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How unspecified are disorders of children with a pervasive developmental disorder not otherwise specified?

A study of social problems in children with PDD-NOS and ADHD

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Abstract This study examines possible differences and similarities between social behaviour problems in children with problems classified as pervasive developmental disorder not otherwise specified (PDD-NOS) and a group of children with problems classified as ADHD, as measured by parent questionnaires. The instruments involved were the CBCL (Child Behaviour Checklist), the ABC (Autism Behaviour Checklist) and a new instrument: the CSBQ (Children's Social Behaviour Questionnaire). In comparing the PDD-NOS group and the ADHD group, the results show that, according to parent reports, both groups have severe problems in executing appropriate social behaviour, but the PDD-NOS group can be distinguished from the ADHD group by the nature and the extent of these problems. The PDD-NOS group had significantly more social problems (as measured by the CBCL Social scale), withdrawn problems (as measured by the CBCL Withdrawn scale) and PDD-specific problems (as measured on the ABC Relating scale, the ABC Language scale, the CSBQ total score, the CSBQ Social Interaction scale and CBSQ Communication scale). In addition, although the descriptions of the social problems are global, i.e. on scale level, the results also show that the social problems of PDD-NOS children can be positively formulated and described as at least including severe social interaction problems, withdrawn behaviours and communication problems.

Key words Social problems – PDD-NOS-ADHD-autism – parent questionnaires

Introduction

The DSM-IV (4) category PDD-NOS (Pervasive Developmental Disorder-Not Otherwise Specified) is used to indicate a heterogeneous group of conditions that involve severe problems in the development of reciprocal social interaction and/or verbal and non-verbal communication and/or repetitive and stereotyped behaviour patterns. The problems fail to meet all the diagnostic criteria for a specific Pervasive Developmental Disorder (PDD) (i.e. Autism, Asperger's disorder, Rett syndrome or Childhood Disintegrative Disorder) or have had an onset after 30 months of age. Although the diagnostic criteria are almost identical, the ICD-10 classification system (41) uses the term "atypical autism" to categorise the same group. In addition, it goes further by describing various subtypes of atypical autism.

The PDD-NOS category[1] is described in global and negative terms, and lacks an exact and concrete description of the problems. This adversely effects the reliability of diagnostic judgements and may lead to

[1] Or 'atypical autism' in terms of the ICD-10 system. However, in this paper the DSM-IV classification system is used to classify the problems of the subjects involved and therefore DSM-IV terminology will be used.

diverse interpretations. The lack of diagnostic consensus is illustrated by Towbin's (32) description of very different definitions of PDD-NOS. It can be regarded, for example, as a collection of entities that reside on the border of relatively more normal functioning (i.e. the impairment in one of the three core features of PDD is quite mild or perhaps is absent). This advances the idea that PDD-NOS is a form of ''mild'' autism. Another definition refers to individuals who have a late (after 30 months of age) age of onset of autistic symptoms (see ICD-10 subtype 'atypicality in age of onset'). Or PDD-NOS may comprise heterogeneous clinical entities that share two critical features: a) early onset of symptoms and b) impairment in relatedness. The use of this last definition permits one to include a broad range of disorders characterised by problems in relatedness and the capacity to develop empathy. Although very different, each of the above definitions is compatible with the present official classification system.

Some attempts have been made to make the definition for PDD-NOS more explicit (9, 10). Basing their work on the data of the DSM-IV Autistic Field Trial, they suggested a scoring rule for PDD-NOS, to prevent clinicians and researchers from overly diagnosing PDD-NOS among non-PDD-NOS conditions. The scoring rule was based on the absence or presence of the criteria for autistic disorder, i.e. severe impairments in social interaction and communication and exhibition of stereotypical behaviours. Use of this approach means that individuals with less severe expressions of these symptoms (i.e. subthreshold symptomatology) are left out of consideration because their impairments are milder and do not fully meet descriptions such as ''failure to develop'' or ''lack of'' on one or more of the criteria described in the DSM-IV. Despite these improvements, the scoring rule was still seen as being far from ideal.

Other authors have suggested diagnostic criteria for subgroups within the PDD-NOS group. Examples include children with Multiplex Developmental Disorder or Multiple Complex Developmental Disorder (MCDD; 12, 13, 33); children with Deficits in Attention, Motor control and Perception (DAMP; 16, 17); children with Non-verbal Learning Disabilities (NLD; 27). Such studies underline the clinical significance of children with autistic-like social deficits, but also demonstrate the lack of diagnostic consensus in diagnosing and studying such children. To date, insufficient empirical evidence has been found to include any of these subgroups in the official classification systems.

Where the term PDD-NOS is used to describe children with early onset problems in social relations (32), the overlap between the social problems of these children and those with other disorders of childhood may be substantial. The focus of this article is on the extent of overlap in difficulties experienced by children with PDD-NOS and children with Attention Deficits and/or Hyperactivity Disorders, ADHD (DSM-IV; 4). Clarifying the differences and similarities between these groups is of clinical significance and is also very important for research purposes. In clinical practice, children with PDD-NOS may be initially diagnosed as ADHD (26). This may occur because, at first sight, certain problems, such as inattentive behaviour or overfocusing on other children, may seem to be primary.

