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Henrik Sollie^{1,2}, Bo Larsson², and Willy-Tore Mørch³

Abstract

Objective: To explore the significance of adding father ratings to mother and teacher ratings in the assessment of ADHD symptoms in children. **Method:** The ADHD Rating Scale–IV, the Child Behavior Checklist, and the Teacher Report Form were filled out by all three informants for a sample of 48 clinically referred children (79% boys) aged 6 to 15 ($M = 10.1$) years. **Results:** Correspondence between father and teacher reports on ADHD-specific symptoms (intraclass correlation coefficient [ICC] = .38) exceeded that between mothers and teachers (ICC = .23). Fathers rated their children as having fewer problems than did mothers and teachers on Total scale scores and the Inattention subscale of the ADHD Rating Scale–IV. Mother ratings were more sensitive to an ADHD diagnosis, whereas father ratings better predicted an ADHD diagnosis requiring the two-setting criterion. **Conclusion:** The choice of parent informant and informant combination had a considerable impact on parent–teacher concordance and estimates of ADHD symptoms and subtypes in the child. (*J. of Att. Dis.* 2013; 17(8) 699-710)

Keywords

ADHD, children, assessment, informant agreement

ADHD is the most common neurobehavioral disorder in childhood with core symptoms of inattention, hyperactivity, and impulsivity. A substantial variability in the prevalence rate of ADHD has been reported in various epidemiological studies (Polanczyk, de Lima, Horta, Biederman, & Rohde, 2007). Such variability has been explained primarily by differences in methodological characteristics, for example, in diagnostic criteria, source of information, and the requirement of impairment for a formal diagnosis. A high proportion of children with ADHD present with co-conditions such as oppositional defiant, conduct, anxiety, and depressive disorders (Brown et al., 2001). The persistence of ADHD is high in that a majority of children with ADHD continue to meet criteria for the disorder during adolescence and into adulthood (American Academy of Child and Adolescent Psychiatry, 2007; Mannuzza & Klein, 2003).

Several clinical guidelines provide recommendations for the assessment of ADHD in the child (American Academy of Child and Adolescent Psychiatry, 2007; Brown et al., 2001; Taylor et al., 2004). These include the use of multi-method and multi-informant assessment consisting of clinical interviews, observation and physical examination of the child, and the use of rating scales for parents, teachers, and the child. Commonly, no distinction is made between the contributions of mother and father reports of ADHD

problems in the child. Although specific ADHD symptom rating scales are not sufficient for establishing a psychiatric diagnosis of ADHD, they are routinely used in the assessment of ADHD because of their time efficiency, quantification of symptoms, and usefulness in the assessment of the two-setting criterion (Tripp, Schaughency, & Clarke, 2006).

Two problems are pertinent in considering the utility of rating scales in the assessment of ADHD. First, there is low agreement between different informants, such as parents, teachers, and clinicians on child symptoms regardless of symptom type (Offord et al., 1996). Second, there is a lack of recommendations in clinical guidelines of the *Diagnostic and Statistical Manual of Mental Disorders* (4th ed.; *DSM-IV*; American Psychiatric Association [APA], 2000)

¹Kristiansund Hospital, Møre & Romsdal Health Trust, Norway

²Regional Centre for Child and Adolescent Mental Health, Norwegian University of Science and Technology (NTNU), Trondheim, Norway

³University of Tromsø, Norway

Corresponding Author:

Henrik Sollie, Enhet for BUP poliklinikk Kristiansund, Helse Møre og Romsdal, Kristiansund sykehus, Hermann Døhlensv. I, 6508 Kristiansund, Norway.

Email: hesollie@online.no

on the criteria for handling cross-informant disagreement (Wolraich et al., 2004).

When applying the two-setting criterion in the assessment of ADHD in children, the child's behaviors at home and in school are primarily focused. Parents and mental health professionals tend to perceive mothers as the most useful and accurate informant of behavioral and emotional problems in the child (Loeber, Green, & Lahey, 1990; Phares, 1997), and few cross-informant studies have included fathers when comparing parent and teacher ratings in the assessment of such problems in the child. Most of the clinic- and community-based studies of child ADHD symptoms include mothers as informants, or the gender-neutral term *parents* with an underrepresentation of fathers, resulting in a substantial lack of knowledge on the influence of father's perspectives on such problems (Phares, 1992; Singh, 2003).

The landmark meta-analysis of cross-informant variation by Achenbach, McConaughy, and Howell (1987) included 119 different studies on behavioral and emotional problems in children/adolescents from 1 to 19 years of age. For similar informants (e.g., mothers vs. fathers), the mean Spearman correlation coefficient was .60 and much higher than for different types of informants (e.g., parent vs. teachers) with a mean rho of .28. Only 8 studies compared teacher versus mother *and* father ratings with no significant difference between rhos. In these studies, all items addressed general behavioral/emotional problems in the child. In a recent meta-analysis by Duhig, Renk, Epstein, and Phares (2000), the focus was solely on the correspondence between mother and father ratings of child problems. Although mothers tended to report slightly more behavioral problems in the child than fathers, the differences were small and nonsignificant.

