

Match or Mismatch? Influence of Parental and Offspring ASD and ADHD Symptoms on the Parent–Child Relationship

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Abstract Few studies have examined the influence of parental ASD and ADHD symptoms in combination with child pathology on the parent–child relationship as perceived by the child. A sample of 132 families was recruited with one child with ASD (with/without ADHD), and one unaffected sibling. Affected children (regardless of diagnosis) reported lower acceptance and conflict resolution scores than their unaffected siblings, with conflict resolution scores (but not acceptance) being lower than the norm according to both affected and unaffected children in both fathers and mothers. Higher paternal, but not maternal, ASD and ADHD symptoms were related to poorer scores regarding acceptance and conflict resolution, respectively. Treatment targeting conflict resolution skills of parents and the feeling of being less accepted in children with ASD/ADHD may be beneficial.

Keywords Autism spectrum disorder · Attention-deficit/hyperactivity disorder · Parental symptoms · Parent–child relationship

Abbreviations

ADHD	Attention deficit hyperactivity disorder
ADI-R	Autism diagnostic interview revised
ASBQ	Adult's Social Behavior Questionnaire
ASD	Autism spectrum disorders
AQ	Autism quotient
BOA	Biological origins of autism
CAARS	Conners' adult rating scales
CRS-R	Conners' long version rating scales revised
CSBQ	Children's Social Behavior Questionnaire
IMAGE	International multicenter ADHD genetics study
NVA	Dutch autism association
PACHIQ-R	Parent-Child Interaction Questionnaire
PACS	Parental account for childhood symptoms
PDD-NOS	Pervasive developmental disorder—otherwise specified
SCQ	Social Communication Questionnaire

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Introduction

It is now widely acknowledged that autism spectrum disorder (ASD) and attention deficit–hyperactivity disorder (ADHD) frequently co-occur together within the same patient (Rommelse et al. 2010; Ronald et al. 2008; Rowlandson and Smith 2009) and within the same families (Freitag 2007; Pamploma et al. 2009). ASD is characterized by impaired communication and social interaction skills, as well as repetitive and restricted behavior and interests (APA 2000), ADHD by severe inattention, hyperactivity and

impulsivity (APA 2000). Both disorders appear to share at least a substantial proportion of their genetic influences, as well as related functional and structural brain abnormalities (see for a review Rommelse et al. 2011). In addition, in both disorders it has been reported that parents of affected children often display subthreshold or above threshold symptoms (Constatino and Todd 2005; Faraone et al. 2009). Parental symptom information has often been used to unravel family-genetic transmission of ASD and ADHD symptoms. However, to what extent these parental symptoms may influence the family environment is largely unknown. Particularly in ASD, the influence of parental symptoms on parenting is a very neglected area, most likely due to the sensitive nature of this topic since Bettelheim (1967) unleashed his idea that the cause of autism was a lack of maternal warmth towards the child. Though this idea was based on clinical impressions and has never been confirmed, it is of great relevance to study the influence of parental symptoms since the family environment can have a substantial impact on the child's social and cognitive development functioning (Reed et al. 2008; Wachtel and Carter 2008).

Given the previously mentioned dark history of ASD and parenting, it bears no surprise that we only were able to find a few studies on family environment influenced by parental ADHD (see for a review Johnston et al. 2012), and not parental ASD symptoms. Parental ADHD symptoms appear to be associated with suboptimal parenting; a less optimal parenting style, higher levels of family conflict and less family cohesion. However, it is unclear to what extent these parental symptoms relate to suboptimal parent-child relationships independent from, or in combination with, child pathology. It is well known that children with developmental pathology such as ASD and ADHD put a larger strain on parenting skills than typically developing children (Harpin 2005; Herring et al. 2006; Rutgers et al. 2007). Child ASD and ADHD symptoms were both, for example, related to more family conflict (Biederman et al. 1995; Higgins et al. 2005; Kelly et al. 2008; Wells et al. 2000) and strained parent-child relationships (Harpin 2005; Kaminsky and Dewey 2002; Weiss and Hechtman 2000). Thus, previous literature clearly suggests that both parental and offspring ASD and ADHD symptoms may have a negative effect on parenting, but the combination of both is scarcely investigated. It could be hypothesized that the most difficult rearing situation exists when families have a parent with high ASD or ADHD symptoms and an unaffected child, or vice versa (a discordant pair). This has been reported in two recent studies that have found that parental ADHD symptoms were associated with poorer school performance or prosocial behavior in offspring without ADHD, but not in offspring with ADHD (Biederman et al. 2002; Griggs and Mikami 2011). Vice versa, behavioral and emotional problems of a child in

