Oppositional Defiant Disorder—Gender Differences in Co-occurring Symptoms of Mental Health Problems in a General Population of Children

Linda Helen Munkvold · Astri Johansen Lundervold · Terje Manger

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Abstract Informant- and gender-specific characteristics of Oppositional Defiant Disorder (ODD) and how these might relate to patterns of comorbidity need to be further clarified. We collected data from 7,007 children (aged 7–9) who participated in the Bergen Child Study (BCS), an ongoing population-based study of children’s development and mental health. A questionnaire containing the DSM-IV behavioral descriptions of ODD was distributed to parents and teachers. Co-occurring symptoms of mental health problems were measured by the Strengths and Difficulties Questionnaire (SDQ). The boys (n = 122) and girls (n = 41) with symptomatic ODD had an increased risk of co-occurring emotional symptoms, hyperactivity or inattention and peer problems, as compared to their peers without symptomatic ODD. The impact of symptomatic ODD was higher for boys than girls in teacher reported SDQ ratings, except for emotional symptoms. There were no significant interaction effects of gender in parent SDQ ratings. Our results are contrary to the gender paradox hypothesis, which states that co-occurring symptoms of mental health problems are more frequent among girls with ODD as compared to boys with ODD.

Keywords Oppositional defiant disorder · DSM-IV · SDQ · Gender differences

Abbreviations
BCS Bergen Child Study
ODD Oppositional Defiant Disorder
SDQ Strengths and Difficulties Questionnaire

Oppositional Defiant Disorder (ODD) reflects a pattern of negativistic, defiant, disobedient and hostile behavior towards authority figures that lasts for at least 6 months, and is severe enough to affect the child’s functioning (APA 2000). ODD is one of the most prevalent and resource-demanding mental health problems among children and adolescents (Loeber et al. 2000). The prevalence rates range from 2.6% to 15.6% in community samples, and from 28% to 65% in clinical samples (Boylan et al. 2007). Although the developmental progression from ODD to Conduct Disorder (CD) is established in the DSM-IV criteria and in research, most children with ODD do not go on to develop CD (Loeber et al. 2000; Rowe et al. 2002), and a large proportion of children with CD do not meet the diagnostic criteria for ODD (Lahey et al. 2000a; Maughan et al. 2004; Rowe et al. 2002).

According to the DSM-IV, ODD cannot be diagnosed in the presence of Conduct Disorder (CD). Due to this hierarchical rule, ODD and CD are often combined in empirical studies, or ODD is excluded altogether. Consequently, ODD has rarely been studied as an independent disorder (Angold and Costello 2001; Angold et al. 1999). Little is known, therefore, about the associations between ODD and other mental disorders independent of comorbidity with CD. One of the few studies available, which investigated comorbidity findings for the two diagnoses separately (Maughan et al. 2004; Simonoff et al. 1997),
found ODD to be associated with more comorbidity as compared to CD, and to involve a broader spectrum of other disorders. Other studies have shown that ODD and CD are associated with differential risk factors and with distinct age-profiles (Dick et al. 2005; Frick et al. 1994; Maughan et al. 2004). Whether ODD should be conceptualized as a milder version of CD, or whether it is a complicating condition occurring only in the context of pre-existing comorbid disorders, is still largely unknown (Nock et al. 2007). Research on the distinct features of ODD may have been constrained by the DSM-IV prohibition against diagnosing ODD in the presence of CD (Green et al. 2002). Studies of ODD as an independent clinical construct are thus warranted, and the possible overlap with CD may be disregarded for this purpose.

Disruptive, antisocial behavior such as ODD has historically been considered a male problem (Loeber et al. 2000), and factors that account for the development of ODD in girls are only partly understood (Hipwell et al. 2002; Messer et al. 2006). Population-based studies suggest that ODD is more common among preadolescent boys than girls (Boylan et al. 2007; Lahey et al. 1999; Munkvold et al. 2009). At the same time, data on gender differences in the prevalence of ODD generally are much more inconsistent than for CD (Loeber et al. 2000). Certain methodological explanations, such as biased sampling, have been offered for this (Waschbusch and King 2006). The ratio of boys to girls for ODD is commonly much higher in clinical samples than in population-based samples (Rutter et al. 2003), and the ODD/CD literature contains a mixture of both sample-types. Biased diagnostic criteria provides another common explanation, as the DSM-criteria for ODD and CD primarily are based on studies of preadolescent boys (Lahey et al. 1994). Their suitability for diagnosing ODD/CD in girls has thus been questioned by several authors (Crick and Zahn-Waxler 2003; Hartung and Widiger 1998; Zoccolillo 1993).