Several researchers have pointed to an overlap between children with problems classified as PDD-NOS and those with problems classified as Attention Deficit Disorders (5, 11, 17, 32). Many children with attentional problems have problems in relating to other people (15, 19, 22, 37). On the other hand, many children with PDD-NOS suffer from problems in attention processes (2, 3), hyperactivity, acting-out behaviour and poor self-control (20).

Although the overlap in clinical symptoms seems evident, the DSM-IV permits the use of an ADHD diagnosis only when the symptoms of ADHD do not occur during the course of a PDD. It is therefore almost impossible to give a PDD-NOS and an ADHD diagnosis at the same time. As a result, children combining PDD-NOS and ADHD symptoms are not discussed in the literature. Studies including children with ADHD, PDD-NOS and those who meet the criteria of both disorders would help to provide a clearer picture of the extent of differences and similarities between the groups.

Studies investigating the social difficulties of children with problems classified as PDD-NOS are scarce compared to the large body of literature involving autistic subjects. Although children described as having PDD-NOS vary considerably with respect to the number and severity of their social difficulties (24, 31), it is generally assumed that the social relations of children with PDD-NOS, like those of children with autism, are characterised by a lack of social and emotional reciprocity. Several authors have speculated on explanations for the social problems of PDD children (e.g. The Theory-of-Mind hypothesis (17, 28, 29); attention deficits (14)). Similarly, several underlying causes have been suggested for children with ADHD (arising from problems in attention, hyperactivity and self-regulation (6, 7); deficits in social cognition (17); a performance or production deficit (22); sub-groups of ADHD with social problems (19, 40).

Arguably there is considerable overlap in problems between children with ADHD and children with PDD-NOS. Although a lack of social and emotional reciprocity is generally a characteristic and central problem of children with PDD-NOS, the social interactions of many children with problems classified as ADHD can also be characterised as lacking reciprocity. Many children with problems classified as PDD-NOS also suffer from specific attention deficits. In both groups, social problems may arise through deficits in social cognitive skills, or an inability to apply these skills adequately, or

attention deficits, or a combination of several or all of these characteristics.

Aims of the present study

The present article aims to study the extent of overlap in social and communicative difficulties experienced by children, clinically diagnosed with PDD-NOS or ADHD. It aims to further characterise their problems and identify features that may be distinctive to one group or the other. It does not pretend to investigate the underlying causes of their social problems. However, charting the overlap and differences in problems may help future research in this field. The study adds to the field by also including children who meet the criteria for both PDD-NOS and ADHD. For comparison purposes, three control groups were used: a high functioning autistic group, a clinical group consisting of children with child psychiatric problems other than PDD-NOS or ADHD and a healthy, normally developing control group.

The instruments used in this study are three parent questionnaires, so the research is based on the description of symptoms as reported by parents. One of these measures, the Child Behaviour Checklist (1, 34), covers a rather broad range of behavioural and emotional problems. The second, the Autism Behaviour Checklist (21), specifically charts autistic symptomatology (i.e. more severe forms of PDD). The third, the Children's Social Behaviour Questionnaire (23), describes the problems of children with PDD in general, including those of children with lesser variants of PDD, such as PDD-NOS.

Methods

Subjects

Five different clinical samples were included in this study. Most of the children involved were patients at an outpatient clinic for child and adolescent psychiatry, which specialises in developmental disorders. The initial sample consisted of 545 (out of 2697 referrals), 5–12 year-old children. The first group consisted of 190 children with severe problems in social interaction, communication or a restricted repertoire of activities and interests classified as PDD-NOS. None of these children met the DSM-IV criteria for (high functioning) autism, or another specific pervasive developmental disorder. The second group consisted of 152 children with problems classified as ADHD (children diagnosed as ADHD-NOS were excluded from the sample). The third group consisted of children whose problems met the criteria for both PDD-NOS and ADHD (N = 98). The fourth group was a clinical control group (CC group) consisting of 65 children with anxiety disorders (N = 27), depressive disorders (N = 16), somatization disorders (N = 18) and tic disorders (N = 4). All of these children were selected on the basis of clinical diagnosis. A smaller group was then selected on a random basis, but ensuring that all groups were comparable with respect to age and gender. Children with mental retardation (N = 40) were excluded from each of the different clinical samples.

To compare the data of the four clinical groups with the data of children with a specific pervasive developmental disorder, a fifth clinical group was included. This group comprised 64 high functioning autistic children (HFA group) and consisted partially of children who were referred to the outpatient clinic and who were not mentally retarded. There were few such children, however, so the main part of this group (87.5%) was obtained through autism teams from different parts of the Netherlands (the response rate for this group is unknown, since, in order to ensure the anonymity of parents and children, recruitment of the parents was carried out by the autism teams themselves).

At the outpatient clinic, classification of the problems of the clinical groups was established after extensive diagnostic procedures. These included several clinical interviews. In these interviews parents were questioned about their child's present functioning on various developmental domains. These included the child's readiness to initiate social interaction (e.g. with peers), reactions to social approaches made by others, the quality (e.g. reciprocity) of their social relationships, speech and language development, attention problems, and motor functioning. In addition, parents were asked about the developmental history of their children. One or more play contacts with the child provided additional information concerning matters such as the social interaction and communication capacities of the child.