combination with a parent with low or no symptoms, contribute significantly to parental stress, parent mental health, family dysfunction and marital problems (Berg-Nielsen et al. 2002; Herring et al. 2006; Piven et al. 1991). Another possibility is that the most difficult rearing situation may be evoked by children having the *same* symptoms as their parents (a homotypic concordant pair) as has been observed for parental ADHD and child ADHD which contributes to the reciprocal negative interactions in these families (Chronis-Tuscano et al. 2008). However, it has also been suggested that mothers with high ADHD symptoms may be more positive and affectionate with their children with high ADHD symptoms (Psychogiou et al. 2008).

A rather unexplored area of parent-child pathology in relation to family environment is the issue of heterotypic concordance. We refer to heterotypic concordancy in situations in which both parent and child are displaying symptoms, but of *different* disorders. For instance, having a child with ADHD that is talkative, distractible, demanding, and less cooperative may be particularly straining for parents having high levels of ASD symptoms, such as being rigid and poorer in social skills (Ornstein-Davis and Carter 2008). Vice versa, a child with high ASD symptoms requiring a predictable and organized family environment may probably be worst off having a parent with high levels of ADHD symptoms. It may be suggested that these particular combinations may negatively impact each other, as has for instance been shown in depressed mothers rearing a child with emotional and behavioral disturbances (Civic and Holt 2000; Harrison and Sofronoff 2002). It thus remains to be determined which combination of parent-child pathology is related to the most suboptimal family environment.

In this study we explore the influence of parental ASD and ADHD symptoms in combination with offspring ASD and ADHD symptoms on the parent-child relationship as perceived by the child. These child perceptions may be influenced by various factors such as child gender (Sentse et al. 2009) and child age (Berkien et al. 2012; Taber 2010). In addition, gender of the parent (Phares et al. 2009; Smetana et al. 2006; Yahav 2006) may also have an effect on child perception. For example, children reported more positive affect and less negative affect towards their mother compared with their father (Phares et al. 2009). However, in general the importance of child perception towards the parent-child relationship is highlighted by the fact that a negative perception of this relationship may provide higher levels of the child emotional behavioral problems (Phares and Renk 1998), whereas a more positive perception of the parent-child relationship are associated with less problem behavior (Bosco et al. 2003; Lange et al. 1997; Nelson et al. 1999). Although the perception of the child may not reflect the 'actual' situation, previous studies indicate that the behavior of the child is more influenced by the child's

perception of parenting, rather than by the *actual* parenting behaviors of the parent (Yahav 2006). In order to disentangle the effects of parent and offspring ASD and ADHD symptoms on the parent–child relationship, we included families from two ongoing ASD and ADHD genetics studies for whom childrens' self reported parent–child relationship data concerning fathers and mothers was available for both affected children and their unaffected siblings. These data allowed us to tease apart the effects of parent and child ASD and ADHD pathology, parent and offspring gender, and examine their possible interaction effect on the child perception of the parent–child relationship. If related to parental pathology, it was expected that affected and unaffected siblings rated the same parent similarly. If related to child pathology, a positive or negative perception towards the parent was only expressed by the affected child. If related to the combination of parental and child pathology, a positive or negative perception towards the parent was expressed by an affected child, but only in combination with parental symptoms. In general, more favorable scores towards mothers than fathers were expected, regardless of the child's gender. By comparing these effects in the three types of families (proband with ASD-only, ADHD-only or ASD + ADHD), both homotypic and heterotypic concordant parent-offspring effects could be examined.

Methods

Participants

Children

A total of 132 families were recruited from two ongoing ASD and ADHD family—genetics studies (*Biological Origins of Autism [BOA]* and *International Multicenter ADHD Genes study [IMAGE]*). Families were included in the studies if (1) they had at least one child between 2 and 20 years with a clinical ASD (+ADHD) diagnosis (*BOA*) or if they had at least one child between 5 and 19 years with a clinical ADHD (combined subtype) diagnosis (*IMAGE*), (2) at least one biological sibling (regardless of possible ASD or ADHD-status) and, (3) at least one biological parent willing to participate. In the current study only families with two participating biological parents were included. All families were of European Caucasian descent. Participants were excluded if they had an $IQ \leq 60$, specific learning or language disorders, a diagnosis of epilepsy, a defined genetic or non-genetic cause of ASD or ADHD (Rett's syndrome, fragile X syndrome) or a genetic disease such as Down-syndrome. Comorbid *DSM-IV* disorders were not excluded, with the exception of a

diagnosis of autistic disorder in the *IMAGE* study (other ASD subtypes were allowed).