One important, unresolved issue in the area of ODD and gender differences is whether boys and girls with ODD differ in their patterns of comorbidity (Maughan et al. 2004). Certain studies have shown that although the prevalence of antisocial behavior is lower in females than in males, the risk of comorbid conditions such as emotional problems is higher among females. This phenomenon is commonly referred to as the “gender paradox of comorbidity” in the ODD/CD research literature (Eme 1992; Loeber and Keenan 1994; Zahn-Waxler et al. 1995). Eme (1992) suggests that this is related to the “selective female affliction” phenomenon, whereby the prevalence of childhood psychiatric disorders is lower among girls than boys, but when girls do have disorders, they are more severely afflicted. Within male peer groups conflicts and physical aggression such as hitting, kicking and attacking the property of others is quite normal even at an early age (Maccoby 2004). Overt aggression is relatively uncommon among young girls, and symptoms of ODD/CD in girls could thus be reflective of more severe dysregulation and impairment.

In support of the “gender paradox hypothesis”, more recent population-based studies have demonstrated lower prevalence of ODD/CD, but stronger developmental links between ODD, ADHD, and CD, among girls aged 5–16 as compared to boys (Costello et al. 2003; Maughan et al. 2004). One study of children and adolescents aged 9–16 found the association between ADHD and CD to be explained by the presence of ODD in boys, whereas ADHD alone was considered a significant predictor of CD in girls, even when controlling for comorbid ODD (Lahey et al. 2000a). A longitudinal study of Dutch children aged 4–18 found that the proportion of boys following a deviant CD trajectory was twice as high as for girls. Interestingly, engagement in this deviant trajectory was predicted by ODD and ADHD in girls, but only by ODD in boys (van Lier et al. 2007). A recent study of inpatient adolescents in Finland found no gender differences in the prevalence of ODD/CD symptoms, but girls with ODD/CD had higher rates of comorbid mental health problems as compared to boys (Lehto-Salo et al. 2009). Results from the Great Smoky Mountains Study found ODD to be highly predictive of CD only in boys, whereas ODD in girls predicted subsequent depression and anxiety (Rowe et al. 2002). The key role of ODD in the development of internalizing problems in girls has been confirmed in other studies (Burke et al. 2010). Some studies have not reported higher rates of co-occurring mental health problems in girls with ODD/CD as compared to boys (see Loeber et al. 2000, for a review). Although the data on this issue are somewhat inconsistent, there is ample evidence that gender is a crucial parameter in the development of ODD and its comorbid conditions.

One possible basis for the inconsistent findings concerning comorbidity and gender differences in ODD has to do with underlying informant discrepancies (Maughan et al. 2004). Assessment of mental health problems in children commonly relies on information provided by multiple informants such as parents and teachers. However, the consistency in multiple-source information is at best moderate (Achenbach et al. 1987; Cai et al. 2004). As a consequence, the estimated prevalence of ODD/CD varies between 1.6% and 10.2% in community samples (Munkvold et al. 2009; Offord et al. 1996), and between 9.7% and 23% in clinical samples (MacLeod et al. 1999). Much of this variation depends on whether parents, teachers, children, or clinicians are used as separate or combined informants. Previous research has demonstrated that ODD/CD identified by parents versus teachers is associated with different correlates and patterns of comorbidity (Drabick et al. 2007; Munkvold et al. 2009;
Offord et al. 1996). Moreover, informant discrepancy is a challenge in itself in the assessment of potential comorbid conditions such as ADHD (Gomez 2007), mood disorders, and anxiety (Youngstrom et al. 2000). Unfortunately, very few epidemiological studies of ODD have included teacher reports. The British Child Mental Health Survey is one exception (Maughan et al. 2004), but for analyses of comorbidity teacher and parent reports were combined. The possible situational or informant-specific differences in ODD and its associated mental health problems still need to be further clarified.

The magnitude of discrepancies between parent and teacher reports tends to vary depending on the gender of the child being rated: Correlations between parent and teacher ratings are generally higher for boys than girls (Collishaw et al. 2009; Javo et al. 2009). Studies of the relative predictive value of parent and teacher reports with respect to mental health problems, have shown that parents are slightly more reliable informants regarding emotional disorders in children, whereas teachers are more reliable informants regarding conduct and hyperactivity disorders (Goodman et al. 2003). A multi-informant approach to the assessment of ODD is therefore warranted, and in order to examine informant-specific associations with comorbid conditions, parent and teacher ratings need to be studied separately. To our knowledge, no population-based study of ODD has previously done this.

Aims of the Study

The current study examined parent and teacher reports of co-occurring symptoms of mental health problems among children with symptoms of ODD above the DSM-IV diagnostic threshold (here referred to as “symptomatic ODD”) in a population-derived sample of boys and girls aged 7–9. We expected boys to display more ODD symptoms than girls. We also expected the association between ODD symptoms and symptoms of other mental health problems to vary as a function of informant (parent or teacher), and as a function of the gender of the child being rated. In line with the “gender paradox” hypothesis, we expected girls with symptomatic ODD to be identified with more co-occurring symptoms of mental health problems as compared to boys with symptomatic ODD.

