

**Factors related to the comorbidity between oppositional defiant disorder and anxiety disorders in preschool children**

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### Abstract

**Background:** The aim of the study is to identify the main factors related to comorbid oppositional defiant disorder (ODD) and anxiety disorders (AD), for preschoolers, and to assess the moderating role of the children's sex. **Design:** The initial sample of 622 children was assessed longitudinally at the ages of 3 and 5 years by means of questionnaires and a diagnostic interview. At baseline, there were 310 boys (49.8%), most participants were of Caucasian-white ethnicity (554, 89.1%), 398 children attended to public school (64.0%) and families socioeconomic status was 64.3% medium-high, 14.1% medium and 20.5% medium-low or low levels. **Methods:** For the analysis, children diagnosed with ODD and/or AD were selected: n=103 at 3 years old (44 ODD, 42 AD and 17 ODD+AD) and n=106 at 5 years old (31 ODD, 60 AD and 15 ODD+AD). **Results:** High levels of the child's negative affectivity and the mother's aggressive behavior (versus AD), and high scores in the father's psychopathology measurements (versus ODD) are related to the presence of comorbid ODD+AD at the age of 3. High scores in the child's approach-positive anticipation, fears (only in boys, in girls the reverse effect occurred) compared to ODD and AD independently and aggressive behavior (versus AD), and low scores for smiling and laughter (versus ODD only and AD only) are predictive of comorbidity at the age of 5. **Conclusions:** Temperament traits may be a common factor in explaining longitudinal ODD+AD comorbidity.

**Keywords:** anxiety disorders; comorbidity; oppositional defiant disorder; preschool age; risk

## **Introduction**

Oppositional defiant disorder (ODD) is characterized by negativistic, defiant, disobedient and hostile behavior, particularly towards figures of authority (American Psychiatric Association, 2000). An anxiety disorder (AD), on the other hand, is characterized by excessive worries or fears, behavioral avoidance, a high degree of interference and usually physiological symptoms. Rates of ODD in children ranged from 2% to 15% (Lahey, Miller, Gordon, & Riley, 1999; Maughan, Rowe, Messer, Goodman, & Meltzer, 2004), and the lifetime prevalence of anxiety disorders in children and adolescents is about 15% to 20% (Beesdo, Knappe, & Pine, 2011).

Heterotypic continuity of ODD with concurrent and subsequent internalizing disorders has not been studied as much as the homotypic comorbidity of ODD with externalizing disorders (Lavigne, Gouze, Bryant, & Hopkins, 2014). Currently, the findings indicate high concurrent heterotypic between ODD and AD (Greene et al., 2002) and between AD and ODD (Drabick, Gadow, & Loney, 2008). In preschoolers, ODD and AD comorbidity (ODD+AD) ranges from 7% to 14% (Martín, Granero, & Ezpeleta, 2014; Wichstrøm et al., 2012). There is evidence that ODD+AD comorbidity in 3 to 5 year-old preschoolers is associated with greater functional impairment in relationships with others and in school (Martín et al., 2014). Therefore it is essential to study the association of both disorders early in life in order to minimize its impact (Champion, Goodall, & Rutter, 1995) since early diagnosis and interventions can have immediate and long-term effects (Mash & Hunsely, 2007).

Several associated variables have been identified for ODD at young ages: harsh and inconsistent parenting, maternal depression, parental psychopathology, high levels of impulsivity, disinhibition and dysphoria (Dougherty et al., 2011; Fossum, Mørch, Handegard, Drugli, & Larsson, 2009; Krueger, McGue, & Iacono, 2001; Munson, McMahon, & Spieker,

2001; Owens & Shaw, 2003; Silverman, Cerny, Nelles, & Burke, 1988). On the other hand, the variables more strongly related to the presence of early AD include early childhood anxiety symptoms, reactive temperament, high levels of inhibition, negative learning experiences, stressful life events, adverse family factors, parental depression, shyness, emotional reactivity/inhibition, fear, low exuberance, low sociability and behavioral inhibition, negative emotionality, attention-deficit/hyperactivity disorder, parental anxiety, peer victimization, lower positive affectivity, sleep problems and a deficit in social skills (Dougherty et al., 2011; Dougherty et al., 2013; Kagan, Snidman, Zentner, & Peterson, 1999; Mian, Wainwright, Briggs-Gowan, & Carter, 2011; Muris, van der Pennen, Sigmond, & Mayer, 2008; Prior, Smart, Sanson, & Oberklaid, 2000; Spence, Najman, Bor, O'Callaghan, & Williams, 2002; Tellegan, 1985; Wichstrøm, Belsky, & Berg-Nielsen, 2013).