In studies of community samples, the agreement between parents and teachers is generally in the low-to-moderate range for more general problems as well as for ADHD-specific symptoms (Amador-Campos, Forns-Santacana, Guàrdia-Olmos, & Però-Cebollero, 2006; Grietens et al., 2004; Murray et al., 2007; Papageorgiou, Kalyva, Dafoulis, & Vostanis, 2008), whereas the agreement between parent and teacher ratings of child symptoms in general is higher for clinically referred children (Amador-Campos et al., 2006; Antrop, Roeyers, Oosterlaan, & Van Oost, 2002).

In general population (Wolraich et al., 2004) and clinic samples of children (Antrop et al., 2002; Mitsis, McKay, Schultz, Newcorn, & Halperin, 2000), parent-teacher concordance for ADHD symptoms in children has been evaluated. Although correlations were found to be significant, their size was modest in two studies Mitsis et al., 2000; Wolraich et al., 2004) but low and nonsignificant in another one (Antrop et al., 2002). In the Multimodal Treatment Study of Children with ADHD, Langberg et al. (2010) reported moderate parental correspondence on ratings of

inattention and hyperactivity/impulsivity symptoms in the child. The correlations were higher for Oppositional Defiant Disorder (ODD) symptoms as well as for externalizing symptoms on the Child Behavior Checklist (CBCL). Mothers rated their children as having significantly higher problem levels than did fathers on all scales.

Given a positive parent-reported diagnosis in the child, the probability of a positive teacher-reported diagnosis has been examined in clinic-referred samples of children fulfilling clinical criteria for Attention Deficit Disorder/ADHD (Biederman, Keenan, & Faraone, 1990; Zeiner, 1997). The results indicate that in this setting, it is likely that an ADHD diagnosis based on parent report will be confirmed by a teacher report in most of the cases.

The *DSM-IV* (APA, 2000) criteria require pervasiveness of ADHD symptoms by stating that "some impairment of the symptoms is present in two or more settings." However, the *DSM-IV* does not indicate degree of impairment required in each setting, and current *DSM-IV*-based practice parameters do not provide specific recommendations on how to combine ratings of ADHD symptoms in children from different informants in different (e.g., parents and teachers) or similar settings (e.g., mothers and fathers). Different strategies for combining informant ratings have been proposed for symptom endorsement by multiple informants (e.g., parent *and* teacher), one informant only (e.g., parent *or* teacher), or combining informant information by summing or averaging symptom scores from different informants (Offord et al., 1996; Youngstrom, Findling, & Calabrese, 2003). The use of different approaches for choosing parent informants or combining parent and teacher ratings may impact the estimated prevalence rates as well as diagnostic decisions in a clinical setting (Langberg et al., 2010; Mitsis et al., 2000; Offord et al., 1996; Power et al., 1998; Tripp et al., 2006; Wolraich et al., 2004; Youngstrom et al., 2003).

Although some studies have compared teacher ratings with mother and father ratings on behavioral/emotional symptoms in the child (Achenbach et al., 1987), the present study adds to the findings of existing research by comparing reports of three important informants on specific ADHD symptoms in the child. The main objective of the present study was to compare father, mother, and teacher reports, and various combinations of these informant ratings in the assessment of ADHD symptoms in children aged 6 to 15 years referred to a regular outpatient psychiatric clinic. In specific, the following issues were addressed:

1. Correspondence between mother, father, and teacher ratings of ADHD-specific symptoms, externalizing and internalizing problems in the child
2. Informant agreement on ADHD as a categorical diagnosis

3. Differences between mother, father, and teacher reports on ADHD-specific and broadband measures of emotional/behavioral problems in the child
4. Fulfillment of the criteria for ADHD symptoms by informant source
5. Base rates for ADHD symptoms as reported by mothers, fathers, and teachers
6. Conditional probabilities for symptom endorsement by teachers, given a positive report by mother or father

Method

Participants

Of 69 children consecutively referred to an interprofessional team in a regular child psychiatric outpatient clinic in the midst of Norway because of hyperactivity/attention problems or behavioral disturbance in the child, 21 children were excluded because the information was given from only one parent, mainly because of being a single caregiver. The participants were referred from school psychology service (58%), general practitioners/other health personnel (30%), and child welfare (13%). All but one of the families were native Norwegians. The sample was recruited during a 2-year period between 2003 and 2005. There was no significant difference between the study sample and the excluded children regarding age, sex, teacher-reported ADHD symptoms, and Total Problems on the Teacher Report Form (TRF).

The final study sample consisted of 38 boys (79%) and 10 girls (21%) between 6 and 15 years of age ($M = 10.1$, $SD = 2.9$). The rating scales were filled out by 48 biological mothers, 43 biological fathers, 5 stepfathers, and 48 ordinary teachers of whom 15 were males (31.3%) and 33 females (68.8%).

Assessment Procedures

All children underwent a standard assessment procedure consisting of an open clinical interview with parents, a semistructured interview with the Schedule for Affective Disorders and Schizophrenia for School-Age Children, Present and Lifetime Version (Kiddie-SADS-PL), clinic and school observations, and medical examination of the child. None of the children received any form of medication during the assessment period.

The ADHD Rating Scale-IV (DuPaul, Power, Anastoupoulos, & Reid, 1998) and the CBCL (Achenbach & Rescorla, 2001) were filled out by both parents. The ADHD Rating Scale-IV (DuPaul et al., 1998) and the TRF (Achenbach & Rescorla, 2001) were filled out by the child's teacher (for details, see the following descriptions).

