and lack of insight. So, the use of objective measures about children friendship and adjustment could add validity to our study. Also, we did not collect information about reciprocity in children's friendships. Adopting a dyadic approach would allow us to circumvent the fact that some children who suffer from ADHD may not report the quality of their friendships accurately. Nonetheless, problems with biased self-report data have been reported in studies that analyzed perceptions of friendship in children with a formal diagnosis of ADHD (for a review see Mikami 2010), but not in studies that examined children with ADHD symptoms. Finally, the low Cronbach alpha of the Best Friend Conflicts Scale should be noted.

Despite these limitations, this study adds to the literature an interesting description of perceptions of friendship quality in children with ADHD symptoms, and an investigation the role of aggressive behaviour and emotional and behavioural instability in the relationship between ADHD symptoms and best friend conflicts. We uncovered important gender differences in the association of ADHD symptoms with conflict within close friendships. This study contributes to a better understanding of gender differences in peer-related socio-behavioural impairments of children who suffer from ADHD symptoms. Future research should explore this line of research. Our findings have provided indirect evidence of the developmental importance of social and emotional impairments in ADHD symptomatology; a number of studies have already underlined the importance of further examining the development of social and emotional skills in children with ADHD symptoms, and suggested that deficits in specific social skills may account for many of the difficulties in peer relationships experienced by children with ADHD symptoms (Blachman and Hinshaw 2002). Finally, this study contributes to the small body of literature on Italian children with ADHD symptoms. Although some effects may be culturally specific, for example the discrepancies between Italy and United States in the qualitative and quantitative classification of ADHD symptoms (Frazzetto et al. 2007), the direction of the relationship between ADHD symptoms and social, behavioural and emotional dimensions of children's functioning reported in this study is consistent with the international consensus. Future research should continue to examine children with ADHD symptoms, not only to improve the definition of the disorder, but to develop interventions to prevent some difficulties, such as peer conflicts, which are differently associated with the symptomatology in boys and girls.

In summary, successful peer relationships are important for all children both in terms of current and future wellbeing. Children who do not succeed in the peer relationship

domain are at risk for a multitude of problems throughout their life span. Further clarification of how children with ADHD symptoms perceive their best friendships and how certain behavioural and emotional dimensions of children's psychosocial adjustment are related to close friendships appears necessary and might enable the development of specific interventions targeting dyadic friendship (see Hoza et al. 2003) to ameliorate the problematic and adverse peer relationships of Italian boys and girls with ADHD symptoms.

References

- Abikoff, H., Hechtman, L., & Klein, R. G. (2004). Symptomatic improvement in children with long-term methylphenidate and multimodal psychosocial treatment. *Journal of American Academic Children and Adolescent Psychiatry*, 43, 802–811.
- American Psychiatric Association. (2000). *Diagnostic and Statistical Manual of Mental Disorders*. 4th rev ed. Washington, DC.
- Angold, A., Costello, E. J., Farmer, E. M. Z., Burns, B. J., & Erkanli, A. (1999). Impaired but undiagnosed. *Journal of the American Academy of Child and Adolescent Psychiatry*, 38, 129–137.
- Bagwell, C. L., Molina, B. S. G., Pelham, W. E., & Hoza, B. (2001). Attention-deficit hyperactivity disorder and problems in peer relations: predictions from childhood to adolescence. *Journal of the American Academy of Child and Adolescent Psychiatry*, 40, 1285–1292.
- Barkley, R. A. (1997). Behavioral inhibition, sustained attention, and executive functions: constructing a unifying theory of ADHD. *Psychological Bulletin*, 121, 65–94.
- Baron, R., & Kenny, D. A. (1986). The moderator-mediator variable distinction in social psychological research: conceptual, strategic and statistical considerations. *Journal of Personal Social Psychology*, 51, 1173–1182.
- Barry, T. D., Lyman, R. D., & Klinger, L. G. (2002). Academic underachievement and attention-deficit/hyperactivity disorder: the negative impact of symptom severity on school performance. *Journal of School Psychology*, 40, 259–283.
- Berndt, T. J. (1982). The features and effects of friendship in early adolescence. *Child Development*, 53, 1447–1460.
- Berndt, T. J. (2002). Friendship quality and social development. *Current Directions in Psychological Science*, 11, 7–10.
- Berndt, T. J., & Keefe, K. (1995). Friends' influence on adolescents' adjustment to school. *Child Development*, 66, 1312–1329.
- Biederman, J., Monuteaux, M. C., Doyle, A. E., Seidman, L. J., Wilens, T. E., Ferrero, F., et al. (2004). Impact of executive function deficits and Attention-Deficit/Hyperactivity Disorder (ADHD) on academic outcomes in children. *Journal of Consulting and Clinical Psychology*, 72, 757–766.
- Blachman, D. R., & Hinshaw, S. P. (2002). Patterns of friendship in girls with and without Attention-Deficit/Hyperactivity Disorder. *Journal of Abnormal Child Psychology*, 30, 625–640.
- Bollmer, J. M., Milich, R., Harris, J. J., & Maras, M. A. (2005). A friend in need. The role of friendship quality as a protective factor in peer victimization and bullying. *Journal of Interpersonal Violence*, 20, 701–712.
- Bukowski, W. M., Hoza, B., & Boivin, M. (1994). Measuring friendship quality during pre- and early adolescence: the development and psychometric properties of the friendship quality scale. *Journal of Social and Personal Relationships*, 11, 474–484.
- Caprara, G. V., & Pastorelli, C. (1993). Early emotional instability, prosocial behavior, and aggression. Some methodological aspects. *European Journal of Personality*, 7, 19–36.
- Caprara, G. V., Pastorelli, C., Barbaranelli, C., Incatasciato, M., & Rabasca, A. (1997). Emotional instability, physical and verbal aggression, and prosocial behavior as precursors of scholastic achievement and social adjustment. *Social/Clinical Psychology Plenum Press Series*, 111–120.
- Cornoldi, C., Marzocchi, G. M., Belotti, M., Caroli, M. G., Meo, T., & Braga, C. (2001). Working memory interference control deficit in children referred by teachers for ADHD symptoms. *Child Neuropsychology*, 7, 230–240.