Children were diagnosed on the basis of DSM-IV criteria. The DSM-IV does not provide positive criteria for PDD-NOS. According to Towbin (32) this category can be described as representing "a heterogeneous collection of disorders that share core features of delays in social relatedness and/or deficits in the capacity to reciprocate and understand social interactions, but these can be much milder than those seen in autism. Persons with PDD-NOS can have restricted interests, limitations in imaginative play, and stereotyped activities but these may be quite mild or absent" (p. 124). This description is applicable to the PDD-NOS children involved in this study. The nature and/or severity of their symptoms were not in accordance with the criteria for (high functioning) autism.

Data referring to special education and school type were used as an indication of the approximate level of functioning of the majority of children in the PDD-NOS, ADHD, PDD-NOS/ADHD group and CC group. Most children (79% of the children for whom school data were available) in these groups

attended an elementary school, 21% attended a special school. There were significant differences between the groups regarding the number of children in special schools. In the CC group only 3% attended a special school, whereas most (69%) of the HFA group attended a special school. No differences were found between the PDD-NOS, PDD-NOS/ADHD and ADHD group with regard to the number of children in special schools ($\chi^2 = 2.1$, $p = 0.36$). With respect to the type of special education, all of the children attended schools that only admitted children with intelligence levels within the normal range.

A sixth group (normal controls = NC group) consisted of 113 normally developing children aged 5–12. None of these children had been in contact with psychological or psychiatric services. Several elementary schools in northern Holland were selected at random and asked to participate in the research project. When parents agreed to participate, they received a booklet containing the CBCL, ABC and the CSBQ. Response rate for the normal control group was 80%. The children in the NC group were selected at random from an initial sample of 234 children in order to create a NC group, which was matched for sex and age with the other groups. Table 1 summarises the sample characteristics.

The groups were comparable in terms of age and gender. Differences were considered statistically significant if $p < 0.01$. A chi-square analyses of the gender distribution in all groups showed no significant differences among the five groups in sex ($\chi^2 = (9.1)$, $p = 0.11$). Analyses of variance showed no significant differences among the five groups in age, ($F(5, 676) = 2.6$, $p = 0.02$).

Instruments

The DSM-IV criterion questionnaire for clinicians

To obtain more detailed information about the amount and severity of PDD symptoms, clinicians completed a checklist based on DSM-IV symptoms for PDD. Each DSM-IV criterion was divided into one or more concrete items which followed the literal text of the DSM-IV resulting in 20 items that could be rated as absent (0), mild (1), moderate (2) or severe (3). This meant that less severe expressions of autistic symptoms could also be rated. Eight items concerned problems in social interaction, seven referred to problems in (non-) verbal communication and five focused on stereotyped and restricted activities or interests. Three additional questions dealt with age of onset of problems in social interaction, language and pretend play.

It was reasoned that if children with PDD-NOS (i.e. children who did not meet the criteria for autistic disorder) differ significantly from the children in the other two clinical groups (i.e. ADHD and clinical controls) with respect to the amount and severity of PDD symptoms, this would provide support for a general PDD-spectrum diagnosis.

As this checklist was introduced about six months after the start of this study, data on PDD symptoms were only available for 74% of the PDD-NOS group, for 44% of the PDD-NOS/ADHD group, and for 53% of the ADHD group (total N = 264). For each of the groups, subscores were computed for the three problem domains: Social interaction (maximum score 24), Communication (maximum score 21) and Stereotyped and restricted behaviour patterns (maximum score 15).

Two raters independently scored the checklist for a sample of 15 children. A high level of inter-rater reliability was obtained for the total score (intraclass correlation coefficient: 0.91, (8)) and for the subscores for different domains (Social interaction, ICC = 0.82; Communication, ICC = 0.91; Restricted repertoire of activities and interests, ICC = 0.66). Internal scale consistency (Cronbach's α) for the various subscales was computed (Social interaction $\alpha = 0.86$; communication $\alpha = 0.88$, and Restricted repertoire of activities and interests $\alpha = 0.84$).

Parent questionnaires

Parents were asked to complete a number of questionnaires: the Dutch version of the Child Behaviour

Table 1 General sample characteristics

	PDD-NOS (N = 190)	ADHD (N = 152)	PDD-NOS/ ADHD (N = 98)	CC_ (N = 65)	HFA (N = 64)	NC (N = 113)
Mean age	8.3	8.3	8.8	9.2	8.2	8.4
Range	5–12	5–12	5–12	6–12	5–12	5–12
SD	2.2	2.1	2.6	2.2	2.3	2.3
Males	159 (84%)	136 (89%)	86 (88%)	50 (77%)	57 (89%)	91 (81%)
Females	31 (16%)	16 (11%)	12 (12%)	15 (23%)	7 (11%)	22 (19%)

CC_ = Clinical Control group
HFA = High Functioning Autism
NC = Normal Controls

Checklist 4–18 (CBCL) (34), the Autism Behaviour Checklist (ABC) (21) and an experimental parent questionnaire, the Children's Social Behaviour Questionnaire (CSBQ) (23). The CBCL covers a broad range of behavioural and emotional problems. It provides standardised ratings for the total amount of problem behaviour, for two broadband scales and for nine specific syndrome scales. Since the focus in this article was on social problems, the following measures from the CBCL were used: the total problem score as an indication of general psychopathology and the subscales 'Withdrawn', and 'Social problems' as measures of social behaviour problems. The subscale 'Attention problems' will be included to have an impression of the attention problems in the groups.