Material and Methods

Sample

The sample was derived from the first wave of the Bergen Child Study (BCS), an ongoing population-based study of children’s development and mental health. The BCS is described in detail in separate publications (Heiervang et al. 2007; Stormark et al. 2008), and only a brief presentation is provided here. The sampling frame included all 9,430 children in the 1993 through 1995 birth cohorts in the municipality of Bergen, Norway. Bergen is the second largest city in Norway with a population of 233,291 in 2002, at the time of data collection. Teacher and parent versions of a set of screening instruments were distributed by the school teachers in October of 2002 when the children attended 2nd–4th grade (7–9 years of age). At that time most teachers had known their students for at least one year. Based on parental informed consent, 7,007 children (74.3%; 3,529 boys and 3,478 girls) participated in the study. In 2002 6.4% of the population in Norway was made up of immigrants; 66% of whom were from non-western countries. In the present sample 5% of the children spoke a foreign language at home. Questions about other demographic characteristics of the sample were not included in the screening-phase of the BCS, and it is not considered appropriate to ask about ethnicity in Norway.

Measures

In the first stage of the BCS, parents and teachers rated children’s behavior and mental health on a four-page screening questionnaire. Both parents and teachers were asked to rate the child’s behavior during the last six months. The screening questionnaire covered a wide range of emotional and behavioral symptoms and associated functional impairment (see Heiervang et al. 2007 for details). The questionnaire included a Norwegian translation of the SNAP-IV (Swanson, Nolan, and Pelham-IV) questionnaire (Swanson et al. 2001), and the Strengths and Difficulties Questionnaire (SDQ) (Goodman 1997, 1999). The SNAP-IV is a checklist based on the DSM-IV symptom description for ODD (APA 2000) and other diagnoses. On the original form, the rater was asked to indicate on a four-point scale whether the eight behavioral descriptions of ODD fit the child “not at all”, “just a little”, “pretty much” or “very much” (Swanson et al. 2001). For the purpose of the Bergen Child Study, the items were translated into Norwegian, and the scoring was altered to a three-point scale in order to ensure identical response categories for the entire questionnaire (0 = “not true”, 1=”somewhat true”, and 2=“certainly true”). The scores on these eight DSM-IV based items (here referred to as the ODD-scale) were used to identify children with symptoms of ODD.

The SDQ is a dimensional measure of child mental health with good sensitivity and specificity regarding the identification of children with clinical disorders (Goodman and Goodman 2009; Goodman 2001; Goodman et al. 2004). We used the SDQ-scores to examine co-occurring
symptoms of mental health problems. The SDQ is divided into five subscales (hyperactivity or inattention, emotional symptoms, conduct problems, peer relationship problems, and prosocial behavior), each consisting of five questions with three possible response categories (0 = “not true”, 1 = “somewhat true”, and 2 = “certainly true”). A total difficulties score is computed by combining the first four subscale scores. The subscale scores ranged from 0–10, and the total difficulties score ranged from 0–40. In addition, an impact assessment is based on the overall problem severity, distress to the child, interference in everyday life and burden to others. In the screening phase of the BCS a child was defined as screen positive if: (1) the total difficulties score exceeded the 90th percentile for parents and/or teachers SDQ scores, and/or (2) there were severe impairments according to the impact section of the SDQ, and/or (3) scores on one of the other scales included in the screening questionnaire were equal or above the 98th percentile.

Due to overlapping items on the SDQ conduct problems scale and the ODD-scale, the SDQ conduct problems scale was excluded from the current analyses. The prosocial behavior subscale was also excluded. As recommended by Goodman (2001), a cut-off at the 90th percentile was used to define children as high scorers on the remaining three SDQ-sub scales (i.e. emotional symptoms, hyperactivity or inattention and peer problems).

Of the returned questionnaires, 6,150 children (88%; 3,064 boys and 3,086 girls) had no missing items on the ODD-scale in parents’ and teachers’ reports. The percentages of missing cases varied from 4.4% to 5.7% on the SDQ subscales. There were no statistically significant differences between children with and without complete ODD-scales regarding age, gender or screen status (i.e. being screen negative or screen positive). Due to the large number of subjects in our study, children without complete ODD-scales were excluded, and listwise deletion of missing cases was used in all statistical analyses.

