Prevalence, comorbidity, functioning and long-term effects of subthreshold oppositional defiant disorder in a community sample of preschoolers

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Abstract
To study the prevalence of subthreshold oppositional defiant disorder (ST ODD)—less than 4 symptoms, but nonetheless an impairing form of oppositional defiant disorder (ODD)—its coexistence with other homotypic externalizing and heterotypical internalizing problems in children and associated impairment, as well as the long-term effect of this condition. A population-based sample of 622 preschoolers (5.0% boys) was followed up from preschool to preadolescence. Parents were interviewed when the children were 3, 6 and 9 years old with the Diagnostic Interview for Preschoolers/Children and Adolescents versions following DSM-5 and the children’s functioning was assessed by trained clinicians. ST ODD diagnosis is highly prevalent (19.4–25.5%), highly comorbid [homo- (1.9–18.4%) and heterotypical (5.8–23.7%)], resulting in functional impairment across child development in a similar way for both genders. ST is also a risk factor condition that predicts the presence of psychological problems and impairment in childhood and preadolescence from preschool age. A broader clinical assessment and intervention similar to that provided full syndrome cases is needed for children presenting subthreshold forms of ODD.

Keywords Dimensional · ODD · Preschoolers · Subthreshold

Introduction
Oppositional defiant disorder (ODD), a persistent pattern of hostile, negativistic, defiant and disobedient behavior is among the most prevalent diagnoses in children and adolescent mental health settings [1, 2], presenting high concurrent and consecutive homo- and heterotypical [3] and implying a high level of functional impairment [4]. The current DSM-5 [5] diagnostic system is symptom-count based; for example, to meet the diagnostic criteria for ODD an individual must present four or more of eight symptoms associated with personal or environmental distress, or school-related or social impairment. Evidence suggest that within this categorical ODD there is a heterogeneity in the symptoms group, and different dimensions [6] with different comorbidity and predictive values have been found [7–9].

The attempt to define psychopathology in terms of narrow diagnostic categories has been considered flawed by many authors [10–13]. This futility is reflected in common comorbidity, heterogeneity among diagnostic categories, the presence of diagnoses depending on the context or an informant, and age. In fact, the inclusion of impairment as diagnostic criteria in the DSM system is a step towards assuming that symptom counting only is not sufficient to identify problems. Mental disorders appear to be continuousphenomenological and longitudinally—with subthreshold states [14]. Diagnostic rules or cutoffs have often been arbitrarily set [15] and there is little evidence to support the cut-off as distinctive from a different number of symptoms [13]. One important consequence of this arbitrariness could be the neglect of children not fulfilling the threshold but nonetheless suffering inadequate functioning. Conditions with relevant psychiatric symptoms that do not meet the full criteria of a
disorder according to the prevailing classification systems are receiving increased attention, including Attention Deficit and Hyperactivity Disorder (ADHD) [16–18], depression [16], anxiety, [19], disruptive behavior disorders [18], bipolar disorder, autism and psychotic disorders [14]. Some studies have investigated comorbidity between subthreshold conditions [20], most of which examine whether a single subthreshold condition escalates into the full syndrome (FS) form of that disorder; equally important, though, is whether subthreshold conditions (ST) are likely to develop other FS disorders different from the ST one, and whether these associations are maintained after adjusting for comorbidity [21]. In the particular case of ODD, longitudinal studies [9, 22] indicate that ODD diagnoses tend to predict internalizing problems.

Besides investigating the high prevalence and negative impact of ODD from an early age, as far as we know, none of the studies focuses specifically on ST ODD, and in fact some studies exclude ODD when investigating subthreshold CD [20]. In this context, and aware of the importance of prevention considering the evidence for the possibility of escalation, we carried out a longitudinal study on ST ODD from preschool age to preadolescence.

The aims of this paper are to study the prevalence of ST ODD from preschool age to preadolescence, to establish the presence of comorbidity and to assess the functioning of children with ST ODD compared to both those with FS ODD and those without ODD symptomatology (Control Group CG). For each measure, we investigated whether individuals classified as ST had a similar outcome profile to those who met the DSM-5 diagnosis, or whether they were more similar to the CG. We also examined the predictive value of presenting ST ODD at age 3 for FS ODD and other comorbidities and functioning at ages 6 and 9, and at age 6 for age 9. All the objectives were addressed considering the possibility of sex differences.

Method

Participants

The data used in this work are from a longitudinal study of behavioral problems in children followed since preschool. The research was launched with a two-phase design and an initial random sample of 2283 children selected from all the registered preschoolers (age 3) in Barcelona during the 2009–2010 academic year. Children with intellectual disabilities or pervasive developmental disorders were excluded.