According to Sponheim (30), the ABC can be used to differentiate the PDD group from the non-PDD group and to differentiate autistic disorder from other disorders within the PDD spectrum. Considering the focus of this study, the total ABC score was used as a general indication of the amount of autistic behaviour and the subscales 'Relating', 'Language' and 'Social & self-help' were as specific measures of social and communicative behaviour.

The 96 items of the CSBQ cover a broad range of problem behaviour seen in children with milder forms of PDD. The CSBQ items are scored in the same way as the CBCL. The parent is asked to respond to each item by indicating whether it does not describe the child (score 0), infrequently describes the child (score 1), or clearly applies to the child (score 2). An initial study, in which a 134-item version of the CSBQ was used, showed that inter-rater reliability (between parents) for the questionnaire was high and that the questionnaire has the potential to discriminate between children with PDD-NOS and normally developing children (23).

For the purpose of this study, a number of items relevant to the social and communicative area were grouped into subscales which were based on the DSM-IV criteria. These subscales were supposed to measure 1) Social interaction (20 items) and 2) Communication (15 items). The internal scale consistency of both groups was high. Crohnbach's α was 0.90 for Social interaction and 0.88 for Communication. Examples of typical items for the subscales are presented in Table 2.

Preliminary data of the reliability of the instrument were available for the version used in this study. Mothers and fathers completed the CSBQ independently of each other. High levels of inter-rater reliability (N = 23) were obtained for the CSBQ Total Score (ICC = 0.83) and the Social Interaction scale (ICC = 0.83). The reliability of the Communication scale was satisfactory (ICC = 0.73). Some mothers (N = 21) were asked to complete the CSBQ on a second occasion after an interval of approximately four weeks. Retest reliability was high for the CSBQ Total score (ICC = 0.90) and Social Interaction scale (ICC = 0.90). It was satisfactory for the Communication scale (ICC = 0.76).

Table 2 Examples of items in CSBQ subscales

Subscale	Examples[1]
Social interaction (20 items)	– Has difficulties associating with peers – Does not understand that certain thing are "not done" – Lives in a world of his/her own – Has difficulty putting him/herself in someone else's position, e.g. does not understand why someone is angry – Behaves inappropriately in public places – Does not take the needs of others into account
Communication (15 items)	– Talks confusedly; jumps from one subject to another in speaking – Does not fully understand what is being said to him/her, i.e tends to miss the point – Does not understand jokes – Frequently says things which are relevant to the conversation – Takes things literally, e.g. does not understand certain expressions – Is exceptionally naïve; believes anything you say

[1] The examples used have the highest correlations with the subscores of the scale

Procedure and statistical analyses

The clinical groups consisted of children who were referred to a child and adolescent psychiatric outpatient clinic in the period between January 1996 and December 1997. All parents of these children were asked to complete a booklet containing questions about background information (i.e. pregnancy, family history and school situation) and the questionnaires described earlier (CBCL, ABC and CSBQ). The response rate was 99%. Ninety percent of these parents gave permission to use their responses for research purposes. The parents and the children were seen by a child psychiatrist for a clinical interview and for observation of play activities. Afterwards, the child psychiatrist completed the PDD checklist on the basis of the information available from the contacts with parents and child. The diagnoses were added to the parent questionnaire database, after which a selection of the

children for this study was made, based on the diagnoses and the age of the child.

If parents of HFA children agreed to participate, the CSBQ and additional information were sent to them by mail. For practical reasons, only CSBQ data were available for these children.

In the next section, the results of the comparisons between the separate groups will be presented for each questionnaire. Because the results of the CC group and the NC group indicated that the scores were asymmetrically distributed with low mean scores, these groups were not included in the analyses on group differences. Group differences between the other groups were tested by means of an ANOVA and post-hoc Bonferroni analyses. Given the aims of the present study, pairwise comparisons between the PDD-NOS group, the PDD-NOS/ADHD group, and the ADHD group were made. The HFA group was only included in the comparisons of the CSBQ scores. Considering the sample size and the number of comparisons involved, differences were considered statistically significant if $p < 0.01$.

Results

DSM-IV symptoms for PDD in the groups

First, overall differences in PDD symptoms on the PDD-checklist for clinicians were tested in the PDD-NOS group, the PDD-NOS/ADHD group and the ADHD group. Table 3 shows the mean scores and standard deviations for each of the included clinical groups.

The mean scores of the PDD-NOS group were higher than those of the other groups. The analysis of variance showed significant overall differences between the three groups in each of the problem domains (Social interaction, $F(2, 261) = 56, 4$, $p < 0.001$); Communication, $F(2, 261) = 10, 1$, $p < 0.001$ and Stereotyped and restricted behaviour, $F(2, 259) = 6, 1$, $p < 0.01$). The post-hoc Bonferroni test showed that the scores of children in the PDD-NOS group differed significantly from the ADHD group on all three domains ($p < 0.001$). Although the scores of the PDD-NOS group were higher on each domain, no significant differences were found between the PDD-NOS group and the PDD-NOS/ADHD group. In the comparison of the PDD-NOS/ADHD group with the ADHD group the scores differed significantly on the Social interaction domain ($p < 0.001$). On the Communication and the Stereotyped and restricted behaviour domains, the scores did not differ significantly.