For the purpose of the current study, the ODD-scale derived from the SNAP was rated by parents and teachers on a 3-point scale (0 = “not true”, 1 = “somewhat true”, and 2 = “certainly true”). The categories 0 and 1 were collapsed to form a dichotomy: Absence of behavior (0, 1 = 0) and presence of behavior (2 = 1). A child was assigned to the ODD group if a total of four or more ODD-symptoms (i.e. above the DSM-IV threshold) were reported by the parent and/or the teacher (i.e. a total of 4+ symptoms from either informant in any combination). This strategy, known as the or-rule, is commonly applied in research and has shown satisfactory validity as compared to other strategies for integrating multi-informant information (Munkvold et al. 2009; Piacentini et al. 1992). Based on the or-rule, 163 children, or 2.7% of the 6,150 children with complete ODD scales, were identified with symptomatic ODD. This included significantly more boys (4.0%) than girls (1.3%) (χ² = 42.0, p < 0.001). Considered separately, both parents and teachers identified 1.4% children with symptomatic ODD, but they only co-identified 0.2% (2 girls and 10 boys). In order to examine the full range of ODD symptoms, our definition of ODD suspended the DSM-IV rule that ODD cannot be diagnosed in the presence of CD. This strategy has been referred to previously as “inclusive ODD” (Maughan et al. 2004).

Statistical Analyses

We used the full range of responses (0, 1, and 2) and performed independent-samples t-tests to analyze gender differences in mean sum-scores on the SDQ scales. The magnitudes of gender-differences in the mean sum-scores in parents’ and teachers’ ratings are reported as effect sizes (Cohen’s d), and are interpreted according to the guidelines of Cohen (1988): A d-value of 0.20 is small, 0.50 is medium, and 0.80 is large. The three selected SDQ subscales were dichotomized at the 90th percentile for the whole sample, and children with scores above the 90th percentile were defined as high scorers. Cross-tabulations were used to estimate the risk of children with ODD to be defined as high scorers on the SDQ scales, as compared to non-ODD children. Analyses were done separately for boys and girls, and for parent and teacher SDQ ratings. Results are presented as odds ratios (OR) with 95% confidence intervals. Finally, we performed a series of two-way between-groups analyses of variance to explore the impact of gender and group status (i.e. ODD or non ODD) on co-occurring symptoms of mental health problems (as measured by the SDQ). Results are presented as main- and interaction effects, and effect sizes are reported as partial eta squared. The SPSS version 18.0 was used for all statistical analyses.

Ethics

The study was approved by the Regional Committee for Medical and Health Research Ethics, Western Norway, and by the Ombudsman for Privacy in Research, Norwegian Social Science Data Services.

Results

There was a statistically significant gender difference on all three SDQ subscales, except for teacher-reported emotional symptoms. For parent ratings the effect sizes (d-values) were small or small to medium, whereas for teacher ratings they were small and medium to large (see Table 1).
The total number of SDQ subscales was six (three from teacher reports and three from parent reports). Of the 163 children with symptomatic ODD, 96.4% were identified as high scorers on at least one SDQ subscale, either by parents or teachers (Table 2). Almost half (47.9%) of the ODD children were identified as high scorers on four or more SDQ subscales, and 12.1% were identified as high scorers on all six SDQ subscales (14.5% of ODD boys and 4.9% of ODD girls). There was a tendency to an increased male preponderance with increasing symptom-load regarding co-occurring symptoms of mental health problems (see Table 2).

Boys and girls with symptomatic ODD had a statistically significant higher risk of being identified as high scorers on all six SDQ subscales as compared to non-ODD children (Table 3). For instance, 46.3% of girls and 49.2% of boys with symptomatic ODD were rated by their parents as high scorers on the emotional symptom scale, as compared to 10.3% for non-ODD girls and 9.5% for non-ODD boys. According to teacher reports, 73.0% of boys and 34.1% of girls with symptomatic ODD were rated as high scorers on the hyperactivity scale, as compared to 14.8% of non-ODD boys and 2.9% of non-ODD girls. All differences between children with symptomatic ODD and their non-ODD peers were statistically significant at the $p<0.001$ level.

There were significant main effects of group status (i.e. ODD vs. non-ODD) on all SDQ subscale scores, both in parent and teacher reports. Group status explained 4-7% of the variance in SDQ scores. There were also significant main effects of gender on parent- and teacher reports of hyperactivity, and in teacher reports of peer problems, with effect sizes ranging from 0.01 to 0.02 (i.e. 1-2% explained variance). The only significant group x gender interaction effects were found on teacher reports of hyperactivity and peer problems, with an effect size of 0.01 (see Table 4). All interaction effects were ordinal, and main effects could thus also be interpreted.