The proportion of participants in the first phase was 58.7% (N = 1341 families) and no differences were found by sex (p = 0.95) on comparing participants and refusals. However, the proportion of refusals was statistically higher for families in low socioeconomic groups (p < 0.001). The screening for inclusion in the second phase was carried out with the parents’ version of the Strengths and Difficulties Questionnaire for 3 and 4-year-olds (SDQ3−4) [23]. In this second phase, all the children with a positive screening score for behavioral problems (n = 522) and a random sample of 30% of the children with a negative screening score (n = 235) were invited to continue. The final second-phase sample included 82.2% of the families invited to continue (N = 622 children, 416 with positive screening and 206 with negative screening); no statistical differences were found by sex (p = 0.820) or type of school (p = 0.850) on comparing participants and refusals in this second phase. The children’s mean age was 3.8 (SD = 0.33), 311 were boys (5.0%) and 554 were white (89.1%). At the follow-up when the children were 6 years old, 511 (82.2%) participants remained (83.4% with positive screening and 79.9% with negative screening; p = 0.270) and 443 (71.2%) participated in the assessment at age 9 (7.4% with positive screening and 73.6% with negative screening; p = 0.369). In addition to the screening group at age 3, no differences were found at ages 6 and 9 between the remaining participants and those who dropped out by sex (p ≥ 0.331), type of school (p ≥ 0.361), and level of ODD symptoms (p ≥ 0.111). Regarding socioeconomic status (SES) [24], more participants from low and medium–SES families dropped out of the study at the 6- and 9-year-old follow-ups (p ≥ 0.043). Table 1 shows the sociodemographic and clinical features of the sample at each follow-up.

Measures

Diagnostic Interview of Children and Adolescents for Parents of Preschool Children (DICA-PPC)/Diagnostic Interview of Children and Adolescents for Parents (DICA-P). The DICA [25] is a semi-structured interview and a computerized instrument that generates diagnoses through computerized algorithms following the DSM-5 definitions. In semi-structured interviews, if after the question parents cannot give a precise answer or the answer is not clear enough to decide about the presence (yes) or absence (no) of a symptom, then interviewers are allowed to use clarification questions. Also interviewers completed the CGAS and CAFAS/PECFAS (see below) after a global consideration of all the answers of the parents in the interview. The first follow-up, at age 3, covered the whole life period, the following follow-ups covered the last year, means the period in between the former and the present interview. Participants are asked if the problem or symptom “was present at any time during the last year since we last interviewed you?” Impairment is included in the definitions of the diagnoses. Information about impairment (how the symptoms/disorders affect the child’s daily life at school, with the family and with peers),
family burden (the consequences of the child’s symptom/disorder within the family) and seeking professional help and treatment for the problem was obtained after the assessment for each disorder. After completing the questions corresponding to diagnostic criteria for each disorder, parents were asked “how would you say these concrete problems we have just talked about, interfere in the family/school/friendship functioning or in the child discomfort”? Sub-threshold conditions are defined as cases that present less than symptoms, which is the DSM-5 threshold criteria for ODD, but do indicate functional impairment in the impairment questions that ask about how the present symptoms as a whole, affect functioning. Diagnoses for ADHD, CD, major depression and anxiety/phobia were generated and counts of the number of symptoms were also obtained for ODD. For the present study, in addition to ODD, ADHD, generalized anxiety disorder, separation anxiety disorder, social anxiety and phobia were analyzed. These four anxiety disorder were analyzed all together under the name of Any anxiety, considering it as present if at least one of the four was present. The interview presents good psychometric properties [26]. Major depression or CD were not included due to the low prevalence.

The Strengths and Difficulties Questionnaire (SDQ1−4) [27] is a brief screening questionnaire on children’s mental health completed by parents. It contains 25 items with three response options (not true, somewhat true, certainly true) related to emotional, conduct and hyperactivity symptoms, and peer problems. The conduct problems score was used as screening. Four ODD symptoms (deliberately annoys people, blames others, touchy, angry and resentful) were added to the list of questions for screening purposes.

The Children’s Global Assessment Scale (CGAS) [28, 29] is a global measure of functional impairment rated by the interviewer after the diagnostic information from the diagnostic interview is recruited. Scale scores range from 1 (maximum impairment) to 100 (normal functioning) and scores above 70 indicate normal adaptation.

The Preschool and Early Childhood Functional Assessment Scale (PECFAS) and the Child and Adolescent Functioning Assessment Scale (CAFAS) [30]. Both instruments determine the extent to which a subject’s functioning is

Table 1 Characteristics of the sample at each follow-up

| Variable              | Measure               | Follow-up   |
|-----------------------|-----------------------|-------------|
|                       |                       | Age 3 (N=622) | Age 6 (N=511) | Age 9 (N=443) |
| Demographics          |                       |             |             |             |
| Age (years), M (SD)   | 3.8 (0.33)            | 6.6 (0.35)  | 9.7 (0.35)  |
| Sex                   | Females, n (%)        | 311 (5.0)   | 254 (49.7)  | 221 (49.9)  |
| Socioeconomic status  | High, n (%)           | 205 (33.0)  | 172 (33.6)  | 155 (35.0)  |
|                       | Medium-medium–high, n (%) | 280 (45.0) | 239 (46.8)  | 209 (47.2)  |
|                       | Medium–low/low, n (%) | 137 (22.0)  | 100 (19.6)  | 79 (17.8)   |
| Ethnicity             | Caucasian, n (%)      | 554 (89.1)  | 465 (91.0)  | 407 (91.9)  |
|                       | American Hispanic, n (%) | 40 (6.4)   | 27 (5.3)    | 19 (4.3)    |
|                       | Asian, n (%)          | 6 (1.0)     | 5 (1.0)     | 5 (1.1)     |
|                       | Other, n (%)          | 22 (3.5)    | 14 (2.7)    | 12 (2.7)    |
| Prevalence (DSM-5)*   | ADHD, n (%)           | 29 (4.6)    | 40 (7.9)    | 48 (1.6)    |
|                       | CD, n (%)             | 9 (1.5)     | 2 (0.4)     | 1 (0.3)     |
|                       | MD, n (%)             | 1 (0.1)     | 2 (0.4)     | 8 (1.7)     |
|                       | Any anxiety, n (%)    | 48 (7.7)    | 43 (8.6)    | 60 (13.3)   |
|                       | ODD (full syndrome), n (%) | 46 (7.3) | 33 (6.6)    | 37 (8.2)    |
| Comorbidity (DSM-5)*  | ODD and ADHD, n (%)   | 29 (4.7)    | 40 (92.1)   | 47 (1.5)    |
|                       | ODD and any anxiety, n (%) | 48 (7.7)  | 43 (8.5)    | 60 (13.4)   |
| Functioning           | CGAS total score; M (SD) | 78.7 (9.2) | 76.5 (9.3)  | 69.7 (11.1) |
|                       | PECFAS/CAFAS School, n (% yes) | 104 (16.7) | 92 (18.2)   | 116 (25.8)  |
|                       | PECFAS/CAFAS Home, n (% yes) | 250 (4.3)  | 155 (3.6)   | 115 (25.6)  |
|                       | PECFAS/CAFAS Behavior, n (% yes) | 111 (17.8) | 65 (12.9)   | 103 (23.0)  |
|                       | PECFAS/CAFAS Emotions, n (% yes) | 163 (26.2) | 74 (14.6)   | 108 (24.1)  |