Few studies have examined the predictors of ODD and AD when present together. Reported associated variables for ODD+AD in later childhood are high negative emotionality and low inhibitory control, parenting styles (e.g. rejection) and parental psychopathology (Drabick et al., 2008; Franco, Saavedra, & Silverman, 2007; Muris, de Jong, & Engelen, 2004; Roelofs, Meesters, ter Huurne, Bamelis, & Muris, 2006). Studies into comorbidity associated variables in preschoolers are scarce. A longitudinal study evaluating the temperament of children from 21 months to 6 years suggests that a common predictor of disruptive behavior disorders and internalizing disorders is a history of behavioral disinhibition (Hirshfeld-Becker et al., 2007). Another study about infant risk factors associated with internalizing, externalizing, and co-occurring behavior problems in children from 5 months to 5 years old showed that maternal anxious and depressive symptoms, younger maternal age, and family conflict independently predicted early co-occurring problems. Additionally, in the context of hostile parenting, children high in anger were at increased risk of developing early co-occurring problems (Edwards & Hans, 2015). These

findings suggest that temperament, parental psychopathology and stressors may be predictors of comorbid ODD+AD in preschoolers.

Parental psychopathology plays an important role in the development of children. Maternal psychopathology symptoms were associated with externalizing, internalizing, and social problems in preschoolers and paternal psychopathology symptoms were associated with internalizing problems at age 3 and 6 (Breux, Harvey, & Lugo-Candelas, 2014). Numerous studies have shown that psychopathology in fathers is associated with a variety of negative emotional and behavioral outcomes in children (Beardslee, Gladstone, & O'Connor, 2011; Phares & Compas, 1992). Children of fathers with psychopathology showed similar rates of parent-child conflict and elevated rates of externalizing disorders to children of mothers with psychopathology (Weitzman, Rosenthal, & Liu, 2011). From a development perspective, a mutual relationship between the variables may even be postulated: children with difficult temperament features could hinder parenting practices, particularly in those caregivers who experience and perceive their own psychological problems, while parents who present psychological difficulties could aggravate children's internalizing and externalizing behaviors.

Several hypotheses have been proposed to explain the association between ODD and AD. Firstly, shared associated variables could lead to co-occurrence of ODD+AD. Potential leading associated variables include child temperament, parent-child processes, social information processing biases, or exposure to neighborhood violence (Drabick, Ollendick, & Bubier, 2010). Bubier and Drabick (2009) suggest that a difficult temperamental style, a tendency to perceive situations as threatening and to make hostile attributions, and heightened autonomic arousal in stressful social situations may contribute to and exacerbate symptoms of anxiety and reactive aggression and consequently lead to clinically identifiable comorbid anxiety and disruptive behavior disorders among children. Fraire and Ollendick (2013)

suggested that three processes are common in the occurrence of this comorbidity: a) the process of emotional dysregulation, which may encompass difficulties in regulating emotional arousal, low effortful control, and difficulties with both anger and anxiety; b) the information processing deficits in internalizing and externalizing problems of behavior, which may lead to interpreting ambiguous situations as threatening; and c) the parental psychological overcontrol and poor parental emotional expressivity.

Secondly, AD affects ODD symptoms in two pathways: a) AD symptoms may mitigate ODD symptoms; b) AD symptoms may exacerbate ODD symptoms (Drabick et al., 2010). Following the first pathway, a child with ODD and social anxiety, for example, may show more sensitivity to social rewards and social punishment, which may reduce disruptive behavior. And following the second path, anxiety and ODD associated with the misinterpretation of social situations may increase the occurrence of episodic conflicts, since the situation would be altered by a negative bias.