**Discussion**

In our population-derived sample of 7,007 children aged 7-9 years we found that symptomatic Oppositional Defiant Disorder (ODD) was significantly less frequent among girls than boys (1.3% vs. 4.0%, respectively). Compared to non-ODD children, boys and girls with symptomatic ODD had an increased risk of exhibiting emotional symptoms, hyperactivity and peer problems, as reported on the Strengths and Difficulties Questionnaire (SDQ) (Goodman 1999). In fact, 96.4% of children with symptomatic ODD were identified as high scorers on one or more SDQ subscales, either according to parents or teachers, and almost half (47.9%) ranked as high scorers on all six SDQ subscales. There were significant main effects of group status (i.e. ODD vs. non-ODD) on all SDQ ratings, both according to parents and teachers. There were also significant main effects of gender on parent- and teacher reports of hyperactivity, and in teacher reports of peer problems, with effect sizes ranging from 0.01 to 0.02 (i.e. 1-2% explained variance). The only significant group x gender interaction effects were found on teacher reports of hyperactivity and peer problems, with an effect size of 0.01 (see Table 4). All interaction effects were ordinal, and main effects could thus also be interpreted.

**Table 1** 90th percentile cut-offs and gender differences in mean SDQa ratings

<table>
<thead>
<tr>
<th></th>
<th>Full sample (n=7,007)</th>
<th>Girls (n=3,478)</th>
<th>Boys (n=3,529)</th>
<th>t</th>
<th>d</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Parent SDQa ratings</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional symptoms</td>
<td>4</td>
<td>1.2 (1.7)</td>
<td>1.4 (1.7)</td>
<td>*-2.9</td>
<td>-0.07</td>
</tr>
<tr>
<td>Hyperactivity</td>
<td>6</td>
<td>2.3 (1.9)</td>
<td>3.0 (2.3)</td>
<td>**14.8</td>
<td>0.36</td>
</tr>
<tr>
<td>Peer problems</td>
<td>3</td>
<td>0.9 (1.4)</td>
<td>1.0 (1.6)</td>
<td>**4.6</td>
<td>0.12</td>
</tr>
<tr>
<td><strong>Teacher SDQa ratings</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional symptoms</td>
<td>2</td>
<td>0.6 (1.3)</td>
<td>0.7 (1.3)</td>
<td>0.7</td>
<td>0.02</td>
</tr>
<tr>
<td>Hyperactivity</td>
<td>5</td>
<td>1.4 (1.7)</td>
<td>2.9 (2.7)</td>
<td>**25.7</td>
<td>0.62</td>
</tr>
<tr>
<td>Peer problems</td>
<td>2</td>
<td>0.6 (1.3)</td>
<td>0.9 (1.6)</td>
<td>**7.8</td>
<td>0.19</td>
</tr>
</tbody>
</table>

*a Strengths and Difficulties Questionnaire

**Table 2** The frequency of children with symptomatic ODD identified either by parents or teachers as high-scorers on one or more SDQa subscales

<table>
<thead>
<tr>
<th></th>
<th>1+</th>
<th>2+</th>
<th>3+</th>
<th>4+</th>
<th>5+</th>
<th>6</th>
</tr>
</thead>
<tbody>
<tr>
<td>ODD children (n=163)</td>
<td>96.4 (159)</td>
<td>84.2 (139)</td>
<td>71.5 (118)</td>
<td>47.9 (79)</td>
<td>32.1 (53)</td>
<td>12.1 (20)</td>
</tr>
<tr>
<td>ODD Girls (n=41)</td>
<td>92.7 (38)</td>
<td>82.9 (34)</td>
<td>61.0 (25)</td>
<td>39.0 (16)</td>
<td>17.1 (7)</td>
<td>4.9 (2)</td>
</tr>
<tr>
<td>ODD Boys (n=122)</td>
<td>97.6 (121)</td>
<td>84.7 (105)</td>
<td>75.0 (93)</td>
<td>50.8 (63)</td>
<td>37.1 (46)</td>
<td>14.5 (18)</td>
</tr>
</tbody>
</table>
significant main effects of gender on parent- and teacher reports of hyperactivity, and teacher reports of peer problems. There was a significant interaction effect of group status x gender on teacher reports of hyperactivity and peer problems, but there were no interaction effects on any parent SDQ ratings. The "gender paradox hypothesis", which regards ODD/CD and the co-occurrence of mental health problems, was not evident among the children in our sample (aged 7-9).

Children with symptomatic ODD had a significantly higher risk of being defined as high scorers on all SDQ-scales as compared to non-ODD peers. For instance, 73.0% of the boys were defined as high scorers in teacher ratings of hyperactivity as compared to 14.8% of the non-ODD boys. For the girls, 46.3% were defined as high scorers in parent ratings of emotional symptoms, as compared to 10.3% of non-ODD girls. Our results are in line with previous studies that report strong associations between ODD/CD and other mental health problems such as depression, anxiety disorders, and hyperactivity (Angold et al. 1999; Boylan et al. 2007; Maughan et al. 2004). One of the research questions most relevant to the forthcoming DSM-V is related to the empirical foundation of the diagnosis of ODD. A reconsideration of its status as a mental disorder has been suggested, and authors have argued that ODD is a transient condition, unless it occurs together with other mental disorders (see Moffitt et al. 2008, for a further discussion). ODD is not merely a predisposing factor for CD, but also a common starting point for the later development of other mental disorders such as anxiety and depression (Loeber et al. 2009). We found that symptoms of ODD occurred jointly with at least one symptom of other mental health problems in 96.4% of the cases. In 12.1% of the cases, children with ODD had co-occurring emotional symptoms, hyperactivity and peer problems according to parents and teachers. ODD could