The DSM-IV item referring to an early age of onset (as before age of three years) of social interaction problems was used far more frequently for the PDD-NOS group and the PDD-NOS/ADHD group than for the ADHD group. More than half of the children of the PDD-NOS group had early onset problems in the social communication domain, whereas the rates of children in the ADHD and the PDD-NOS/ADHD group were much smaller. A delay in symbolic or imaginative play with onset prior to age three occurred less frequently in all three groups and was most applicable to the PDD-NOS/ADHD group. The checklist scores support the validity of a PDD-spectrum diagnosis for both PDD-NOS groups.

Comparisons of the groups on the CBCL, ABC and the CSBQ

Table 4 provides an overview of the Total Scores and Subscale Scores on the different questionnaires for all groups (HFA, PDD-NOS, ADHD, PDD-NOS/ADHD, CC, NC).

The CBCL

Analyses of variance showed significant overall differences among the groups on the CBCL Total Problem Score, $F(2, 415) = 5.8$, $p < 0.01$; the CBCL Social Problems

Table 3 Mean scores and standard deviations of the clinical groups on the PDD checklist

	PDD-NOS (N = 140)		ADHD (N = 81)		PDD-NOS/ADHD (N = 43)	
	M	SD	M	SD	M	SD
Social Interaction (0–24)	13.3	5.1	4.1	7.5	10.3	6.8
Communication (0–21)	6.4	4.9	2.0	9.8	4.4	7.0
Stereotyped & restricted behavior (0–15)	4.0	4.0	1.5	7.2	2.4	4.5
Delays with onset prior to age 3 years in:	Yes	No	Yes	No	Yes	No
Social interaction	85%	15%	8%	92%	71%	29%
Language as used in social communication	57%	43%	6%	94%	26%	74%
Symbolic or imaginative play	24%	76%	4%	96%	36%	64%

Table 4 Overview of the mean Total scores and mean Subscale scores and standard deviations on the questionnaires for the different groups

	HFA (N = 64)		PDD-NOS (N = 190)		ADHD (N = 152)		PDD-NOS/ ADHD (N = 98)		CC (N = 65)		NC (N = 113)	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
CBCL												
CBCL Total score			67.5 (55%)*	26.9	62.6 (45%)	25.2	74.0 (63%)	24.9	49.2 (30%)	27.4	21.8 (2%)	14.3
CBCL Social problems			6.2 (45%)	3.2	4.8 (29%)	3.1	7.1 (59%)	3.2	2.9 (11%)	2.5	1.3 (1%)	1.5
CBCL Withdrawn			6.5 (41%)	3.6	4.1 (11%)	2.9	4.8 (18%)	3.2	5.5 (25%)	3.4	2.0 (2%)	1.9
CBCL Attention			10.3 (49%)	4.5	9.5 (30%)	3.2	11.1 (51%)	3.7	4.9 (13%)	3.6	3.0 (2%)	2.4
ABC												
ABC Total score			32.4	23.6	25.5	19.8	34.8	24.8	8.2	7.8	6.5	9.2
ABC Relating			9.0	7.5	5.8	6.6	9.1	8.3	2.3	3.6	0.8	2.4
ABC Language			4.2	5.6	2.5	3.8	4.0	4.4	0.3	0.7	0.6	2.0
ABC Social & self-help			9.6	5.3	8.4	5.6	10.9	5.7	4.1	4.1	3.1	3.4
CSBQ												
CSBQ Total score	92.0	30.4	71.0	29.6	59.9	23.5	80.2	24.6	35.1	22.7	20.6	15.7
CSBQ Social Interaction	21.3	6.6	16.4	7.7	12.5	6.6	18.2	7.0	7.0	6.4	3.4	3.4
CSBQ Communication	16.6	5.6	11.4	6.4	9.1	5.2	13.2	6.1	3.8	3.8	3.8	3.4

* The percentages shown in brackets represent the CBCL scores in the clinical range ($t > 70$)

scale, $F(2, 411) = 16.4$, $p < 0.001$, and the CBCL Withdrawn scale, $F(2, 417) = 23.5$, $p < 0.001$. On the Attention problems scale, the overall differences just failed to reach significance level, $F(2, 402) = 4.6$, $p = 0.01$.

Post-hoc analyses of the contrasts showed that the Total CBCL scores of the PDD-NOS group did not differ significantly in comparison with the PDD-NOS/ADHD group and in comparison with the ADHD group (PDD-NOS vs. PDD-NOS/ADHD, ($p = 0.14$); PDD-NOS vs. ADHD, ($p = 0.28$)). The PDD-NOS/ADHD group had significantly higher CBCL Total scores than the ADHD group ($p < 0.001$).

On the CBCL Social Problems scale the children in the PDD-NOS/ADHD group received the highest scores. Their scores did not differ significantly from the PDD-NOS group ($p = 0.11$). Both groups had significantly higher scores than the children in the ADHD group (in both comparisons: $p < 0.001$).