- Cuffe, S., Moore, C. H., & McKeown, R. (2005). Prevalence and correlates of ADHD symptoms in the national health interview survey. *Journal of Attention Disorders, 9*, 392–401.
- Diamantopoulou, S., Henricsson, L., & Rydell, A. M. (2005). ADHD symptoms and peer relations of children in a community sample: examining associated problems, self-perceptions, and gender differences. *International Journal of Behavioral Development, 29*(5), 388–398.
- Diamantopoulou, S., Rydell, A. M., Thorell, L. B., & Bohlin, G. (2007). Impact of executive functioning and symptoms of attention deficit hyperactivity disorder on children's peer relations and school performance. *Developmental Neuropsychology, 32*, 521–542.
- Dodge, K. A., & Coie, J. D. (1987). Social information processing factors in reactive and proactive aggression in children's peer groups. *Journal of Personality and Social Psychology, 53*, 1146–1158.
- Faraone, S. V., Sergeant, J., Gillberg, C., & Biederman, J. (2003). The worldwide prevalence of ADHD: is it an American condition? *World Psychiatry, 2*, 104–113.
- Fonzi, A., Tani, F., & Schneider, B. (1996). Adattamento e validazione su un campione italiano della scala sulla qualità dell'amicizia (F.Q.S.) di Bukowski, W.M., Hoza, B., Boivin, M. *Giornale Italiano di Psicologia, 23*(1), 107–122.
- Frazier, T. W., Youngstrom, E. A., Glutting, J. J., & Watkins, M. W. (2007). ADHD and achievement: meta-analysis of the child, adolescent, and adult literatures and a concomitant study with college students. *Journal of Learning Disabilities, 40*, 49–65.
- Frazzetto, G., Keenan, S., & Singh, I. (2007). 'I bambini e le droghe': the right to Ritalin vs the right to childhood in Italy. *BioSocieties, 2*, 393–412.
- Furman, W. (1996). The measurement of friendship perceptions: Conceptual and methodological issues. In W. M. Bukowski, A. F. Newcomb, & W. W. Hartup (Eds.), *The company they keep: Friendship in childhood and adolescence*. New York: Cambridge University.
- Gershon, J. (2002). A meta-analytic review of gender differences in ADHD. *Journal of Attention Disorders, 5*, 143–154.
- Hartup, W. W., & Stevens, N. (1997). Friendship and adaptation in the life course. *Psychological Bulletin, 121*, 355–370.
- Hoza, B. (2007). Peer functioning in children with ADHD. *Ambulatory Pediatrics, 7*, 101–106.
- Hoza, B., Mrug, S., Pelham, W. E., Jr., Greiner, A. R., & Gnagy, E. M. (2003). A friendship intervention for children with attention-deficit/hyperactivity disorder: preliminary findings. *Journal of Attention Disorders, 6*, 87–98.
- Hoza, B., Mrug, S., Gerdes, A. C., Hinshaw, S. P., Bukowski, W. M., Gold, J. A., et al. (2005). What aspects of peer relationships are impaired in children with ADHD? *Journal of Consulting and Clinical Psychology, 73*, 411–423.
- King, S., Waschbusch, D. A., Pelham, W. E., Frankland, B. W., Andrade, B. F., Jacques, S., et al. (2009). Social information processing in elementary-school aged children with ADHD: medication effects and comparison with typical children. *Journal of Abnormal Child Psychology, 37*, 579–589.
- Ladd, G. W., Kochenderfer, B. J., & Coleman, C. C. (1996). Friendship quality as a predictor of young children's early school adjustment. *Child Development, 67*, 1103–1118.
- Loe, I. M., & Feldman, H. M. (2007). Academic and educational outcomes of children with ADHD: literature review and proposal for future research. *Ambulatory Pediatrics, 7*(1), 82–90.
- MacKinnon, D. P., & Dwyer, J. H. (1993). Estimating mediated effects in prevention studies. *Evaluation Review, 17*, 144–158.
- Maedgen, J. W., & Carlson, C. L. (2000). Social functioning and emotional regulation in the attention deficit hyperactivity disorder subtypes. *Journal of Clinical Child Psychology, 29*, 30–42.
- Marzocchi, G. M., & Cornoldi, C. (2000). Una scala di facile uso per l'individuazione di comportamenti problematici dei bambini con deficit di attenzione e iperattività. *Psicologia Clinica dello Sviluppo, 4*, 43–61.
- Mikami, A. Y. (2010). The importance of friendship for youth with Attention-Deficit/Hyperactivity Disorders. *Clinical Child and Family Psychology Review, 13*, 181–198.
- National Institute of Statistics. (2012). *Italy in figures 2012*. Retrieved in January 2013: <http://www.istat.it/it/archivio/30329>.
- Newcomb, A. F., & Bagwell, C. L. (1995). Children's friendship relations: a meta-analytic review. *Psychological Bulletin, 117*, 306–347.
- Noakes, M. A., & Rinaldi, C. M. (2006). Age and gender differences in peer conflict. *Journal of Youth Adolescence, 35*, 881–891.
- Normand, S., Schneider, B. H., & Robaey, P. (2007). Attention deficit/hyperactivity disorder and the challenges of close friendship. *Journal of the Canadian Academy of Child and Adolescent Psychiatry, 16*, 67–73.