And thirdly, one disorder may predict the other (Bufferd, Dougherty, Carlson, Rose, & Klein, 2012). Bubier and Drabick (2009) suggest that ODD in early childhood may be more likely to confer a risk of anxiety disorders. This could happen because the child with ODD has a difficult temperament, which could lead to situations in which poor conflict resolution could generate a feeling of lack of control and carry potential anxiety. Nevertheless, a recent study on the dimensions of oppositional defiant disorder in young children and heterotypic continuity with anxiety (Lavigne et al., 2014) indicated that the behavior factor of ODD and the negative affect factor of ODD did not improve the predictive ability of initial levels of anxiety for subsequent anxiety levels. The opposite may also be possible, with anxiety symptoms increasing the risk of externalizing a disorder. Bufferd et al. (2012) found that anxiety at age 3 predicts ODD at age 6 but not vice versa. It is possible that in order to avoid fearful contexts, children with anxious symptoms may become non-compliant and aggressive

to avoid fearful contexts and stimuli. Specifically, generalized anxiety disorder and separation anxiety disorder in late childhood and adolescence may predict the development of ODD and conduct disorder in adolescence. When a child with anxiety is approaching the adolescent stage, the constant emotional disturbance frequently experienced during this stage can lead to externalizing problems, particularly ODD. Furthermore, it appears that sex can interact with potential associated variables for the internalizing and externalizing disorders, with a different effect for boys and girls. Findings suggested that boys characterized by their high activity level and low levels of fear in infancy escalated in both externalizing and internalizing symptoms, whereas boys with high fear and low activity levels showed an increase in internalizing symptoms (Colder, Mott, & Berman, 2002). It is therefore important to examine associated variables by considering gender-specific pathways to disorders.

The aim of this work is to identify the main variables associated with the comorbidity of ODD+AD in a longitudinal design of n=622 community preschoolers followed from age 3 to 5. Of these 622 preschoolers, who were diagnosed with ODD only, AD only or both concurrently, we selected: n=103 at 3 years old (44 ODD only, 42 AD only and 17 ODD+AD) and n=106 at 5 years old (31 ODD only, 60 AD only and 15 ODD+AD), and we sought to evaluate the potential role of the child's sex as a moderating variable in the previous relationships. The list of potential variables related to comorbidity ODD+AD include the child's temperament traits and aggression levels, parental style and the parents' psychopathology scores, reported by parents and teachers. According to the accumulated evidence in literature, we hypothesize that the dimensions of temperament pertaining to negative affectivity and effortful control will be associated with the presence of comorbid ODD+AD. This comorbid disorder will also have higher levels of aggressiveness because children have a negative affect that predisposes them to solve situations aggressively. Also, we hypothesized that the degree of risk associated ODD+AD comorbidity with paternal



psychopathology is comparable to that associated with maternal psychopathology. We hypothesize that low positive parenting style and high over-controlling parenting style are part of the underlying processes of ODD+AD comorbidity. Finally, we expect ADs to exacerbate ODD in childhood. All these variables could differently affect ODD+AD comorbidity depending on the sex of children.

## **Methods**

### ***Participants***

The sample is part of a large longitudinal research project on behavioral disorders in childhood. A two-phase design was employed, extensively described in 3). A total of 2,283 families were obtained from the census of all 3-year-old children attending school in Barcelona (N = 13,578). A total of 1,341 agreed to participate in the first phase. Sixty-three children were excluded due to language issues or overall developmental problems, and the remaining 1,278 were screened using the behavioral problems scale of the Strengths and Difficulties Questionnaire (parent version) for 3 to 4 year-olds (SDQ3-4; Goodman, 1997) plus four symptoms from the Diagnostic and Statistical Manual of Mental Disorders ODD (DSM-IV-TR; American Psychiatric Association, 2000) not present in the questionnaire (deliberately annoys people, blames others, is touchy, angry and resentful). A positive screening was considered to be raw scores of  $\geq 4$  in the SDQ<sup>3-4</sup> conduct problems scale or a response option of 2 ('certainly true') in any of the 8 DSM-IV ODD symptoms list.

Exclusion criteria included children showing intellectual disability or pervasive developmental disorders, families with difficulties with the two official languages in Catalonia (Spanish or Catalan), or without a primary caregiver who could report about the child.