On the CBCL Withdrawn scale, the children in the PDD-NOS group had significantly higher scores in comparison with both the children in the PDD-NOS/ADHD group and the ADHD group (in both comparisons: $p < 0.001$). The scores of the ADHD group and the PDD-NOS/ADHD group did not differ significantly ($p = 0.27$).

On the CBCL Attention problems scale, the differences between the PDD-NOS and the PDD-NOS/ADHD groups were not significant ($p = 0.39$). Similarly, the scores of the PDD-NOS and the ADHD groups did not differ significantly ($p = 0.24$). However, the scores of the PDD-NOS/ADHD were significantly higher than the ADHD group ($p < 0.01$).

The ABC

The scores of the PDD-NOS group and the ADHD groups fell well below the ABC's diagnostic threshold for autism.

Analyses of variance showed significant overall differences among the three groups in the ABC Total Score $F(2, 364) = 5.4$, $p < 0.01$; the ABC Relating scale $F(2, 386) = 8.8$, $p < 0.001$; the ABC Language scale $F(2, 391) = 5.4$, $p < 0.01$ and the ABC Social & self-help scale $F(2, 394) = 5.7$, $p < 0.01$.

Post-hoc analyses showed that the ABC Total score of the PDD-NOS/ADHD group did not differ significantly from the PDD-NOS group ($p = 1.0$), but it did differ significantly from the ADHD group ($p < 0.01$). No significant difference was found between the PDD-NOS group and the ADHD group ($p = 0.03$).

On the ABC Relating scale, children in the PDD-NOS and the PDD-NOS/ADHD groups had significantly higher scores than the ADHD group (in both comparisons: $p < 0.01$). The scores of the PDD-NOS and the PDD-NOS/ADHD groups did not differ from each other ($p = 1.0$).

The scores on the ABC Language scales, again, did not differ significantly between the PDD-NOS and the PDD-NOS/ADHD groups ($p = 1.0$). Also the scores of the PDD-NOS/ADHD and the ADHD groups did not

differ significantly ($p = 0.06$). However, the scores of the PDD-NOS group were significantly higher than those of the ADHD group ($p < 0.01$).

On the ABC Social and self help scale the scores of the PDD-NOS/ADHD and the PDD-NOS groups did not differ significantly ($p = 0.23$), whereas the scores of the PDD-NOS/ADHD group and the ADHD group did ($p < 0.01$). The PDD-NOS and the ADHD groups did not differ significantly ($p = 0.17$).

The CSBQ

As with the other instruments, differences on CSBQ scores were tested by means of one-way ANOVAs with post-hoc Bonferroni tests. In these comparisons, a fourth group was included, the HFA group.

The analyses of variance showed significant overall differences among the four groups on the CSBQ Total score $F(3, 490) = 24.7$, $p < 0.001$; on the CSBQ Social interaction scale $F(3, 492) = 27.1$, $p < 0.001$; and on the CSBQ Communication scale $F(3, 490) = 26.5$, $p < 0.001$.

Post-hoc analyses showed that the HFA group scored significantly higher in comparison with the PDD-NOS group and the ADHD group on the CSBQ Total score (in both comparisons: $p < 0.001$). The scores of the HFA and the PDD-NOS/ADHD groups did not differ significantly ($p = 0.04$). Also the scores of the PDD-NOS/ADHD and the PDD-NOS groups did not differ significantly ($p = 0.04$), whereas the scores of the PDD-NOS and the ADHD groups did ($p < 0.01$). The scores of the PDD-NOS/ADHD and the ADHD groups differed significantly ($p < 0.001$).

On both subscales, the Social interaction and the Communication, the same order of scores appeared: the HFA group scored highest, followed by the PDD-NOS/ADHD group, the PDD-NOS group, and the ADHD group. On the Social interaction scale the difference between the HFA group and the PDD-NOS/ADHD group was not significant ($p = 0.05$). The scores of both other groups were significantly lower than the HFA group (in both comparisons: $p < 0.001$). In comparison with the PDD-NOS/ADHD group, the scores of the PDD-NOS group did not differ significantly ($p = 0.20$), whereas the scores of the ADHD group were significantly lower ($p < 0.001$). The scores of the PDD-NOS group were significantly higher than the scores of the ADHD group ($p < 0.001$).

On the Communication scale the HFA group scored significantly higher in comparison with all groups (HFA vs. PDD-NOS, ADHD, ($p < 0.001$); HFA vs. PDD-NOS/ADHD, ($p < 0.01$)). The scores of the PDD-NOS/ADHD did not differ significantly with the PDD-NOS group ($p = 0.10$). Both groups scored significantly higher than the ADHD group (PDD-NOS/ADHD vs. ADHD, ($p < 0.001$); PDD-NOS vs. ADHD, ($p < 0.01$)).

Discussion

The present study set out to examine differences and similarities in the social and communicative problems of children with problems classified as PDD-NOS and ADHD by means of a number of parent questionnaires. Based on the literature on the problems of PDD-NOS children (24, 31, 32), it was expected that this group would have relatively severe difficulties in social and communicative behaviours, such as understanding and empathising with other people's feelings and thoughts, but that these would be fewer or have a different nature in comparison with high functioning autistic children. Another expectation was that children in the ADHD group would also have considerable problems in social behaviour (5, 17, 38, 39) and possibly also have autistic-like problems (11), although these were expected to be less severe than those of the PDD-NOS group. A third expectation concerned attention deficits. It was expected that these problems would occur in both groups, but to a larger extent in the ADHD group, since they are a central characteristic of this group (ICD-10 (41); DSM-IV (4)). Attention deficits have also been described in several studies on PDD-NOS children (for instance (2, 3)).