The children were tested with Conners' Continuous Performance Test (Conners, 2000). Intellectual functioning in the child was assessed by means of the Wechsler tests (Wechsler, 1991) for all except for one child. Four children were tested with the Wechsler Preschool and Primary Scale of Intelligence-Revised (WPPSI-R), 11 children were tested with the Wechsler Intelligence Scale for Children-Revised (WISC-R; Mean Full Scale IQ = 94.9, $SD = 12.7$), and 32 children were tested with the Wechsler Intelligence Scale for Children-third edition; (WISC-III; Mean Full Scale IQ = 90.6, $SD = 14.9$). Because of the naturalistic design of the study and due to a change of WISC version during the study period, the children were assessed with two different WISC versions.

Based on all the assessment material and a consensus discussion in the professional team, the final diagnoses were set by an experienced physician/psychiatrist or psychologist. Thirty-one children (65%) received a primary diagnosis of hyperkinetic disorder according to the International Classification of Diseases, Tenth Revision (ICD-10), and 11 of these children had one or more comorbid diagnoses. Eleven children (23%) had substantial ADHD symptoms without fulfilling all the criteria for a diagnosis. Six children (12%) received other psychiatric diagnoses (ODD and pervasive developmental disorders), and two of them had a comorbid hyperkinetic disorder.

The parents received the rating scales at their first visit to the clinic with the instructions to fill them out separately at home. After permission from the parents, the rating scales were administered to the child's teacher.

Measures

ADHD Rating Scale-IV. This measure includes 18 symptom criteria for a diagnosis of ADHD according to the *DSM-IV* criteria (DuPaul et al., 1998). The respondents assess the frequency for each child symptom on a 0 to 3 scale (0 = *never or rarely*, 1 = *sometimes*, 2 = *often*, and 3 = *very often*). The scale is divided into nine inattention symptoms and nine hyperactive/impulsive symptoms with a score range of 0 to 27 for each subscale, and 0 to 54 for the total scores. To fulfill the criteria for a symptomatic ADHD diagnosis according to the *DSM-IV*, six of nine symptoms occurring "often" or "very often" in one or both the subscales must be present (Lahey, Pelham, Loney, Lee, & Willcutt, 2005).

The ADHD Rating Scale-IV has been found to have excellent internal consistency. For the parent version, DuPaul et al. (1998) reported the following alpha coefficients: .92 (total score), .86 (inattention), and .88 (hyperactivity-impulsivity). For the teacher version, the following alpha coefficients were found: .94 (total score), .96 (inattention), and .88 (hyperactivity-impulsivity). In the present study, the alpha coefficients ranged from .91 (mother ratings) to .92

(father and teacher ratings) on the total score. The mean total scores were 29.1, 24.8, and 26.3 for mothers, fathers, and teachers, respectively.

CBCL. This measure is one of the most widely used generic rating scales for assessing the parent's perception of social competencies and emotional/behavioral problems in the child (Achenbach & Rescorla, 2001). The problem scales consist of 118 items rated on a 3-point scale (0 = *not true as far as you know*; 1 = *somewhat or sometimes true*; 2 = *very true or often true*). In addition to Total Problems and two broadband factors, Internalizing and Externalizing Problems, the CBCL generates eight problem subscales. The 2001 version of the CBCL also generates six *DSM*-oriented scales with adequate reliability and validity (Achenbach, Dumenci, & Rescorla, 2003; Nakamura, Ebesutani, Bernstein, & Chorpita, 2009). The *DSM*-oriented ADHD scale has been found to be superior to the original Attention Problem Scale in the identification of patients with ADHD (Aebi, Metzke, & Steinhausen, 2009).

TRF. On this measure, teachers are asked to rate school competencies and emotional/behavioral problems in the child. The TRF (Achenbach & Rescorla, 2001) consists of 118 problem items with 89 items identical to the parent version, the CBCL. In the present study, all the 118 items were used for descriptions of the characteristics of the sample, while the 89 common items were used in all comparisons between the informants.

The Total Problems scale had the following Cronbach's alpha values for mothers, fathers, and teachers: .98, .96, and .96, respectively. For Internalizing Problems, the corresponding values were .93, .93, and .87, respectively, and for Externalizing Problems, the corresponding values were .94, .93, and .95, respectively.

On the CBCL, the mean Total Problems score for the present clinic sample was 57.9 ($SD = 33.3$) for mother ratings and 47.0 ($SD = 29.3$) for father ratings. The mean score of the TRF Total Problems for teacher ratings was 58.6 ($SD = 31.8$). These figures contrast to much lower estimates on the CBCL and TRF measures as reported in recent Norwegian national surveys of school-aged children (Drugli & Larsson, 2010; Jozefiak, Larsson, Wichstrøm, & Rimhaug, 2011). On the CBCL, the mean Total Problems scores for 6- to 12-year-old children were 13.3 ($SD = 12.1$) for girls and 16.7 ($SD = 15.5$) for boys. For TRF, the corresponding score was 17.2 ($SD = 21.4$). When compared with TRF normative data, 68% of the present clinic sample exceeded the 90th percentile for Attention Problems, whereas 49% and 53% exceeded the 90th percentile for Total Problems and Externalizing Problems, respectively.