All children with a positive screening score were invited to participate (N = 522 cases, 42.9%), as well as a random 30% of the N = 756 children with a negative screening score.

The final sample at the end of the screening phase included 622 children (417 with a positive screening score and 205 negative).

Into the whole sample followed during the preschool age (N = 622), at the baseline measurement time 310 children were boys (49.8%) and Socioeconomic status (Hollingshead, 1975) was distributed as follows: 205 families at high level (33.0%), 195 at medium-high level (31.4%), 88 at a medium level (14.1%), 99 at medium-low level (15.9%) and 35 at low level (5.6%). The number of children attending public school was 398 (64.0%), while the remaining 224 participants (36.0%) attended to private school. Most children were of Caucasian-white ethnicity (554, 89.1%).

From the initial sample of N = 622 participants at age 3 years, n=103 children were selected for the analysis: those who had ODD only (n = 44), AD only (n = 42) or ODD+AD comorbidity (n = 17). The sex distribution was 50 girls (48.5%) and 53 boys (51.5%).

Socioeconomic status (Hollingshead, 1975) was distributed as follows: 52 subjects at high or medium-high levels (50.4%), 19 at a medium level (18.4%) and 32 at medium-low or low levels (31.0%).

The initial N = 622 children were followed for the two next years. This work includes data from assessments at ages 3 and 5, into the same cohort of children (repeated samples). At the age of 5, data was available for n=537 (86.3%) of the children who initiated the follow-up. No statistical differences emerged between dropouts during the follow-up and completers in sex ( $p=.44$ ) nor socioeconomic status ( $p=.29$ ). From this sample, n=106 children were selected with ODD only (n = 31), AD only (n = 60) or ODD+AD comorbidity (n = 15). No significant differences emerged for sex distribution ( $p = .284$ ) and socioeconomic status ( $p = .258$ ) when comparing the diagnostic groups.

### ***Instruments***

#### *The Diagnostic Interview for Children and Adolescents for Parents of Preschool and Young Children*

The Diagnostic Interview for Children and Adolescents for Parents of Preschool and Young Children (DICA-PPYC; Reich & Ezpeleta, 2009) is a semi-structured interview adapted to the Spanish population (Ezpeleta, de la Osa, Granero, Domènech, & Reich, 2011), and is designed to assess mental disorders in children aged 3-7 years according to the DSM-IV criteria. The diagnoses of the interview were used to form the groups (ODD, AD and ODD+AD). In this study AD included separation anxiety, generalized anxiety disorder, specific phobia and social phobia. The "other comorbidity" variable included as a covariate (control value) in the analysis included ADHD, conduct disorder, depression and dysthymia. The instrument showed acceptable test-retest agreement and moderate convergence with other measures of psychopathology. The inter-rater reliability for DICA-PPYC showed good kappa concordance for ODD and AD (Ezpeleta et al., 2011).

#### *The Children's Behavior Questionnaire for 3–7 years*

The Children's Behavior Questionnaire for 3–7 years (CBQ3-7; Rothbart, Ahadi, Hershey, & Fisher, 2001) assesses reactive and self-regulatory temperament for 94 items organized into 15 scales of the first order, which also makes it possible to obtain 3 overall dimensions of temperament: negative affectivity, surgency and effortful control. The information in this tool was provided by the parents. Mothers completed the questionnaire in 62.8% of the cases, fathers in 8.0% and both parents completed it together in 29.3% of the cases. The psychometric properties of this instrument are adequate (Gagne, Van Hulle, Aksan, Essex, & Goldsmith, 2011).

### *The Alabama Parenting Questionnaire*

The Alabama Parenting Questionnaire (APQ; Frick, 1991) assesses the different parental educational styles. We used the APQ-Pr (de la Osa, Granero, Penelo, Domènech, & Ezpeleta, 2013) preschool adaptation consisting of 42 items rated on a Likert scale (from 1 "never" to 5 "always") adapted from the wording of the original eight-item questionnaire, which was considered unsuitable for preschoolers. This evaluates five scales: involvement, positive parenting style, corporal punishment, inconsistent discipline and poor supervision. This study aggregated two scales: norms and autonomy (Meunier & Roskam, 2009). The good psychometric properties of this instrument are detailed in de la Osa et al. (2013).