To examine these aspects, a large PDD-NOS group and a large ADHD group were studied. The sample also included a number of control groups: 1) a group of children who met both PDD-NOS and ADHD criteria, to be able to relate the scores of both groups with this group of children (Although this combination diagnosis is not an official category: according to the DSM-IV, hierarchical rules enforce a classification of PDD-NOS, it may be clinically relevant to assign both diagnoses when children show a combination of social handicaps and attention or/and hyperactivity problems); 2) a clinical control group, to be able to compare the scores with a psychiatric population other than PDD-NOS or ADHD; 3) a high functioning autistic group, to contrast the problems of those with milder forms of PDD with the more severe expressions of PDD; and 4) a healthy control group, as a reference point for all groups. All groups were matched for age and sex.

In order to obtain more detailed information about the amount and severity of PDD symptoms, clinicians completed a DSM-IV checklist. The scores on this checklist revealed that the PDD-NOS group was, with regard to PDD symptoms, clearly distinguishable from the ADHD group, but not from the PDD-NOS/ADHD group. Although these data need to be interpreted with caution, since these data were not available for the complete sample and difficult to assess in relation to the

overall study, they provide support for the impairments of both PDD-NOS groups in the PDD domains.

The DSM-IV items referring to age of onset of the developmental delays as before age three years were used far more frequently for the PDD-NOS groups than for the ADHD group. The fact that more than half of the PDD-NOS children had problems in social interaction with an onset before age three, rules out the possibility that in the present study the PDD-NOS category was restricted to individuals who had a late age of onset of autistic symptoms (32).

The comparisons of the PDD-NOS group and the ADHD group revealed that the PDD-NOS group experienced significantly more social problems (CBCL Social problems), more withdrawn behaviours (CBCL Withdrawn) and more specific PDD related social problems (ABC Relating, ABC Language, CSBQ Total, CSBQ Social interaction and CBSQ Communication). The ADHD group on the other hand, experienced considerably more social problems as compared to, for example, the CC group. The ADHD group and the PDD-NOS group did not differ with respect to general psychopathology (CBCL Total score), general autistic symptomatology (the ABC Total score), social and self-help skills (ABC Social and Self-help scale) and attention problems (CBCL Attention).

These results stress a number of important points. First, the results on the questionnaires add to a clearer description of the PDD-NOS category. The relatively high scores of the PDD-NOS group in comparison with the NC group on all questionnaires indicate that Towbin's suggestion (32) that the PDD-NOS category can be seen as a collection of entities that reside on the border of more normal functioning is not applicable to the problems of the children in this study. As expected, social interaction as well as communication problems are more characteristic for the PDD-NOS group. For example, the items described in the CSBQ describe behavioural peculiarities in social relationships and communication, such as difficulties in associating with peers, inability to empathise, and not understanding social cues. The scores of the children with PDD-NOS were higher than those with ADHD, indicating that these problems are less prominent in the ADHD group. The HFA group scored higher on the CSBQ than the PDD-NOS group, supporting the hypothesis that the impairments in these domains are more severe in autistic subjects. The scores of the HFA group on the CSBQ can also be seen as confirming the PDD specific characteristics of the CSBQ.

Second, the suggestion that autistic-like social problems occur in children with ADHD (11, 17) is confirmed by the data. In comparison with the CC group, the scores of the ADHD group were considerably higher on global measures of social problems, such as the CBCL Social problem scale, but also on measures of PDD behaviours, such as the ABC and the CSBQ. Although the overlap in the social problems of the PDD-NOS group and the ADHD group might be related to the fact that PDD-NOS group had fewer autistic symptoms than the high functioning autism group, this overlap might also be related to the difficulties of classification of both categories described in other studies (20, 26). It might also support the idea that there are subgroups with both social and attention deficits within the PDD-NOS category and the ADHD category (17, 19, 32, 40). The high variation in scores on the Total scores and subscales within both the PDD-NOS and the ADHD group can also be interpreted as providing some support for this idea. This finding indicates that both groups were very heterogeneous in the manifestation of their symptoms. While this study gave no direct attention to possible subgroups within the PDD-NOS or ADHD category, this finding suggests that it would be worthwhile to explore this possibility in further studies.

A third point refers to attention problems. The scores of the PDD-NOS group on the CBCL Attention scale equalled the scores of the ADHD group. It was anticipated that attention problems would be present in the PDD-NOS group, since symptoms of inattention and impulsiveness can be viewed in the context of the syndrome and have been reported in studies of PDD-NOS children (2, 3). Problems in shifting attention are even mentioned as a primary deficit in autism and as the basis for impairments in social behaviours (14). In addition, the scores of the children with PDD-NOS/ADHD even exceeded the scores of those with ADHD. The occurrence of attention deficits to this large extent in both PDD-NOS groups might have implications for the treatment and care of these children and their parents. Possibly, social and attention problems interact in a unfavourably way. However, the CBCL offers little possibility for examining attention problems in detail, since the items of the scale are restricted in the range of problems described and the number of items actually available.