### Table 3 The risk (odds-ratio) of girls and boys with symptomatic ODD to be classified as high scorers on the SDQ's subscales

<table>
<thead>
<tr>
<th></th>
<th>High scoring Girls</th>
<th></th>
<th>High scoring Boys</th>
<th></th>
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<tbody>
<tr>
<td></td>
<td>Non-ODD% (n)</td>
<td>ODD% (n)</td>
<td>OR (95% CI)</td>
<td>Non-ODD% (n)</td>
</tr>
<tr>
<td>Parent SDQ-ratings</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Emotional symptoms</td>
<td>10.3 (313)</td>
<td>46.3 (19)</td>
<td>*7.5 (4.0–14.1)</td>
<td>9.5 (280)</td>
</tr>
<tr>
<td>Hyperactivity</td>
<td>6.3 (192)</td>
<td>39.0 (16)</td>
<td>*9.5 (5.0–18.1)</td>
<td>12.3 (361)</td>
</tr>
<tr>
<td>Peer problems</td>
<td>10.1 (307)</td>
<td>65.9 (27)</td>
<td>*17.2 (8.9–33.1)</td>
<td>13.5 (397)</td>
</tr>
<tr>
<td>Teacher SDQ-ratings</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional symptoms</td>
<td>15.4 (468)</td>
<td>53.7 (22)</td>
<td>*6.4 (3.4–11.9)</td>
<td>14.5 (427)</td>
</tr>
<tr>
<td>Hyperactivity</td>
<td>2.9 (87)</td>
<td>34.1 (14)</td>
<td>*17.6 (8.9–34.8)</td>
<td>14.8 (435)</td>
</tr>
<tr>
<td>Peer problems</td>
<td>17.1 (521)</td>
<td>58.5 (24)</td>
<td>*6.8 (3.6–12.8)</td>
<td>21.1 (621)</td>
</tr>
</tbody>
</table>

* Strength and Difficulties Questionnaire

### Table 4 Mean group- and gender differences on the Strengths and Difficulties Questionnaire (SDQ) subscales

<table>
<thead>
<tr>
<th></th>
<th>Girls</th>
<th></th>
<th>Boys</th>
<th></th>
<th>ANOVA</th>
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</thead>
<tbody>
<tr>
<td></td>
<td>Non-ODD</td>
<td>ODD</td>
<td><strong>F</strong></td>
<td>Gender</td>
<td>Group*</td>
</tr>
<tr>
<td>Parent SDQ-ratings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional symptoms</td>
<td>1.3 (1.6)</td>
<td>3.8 (2.7)</td>
<td>1.1 (1.6)</td>
<td>3.4 (2.5)</td>
<td><strong>255.5</strong></td>
</tr>
<tr>
<td>Hyperactivity</td>
<td>2.2 (1.9)</td>
<td>5.1 (2.8)</td>
<td>2.9 (2.2)</td>
<td>6.1 (3.0)</td>
<td><strong>268.9</strong></td>
</tr>
<tr>
<td>Peer problems</td>
<td>0.8 (1.4)</td>
<td>3.4 (2.1)</td>
<td>0.9 (1.5)</td>
<td>3.5 (2.8)</td>
<td><strong>376.3</strong></td>
</tr>
<tr>
<td>Teacher SDQ-ratings</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Emotional symptoms</td>
<td>0.6 (1.2)</td>
<td>2.4 (2.4)</td>
<td>0.6 (1.2)</td>
<td>2.7 (2.4)</td>
<td><strong>277.0</strong></td>
</tr>
<tr>
<td>Hyperactivity</td>
<td>1.4 (1.7)</td>
<td>4.4 (3.0)</td>
<td>2.7 (2.5)</td>
<td>7.1 (2.9)</td>
<td><strong>353.2</strong></td>
</tr>
<tr>
<td>Peer problems</td>
<td>0.6 (1.3)</td>
<td>2.8 (2.5)</td>
<td>0.8 (1.4)</td>
<td>3.8 (3.0)</td>
<td><strong>432.9</strong></td>
</tr>
</tbody>
</table>

Values represent means (SD)

* ODD vs. non-ODD; ** p<0.001; * p<0.01; `η`= partial eta squared
thus be considered an important marker for a broader pattern of behavioral and emotional dysregulation. This is in line with other longitudinal studies demonstrating the key role of ODD in the development of psychopathology in children and adolescents (Burke et al. 2010; Copeland et al. 2009).