Acronyms: ADHD attention deficit and hyperactivity disorder, CD conduct disorder, CAFAS Children and Adolescents Functional Assessment Scale, CGAS Children General Assessment Scale, MD mood disorder, ODD oppositional defiant disorder, PECFAS Preschool Children Functional Assessment Scale

*Weighted prevalence
impaired in each of eight psychosocial areas. In this study, five scales were used (School, Home, Conduct, Humor and Emotions) as the prevalence of impairment due to autolysis, use of substances, cognition problems and bad functioning in the community was extremely low. Impairment in the humor scale was also too low to be analyzed at ages 3 and 6. PECFAS was used for the follow-ups at ages 3 and 6 and CAFAS was used to assess the children at the 9-year-old follow-up. Both instruments include an area with many different examples of impaired functioning and the assessment is scored based on four levels of impairment (0 = no or minimal impairment; 10 = mild impairment or distress; 20 = moderate impairment; and 30 = severe impairment). CAFAS has good psychometric properties in the Spanish population [31]. In this study, we analyzed the dichotomous classification [no impairment (0) versus minimal, mild to severe [10–32].

**Procedure**

The project was approved by the ethics review committee of the authors’ institution. The head teachers of the participating schools, as well as the children’s parents, received a complete description of the study. The families were recruited at the schools and they gave written consent. All the parents of the children in P3 (aged 3) in participating schools were invited to answer the SDQ3−4 at home and return it to the schools. The families who agreed and met the screening criteria were contacted by telephone and the parents were interviewed at the school. The interviewers were previously trained and were blind to the children’s screening group. Before conducting the interviews, all the interviewers were required to demonstrate a minimum interrater agreement of $k \geq 0.80$ across all the symptoms for at least eight consecutive training interviews. Interrater agreement was revised at every follow-up for those interviewers remaining in the study.

After each interview, the interviewer completed the CGAS and PECFAS/CAFAS. All the measures described above, except for the SDQ used for screening purposes, were taken at 3, 6 and 9 years.

**Statistical analysis**

The statistical were conducted with SPSS24, weighted by assigning sampling weights inversely proportional to the probability of participant selection. Confidence intervals for prevalence of ST were estimated using Wilson’s method. Differences among groups (CG, ST ODD and FS ODD) regarding sex and SES were analyzed using chi-square tests. Changes in proportions among the three groups over time were performed following [30], an extension of McNemar’s test for paired nominal data with more than two categories. Last, differences among groups for impairment, comorbidity with ADHD, CD and any anxiety were analyzed both cross-sectionally and longitudinally with multiple linear and binary logistic regression models for quantitative (CGAS scores) and dichotomous measures (CAFAS/PECFAS and DSM-5 diagnoses), respectively. Additionally, polynomial contrasts were conducted considering the ordered nature of the groups (CG, ST ODD and FS ODD).

**Results**

The prevalence of ST ODD diagnoses at ages 3, 6 and 9 was 22.0% [95% CI: 18.9%, 25.4%], 19.4% [95% CI: 16.2%, 23.0%] and 25.5% [95% CI: 21.8%, 29.8%], respectively. No differences in prevalence between the sex were found among children with ST in any of the three temporal assessments ($p \geq 0.689$). Regarding SES, no differences were found at age 6 and 9 ($p \geq 0.245$), whereas more medium–low and SES children were shown to have ST or FS at age 3 [linear trend: $\chi^2(1) = 4.65, p = 0.031$]. Comparing the percentage of children in each diagnostic category (CG, ST ODD and FS ODD) through the follow-ups, no significant differences were found between ages 3 and 6 ($p = 0.061$) or between ages 3 and 9 ($p = 0.124$), whereas between ages 6 and 9 more children changed from CG to ST ODD than vice versa [$\chi^2(3) = 9.65, p = 0.022$].