Both the children already clinically diagnosed with ASD or ADHD and their siblings were carefully screened for the presence of ASD symptoms with the Social Communication Questionnaire (SCQ; Rutter et al. 2003) (for the fully described procedure of the SCQ in the *BOA* and *IMAGE* studies, see van Steijn et al. 2012). The Autism Diagnostic Interview Revised (ADI-R) (Le Couteur et al. 2003) (*BOA*) or the Children's Social Behavior Questionnaire (CSBQ) (Luteijn, Minderaa, and Jackson 2002) (*IMAGE*), a parental 49 item questionnaire measuring social problem behavior with adequate reliability and validity (Luteijn et al. 2002) were administered for all children scoring above clinical cut-off of the SCQ. Children were given a diagnosis of ASD if scoring clinically on the ADI-R (*BOA*) or above clinical cut off on the SCQ (>15) in addition to a score above the 95th percentile on the CSBQ (*IMAGE*) (Hartman et al. 2007). All children were also carefully screened for the presence of ADHD symptoms using the Conners long version Rating Scales Revised (CRS-R) (Conners 1997) completed by parents and teachers. For all children scoring above the cut-off on one of three *DSM-IV* ADHD scales (≥ 63), the Parental Account for Childhood Symptoms (PACS) (Taylor et al. 1991) was administered by a certified clinician. Thereafter, a standardized algorithm was applied with the scores of the PACS and the teacher version of the CRS-R to construct a formal diagnosis of ADHD (for details see, Rommelse et al. 2007a).

We were able to include 47 children with an ASD diagnosis without clinical ADHD symptoms (all from the *BOA* study), 52 children with an ADHD diagnosis without clinical ASD symptoms (all from the *IMAGE* study), and 33 children with ASD + ADHD diagnosis (24 from the *BOA* study and 9 from the *IMAGE* study). For each affected child, one unaffected sibling closest in age was selected. This resulted in 70 same-sex sibpairs and 62 different sex sibpairs with a mean age difference of 2.68 years ($SD = 1.5$) (See Table 1).

Parents

In the *BOA* sample, all parents were screened for the presence of ASD symptoms with the self report Autism Spectrum Quotient (AQ; Baron-Cohen et al. 2001). In total, self reported ASD data was available for 71 fathers and 71 mothers having a child with ASD (with/without ADHD) (not available for parents with a child with ADHD only). In the *IMAGE* sample, parents were screened for ASD using the spouse report Adult's Social Behavior Questionnaire (ASBQ; Hartman et al., in press) Spouse reported ASD data was available for 48 fathers and 44 mothers having a child with ADHD (with/without ASD) (not available for

Table 1 Characteristics participants

	ASD families (N = 47)		ADHD families (N = 52)		ASD + ADHD families (N = 33)				
	Within families		Within families		Within families				
	Probands/siblings M (SD)	t tests Contrast	Probands/ siblings M (SD)	t tests Contrast	Probands/siblings M (SD)	t-tests Contrast	Norms (n) M (SD)	Between probands Contrast	Between siblings Contrast
% male	83.0/42.6	prob > sib*	75.5/59.2	prob > sib	91.7/38.9	prob > sib		ns	ns
Age in years	13.0 (3.3)/12.6 (3.6)	ns	12.2 (3.0)/11.9 (3.0)	ns	12.4 (3.1)/12.2 (3.9)	ns		ns	ns
SCQ	17.5 (7.8)/3.8 (3.7)	prob > sibs	6.2 (3.3)/4.1 (2.8)	prob > sibs	18.2 (6.1)/4.3 (3.7)	prob > sibs	4.7 (5.0) ^a	ASD + ADHD > ADHD > n	ns
CSBQ			29.2 (15.3)/14.4 (9.1)	prob > sibs	42.6 (16.9)/6.5 (10.0)	prob > sibs	8.3 (2.7) ^b	ASD + ADHD > ADHD > n	ADHD > ASD + ADHD
CRS-R ^c	58.5 (9.0)/53.5 (6.9)	prob > sibs	72.5 (8.4)/53.1 (9.6)	prob > sibs	72.1 (7.6)/49.9 (6.6)	prob > sibs	50 (10)	ASD + ADHD > ASD > n	ADHD > ASD + ADHD
% ASD (ADI) ^d	100/0		0/0		100 ^g /0				
% ADHD (PACS) ^f	0/0		100/0		100/0				
Autism quotient	Fathers/mothers 114.6 (19.0)/11.2 (23.0)	ns	Fathers/mothers –		Fathers/mothers 108.5 (16.2)/104.9 (24.2)	ns	105.7 (11.0)/	Between fathers ASD > ASD + ADHD	Between mothers ASD > n
ASBQ ^h	–		12.2 (12.4)/12.9 (13.1) ⁱ	ns	17.1 (14.4)/14.2 (17.0) ^j	ns	102.9 (11.5) ^g	ADHD < ASD + ADHD	ns
ADHD DSM-IV Raw inattention scores	5.1 (4.4)/3.5 (2.9)	ns	5.8 (3.7)/5.7 (4.6)	ns	6.0 (4.4)/4.1 (4.9)	ns	5.3 (3.2)/5.3 (3.1) ^j	ns	ADHD > ASD; ASD > n
ADHD DSM-IV Raw hyperactive scores	5.0 (3.3)/4.9 (3.0)	ns	7.0 (4.9)/7.2 (5.5)	ns	6.3 (4.7)/4.7 (5.1)	ns	6.7 (3.3)/7.0 (2.9) ^j	ASD < ADHD; ASD + ADHD < n; ns	ADHD < ASD < ASD + ADHD < n; ASD + ADHD < n