The fourth point concerns the presence of withdrawn behaviour. The results showed that the children in the PDD-NOS group exhibited significantly more withdrawn behaviour than the ADHD children. With regard to this, the PDD-NOS group was comparable to the CC group. In addition, the scores of the ADHD group were comparable to those of the PDD-NOS/ADHD group. From these results it can be concluded that 1) withdrawn behaviour seems to be specific for the PDD-NOS group in comparison with the ADHD group, but 2) the PDD-NOS/ADHD group does not exhibit this behaviour. Although very speculative, this may point to the existence of a PDD-NOS subgroup, which is more withdrawn, and PDD-NOS subgroup which is more outgoing. It may also be that the symptoms of children with ADHD do not include withdrawn behaviour. These points need further investigation.

A fifth point refers to the scores on the ABC. Contrary to what was expected, no significant differences were found between the ADHD and PDD-NOS groups on the ABC Total score and the ABC Social & self-help. The following explanations may be advanced for this result. It is possible that children with ADHD, or maybe a subgroup of these children, experience some of the problems associated with autism measured by the ABC. Another possible explanation for this finding could be that, given the subthreshold scores of the PDD-NOS group, the ABC might not be an adequate instrument for studies dealing with autistic-like features, since the initial point of reference for the items of the ABC was the description of typical autistic behaviour. For parents of ADHD children and PDD-NOS children, in particular, a more flexible descriptions of problems might be required. In some other studies on the ABC, concern about its reliability and specific diagnostic validity has precluded its general use both as a screening tool and diagnostic instrument (18, 25, 30, 35, 36). The high scores on the Social & self-help scale might also have contributed to the high ABC Total score. The high scores of the ADHD children on this scale are probably due to the fact that many of the items of these scales describe problems in executing appropriate behaviour. This pattern could arise from general dysfunctioning, from an attention deficit or perhaps hyperactivity, but it could also be caused by a disorder in understanding social cues and empathising. This means that the high scores obtained by the two groups on this scale could arise for different reasons.

The last point refers to the clinical importance of the PDD-NOS/ADHD group. In terms of the DSM-IV, assigning a PDD-NOS/ADHD diagnosis is officially not permitted, but the results of this group show their severe (social) handicaps. Although they were less withdrawn than the PDD-NOS group, their scores were at least as serious as those of the PDD-NOS group. There was even some indication that their social interaction problems (CSBQ Social interaction) did not differ from those of the HFA group. In addition, their attention problems equalled those of the PDD-NOS, but exceeded those of the ADHD group. This combination of problems (i.e. social problems with a more ''outgoing'' character in combination with severe attention problems) might be extremely difficult to handle for parents, but also in school situations, and may need a special treatment approach. Since no other studies have reported social problems for similar groups, the prevalence of the combination diagnosis is unclear. Further studies are needed to examine whether this group is an essentially different group with typical characteristics.

The present findings indicate that, although the CSBQ needs further refinement, it is a useful instrument for differentiating the extent and the nature of social problems of children with PDD-NOS from those with other disorders.

While the results of this study are promising, several methodological aspects need further attention. The groups included in the sample were matched for age and sex, but intelligence data were only available for a minority of the children in the clinical groups and could therefore not be used in the comparisons of the groups. Since the level of general intelligence fundamentally contributes to the expression of psychopathology, further studies need to include more precise measures of intelligence in order to investigate the possible influence of intelligence (verbal and performance) on the manifestation of developmental problems. Other studies (28, 29) have revealed that IQ level may have a strong effect on the results obtained, such as on social cognitive skills.

Information concerning the children's functioning was gathered by means of parent questionnaires. In studies of pervasive developmental disorders, information concerning the extent and nature of problems in different situations should be examined, preferably on the basis of different informants. In further studies, comparisons using standardised teachers' reports and information from clinicians, for example, would be useful.

In this study, the clinical samples were formed on the basis of the DSM-IV classification given by the clinician. Although this was not an ideal situation, the problems of the children were carefully assessed and classified. A checklist on the DSM-IV criteria was used as a confirmation and a further specification of this judgement. However, in future studies, data on for instance inter-rater reliability will be necessary. Also, checklists could be used to form groups or subgroups on the basis of the amount and severity of DSM-IV symptoms in order to avoid classification problems. In addition, complete description of the differences in symptomatology between the ADHD and the PDD-NOS group, requires further examination and clarification of areas such as attention, motor problems, (hyper)activity, anxiety problems, stereotyped behaviours and cognitive problems.

Studies aimed at accurate description of specific symptoms and the overlap and boundaries of symptoms among different groups of children can contribute to the development of more specific research approaches and the development of specific treatment facilities and support for the children and their parents. In the case of PDD-NOS, ADHD and other clinical groups, such work would add to the extent and quality of our knowledge of the social problems experienced by these children. It would also help to clarify the basic differences between the behaviour patterns of one group and another. In demonstrating that PDD-NOS children differ from other clinical groups in the patterns of social

behaviour which they show and in demonstrating that ADHD children suffer from substantial social problems, the present study has shown the value of such research.

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