No interaction was found between sex and diagnostic group on outcomes (comorbidity, functioning assessed with CGAS scores and PECFAS/CAFAS levels) in any of the three follow-ups, either cross-sectionally or longitudinally. The results of the outcome profile in Table 2 show concurrent associations between the FS ODD group condition and functioning and comorbidity. OR values related to comorbidity were generally higher for the comparison between the CG and the ST ODD groups than between the ST ODD and FS ODD groups for all the follow-ups (at 3, 6 and 9 years), indicating that the ST ODD group had more differences from the CG and more similarities with the FS ODD group. The only exception was heterotypical comorbidity (the presence of any anxiety) at age 3, which presented a higher odds ratio [OR = 4.79; Wald (1) = 9.45, $p = 0.002$] for the FS ODD-ST ODD comparison than for the ST ODD-CG one (0.85), the latter not being statistically significant. Furthermore, apart from the presence of heterotypical comorbidity at ages 3 and 6, all the variables considered showed a lineal trend of greater comorbidity throughout the groups (from CG to FS ODD). A quadratic trend was also found for some homo- and heterotypical.

As regard functional impairment, only functioning at home at age 9 was higher for the FS ODD-ST ODD comparison [OR = 21.27; Wald(1) = 15.31, $p < 0.005$] than for the ST-CG [OR = 9.47; Wald(1) = 65.30, $p < 0.005$] one.
Table 2  Concurrent association of functioning and comorbidity with ST ODD

| Response at age 3 | CG | At age 3 | Omnibus test $F$/$\chi^2$ ($\rho$) | Comparisons: B/OR (pvalue)* | Polynomial contrasts* |
|------------------|----|----------|-----------------------------------|-----------------------------|----------------------|
|                  |    | ST ODD   | FS ODD                           | ST vs. CG       | FS vs. ST  | LT (pvalue) | QT (pvalue) |
| CGAS             | 82.1 (7.7) | 73.0 (7.0) | 66.9 (8.0) | 145.2 (< .001) | −9.24 (< .001) | −6.43 (< .001) | <0.001 | 0.108 |
| PECFAS           | 1.3 | 29.2     | 41.3 | 44.0 (< .001) | 3.66 (< .001) | 1.71 (1.132) | <0.001 | 0.132 |
| Home (% yes)     | 18.9 | 89.7     | 97.8 | 312.4 (< .001) | 36.1 (< .001) | 8.74 (1.100) | <0.001 | 0.315 |
| Behavior (% yes) | 8.7 | 32.8     | 6.9 | 9.7 (< .001) | 5.22 (< .001) | 3.24 (1.001) | <0.001 | 0.345 |
| Emotions (% yes) | 22.6 | 32.1     | 44.4 | 12.0 (.002) | 1.61 (.028) | 1.68 (1.137) | <0.001 | 0.925 |
| ADHD (% yes)     | 1.6 | 1.9      | 15.6 | 29.8 (< .001) | 7.76 (< .001) | 1.61 (.334) | <0.001 | 0.046 |
| Any anxiety (% yes) | 6.8 | 5.8      | 22.2 | 11.3 (.004) | .85 (.696) | 4.79 (.002) | <0.001 | 0.039 |
| Response at age 6 | CG | At age 6 | ST ODD | FS ODD | ST vs. CG       | FS vs. ST  | LT (pvalue) | QT (pvalue) |
| CGAS             | 79.8 (6.7) | 7.2 (9.2) | 6.8 (7.7) | 16.6 (< .001) | −9.54 (< .001) | −9.67 (< .001) | <0.001 | 0.944 |
| PECFAS           | 13.1 | 3.6      | 39.4 | 24.3 (< .001) | 2.89 (< .001) | 1.54 (1.297) | <0.001 | 0.283 |
| Home (% yes)     | 14.1 | 71.1     | 97.1 | 194.1 (< .001) | 14.82 (< .001) | 21.96 (.019) | <0.001 | 0.775 |
| Behavior (% yes) | 3.7 | 3.6      | 63.6 | 103.9 (< .001) | 11.07 (< .001) | 3.92 (.001) | <0.001 | 0.998 |
| Emotions (% yes) | 9.6 | 22.4     | 48.5 | 34.7 (< .001) | 2.71 (.001) | 3.38 (.004) | <0.001 | 0.725 |
| ADHD (% yes)     | 3.5 | 17.3     | 29.4 | 34.1 (< .001) | 5.68 (< .001) | 1.97 (1.147) | <0.001 | 0.138 |
| Any anxiety (% yes) | 7.7 | 8.2      | 18.2 | 3.37 (.185) | <0.001 | 0.001 | <0.001 | <0.001 |
| Response at age 9 | CG | At age 9 | ST ODD | FS ODD | ST vs. CG       | FS vs. ST  | LT (pvalue) | QT (pvalue) |
| CGAS             | 74.3 (9.3) | 62.3 (56.6) | 56.6 (8.6) | 122.4 (< .001) | −12.41 (< .001) | −5.33 (.002) | <0.001 | 0.002 |
| PECFAS           | 15.8 | 44.3     | 48.6 | 44.5 (< .001) | 4.22 (< .001) | 1.22 (.600) | <0.001 | 0.018 |
| Home (% yes)     | 8.7 | 47.4     | 94.6 | 162.5 (< .001) | 9.47 (< .001) | 21.27 (< .001) | <0.001 | 0.353 |
| Behavior (% yes) | 4.0 | 57.9     | 67.6 | 18.4 (< .001) | 32.51 (< .001) | 1.50 (.311) | <0.001 | <0.001 |
| Humor            | 14.1 | 47.0     | 36.1 | 49.3 (< .001) | 5.41 (< .001) | .64 (.260) | 0.001 | <0.001 |
| Emotions (% yes) | 14.1 | 46.5     | 35.1 | 47.4 (< .001) | 5.29 (< .001) | .61 (.212) | 0.002 | <0.001 |
| ADHD (% yes)     | 6.1 | 18.4     | 22.2 | 18.3 (< .001) | 3.48 (< .001) | 1.32 (.542) | 0.001 | 0.147 |
| Any anxiety (% yes) | 8.7 | 23.7     | 18.9 | 15.7 (< .001) | 3.25 (< .001) | .71 (.474) | 0.080 | 0.019 |