* prob and sibs = probands and siblings

^a Social Communication Questionnaire, norms based on population cohort (N = 247) (Chandler et al. 2007)^b Children's Social Behavior Questionnaire, norms based on a study of Luteijn (N = 232) (1998)^c Conners long version Rating Scales Revised^d Autism diagnostic interview (ADI-R)^e Based on N = 24, the other 12 children were included if they scored above cutoff on the SCQ (>15) and CSBQ (>based on 95th percentile Hartman et al. 2007)^f Parental account for childhood symptoms (PACS)^g Hoekstra et al. (2008). Mean scores of ASD + ADHD families were based on N = 24 parents^h Adult's Social Behavior Questionnaire. Mean scores of ASD + ADHD families were based on N = 9 parentsⁱ About 21 % of father data and 28 % of mother data were missing^j Norms from the Dutch Twin Register (Boomsma et al. 2010)

parents with a child with ASD only). The AQ consists of 50 items rated on a 4-point rating scale. The ASBQ contains 49 items on a 3-point scale and measures the social problem behavior of adults (Horwitz et al. 2005). Both total scores were used as indication of ASD symptom severity (Hoekstra et al. 2008, 2007). The psychometric qualities of both instruments are good (Hartman et al. in press; Hoekstra et al. 2008). Self-reported ADHD symptoms of the parents were assessed with the DSM raw total score for ADHD on a 4-point rating scale of the Conners Adult Rating Scales- Self-report: Long version (CAARS: Conners, Erhardt, and Sparrow 1998; Conners et al. 1999) in the *BOA* sample and the self report questionnaire for ADHD (Kooij et al. 2008) in the *IMAGE* sample.

Instruments

To assess the perception of children regarding the parent–child relationship, the Dutch version of the Parent–Child Interaction Questionnaire-revised (PACHIQ-R; Lange 2001) was used. The Dutch version of the PACHIQ-R has been shown to demonstrate adequate reliability and validity (Lange 2001; Lange et al. 2002) and consists of 25 items developed to measure the perception of each child regarding the relationship with their fathers and mothers. The PACHIQ-R contains two scales: acceptance and conflict resolution. The subscale *acceptance* consists of 8 items (for example ‘my father/mother and I get on well’, ‘my father/mother is proud of me’), and refers to the level of warmth, comfort and protection that a child experiences at home. The subscale *conflict resolution* consists of 17 items (for example ‘when my father/mother tells me not to do something, I do it anyway’, ‘my father/mother thinks that I cannot do anything for myself’) and refers to the quality of preventing and solving problems by parents. For both the subscales, a higher score refers to a more positive relationship between parent and child. Responses were given on a 5-point scale with for the first 14 items representing (1) completely not true for me; (2) not true for me; (3) in between; (4) true for me; (5) completely true for me. The latter 11 items were scored as (1) never; (2) almost never; (3) sometimes; (4) almost always; (5) always. Children filled out the PACHIQ-R under supervision of the researcher, who verified after each question if the child had understood the question correctly. Children completed the PACHIQ-R separately for fathers and mothers. Norm data of the PACHIQ-R were available for each subscale and for both fathers and mothers regarding $N = 372$ families without psychopathology (Lange 2001).