### *The Children's Aggression Scale*

The Children's Aggression Scale (CAS; Halperin & McKay, 2008) assesses aggressive behavior for 22 items with a Likert scale (from 0 = "never" to 4 = "many days"). In this study, verbal aggression, physical aggression and total aggression were analyzed. The questionnaire was answered by teachers when the children were 3 years old. The scale as a whole has excellent reliability (Halperin, McKay, Grayson, & Newcorn, 2003).

### *Risk Factors Schedule*

Risk Factors Schedule (PFR in Spanish; Unitat d'Epidemiologia i de Diagnòstic en Psicopatologia del Desenvolupament, 2009) consists of a listing of situations which can have a significant impact on the development of mental disorders. The number of stressful life events was analyzed.

### *The Adult Self-Report*

The Adult Self-Report (ASR; Achenbach & Rescorla, 2003) was used to assess the psychological problems and psychosocial functioning of parents for 126 items. This made it possible to obtain scores on 5 scales of adaptive functioning (friends, couples, family, work

and education), 8 syndrome scales (anxiety-depression, withdrawal, somatic complaints, thought problems, attention problems, aggressive behavior, rule breaking and intrusive behavior) and 3 scales of substance use (snuff, alcohol and drugs). In this study the responses of fathers and mothers were analyzed. The ASR is widely used, and has strong research foundations and psychometric properties (Achenbach & Rescorla, 2003).

This study analyzed the diagnoses generated with the DICA interview in children of 3 and 5 years of age, and scores from questionnaires obtained when the participants were 3. The internal consistency of the analyzed scales is included in Table A (online).

### ***Procedure***

Approval was obtained from the Ethics Review Committee of the authors' institution. Head teachers of the participating schools were provided with a full description of the research, and their collaboration was also requested. Families were recruited at the school and they were invited to participate in the longitudinal project. All the families included in the study gave written consent. Interviewers trained to use the DICA-PPYC interviewed parents at the schools. The interview panel consisted of 10 members who completed an intensive 1-week training period consisting of learning the characteristics of the symptoms and disorders, the methods for identifying these characteristics and how to code the symptoms. The questionnaires were answered at the center by the participants' parents.

### ***Data analysis***

Data analysis was carried out using SPSS20 for Windows. Due to the multi-phase design the analysis was weighted, assigning to each participant a weight equal to the inverse probability of selection in the second phase of sampling (after the screening).

To obtain the best predictors of the criterion (dependent variable) *diagnostic subtype* (ODD only, AD only or ODD+AD comorbidity), regression analyses were estimated considering the potential risk factors of the independent variables. Since the response in this modeling corresponds to a multilevel nominal variable, multinomial logistic regression was carried out. This statistical procedure (also known as polytomous LR, multiclass LR or multinomial logit) constitutes an extension of the binary logistic regression to multiclass dependent variables (categorical outcomes with more than two levels), and consequently each estimated B-parameter in regressions with multiple predictor variables represents the expected change in the *log* odds of being in the corresponding class of the criterion (compared to other reference groups) for a unit increase in the corresponding independent variable while holding the other predictor variables constant at a certain value. Each exponentiated  $e^B$  coefficient is the ratio of two odds (odds ratio, OR), or the change in odds in the multiplicative scale for a unit increase in the corresponding predictor variable while controlling for the other variables.

The estimation of the predictive models was done in two steps. Firstly, due to the large list of independent variables, initial single multinomial s were adjusted (one regression for each independent variable). Each single model was controlled by the covariates “presence of comorbidities other than ODD and AD” and children’s sex. And since one objective of the analysis was to obtain evidence about the potential moderating role of the children’s sex on the relationship between the independent variables and the diagnostic subtype, the interaction parameter of the children’s sex was tested for each potential predictor; non-relevant interaction parameters ( $p > .10$ ) were excluded from the model while relevant interactions ( $p \leq .10$ ) were retained and single effects were estimated (single effects represent the contribution of the risk factor on the criterion separately for boys and girls).