Ethics

Informed consent was obtained from all parents. The study was approved by the Regional Committee for Medical

Research Ethics, Health Region IV, and by the Norwegian Data Inspectorate.

Statistics

Relationships between informant ratings on the ADHD Rating Scale-IV and the CBCL/TRF were measured by intraclass correlation coefficient (ICC). The multi-informant comparisons were based on raw scores for the ADHD Rating Scale-IV and for the common items on the CBCL/TRF (Youngstrom, Loeber, & Stouthamer-Loeber, 2000). The proposed guidelines by Cohen were used to define small ($r = .10$), medium ($r = .30$), and large ($r = .50$) correlations and effect sizes. The differences in the correlation sizes between informant pairs and problem scales were tested by using z transformations.

The mean differences between the pairs of informants on the ADHD Rating Scale-IV and the CBCL/TRF were analyzed by means of paired t tests. Effect sizes were calculated for significant differences according to Field (2005) with values more than $r = .50$ representing a large effect size.

Agreement between mother, father, and teacher reports concerning the absence/presence of an ADHD diagnosis in the child was measured by means of percentage of agreement and Cohen's kappa. According to Landis and Koch (1977), kappa values of 0.21 to 0.40 represent fair agreement, those between 0.41 and 0.60 indicate moderate agreement, those between 0.61 and 0.80 represent substantial agreement, and values between 0.81 and 1.00 represent excellent agreement.

Conditional probabilities for symptom endorsement by teachers, given a positive or negative report by mothers or fathers, were measured by calculating positive predictive value (PPV) and negative predictive value (NPV) following the guidelines by Faraone, Biederman, and Zimmerman (2005). We also calculated "sensitivity" defined as the probability of a parent report confirming a positive teacher report and "specificity" defined as the probability of a parent report confirming a negative teacher report.

Fulfillment of symptom criteria by informant source was estimated by using combinations of informants. An alpha level of $p < .05$ was used to indicate statistical significance.

Results

Informant Correspondence on ADHD Symptoms and CBCL/TRF Problem Scales

Detailed results for agreement between mother versus father pairs, mother versus teacher pairs, and father versus teacher pairs on the ADHD Rating Scale-IV and the problem scales on the CBCL/TRF are shown in Table 1. The

Table 1. Intraclass Correlations for Ratings by Mother/Father, Mother/Teacher, and Father/Teacher Pairs on the ADHD Rating Scale–IV, Problem, and DSM-Oriented Scales on the CBCL/TRF ($N = 48$).

Measure	Mothers vs. fathers	Mothers vs. teachers	Fathers vs. teachers
ADHD Rating Scale–IV			
Inattention	.71**	.33*	.38**
Hyperactivity-Impulsivity	.62**	.34**	.43**
Total scale	.66**	.23	.38**
Problem scales CBCL/TRF			
Externalizing Problems	.80**	.40**	.42**
Internalizing Problems	.62**	.37**	.21
Social Problems	.71**	.52**	.20
Attention Problems	.72**	.38**	.48**
Rule-Breaking Behavior	.81**	.54**	.50**
Aggressive Behavior	.80**	.30*	.52**
DSM scales CBCL/TRF			
ADHD	.63**	.25*	.50**
ODD	.67**	.44**	.61**
Conduct Disorder	.75**	.52**	.44**

Note: *DSM* = *Diagnostic and Statistical Manual of Mental Disorders*; CBCL = Child Behavior Checklist; TRF = Teacher Report Form.

* $p < .05$. ** $p < .01$.

differences in ICCs between mother versus father reports and parents versus teachers were statistically significant for the ADHD Inattention subscale, Total scale (mothers vs. teachers), CBCL/TRF Externalizing Problems, Rule-Breaking Behavior, Aggressive Behavior, CBCL/TRF Internalizing Problems (fathers vs. teachers), Social Problems (fathers vs. teachers), Attention Problems (mothers vs. teachers), ADHD *DSM* subscale (mothers vs. teachers), and Conduct Disorder *DSM* subscale (fathers vs. teachers). Although agreement between mother and father ratings on ADHD symptoms as reflected by ICCs was lower than for Externalizing Problems and externalizing subscales on the CBCL, the differences were nonsignificant.

For all separate ADHD items except one (“Does not seem to listen when spoken to directly”), the correlations between mother and father ratings were significant varying between .41 and .77. Lower ICC estimates between mother and teacher reports on separate items were found and varied between .03 (“Talks excessively”) and .46 (“Fails to give close attention to details or makes careless mistakes in schoolwork”). Corresponding figures were found for father and teacher reports with estimates varying between .12 (“Blurts out answers before questions have been completed”) and .47 (“Is on the go or acts as if driven by a motor”).

To examine whether the child’s IQ had a moderating effect on informant concordance, the sample was divided into two groups according to the child’s IQ score. Informant

reports of children with low IQ ($M = 80.6$, $SD = 8.9$) were compared with those children with high IQ ($M = 103.6$, $SD = 8.3$). For the Inattention subscale and Total Problems on the ADHD, the ICCs between mothers and fathers were significantly higher for parents of children with low IQ compared with those of children with high IQ. However, child IQ had no significant effect on the ICCs between parents and teachers. For the ADHD Hyperactivity-Impulsivity subscale, the ICC between fathers and teachers was significantly higher in the high-IQ group compared with the low-IQ group. In contrast, on this subscale, the child’s IQ had no moderating effects on the ICCs between mothers and fathers and between mothers and teachers.