Procedure

Eligible ASD and ADHD families registered at an outpatient clinic specialized in ASD and ADHD pathology,

members of the Dutch Autism Association (NVA), and families in other pediatric clinics received a brochure containing information about the BOA and IMAGE study and were requested to return a pre-stamped response card. A short telephone screening and, subsequently, screening questionnaires were used to verify if families fulfilled inclusion criteria. The families were invited to visit Karakter or Radboud University Nijmegen Medical Centre, where a trained researcher conducted the ADI-R and/or the PACS. Additional data was collected including blood samples of all family members and neuropsychological data of the children. Both studies were approved by the local medical ethics board and parents and children (above 12 years old) signed for informed consent.

Data-Analyses

Analyses were performed with SPSS 20. The Expectation Maximization (EM) algorithm (Tabachnick and Fidell 2001) was used to impute the missing values when less than 5 % of the parent data and the PACHIO-R was missing. To examine the effect of child diagnosis (affected or not) on the parent–child relationship, two separate (regarding acceptance and conflict resolution) repeated measure ANOVAs were used. Variables included into the model were (1) family type (ASD, ADHD and ASD + ADHD) as between subjects measure and (2) child diagnosis (affected or not) and (3) parent (father/mother) as repeated measures (to account for within family measurements). In addition, all two-way interaction effects were included and dropped from the model if not significant. In addition, one sample *T* test were performed for comparisons with the norm.

To examine to what extent, parental symptoms, diagnosis of the child and the combination between parent and child symptoms were related to the child perception of the parent–child relationship, also repeated measure ANOVAs were used (separately for acceptance and conflict resolution). To combine self (total AQ-score [BOA])- and spouse reported (total ASBQ [IMAGE]) ASD data of parents, both scales were separately standardized using the Van der Waerden transformation (SPSS 20; IBM Corporation, Armonk, New York) and merged into one ASD parent variable. A dummy code was created (self versus spouse report) and used in further analyses. Variables included into the main model were (1) parents’ ASD symptoms (continuous), (2) parents’ ADHD symptoms (continuous), and (3) child diagnosis (affected or not) as repeated measure (to prevent duplicating parental symptom data for children within the same family). In addition to the main effects, two-way (interaction between child diagnosis and parental symptoms) and three-way interactions (the interaction between parental ASD symptoms, parental ADHD

symptoms and child diagnosis) were tested, to examine the match or mismatch between parental and child ASD and ADHD symptoms in relation to the parent–child relationship. Variables also included initially as effects to correct for possible confounders were: 1) family type (ASD, ADHD, ASD + ADHD), (2) self- versus spouse reported ASD data (to examine if type of report influenced the results), (3) sex difference (same sex/different sex) and (4) the absolute age difference between the affected and unaffected child. Correction for multiple testing using the 95 % CI was performed for all analyses using the False Discovery Rate procedure (Benjamini 2010).

Results

Main Effect of Child Diagnosis

Acceptance

No significant two-way interaction (child diagnosis by family type and parent by family type) were found regarding the *acceptance scale* ($F(2,129) = 2.59, p = .08$ and $F(2,129) = 2.51, p = .09$, respectively) indicating that there were overall no differential effects of family type on the difference in rating between affected and unaffected children and fathers and mothers. No main effect of family type were found ($F(2,129) = .77, p = .46$). However, a main effect of parents was found ($F(1,129) = 14.47, p < .001$), indicating that mothers were rated higher than fathers. Last, a main effect of child diagnosis was present ($F(1,129) = 7.37, p = .01$) revealing that affected children reported lower acceptance scores than unaffected children. These effects were also reflected in differences with the norm (see Fig. 1). Affected children reported lower acceptance scores regarding fathers and mothers ($t(131) = -4.24, p < .001$ and $t(131) = -1.72, p = .09$, whereas unaffected children reported similar acceptance scores as the norm ($t(131) = -1.43, p = .16$ and $t(131) = 0.05, p = .96$, respectively).