*Comparisons and polynomial contrasts for omnibus test statistically significant (p < .05)

cg, ST ODD subthreshold oppositional defiant disorder, FS ODD full syndrome oppositional defiant disorder, ADHD attention deficit hyperactivity disorder
All the variables included showed a linear trend of greater impairment in the same direction as comorbidity as regard the groups (CG-ST-FS). Also a quadratic trend for impairment in the areas of school, behavior, humor and emotion was found. Specifically, several patterns were observed. The statistically significant quadratic trend in addition to the linear trend indicates that (a) for homotypic comorbidity at age 3 and impairment in most of the areas at age 9, levels are lower for CG and then percentages increase for ST ODD and flatten for FS ODD; (b) for heterotypical comorbidity at age 3, levels are lower for CG and ST ODD and then percentage increases for FS ODD; for the latter, a different pattern was observed at age 9, since only the quadratic trend was statistically significant, showing that the higher percentage was for ST ODD, it did not statistically differ from FS ODD. Lastly (c) for total impairment (CGAS score, where higher scores indicate less impairment) at age 9 the decrease between CG and ST ODD is higher than between ST ODD and FS ODD.

Table 3 shows how ST ODD predicts comorbidity and functioning at ages 6 and 9; again, the presence of ST ODD at age 3 predicts global and specific impairment in most areas, as well as the presence of FS ODD both at 6 and 9. The of ST ODD at 6 follows the same pattern and also predicts comorbidity with ADHD. Moreover, OR values for the ST ODD-CG comparison at age 3 were mostly statistically significant for the prediction at ages 6 and 9, whereas no differences were found between the FS ODD and ST ODD groups at age 3 in predicting outcomes at ages 6 and 9.

Discussion

Subthreshold ODD is highly prevalent along childhood with stable numbers of around 19–25%, with girls as much affected as boys. The condition is a risk for high homo- and heterotypical comorbidit both concurrently (mainly ADHD and anxiety) and longitudinally (ADHD). This pattern is consistent with that found in FS ODD studies [33]. Also ST ODD condition is as much a long-term predictor of meaningful impairment in several developmental areas as is FS ODD, suggesting that focusing on ST ODD could be relevant for preventive purposes.

The absence of sex differences regarding outcomes obtained for ST contrasts with the results of other studies [34], which have reported more comorbid internalizing disorders in girls for other gender-related problems, such as subthreshold ADHD. Nevertheless, our results are aligned with those obtained by [20], who found that the pattern of comorbidities of subthreshold psychiatry conditions was nearly identical for males and females. In any case, our results indicate the need to assess whether other full syndrome or subthreshold homo- and heterotypical problems are present when facing ST ODD. We consider as relevant the fact that ST ODD concurrently associates with externalizing problems (including FS ODD itself) at any age, also with higher rates of internalizing at age 9. Obviously, this could be related to the different dimensions reported by the literature on ODD [8, 9, 35, 36], which makes ODD a syndrome half-way in the internalized-externalized continuum [13] including negative affect, which is considered a transdiagnostic feature for many children psychopathological disorders [10]. Predictive association of ST ODD for heterotypical comorbidity was only found for ADHD. Other authors have found weak association between anxiety and ODD when accounting for initial levels of internalizing symptoms, assuming little evidence for the unique contributions of ODD to the subsequent internalizing disorders [9]. Maybe the fact that our sample was from general population could also explain the lack of predictive association. The predictive value of subthreshold syndromes for heterotypical comorbidity has also been observed in adolescence by [18, 21], who studied problems other than ODD or included ODD as a disruptive behavior. Crosssectionally, compared to the CG, children with ST ODD exhibited major impairment, albeit less than children presenting FS ODD, in a pattern similar to that found by other authors [16, 17] studying ADHD. However, when it comes to predicting impairment and comorbidity, ST ODD and FS ODD behave in the same way; this is especially relevant to bear in mind when working with very young children whose symptomatology might at times be confusing. Sometimes ST conditions may be considered just “misbehave” or a parent–child relation problem that can be overcome without intervention, ignoring the overwhelming and burden daily situation that imply [37]. Immediate intervention and future assessment should be indicated when ST is detected at early ages, as personal and environmental characteristics can enhance each other to worse the condition and influence treatment outcomes [38, 39].