Hyperactivity is a known risk factor for antisocial behavior (Moffitt et al. 2001). But why do symptoms of hyperactivity and ODD co-occur more frequently among boys than girls, as our results have indicated? Older studies have shown that boys who are inattentive and impulsive are more likely to become aggressive as compared to girls with similar attention deficits (Berry et al. 1985; Carlson et al. 1997). Developmental models suggest that biological vulnerabilities may play a role in early emerging gender differences in behavioral and emotional dysregulation (Eme 2007; Rutter 2003; Susman and Pajer 2004). Adult responses to disruptive behavior are also essential in the escalation of childhood disruptive behavior (Burke et al. 2008; Granic and Patterson 2006). There are indications that adults respond differently towards boys and girls who display socially unacceptable behavior (Lyttton and Romney 1991). For instance, boys are more likely to receive physically harsh discipline from their parents, whereas girls are inclined to get firm, verbal requests aimed at regulating and inhibiting disruptive behavior (Webster-Stratton 1996). Another body of research indicates that children’s behaviors exert at least as much influence on parenting behavior as the vice-versa (Huh et al. 2006; Pardini et al. 2008). Since boys have more hyperactivity problems than girls, and these are likely to influence parental behavior (Deault 2010), differential socialization pressures may exacerbate gender differences in displays of disruptive behaviors, and lead to a stronger association between symptoms of hyperactivity and ODD in boys.

Disruptive behaviors such as ODD are associated with different patterns of co-occurring symptoms of mental health problems, depending on whether parents or teachers report them (Drabick et al. 2007; Munkvold et al. 2009; Offord et al. 1996). According to our results these informant-specific patterns of co-occurring problems vary as a function of gender: The impact of symptomatic ODD on teacher ratings of hyperactivity and peer problems depends on the gender of the child being rated. According to their teachers, ODD boys had higher mean levels of co-occurring symptoms of mental health problems than ODD girls (except for emotional symptoms). One line of argument could provide an explanation for this: It is well known that the biological maturation is slower in boys as compared to girls (Rutter et al. 2003). Boys are more likely, at an early age, to be exposed to risk factors for ODD/CD such as neurodevelopmental problems and family adversity (Lahey et al. 2006; Moffitt and Caspi 2001). The skids are then greased for boys entering school exhibiting more symptoms of behavioral and emotional dysregulation, which may contribute to gender differences in responsivity to socialization pressures (Zahn-Waxler and Polanichka 2004). Once enrolled in school, boys exhibit relatively greater reading problems (Messer et al. 2006), and impulsive, aggressive boys are more often rejected by their school peers (Laird et al. 2001). These early experiences of academic and social failure can trigger negative self-evaluative emotions, such as shame. In response, the victim often becomes angry and aggressive (Izard 2002). Teachers tend to respond differentially to aggressive and disruptive behavior in boys and girls. For instance, they more often ignore disruptive behavior in girls, but if they respond to disruptive behavior they are less likely to follow through on their efforts to dampen it in boys (Arnold et al. 1998). Gender differences, with respect to neurodevelopmental vulnerability and exposure to contextual adversity could therefore explain why ODD shows a stronger association to symptoms of hyperactivity and peer problems in boys as compared to girls in a school setting.