Informant Agreement on ADHD as a Categorical Diagnosis

Mother and father agreed on the presence of ADHD in 69% of the children, whereas the corresponding figures for mother versus teacher and father versus teacher agreement were 64% and 71%, respectively. Results of further analysis on informant agreement and the presence of an ADHD diagnosis in the child showed kappa values of 0.39 (mother and father), 0.24 (mother and teacher), and 0.43 (father and teacher), all indicating fair to moderate agreement.

Comparison of Mother, Father, and Teacher Ratings of Child Problem Levels

Table 2 presents mean values for comparisons between mother, father, and teacher reports on the ADHD Rating Scale–IV, problem scales on the CBCL/TRF, and *DSM*-oriented scales on the CBCL/TRF. Mothers consistently rated their children higher than fathers on all problem scales with differences on 8 out of 12 scales being significant with medium to large effect sizes. Mothers also rated their children significantly higher than teachers on Internalizing Problems on the CBCL and the *DSM*-oriented ODD subscale with medium effect sizes. Although mother ratings exceeded those of teachers on all other problem scales, except for the CBCL Attention Problems and the *DSM*-oriented Conduct Disorder subscale, all these differences were nonsignificant. On half of the problem scales, fathers rated the children higher than teachers, whereas the opposite was true for the rest of the scales, however, all differences being nonsignificant.

Fulfillment of Criteria for ADHD Symptoms by Informant Source

Figure 1 shows how different combinations of informants influence the fulfillment of symptom criteria for ADHD for the whole sample ($N = 48$). Thirty-one children (65%) received a clinical diagnosis of a hyperkinetic disorder. The

Table 2. Means and SDs for Mother, Father, and Teacher Reports of Total Scores on the ADHD Rating Scale–IV, the Problem Scales, and the DSM-Oriented Scales on the CBCL/TRF.

Measure	Mother		Father		Teacher		Mother/ father		Mother/ teacher		Father/ teacher	
	M	SD	M	SD	M	SD	t value	r	t value	r	t value	r
ADHD Rating Scale–IV												
Inattention	15.88	6.40	13.21	6.22	14.81	7.21	3.83**	.55	0.93			1.48
Hyperactivity-impulsivity	13.21	6.73	12.00	6.65	11.36	7.53	1.44		1.56			0.59
Total scale	29.08	11.29	24.80	11.03	26.29	12.52	3.25*	.47	1.31			0.79
CBCL/TRF Problem scales												
Externalizing Problems	0.56	0.36	0.43	0.31	0.45	0.40	4.12**	.56	0.56			1.24
Internalizing Problems	0.33	0.30	0.23	0.24	0.16	0.18	3.25**	.47	3.35**	.50		0.75
Social Problems	0.57	0.39	0.50	0.39	0.47	0.34	1.61		1.61			0.22
Attention Problems	1.06	0.40	0.97	0.39	1.06	0.49	1.81		–0.31			1.00
Rule-Breaking Behavior	0.48	0.37	0.40	0.32	0.39	0.39	2.55*	.36	0.93			0.60
Aggressive Behavior	0.76	0.50	0.62	0.49	0.67	0.57	2.87**	.42	0.78			0.45
CBCL/TRF, DSM scales												
ADHD	1.22	0.40	1.18	0.43	1.16	0.57	0.81		.64			0.18
ODD	1.07	0.62	0.90	0.62	0.83	0.65	2.21*	.35	2.42*	.36		0.83
Conduct Disorder	0.59	0.48	0.48	0.40	0.61	0.57	2.47*	.39	0.18			1.61

Note: DSM = Diagnostic and Statistical Manual of Mental Disorders; CBCL = Child Behavior Checklist; TRF = Teacher Report Form. Results of Paired t Tests and Effect Sizes (*r*) for Significant Results (*N* = 48)

p* < .05. *p* < .01.

presence of ADHD symptom criteria according to the *DSM-IV* varied from low (35%) for father and mother and teacher ratings, to high (83%) mother or father or teacher ratings. When using mother as the single informant, 65% of the children fulfilled the ADHD symptom criteria. For

fathers and teachers, the figures were 46% and 62%, respectively. When the criteria for subtypes were examined, the results showed that mothers rated 45% of the children as belonging to the combined subtype, whereas the corresponding figures for fathers and teachers were 36% and 30%, respectively.

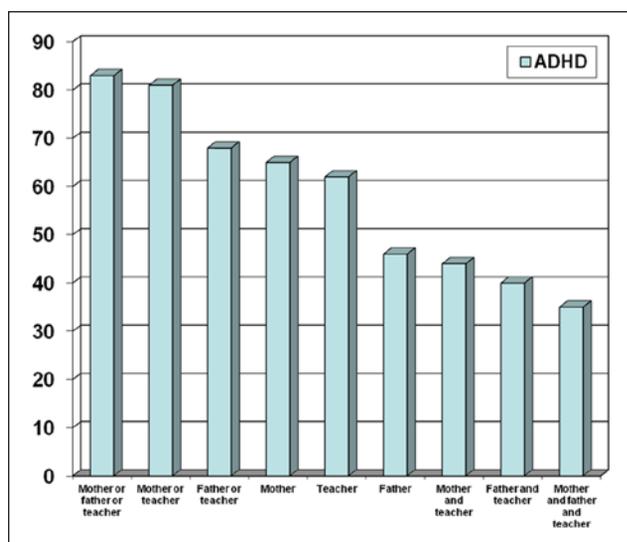


Figure 1. Percentage of outpatient sample fulfilling symptom criteria for ADHD by single informant and various informant combinations (*N* = 48).