Among the strengths of our research is the use of diagnoses generated with structured interviews and not with parent-rated questionnaires, in a large community sample followed from preschool to preadolescence. The study of a preschool sample is particularly interesting because psychiatric conditions with earlyonset have been associated with greater impairment [20]. As far as we know, this is the first study to consider ODD on its own and not mixed with other behavioral disorders. Among the limitations of our research is the fact that the participants who dropped out of the study at the 3-year-old follow-up belonged to lowSES families, which is also the social level most affected by ODD [40]. Our study supports associations between ST ODD and negative outcomes, indicating the need to consider further and more complete assessment and intervention for children presenting ST ODD in the
Table 3 Predictive association of ST with functioning, comorbidity and FS

| Response at age 6 | CG       | At age 3 | Omnibus test | Comparisons: B/OR (p value)* | Polynomial contrasts* |
|------------------|----------|----------|--------------|-----------------------------|----------------------|
|                   | ST ODD   | FS ODD   | F/χ² (p)     | ST vs. CG                   | LT (p value)          | QT (p value)          |
| CGAS Total score; M (SD) | 78.4 (8.5) | 72.9 (1.1) | 71.6 (8.9) | 22.8 (<0.001) | −5.36 (<0.001) | −1.44 (.391) | <0.001 | 0.082 |
| PECFAS School (% yes) | 16.0     | 21.1     | 31.4        | 5.4 (.067)     |                     |                     |               |       |
| Home (% yes)      | 23.9     | 44.3     | 54.3        | 25.2 (<0.001) | 2.53 (<0.001) | 1.44 (.348) | <0.001 | 0.278 |
| Behavior (% yes)  | 8.7      | 23.7     | 22.9        | 18.9 (<0.001) | 3.31 (<0.001) | 0.93 (.866) | 0.012  | 0.042 |
| Emotions (% yes)  | 13.2     | 17.5     | 19.4        | 1.8 (.401)     |                     |                     |               |       |
| Comorbidity ADHD (% yes) | 6.2     | 11.3     | 14.3        | 5.5 (.065)     |                     |                     |               |       |
| Any anxiety (% yes) | 8.4    | 7.0      | 14.3        | 1.2 (.538)     |                     |                     |               |       |
| ODD Full syndrome (%) | 2.0    | 14.0     | 28.6        | 43.1 (<0.001) | 8.76 (<0.001) | 2.50 (.045) | <0.001 | 0.098 |

| Response at age 9 | CG       | At age 3 | Omnibus test | Comparisons: B/OR (p value)* | Polynomial contrasts* |
|------------------|----------|----------|--------------|-----------------------------|----------------------|
|                   | ST ODD   | FS ODD   | F/χ² (p)     | ST vs. CG                   | LT (p value)          | QT (p value)          |
| CGAS Total score; M (SD) | 72.1 (1.0) | 65.0 (9.8) | 57.3 (13.3) | 39.6 (<0.001) | −7.31 (<.001) | −7.59 (.001) | <0.001 | 0.925 |
| CAFAS School (% yes) | 21.7     | 29.8     | 55.2        | 14.1 (.001)    | 1.56 (.103) | 2.71 (.024) | <.001  | 0.375 |
| Home (% yes)      | 17.6     | 42.9     | 79.3        | 6.0 (<0.001)   | 3.57 (<.001) | 4.99 (.002) | <0.001 | .606  |
| Behavior (% yes)  | 13.5     | 42.9     | 65.5        | 59.1 (.001)    | 4.75 (<.001) | 2.73 (.026) | <.001  | .367  |
| Humor             | 19.4     | 32.1     | 55.2        | 18.7 (<.001)   | 1.94 (.016) | 2.54 (.034) | <.001  | .658  |
| Emotions (% yes)  | 19.4     | 31.0     | 51.7        | 16.7 (<.001)   | 1.87 (.023) | 2.42 (.045) | <.001  | .79   |
| Comorbidity ADHD (% yes) | 7.9    | 11.9     | 27.6        | 1.3 (.006)     | 1.62 (.217) | 2.95 (.040) | 0.001  | .460  |
| Any anxiety (% yes) | 12.6   | 13.1     | 27.6        | 5.0 (.082)     |                     |                     |               |       |
| ODD Full syndrome (%) | 3.1    | 17.9     | 37.9        | 43.1 (<.001)   | 6.63 (<.001) | 2.98 (.021) | <.001  | .287  |

| Response at age 9 | CG       | At age 3 | Omnibus test | Comparisons: B/OR (p value)* | Polynomial contrasts* |
|------------------|----------|----------|--------------|-----------------------------|----------------------|
|                   | ST ODD   | FS ODD   | F/χ² (p)     | ST vs. CG                   | LT (p value)          | QT (p value)          |
| CGAS Total score; M (SD) | 72.0 (1.4) | 64.9 (1.4) | 62.7 (11.1) | 25.4 (<0.001) | −7.19 (<0.001) | −2.61 (0.240) | <0.001 | 0.123 |
| CAFAS School (% yes) | 21.6     | 34.7     | 44.8        | 11.7 (0.003)   | 1.92 (.011) | 1.55 (0.306) | 0.006  | 0.716 |
| Home (% yes)      | 2.3      | 42.1     | 33.3        | 18.0 (<0.001)  | 2.86 (<0.001) | 0.67 (0.368) | 0.117  | 0.014 |
| Behavior (% yes)  | 17.0     | 35.8     | 5.0         | 24.6 (<0.001)  | 2.73 (<.001) | 1.73 (.195) | <0.001 | 0.438 |
| Humor             | 19.4     | 37.9     | 34.5        | 14.5 (0.001)   | 2.52 (<.001) | 0.88 (0.776) | 0.052  | 0.075 |
| Emotions (% yes)  | 19.1     | 36.8     | 34.5        | 14.1 (.001)    | 2.48 (<.001) | .91 (0.825) | 0.048  | 0.089 |
| Comorbidity ADHD (% yes) | 9.3    | 12.6     | 2.0         | 3.3 (0.191)    |                     |                     |               |       |
| Any anxiety (% yes) | 12.7   | 13.7     | 17.2        | .7 (0.707)     |                     |                     |               |       |
| ODD Full syndrome (%) | 4.6    | 15.8     | 23.3        | 18.0 (<0.001)  | 3.88 (<0.001) | 1.53 (0.414) | 0.001  | 0.222 |