Conflict Resolution

Regarding the *conflict resolution scale* no two-way interaction effects (child diagnosis by family type and parent by family type) were found ($F(2,129) = 2.07, p = .13$ and $F(2,129) = 1.45, p = .24$, respectively). In addition, no main effect of parents ($F(1,129) = .24, p = .63$) or family type ($F(2,129) = 0.15, p = .86$) were found, indicating that overall fathers and mothers were rated comparably regarding their conflict resolution skills and this did not depend on the type of disorder of their offspring. However, a main effect of child diagnosis was present ($F(1,129) = 15.70, p < .001$),

indicating that probands rated their parents poorer in conflict resolution than unaffected children. Analyses with the norm revealed that, for both fathers and mothers alike, affected children (father $t(131) = -6.89, p < .001$ and mother $t(131) = -5.13, p < .001$) and their unaffected siblings (father $t(131) = -3.52, p = .001$ and mother $t(131) = -2.73, p = .01$) scored significantly lower than the norm (Fig. 2).

Effects of Parental Symptoms and the Combination of Parent and Child Symptoms

A repeated measure ANOVA with parents' ASD symptoms, parents' ADHD symptoms, and child diagnosis (within family repeated measure to account for identical parent symptom information in two siblings), the two- and three-way interactions between these variables, and the confounding effects of absolute sex and age differences between siblings, family type and self versus spouse report, was used to examine the combined effect of child and parent pathology on the acceptance and conflict resolution scales. Overall, no interaction or main effects of the confounders were found, except a two-way interaction between child diagnosis and sex difference regarding the acceptance scores of mothers ($F(1,127) = 7.51, p = .01$). Post-hoc analyses revealed that unaffected children from different-sex-sibpairs reported significant higher maternal acceptance scores than their affected sib ($t(63) = 3.10, p = .003$), whereas no significant differences were found between sibpairs from the same sex ($t(69) = -.64, p = .53$). No two-way interactions between child diagnosis and parental ASD or ADHD symptoms were found (all p 's were between .17 and .91), indicating that there was no effect of a particular combination of parental symptoms and child pathology on the parent–child relationship (see also Table 2). However, main effects were found for paternal ASD symptoms on the acceptance scale ($F(1,127) = 6.31, p = .01$) and of paternal ADHD symptoms on the conflict resolution scale ($F(1,127) = 5.05, p = .03$), but not vice versa ($F(1,127) = 1.35, p = .25, F(1,127) = 1.07, p = .30$, respectively), with higher symptom scores relating to poorer relationship scores. No main effects of maternal ASD or ADHD symptoms were found regarding the acceptance and conflict resolution scale (all p 's were between .18 and .99).

Discussion

The main aim of this study was to examine the influence of (a particular combination of) parental and child ASD and ADHD symptoms on parent–child relationships through the perspective of the child. One of the key findings that

stood out is that regardless of diagnosis, affected children reported lower acceptance and conflict resolution scores compared to their unaffected siblings, with fathers receiving somewhat poorer scores than mothers regarding acceptance towards especially fathers, but also mothers and lower conflict resolution scores towards both fathers and mothers, compared to their unaffected siblings. It is possible that this is not an accurate reflection of parenting practices, because affected children may have more problems with reporting accurate parenting skills regarding acceptance and conflict resolution or may react more strongly to parenting practices than their unaffected siblings (Belsky and Pluess 2009). However, it may also be a true indicator of differential parenting practices towards the offspring with parents displaying a less positive parenting style towards their ASD (with/without ADHD) affected offspring compared to their unaffected offspring. A possible explanation for this might be that affected offspring may evoke more negative feelings by parents because of their talkative, distractible, demanding, moody, less adaptable, and less cooperative and more challenging behavior than their unaffected brothers and sisters (Anastopoulos et al. 2009; Pimentel et al. 2011). In any case, it seems of great clinical relevance to be aware of these issues in ASD (with/without ADHD) families, since the feeling of being less accepted than other children in the family is a strong predictor of future maladaptive behavior (Bosco et al. 2003; Lange et al. 1997; Nelson et al. 1999; Phares and Renk 1998).

Another interesting finding is that mainly the conflict resolution skills, but not the acceptance of their offspring, of the parents were rated lower by their offspring compared to norm scores. This suggests that in these families both fathers and mothers may have difficulties with preventing and solving problems, more so than with providing a warm

and accepting environment for their children. This loving, nurturing and protective environment may serve as a protection towards the potential disadvantages of the difficulties of preventing and solving problems of their parents. It is also associated with positive outcomes such as the development of social behavior (empathy, helpfulness) in children, positive peer relations in adolescence and psychological well-being in adulthood (Khaleque and Rohner 2002; Rohner and Khaleque 2010). In other words, this study provides another piece of evidence against Bettelheims' (1967) hypothesis that the cause of autism was a lack of maternal warmth towards the child. However, differential feelings of acceptance do appear to exist, with affected children feeling generally less accepted by their parents, which may be a cause for clinical concern.