Base Rate and Conditional Probabilities for the Presence of ADHD Symptoms Across Informants

Table 3 summarizes the percentage of ADHD symptoms rated as “present” (occurring “often” or “very often”). Compared with fathers, mothers reported all these symptoms, except for two (“Is on the go or acts as driven by a motor” and “Interrupts or intrudes on others”) as occurring more often, with base rates varying from 27.1 to 68.8, whereas base rates for father ratings varied between 22.9 and 66.7. Overall mean percentage for ADHD symptoms was 53% for mothers, 47.2% for teachers, and 43% for fathers (for details on the ratings of single ADHD symptoms by different informants, see Table 3).

For all ADHD symptoms except two, the PPV was higher for father ratings than for mother ratings, and NPV revealed a similar pattern. For six of the nine inattentive symptoms, and eight of the nine hyperactive-impulsive

Table 3. Base Rates and Conditional Probabilities for Specific ADHD Symptoms Among Clinically Referred Children as Reported by Parents and Teachers ($N = 48$).

ADHD symptoms		Base rate parent	Base rate teacher	Positive predictive value	Negative predictive value
Inattention					
Fails to give close attention to details or makes careless mistakes in schoolwork	Mother	56.3	66.7	74.1	42.9
	Father	45.8		90.1	53.9
Has difficulty sustaining attention in task or play activities	Mother	60.4	66.7	65.5	31.6
	Father	54.2		73.1	40.9
Does not seem to listen when spoken to directly	Mother	58.3	37.5	46.4	75.0
	Father	41.7		50.0	71.4
Does not follow through on instructions and fails to finish work	Mother	62.5	58.3	63.3	50.0
	Father	47.9		78.3	60.0
Has difficulty organizing tasks and activities	Mother	58.3	58.3	64.3	50.0
	Father	37.5		68.4	44.8
Avoid tasks (e.g., schoolwork, homework) that require sustained mental effort	Mother	68.8	50.0	54.5	60.0
	Father	60.4		62.1	68.4
Loses things necessary for tasks or activities	Mother	43.8	31.3	38.1	74.1
	Father	27.1		46.2	74.2
Is easily distracted	Mother	66.7	77.1	78.1	31.3
	Father	56.3		92.6	42.9
Is forgetful in daily activities	Mother	56.3	37.5	48.2	76.2
	Father	47.9		47.8	72.0
Mean inattention symptoms	Mother	59.0	53.7	59.2	54.6
	Father	46.4		67.6	58.7
Hyperactivity-impulsivity					
Fidgets with hands or feet or squirms in seat	Mother	68.8	75.0	72.7	20.0
	Father	66.7		78.1	31.3
Leaves seat in classroom or in other situations in which remaining seated is expected	Mother	58.3	39.6	48.3	73.7
	Father	45.8		59.1	76.9
Runs about or climbs excessively in situations in which it is inappropriate	Mother	52.1	20.1	28.0	87.0
	Father	43.8		33.3	88.9
Has difficulty playing or engaging in leisure activities quietly	Mother	33.3	22.9	33.3	75.8
	Father	22.9		35.3	80.6
Is "on the go" or acts as if "driven by a motor"	Mother	41.7	37.5	55.0	75.0
	Father	43.8		57.1	77.8
Talks excessively	Mother	35.4	37.5	29.4	58.1
	Father	27.1		46.2	65.7
Blurts out answers before questions have been completed	Mother	27.1	31.3	30.8	68.6
	Father	22.9		27.3	67.6
Has difficulty awaiting turn	Mother	56.3	52.1	55.6	52.4
	Father	31.3		66.7	54.5
Interrupts or intrudes on others	Mother	50.0	50.0	66.7	62.5
	Father	52.1		68.0	69.6
Mean hyperactivity-impulsivity symptoms	Mother	47.0	40.7	46.6	63.7
	Father	39.6		52.3	68.1
Overall mean ADHD symptoms	Mother	53.0	47.2	52.9	59.2
	Father	43.0		60.0	63.4

Note: Base rate = percentage of symptoms rated as present ("often" or "very often"); positive predictive value = probability of a symptom reported as "present" by the teacher, given a positive report by mother or father; negative predictive value = probability of a symptom reported as "absent" by the teacher, given a negative report by mother or father.

symptoms, the NPV was higher for father than mother ratings.

We also calculated conditional probabilities for a symptomatic ADHD diagnosis defined as fulfilling at least six of the nine symptoms rated as present on one or both ADHD domains on the ADHD Rating Scale–IV. The results showed that the PPV for mother and father ratings were 71.0 and 86.3, respectively, whereas the NPV was 53.0 for mother ratings and 57.7 for father ratings. Estimate of sensitivity for mother ratings exceeded the one for father ratings (73.3 and 63.3, respectively), whereas the opposite was true for specificity (50.0 and 83.4, respectively).