The second step of the multinomial regression analysis consisted of multivariate models with significant predictors for the diagnostic subtype (ODD only, AD only or

ODD+AD). Stepwise procedure was used considering as independent variables all the significant predictors identified in the single models. Two final multinomial regressions were obtained, one with the main variables explaining the diagnostic subtype at age 3 and the other with the main predictors at age 5 (this last model included as predictors the variables measured at 3 years, and as the criterion the diagnostic subtype at age 5). Both of these final models included the covariates children's sex and other comorbidities different to ODD and AD (at baseline, age 3). The Fadden  $R^2$  coefficient estimated the overall predictive ability of the final regressions.

## **Results**

### ***Frequency distribution and correlation of the main variables of the study***

Table A (online) presents the list of the associated variables analyzed in this study and their distribution (percentages and means) in the three diagnostic groups separately at ages 3 and 5. The frequency distributions for two additional reference groups have also been included with the aim of facilitating the interpretation of the results: a healthy group with children who did not meet criteria for any psychopathological disorder in the diagnostic interview and a group with the children who met the criteria for any disorder different to ODD and AD.

Table B (online) contains the correlation matrix for the main variables considered as potential risk factors for the presence of the ODD+AD comorbidity during preschool age.

### ***Cross sectional associations of associated variables and ODD+AD comorbidity at age 3***

Model 1 included in Table 1 corresponds to the final multinomial regression with the main associated variables (measured at age 3) of the diagnostic subtype (also at age 3,

classified as ODD only, AD only and ODD+AD comorbidity). The results of this model are adjusted to the covariates of the children's sex and comorbidities other than ODD and AD. These two variables played the role of covariates and were adjusted according to the many empirical results evidencing strong associations between young children's gender and the presence of psychological disorders with the potential risk factors (a lack of adjustment could lead to biased results). The odds of presenting a comorbid diagnosis ODD+AD (compared with ODD only) are increased by high scores on the ASR-father-total. The odds of presenting a comorbid ODD+AD (compared with AD only) are increased by high scores on CBQ-anger frustration, low scores on CBQ-inhibitory control, low scores on CAS-verbal aggression and high scores on ASR-mother aggressive behavior. This model obtained a very good overall predictive ability ( $R^2_a = .580$ , adjusted to the covariates included in the regression). Comparing the presence of AD only and ODD only, high scores on anger/frustration and mothers aggression are associated with ODD only, while high scores on fear, inhibitory control and shyness (for females) are associated with AD only.

--- Insert Table 1 ---

### ***Age 3 predictors of ODD+AD comorbidity at age 5***

The second model in Table 1 presents the predictive multinomial model valuing the main associated variables (measured at age 3) of the diagnostic subtype (measured at age 5). This model was also adjusted by the children's sex and the presence of disorders other than ODD and AD at baseline. The presence of the comorbid ODD+AD (compared with both ODD only and AD only) was predicted by high scores on the CBQ-Approach-Positive Anticipation, and low scores on CBQ-Smiling/Laughter. Moreover, the CBQ-Fear score showed a significant interaction with sex ( $p < .001$ ), in the sense that high scores were linked to reduced ODD+AD comorbidity in girls and predictors of such comorbidity in boys. The



odds of ODD+AD comorbidity (compared with ODD only) were associated with low scores on APQ-corporal punishment, while high scores on CAS-Total score predicted ODD+AD comorbidity (compared with AD only). The overall predictive capability of Model 2 was also very good ( $R^2_a = .433$ , adjusted to the covariates included in the regression). The comparison of AD only versus ODD only shows that the odds of ODD are increased for children with high CAS-Total and APQ-Punitive parenting scores.

### ***Stability ODD+AD comorbidity from ages 3 to 5***

Considering the whole sample of participants with the data available at age 5 ( $n=574$ ), 4 children (weighted prevalence equal to 0.35%; 95% CI: 0.10% to 1.27%) presented persistent chronic comorbid ODD+AD during the follow-up between ages 3 and 5, eleven children (1.50%; 95% CI: 0.71% to 2.74%) were comorbid only at age 3, the other 11 only at age 5 (1.50%; 95% CI: 0.71% to 2.74%), and 548 children (96.7%; 95% CI: 94.9% to 97.9%) were free of comorbid ODD+AD during preschool age 3 to 5. According to these results, the risk of developing the comorbidity during ages 3 to 5 (the incidence of children with ODD+AD present at age 5 among those starting the comorbidity absent at baseline) was 1.60% (95% CI: 0.84% to 3.02%), and the risk of remission of the comorbidity during follow-up (the incidence of children without ODD+AD at age 5 among those with the comorbidity present at baseline) was 80% (95% CI: 49.0% to 94.3%).