There were no main effects of gender or interaction effects of gender x group (i.e. ODD vs. non-ODD) on parent- or teacher ratings of emotional symptoms. Other studies have reported a higher risk for emotional problems such as depression among females with ODD/CD, but commonly this pattern does not emerge until adolescence (Moffitt et al. 2001). There is thus a probability that our finding is a consequence of the relatively young age of the children in our sample. Another possibility is that we did not have enough statistical power to distinguish between different dimensions of ODD and investigate whether these relate differently to co-occurring emotional problems for boys and girls. Factor analyses have suggested that symptoms of ODD load on the dimensions “negative affect” and “oppositional behavior” (Burke et al. 2010). In a recent longitudinal study of girls aged 5-8 Burke and colleagues (2010) found that “negative affect” predicted the subsequent development of depression, whereas symptoms of oppositional behavior predicted later CD. Temperamental dimensions measured at the age of 38 months have indicated that “negative emotionality” predict comorbidity between ODD and depression, whereas the temperamental dimension “activity” better predict comorbidity between ODD and ADHD (Stringaris et al. 2010). Other authors have argued that ODD is reflective of the personality traits “low agreeableness” and “high negative emotionality” (Lahey and Waldman 2003). Frequent displays of such traits would probably result in a difficult relationship between the child and the parent/teacher. If a child with hyperactivity problems has co-occurring symptoms of ODD this could worsen the prognosis, as psychosocial treatment of hyperactivity is most effective in the context of a positive
relationship between the parent/teacher and the child (Taylor and Sonuga-Barke 2008). There is evidence that ODD could have an equally worsening effect on emotional problems: Frequent displays of negative emotionality and low agreeableness could increase the level of conflict in the child’s close relationships, leading to stressful life events (e.g. being expelled from school, exposed to harsh discipline or rejected by friends), which increases the likelihood of subsequent emotional problems (Fergusson et al. 2003). In support of this line of argument, studies have demonstrated that ODD/CD commonly precedes the development of depression in adolescents (Burke et al. 2005; Burke et al. 2010; Moffitt et al. 2001; Rowe et al. 2006), and depression is more common among adolescents with ODD/CD than in the general population (Costello et al. 2003; Loeber et al. 2000; Maughan et al. 2004). Taken together, our results do not support the “gender paradox hypothesis” (Loeber and Keenan 1994) stating that the gender with the lowest prevalence of ODD/CD (girls) has the highest rate of co-occurring symptoms of mental health problems. For instance, we found that symptomatic ODD was associated with significantly more hyperactivity problems in boys as compared to girls (according to teachers), contrary to other studies indicating a stronger association between ODD and ADHD in girls (Maughan et al. 2004). There are several possible explanations for our lack of support for the “gender paradox hypothesis”. Older studies commonly combined ODD/CD into one category, or excluded ODD all together. It is thus possible that the “gender paradox” is associated with CD, and not ODD. Another possibility is that the paradox will not be evident until adolescence, i.e. when the onset of comorbid conditions such as anxiety and depression commonly show a marked female preponderance (Zahn-Waxler et al. 2008). Compared to other epidemiological studies, the prevalence rate of ODD among boys is strikingly low in our sample (4.0%). This has been referred to as “the advantage of Nordic mental health”, and possible explanations have been discussed by other authors (Heiervang et al. 2008). Although still more prevalent among boys than girls, ODD is probably less normative among Norwegian boys as compared to boys in other western countries. Following the previously mentioned theoretical explanation for the “gender paradox hypothesis”, ODD could thus be reflective of a broader emotional/behavioral dysfunction for boys, as well as for girls.

Some of the shortcomings of previous ODD studies have encompassed the exclusion of girls (Drabick et al. 2007), the use of clinical samples only (Lehto-Salo et al. 2009), and the absence of teacher ratings (Lahey et al. 2000b). The present study included a large number of both girls and boys in a population-derived sample, and both teacher and parent ratings - assessed approximately at the same time – were included. A possible point of criticism for this study is the use of SNAP/DSM-IV-derived items to identify children with symptomatic ODD, in that the original rating scale was altered from four points to three points for the purpose of the BCS. It remains unclear how this might have affected the magnitudes of our estimates. Analyses of the SNAP/DSM-IV-derived inattention scale (Sorensen et al. 2008), and the altered SNAP/DSM-IV-derived ODD scale (Munkvold et al. 2009), have yielded satisfactory results regarding internal consistency and impact on daily life functions. However, these findings were derived from the same sample as in the current study.

Another limitation of the study is the cross-sectional nature of the data. This makes it difficult to make casual inferences about ODD and associated mental health problems, as our results only reflect a snapshot in time. However, the rarely used synonym for a cross-sectional study - prevalence study - captures the primary purpose of this paper: to shed light on the unresolved issues in the literature regarding gender differences in the prevalence of ODD (Loeber et al. 2000), and gender differences in the co-occurrence of mental health problems associated with ODD (Maughan et al. 2004). Due to relatively few descriptive studies of ODD as an independent diagnostic category, and the few population-based studies providing teacher reports, we argue that our study contribute to the generation of hypothesis about the informant- and gender-specific characteristics of ODD as a clinical construct. Another advantage of a cross-sectional design is that there is no loss to follow-up. This, in combination with a high response-rate (74.3%), strengthens the external validity of our study.

The clinical implications of this study are that when parents or teachers report symptoms of ODD above the diagnostic threshold, there is a very high probability that the child simultaneously displays symptoms of other mental health problems. Clinicians should therefore carefully assess these children in order to provide adequate treatment, addressing the specific problems experienced by the individual child. In a longitudinal perspective, a substantial number of children displaying early symptoms of antisocial behavior or ODD/CD go on to adolescence and young adulthood experiencing significant mental health problems, physical health problems, academic problems, economic problems, and engaging in serious violence (Burke, et al. 2010; Colman et al. 2009; Copeland et al. 2009; Odgers et al. 2008). The cost-estimates of the long-term public health burden following childhood ODD/CD and antisocial behavior are very high (Romeo et al. 2006; Scott et al. 2001). Providing easily accessible treatment at an early developmental stage aimed at reducing ODD symptoms should therefore be of high priority to public health planners, as even a small reduction of the long-term consequences of
these problems would be beneficial to the individual, the family and the society as a whole.

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