Discussion

In the present study of 48 consecutively referred children to an outpatient child psychiatric clinic, the significance of using mother, father, and teacher reports and their combinations in the assessment of ADHD symptoms and disorders in the child was explored.

Compared with findings from two recent Norwegian national surveys of school-aged children (Drugli & Larsson, 2010; Jozefiak et al., 2011), the present clinic sample received substantially higher Total Problems scores on the CBCL/TRF in parental and teacher evaluations of emotional and behavioral problems, thus indicating a severely burdened group of children in the study.

Our findings of parental agreement showed that all correlations between mother and father reports for total scores and the subscales on the ADHD Rating Scale–IV were significant and represented large effect sizes. In line with findings of the study by Langberg et al. (2010), the present study found ICCs between mother and father ratings on ADHD symptoms to be lower than the corresponding values for Externalizing Problems and externalizing subscales on the CBCL.

The significant ICCs between father and teacher reports on total scores of the ADHD Rating Scale–IV (.38) representing medium to large effect size corresponded to the sizes of correlations between parent and teacher reports found in other studies: $r = .42$ (Mitsis et al., 2000), $r = .31$ (Wolraich et al., 2004). The correlation between mother and teacher reports found in our study (.23) was low and nonsignificant but higher than the estimates reported in the study by Antrop et al. (2002), who found no agreement between parent and teacher ratings.

In the present study, the differences in the size of correlations between parent and teacher ratings depended on parent gender, indicating that the gender-neutral term *parents* may mask the important differences between the parents in their perception of problems in the child.

Correspondence between parents was also found to be related to child IQ. Specifically, correspondence was significantly higher between mothers and fathers of children

with low IQ than for those with high IQ on the Inattention scale and Total Problems on the ADHD Rating Scale–IV. A possible reason for this finding may be that children with high IQ may compensate for their attention problems, so that they are less likely to be observed by parents. However, the child's IQ had no moderating effect on the agreement between mothers and fathers on hyperactive-impulsive symptoms, which may appear as a more observable behavior regardless of the child's IQ.

Regarding ADHD as a categorical diagnosis, the agreement between all the informant pairs was fair to moderate with kappa coefficients for father/teacher pairs being higher (0.43) than for mother/teacher pairs (0.24). In other studies of clinic-referred children, even lower estimates have been reported between parent and teacher reports on ADHD, varying from 0.08 to 0.20 (Antrop et al., 2002; Mitsis et al., 2000; Wolraich et al., 2004).

Overall, mothers rated their children as having more problems than fathers on all scales of the ADHD Rating Scale–IV as well as on the CBCL/TRF. Such a tendency for mothers to report more child problems than fathers has been found in several other studies for behavioral problems in general (Christensen, Margolin, & Sullaway, 1992; Duhig et al., 2000; Grietens et al., 2004) and for ADHD-specific symptoms (Langberg et al., 2010).

Although several studies have shown that parents report more behavior problems in children than teachers regarding ADHD symptoms (Antrop et al., 2002; Murray et al., 2007; Papageorgiou et al., 2008) and other symptoms (Grietens et al., 2004), in other studies, teachers have reported higher levels of ADHD symptoms in the child than parents (Amador-Campos et al., 2006).

Although mother and father ratings were highly correlated, the mothers and fathers also showed the strongest mean differences in ratings of the child's problems. A reason for this may be that fathers consistently rated their children as having less problems than mothers, whereas teacher ratings were more differentiated. On problem scales like Attention Problems and the *DSM*-oriented Conduct Disorder Scale, the teachers rated the children as having more problems than did fathers and even the same problem level as the mother ratings. On other problem scales, like Internalizing Problems on CBCL/TRF and the Hyperactivity-Impulsivity subscale on the ADHD Rating Scale–IV, the teachers rated the child's problems to be less than did both parents.

Similar to the findings by Langberg et al. (2010), mothers recognized more study participants with a symptomatic ADHD than fathers. The choice of parent informant combined with teacher ratings affected the recognition of ADHD as a categorical diagnosis as well as for certain ADHD subtypes. More specifically, in mother ratings almost half of the children recognized with ADHD belonged to the combined subtype, whereas fathers and teachers rated

most of the children belonging to the inattentive subtype. A substantial variability in the recognition of ADHD and ADHD subtypes depending on different decision rules for informant combinations has also been found in other studies (Mitsis et al., 2000; Wolraich et al., 2004).

Overall, the mean base rates of ADHD symptoms in the present study were lower than those found in clinical studies by Biederman et al. (1990) and a previous Norwegian study (Zeiner, 1997). In the latter studies, all children satisfied criteria for a *Diagnostic and Statistical Manual of Mental Disorders* (3rd ed; *DSM-III*; APA, 1980)-based ADD diagnosis, whereas the study participants in the present study were referred for assessment of hyperactivity-attention problems, with only 65% of the children receiving a formal diagnosis of hyperkinetic disorder according to the ICD-10 criteria.

The predictive values for individual symptoms as well as for a symptomatic ADHD diagnosis showed higher values for fathers than mothers. Similar to the findings by Biederman et al. (1990), the PPV for a symptomatic ADHD diagnosis was substantially higher than for the individual ADHD symptoms. Measures of sensitivity and specificity revealed that mother ratings were more sensitive and that father ratings were higher in specificity. The differential values for mothers and fathers indicate that mother ratings may be more sensitive for suspected ADHD in the child, whereas father ratings better predict an ADHD diagnosis requiring the two-setting criterion.