- Parker, J. G., & Asher, S. R. (1993). Friendship and friendship quality in middle childhood: links with peer group acceptance and feelings of loneliness and social dissatisfaction. *Developmental Psychology, 29*, 611–621.
- Pastorelli, C., Caprara, G. V., Barbaranelli, C., Cermak, I., & Rozsa, S. (1997). Measuring emotional instability, prosocial behavior and aggression in pre-adolescents: a cross-national study. *Personality and Individual Differences, 23*, 691–703.
- Polderman, T.J.C., Boomsma, D.I., Bartels, M., Verhulst, F.C., & Huizink, A.C. (2010). A systematic review of prospective studies on attention problems and academic achievement. *Acta Psychiatrica Scandinavica, 271–284*.
- Preacher, K.J., & Leonardelli, G.J. (2009). Calculation for the Sobel Test: an interactive calculation tool for mediation tests. Available at www.pepeople.ku.edu/preacher/sobel/sobel.htm.
- Riley, A. W. (2004). Evidence that school-age children can self-report on their health. *Ambulatory Pediatrics, 4*(4), 371–376.
- Skounti, M., Philalithis, A., & Galanakis, E. (2007). Variations in prevalence of attention deficit hyperactivity disorder worldwide. *European Journal of Pediatrics, 166*, 117–123.
- Wahlstedt, C., Thorell, L. B., & Bohlin, G. (2008). ADHD symptoms and executive function impairment: early predictors of later behavioral problems. *Developmental Neuropsychology, 33*(2), 160–178.
- Wheeler, J., & Carlson, C. L. (1994). The social functioning of children with ADD with hyperactivity and ADD without hyperactivity: a comparison of their peer relations and social deficits. *Journal of Emotional and Behavioral Disorders, 2*, 2–12.
- Zalecki, C. A., & Hinshaw, S. P. (2004). Overt and relational aggression in girls with Attention Deficit Hyperactivity Disorder. *Journal of Clinical Child & Adolescent Psychology, 33*, 125–137.