It was further examined if parental symptoms were related to child's perception of the parent–child relationship. Findings indicated that paternal ASD, but not ADHD, was related to poorer acceptance, whereas paternal ADHD, but not ASD, was related to poorer conflict resolution. It is surprising that we did not find this in mothers, yet overall scores for mothers and fathers were very similar in contrast to previous literature (Phares et al. 2009; Smetana et al. 2006; Yahav 2006). It may thus be suggested that fathers with rigid and poorer social skills (ASD symptoms) have more problems in maintaining a positive relationship with their children than mothers with ASD symptoms and fathers without ASD symptoms, and that fathers characterized by a disorganized and chaotic life style (ADHD symptoms) have less conflict resolution skills than mothers with ADHD symptoms and fathers without ADHD symptoms (see for a review Johnston et al. 2012). A possible explanation for this might be that paternal ASD and ADHD symptoms may evoke more negative feelings in the

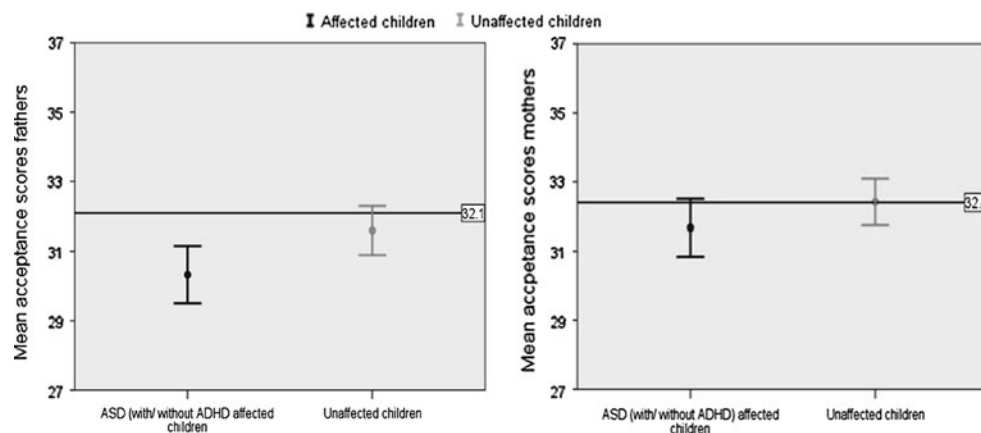


Fig. 1 Comparison of Parent-Child Interaction Questionnaire-Revised (PACIQ-R) acceptance scores between ASD (with/without ADHD) affected children and their unaffected siblings and the norm group. Norms fathers acceptance scale 32.1 (4.5) (N = 352), norms

mothers acceptance scale 32.4 (4.2) (N = 372) (Lange 2001). The error bars represent the 95 % Confidence Intervals (CI) using one-sample *t* test in comparison to the population norm value

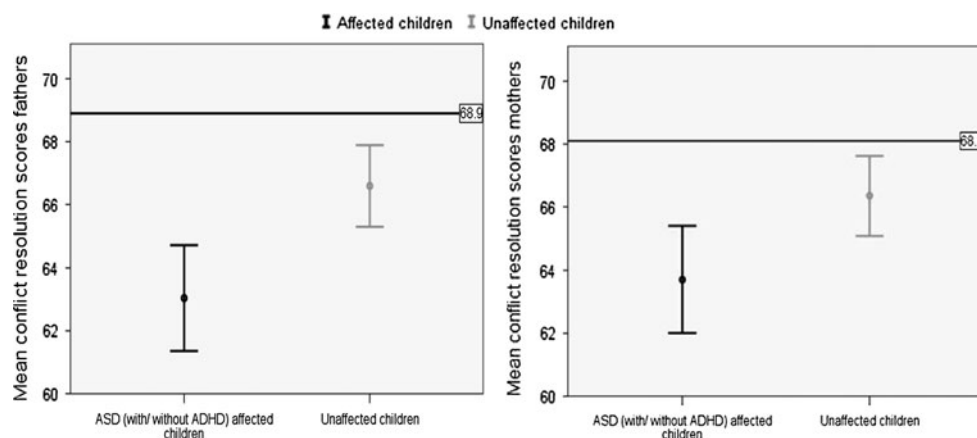


Fig. 2 Comparison of Parent-Child Interaction Questionnaire-Revised (PACHIQ-R) conflict resolution scores between ASD (with/without ADHD) affected children and their unaffected siblings and the norm group. Norms fathers conflict resolution scale 68.9 (7.7)