Although many studies of assessment of ADHD in the child have focused on parent/teacher discrepancies, several explanations may also be applicable for the understanding of mother/father discrepancies (Kraemer et al., 2003). The context or situation in which the child is observed may affect the type and frequency of the child's behavior across settings related to different structure and demands at home and at school (Grietens et al., 2004; Mandal, Olmi, & Wilczynski, 1999). Furthermore, teachers often perceive appropriate child behavior within restricted age ranges and contexts (Antrop et al., 2002), whereas parents are exposed to greater variations of child behavior at home or in other settings (Murray et al., 2007). Mothers and fathers may also report different behaviors in the child because of variability in home contexts. For example, one parent may spend more time in outdoor activities together with the child, whereas the other may spend more time helping the child to organize tasks and activities.

The measurement instrument in itself may also produce informant disagreement (Reid & Maag, 1994). Some items on the ADHD Rating Scale-IV may be interpreted either as an inattention symptom or an ODD symptom. Furthermore, concreteness of symptoms as well as the relatively vague phrasing of response alternatives may also affect informant agreement (Antrop et al., 2002; Christensen et al., 1992). For example, Rohde (2008) reported that parents had an

extremely diverse understanding of what "often" means. Rohde (2008) and Murray et al. (2007) have also argued that some symptoms in the child may be more diagnostic than others. Mota and Schachar (2000) found that the validity of an ADHD diagnosis increased by limiting the evaluation to symptoms that predicted impairment. Once the least effective symptoms were dropped from the diagnostic algorithms, parent/teacher agreement were also enhanced. Furthermore, informant characteristics have been found to predict informant disagreement (Langberg et al., 2010; Van der Oord, Prins, Oosterlaan, & Emmelkamp, 2006). There may also be gender-specific tolerance levels for externalizing behaviors and acceptance of deviant behaviors in the child (Langberg et al., 2010; Singh, 2003), which in turn may affect differential rating of symptoms.

Limitations and Strengths

Several limitations of this study should be noted. The sample size was limited, and outpatients were recruited within a restricted geographical area in the midst of Norway. All, but one, of the families were native Norwegians. Because of the sample size, age- or gender-specific analyses could not be performed. Although all children had substantial ADHD symptoms, only 65% of the sample received a formal diagnosis of hyperkinetic disorder according to the ICD-10. The findings may not be generalized to community samples or clinic samples with another age or gender composition. Although the parents were instructed to fill out the rating scales separately at home, parental collaboration cannot be ruled out.

The strengths of the study are the inclusion of consecutive referrals to a regular child psychiatric outpatient clinic using well-validated and standardized generic and specific assessment instruments filled out by complete pairs of fathers, mothers, and teachers for the whole sample. The gender distribution of the included children is likely to be representative for clinical outpatient samples assessed for possible ADHD.

Implications for Clinic and Research

Although the two-setting criterion for ADHD is established in the *DSM-IV* and multi-informant assessment of ADHD is recommended, the present clinical guidelines provide no specific recommendations on how to handle cross-informant disagreement or on the number of ADHD symptoms and the extent of impairment that is required in the secondary setting to establish a diagnosis of ADHD in the child.

The present study adds to existing research about child ADHD and informant agreement by differentiating the parent by gender. The findings of the present study indicate that the choice of parent informant in the assessment of problems in the child may be one of several explanations

for the discrepant findings in parent and teacher agreement in previous research. Gender of the parents should therefore be provided when interpreting research concerning informant agreement.

The choice of parent informant also has implications in the clinical context concerning estimates of ADHD symptom levels and fulfillment of diagnostic criteria. Where parental discrepancies is a challenge in diagnostic decision making, the discrepancies may also serve to inform clinicians about family dynamics and child behavior in different contexts, which are important in the planning of clinical management (Langberg et al., 2010).

Still there are some common challenges from a research and clinical perspective. To enhance interinformant agreement, it is necessary to reconsider diagnostic criteria and assessment of the presence of criteria, and to improve the wording and quantification of child behavior described in single items (Amador-Campos et al., 2006; Rohde, 2008). There is also a great need to develop further clinical guidelines to operationalize the two-setting criterion (Wolraich et al., 2004). The guidelines should provide advice on how to select parent informants and how to combine and evaluate discrepant reports from mothers and fathers (Langberg et al., 2010).

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Author Biographies

Henrik Sollie is a psychologist working at the child outpatient mental health clinic at Kristiansund Hospital, Norway. He is also

working on a PhD degree at the Regional Centre for Child and Adolescent Mental Health, Department of Neuroscience, Norwegian University of Science and Technology, Trondheim. His research interests are assessment, family dynamics, and comorbid problems related to child ADHD.

Bo Larsson is a professor in child psychiatry at the Regional Centre for Child and Adolescent Mental Health, Norwegian University of Science and Technology, Trondheim. His prime research has been various forms of psychosomatic problems, depression, suicidality, and also treatment of oppositional defiant problems in young children.

Willy-Tore Mørch is a professor in child and adolescent mental health at the Faculty of Health Sciences at the University of Tromsø, Norway. He is the principal investigator of a research program concerning treatment of children with conduct disorder and oppositional defiant disorder.