*Comparisons and polynomial contrasts for omnibus test statistically significant (p < .05)

CG group, ST ODD subthreshold oppositional defiant disorder, FS ODD full syndrome oppositional defiant disorder, ADHD attention deficit hyperactivity disorder
same way as for children with FS, which would benefit both practice and research.

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Compliance with ethical standards

Conflict of interest On behalf of all authors, the corresponding author states that there is no conflict of interest.

References

1. Costello EJ, Mustillo S, Erkanli A, Keeler G, Angold A (2003) Prevalence and development of psychiatric disorders in childhood and adolescence. Arch Gen Psychiatry 60(8):837–844
2. Kim J, Carlson GA, Meyer SE, Bufferd SJ, Dougherty LR, Dyson D (2012) Generalizability of the CBCL dysregulation profile in preschool-aged children. J Child Psychol Psychiatry 53(9):918–926. https://doi.org/10.1111/j.1469-7610.2012.02546.x
3. Burke J, Loeber R (2010) Oppositional defiant disorder and the explanation of the comorbidity between behavioral disorders and depression. Clin Psychol Sci Pract 17(4):319–326. https://doi.org/10.1111/j.1468-2850.2010.01223.x
4. Breslau J, Miller E, Chung WJ, Schweitzer JB (2012) Childhood and adolescent onset psychiatric disorders, substance use, and failure to graduate high school on time. J Psychiatr Res 45(3):295–301
5. American Psychological Association (2013) Diagnostic and statistical manual of mental disorders, 5th edn. American Psychological Association, Washington, DC
6. Lavigne JV, Bryant FB, Hopkins J, Gouze KR (2015) Dimensions of oppositional defiant disorder in young children: model comparisons, gender and longitudinal invariance. J Abnorm Child Psychol 43(3):423–439. https://doi.org/10.1007/s10802-014-9919-0
7. Burke JD (2012) An affective dimension within oppositional defiant disorder symptoms among boys: personality and psychopathology outcomes into early adulthood. J Child Psychol Psychiatry Allied Discip 53(11):1176–1183
8. Ezpeleta L, Granero R, de la Osa N, Penelo E, Domenech JM (2012) Dimensions of oppositional defiant disorder in 3-year-old preschoolers. J Child Psychol Psychiatry 53(11):1128–1138
9. Lavigne JV, Bryant FB, Hopkins J, Granero R (2014) Dimensions of oppositional defiant disorder in young children: model comparisons, gender and longitudinal invariance. J Abnorm Child Psychol 43(3):423–439. https://doi.org/10.1007/s10802-014-9919-0
10. Achenbach TM (2015) Transdiagnostic heterogeneity, hierarchical dimensional models, and societal, cultural, and individual differences in the developmental understanding of psychopathology. Eur Child Adolesc Psychiatry 24(12):1419–1422. https://doi.org/10.1007/s00787-015-0795-0
11. Caspi A, Houts RM, Belsky DW, Goldman-mellor SJ (2015) The p factor: one general psychopathology factor in the structure of psychiatric disorders? Clin Psychol Sci 2(2):119–137
12. Forbes MK, Tackett JL, Markon KE, Krueger RF (2016) Beyond comorbidity: toward a dimensional and hierarchical approach to understanding psychopathology across the life span. Dev Psychopathol 28:971–986
13. Lindhiem O, Bennett CB, Hipwell AE, Pardini DA (2015) Beyond symptom counts for diagnosing oppositional defiant disorder and conduct disorder? J Abnorm Child Psychol 3(7):1379–1387
14. Van Os J (2013) The dynamics of subthreshold psychopathology: implications for diagnosis and treatment. Am J Psychiatry
15. Kraemer HC (2015) Research Domain Criteria (RDoC) and the DSM—two methodological approaches to mental health diagnosis. JAMA Psychiatry 72(12):1163. https://archjama.psychiatryw k.com/article.aspx?doi=10.1001/jamapsychiatry.2015.2134, Accessed 13 Dec 2016
16. Balázs J, Kereszttény A (2014) Subthreshold attention deficit hyperactivity in children and adolescents: a systematic review. Eur Child Adolesc Psychiatry 23(6):393–408. https://doi.org/10.1007/s00787-013-0514-7
17. Hong S-B, Dwyer D, Kim J-W, Park E-J, Shin M-S, Kim B-N et al (2014) Subthreshold attention-deficit/hyperactivity disorder is associated with functional impairments across domains: a comprehensive analysis in a large-scale community study. Eur Child Adolesc Psychiatry 23(8):627–636
18. Malmberg K, Edborn T, Wargelius HL, Larsson JO (2011) Psychiatric problems associated with subthreshold ADHD and disruptive behaviour diagnoses in teenagers. Acta Paediatr Int J Paediatr 100(1):1468–1475