($N = 341$), norms mothers conflict resolution scale 68.1 (7.5) ($N = 326$) (Lange 2001). The error bars represent the 95 % Confidence Intervals (CI) using one-sample t test in comparison to the population norm value

Table 2 Parent-child relationship measured with the Parent-Child Interaction Questionnaire- Revised (PACHIQ-R) in relation to child pathology (affected/unaffected) and parental ASD and ADHD symptoms ($N = 132$)

	Main effect parent symptoms ASD symptoms ^a parents (continuous) F (<i>p</i> -values)	ADHD symptoms ^b parents (continuous) F (<i>p</i> -values)	Parent-child pathology interaction Parental ASD symptoms X child diagnosis F (<i>p</i> -values)	Parental ADHD symptoms X child diagnosis F (<i>p</i> -values)
<i>Fathers</i>				
Acceptance	6.31 (.01)	1.07 (.30)	.23 (.63)	1.92 (.17)
Conflict resolution	1.35 (.25)	5.05 (.03)	1.07 (.30)	.14 (.71)
<i>Mothers</i>				
Acceptance	.00 (.99)	.32 (.57)	.42 (.52)	54 (.47)
Conflict resolution	.34 (.56)	1.82 (.18)	.01 (.91)	.06 (.81)

Findings in bold are significant after correction for multiple testing

^a Parental ASD symptoms measured with the autism quotient (AQ) self report and Adult's Behavior Questionnaire (ASBQ) spouse report

^b Parental ADHD symptoms measured with the Conners Adult Rating Scales-Self-report: Long version (CAARS-S:L)

children, since fathers are—more than mothers- more involved in -for the child- important activities such as play, talking and recreational activities (Craig 2006). Importantly though, no evidence was found for a particular combination of parent-child pathology influencing the parent-offspring relationship, suggesting discordant or concordant parent-child pairs do not pose an even higher risk for a poor relationship above and beyond the main effects of child diagnosis and parental symptoms.

Our findings should be interpreted in the context of several limitations. First, the percentages boys in the proband groups were larger than the percentage boys in the sibling groups. It is possible that boys have the tendency to score lower than girls, resulting in a significantly difference between the probands and sibling group. However, earlier research (Gerlsma et al. 1997; Phares et al. 2009) has found

that ASD affected children and their unaffected siblings score comparable on the perception regarding parental warmth and conflict resolution skills. Second, parental symptoms were assessed with self (ADHD) or self and spouse (ASD). Self reported symptoms may be less valid in high scoring individuals due to limited self awareness (Berthoz and Hill 2005; Kooij et al. 2008; Mazefsky et al. 2011; Young and Gudjonsson 2005). This may result in an underestimation of ASD and ADHD symptoms in parents which might have hampered the lack of findings regarding the match/mismatch between parental symptoms and child symptoms. Further research with objective diagnoses or spouse reported symptoms is needed to clarify this issue. Third, it may be possible that some self-selection bias may have occurred: parents wanting to participate may have been more accepting of their child's diagnosis and therefore may

have better parent–child relationships than parents who refused participation. However, that does not explain the overall lower ratings of probands compared to unaffected siblings.

In conclusion, this is the first study that reports on the influence of parental ASD and ADHD symptoms in combination with child pathology on the parent–child relationship as perceived by the child. The results show that regardless of diagnosis, affected children are more negative regarding perceived acceptance and conflict resolution skills of their parents, than their unaffected siblings, with conflict resolution scores being lower than the norm. It is possible that this is not an accurate reflection of real parenting practices, but the feeling of being less accepted than other children in the family may be a strong predictor of future maladaptive behavior and reason for concern. Furthermore, paternal (and not maternal) ASD and ADHD were related to poorer acceptance and conflict resolution scores, respectively, but no evidence was found for a specific detrimental combination of parent and child pathology on the parent–child relationship. In any case, treatment targeting conflict resolution skills of parents of ASD/ADHD affected children may be beneficial, and clinical awareness in treatment for feelings of differential parental acceptance in affected offspring is required. Longitudinal studies may reveal the outcomes of differential parenting practices and parental symptoms and may indicate whether child diagnosis may moderate this.

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