19. Haller H, Cramer H, Lauche R, Gass F, Dobos GJ (2014) The prevalence and burden of subthreshold generalized anxiety disorder: a systematic review. BMC Psychiatry 14:1–13
20. Lewinsohn PM, Shankman SA, Gau JM, Klein DN (2004) The prevalence and co-morbidity of subthreshold psychiatric conditions. Psychol Med 34(4):613–22. https://www.journals.cambr idge.org/abstract_S00332921703001466.. Accessed 14 Dec 2016
21. Shankman SA, Lewinsohn PM, Klein DN, Small JW, Seeley JR, Altman SE (2009) Subthreshold conditions as precursors for full syndrome disorders: a 15-year longitudinal study of multiple diagnostic classes. J Child Psychol Psychiatry 50(12):1485–94. https://doi.wiley.com/10.1111/j.1469-7610.2009.02117.x. Accessed 14 Dec 2016
22. Martín V, Granero R, Ezpeleta L (2014) Comorbidity of oppositional defiant disorder and anxiety disorders in preschoolers. Psicothema 26(1): 37–32
23. Goodman R (1997) The Strengths and Difficulties Questionnaire: a research note. J Child Psychol Psychiatr 38(5):581–586
24. Hollingshead AB (1975) Four factor index of social status. Yale University, New Haven
25. Reich W, Ezpeleta L (2009) Entrevista Diagnóstica para Niños y Adolescentes—versión para Padres de Preescolares (3–7 años). Universitat Autònoma de Barcelona, Manuscrito no publicado, Departament de Psicologia Clínica y de la Salut
26. Ezpeleta L, de la Osa N, Granero R, Domènech JM, Reich W (2011) The diagnostic interview of children and adolescents for parents of preschool and young children: psychometric properties in the general population. Psychiatry Res 190:137–144
27. Goodman R (2001) Psychometric properties of the strengths and difficulties questionnaire. J Am Acad Child Adolesc Psychiatry. 40(11):1337–1345. https://doi.org/10.1097/00004583-200111000-00015
28. Ezpeleta L, Granero R, de la Osa N (1999) Evaluación del deterioro en niños y adolescentes a través de la Children’s Global Assessment Scale (CGAS). Rev Psiquiatr Infantil-Juvenil. Spain: Siglo Editorial 1:18–26
29. Shaffer D, Gould MS, Brasic J, Ambrosini P, Fisher P, Bird H (1983) A children’s global assessment scale (CGAS). Arch Gen Psychiatry 40:1228–1231
30. Hodges K (1995) Child and Adolescent Functional Assessment Scale (CAFAS). Eastern Michigan University, Ypsilanti
31. Ezpeleta L, Granero R, De La Osa N, Doménech JM, Bonillo A (2006) Assessment of functional impairment in Spanish children. Appl Psychol 55(1):130–143
32. Bowker AH (1948) A test for symmetry in contingency tables. J Am Stat Assoc 43(244):572–574
33. Lavigne JV, Cicchetti C, Gibbons RD, Binns H, Larsen L, Vito CDE (2000) Oppositional defiant disorder with onset in preschool years: longitudinal stability and pathways to other disorders. J Am Acad Child Adolesc Psychiatry 40(12):1393–1400
34. Norén Selinus E, Molero Y, Lichtenstein P, Anckarsäter H, Lundström S, Bottai M et al (2016) Subthreshold and threshold attention deficit hyperactivity disorder symptoms in childhood: psychosocial outcomes in adolescence in boys and girls. Acta Psychiatr Scand 134(6):533–545. https://doi.org/10.1111/acps.12655
35. Burke JD, Hipwell AE, Loeber R (2010) Dimensions of oppositional defiant disorder as predictors of depression and conduct disorder in preadolescent girls. J Am Acad Child Adolesc Psychiatry 49(5):484–92. https://www.sciencedirect.com/science/article/pii/S0890856710001061. Accessed 30 Nov 2014
36. Stringaris A, Goodman R (2009) Three dimensions of oppositionality in youth. J Child Psychol Psychiatry 50(3):216–23. https://www.ncbi.nlm.nih.gov/pubmed/19166573. Accessed 2 Dec 2014
37. Burke JD, Pardini DA, Loeber R (2008) Reciprocal relationships between parenting behavior and disruptive psychopathology from childhood through adolescence. J Abnorm Child Psychol 36(5):679–692. http://search.ebscohost.com/login.aspx?direct=true&db=psyh&AN=2008-07245-005&lang=es&site=ehost-live
38. Cornell AH, Frick P (2007) The moderating effects of parenting styles in the association between behavioral inhibition and parent-reported guilt and empathy in preschool children. J Clin Child Adolesc Psychol 36(3):305–318
39. Booker JA, Capriola-Hall NN, Green RW, Ollendick TH (2019) The parent–child relationship and posttreatment child outcomes across two treatments for oppositional defiant disorder. J Clin Child Adolesc Psychol. https://doi.org/10.1080/15374416.2018.1555761
40. Lavigne JV, Gouze KR, Hopkins J, Bryant FB, Lebailly SA (2012) A multi-domain model of risk factors for ODD symptoms in a community sample of 4-year-olds. J Abnorm Child Psychol 40(5):741–757