In the cohort of children aged 3 diagnosed with ODD only (and taking the whole sample of children with complete data at the end of the follow-up,  $n=574$ , as a reference), the diagnostic subtype was distributed at age 5 as follows: 35.7% in the health control group (absence of any psychological disorder), 28.6% in disorders other than ODD and AD, 25.0% remained in the same diagnostic condition (ODD-only), 3.6% were reclassified into the AD only and 7.1% into the ODD+AD comorbidity groups. The subsample of children aged 3

diagnosed with AD only was distributed as follows two years later: 33.3% in the health control group, 18.2% in the group with disorders other than ODD and AD, 3.0% in the ODD only condition, 42.4% in the AD only condition and 3.0% in the ODD+AD comorbidity.

## **Discussion**

The results of this study make it possible to identify specific associated variables for ODD+AD comorbidity (cross-sectionally and longitudinally) in the general population of preschoolers. Cross-sectionally, at age 3, the factors associated with ODD+AD comorbidity differ in degree from those of ODD; only the father's psychopathology (higher) is specifically associated with ODD+AD comorbidity. The factors associated with ODD+AD comorbidity differ more in comparison with those which are associated with the presence of AD only; in this case the comorbidity is associated with higher levels of anger-frustration, less inhibitory control, less verbal aggression and with high levels of the mother's aggressive behavior, which indicates that these risk characteristics are more attenuated in children who suffer only from AD. Longitudinally however, ODD+AD comorbidity has consistently different levels in its predictors when compared with the disorders individually. The risk profile for ODD+AD comorbidity at 5 years of age would be marked by a temperament characterized by high approach, low fear (in girls), high fear (in boys) and low positive affect, high aggressive behavior when compared with AD, and lower body punishment when compared to ODD at age 3. Therefore ODD+AD comorbidity seems to have specific predictors, which are more clearly established as the children progress in their development. The results of the temporal stability of comorbid ODD+AD indicated that the risk of developing the comorbidity from ages 3 to 5 was 1.60%, and the risk of remission of the comorbidity during follow-up was 80%.

*Child temperament*

The temperament characteristics of children with comorbid ODD+AD at age 3 are characterized by a high negative emotionality, low inhibitory control and a low frequency of verbal aggression. Firstly, difficult temperamental styles, such as negative emotionality, irritability and low frustration tolerance, have been linked to both anxiety and aggression (Bubier & Drabick, 2009), and, in particular, reactive aggression (Ortiz & del Barrio, 2006). This frustration/anger and overt aggression may involve reactive negative affect, and children may become frustrated and angry, and are more likely to lash out at others (Deater-Deckard et al., 2010). Two types of aggression can be distinguished: proactive and reactive. Proactive aggression responds to an instrumental pattern, well-organized and goal-directed, motivated by obtaining reward and regulated by the reinforcement. Reactive aggression, however, responds to a reactive and uncontrolled stimulus, and it is motivated by a challenge pattern, by fear and irritability (Hubbard, Romano, McAuliffe, & Morrow, 2010). Reactive aggression is more linked to hostile attribution and ambiguous stimulus, both elements usually present in children who present the comorbid ODD+AD condition. Low language skills are typical of preschool age, and aggressive behaviors tend to be more physical than verbal. It is not surprising that children with ODD+AD choose physical aggression to deal with problematic situations. Underlying biological processes may contribute to both negative emotionality and the subsequent behavioral problems (Rothbart & Bates, 1998). In addition, this temperamental trait (negative emotionality) may elicit caregiver responses (e.g. harsh discipline), that might lead to problems being externalizing later.

Secondly, we also found that problems in emotional dysregulation and a low inhibitory control indicate a higher probability of experiencing ODD+AD comorbidity. According to the model proposed by Drabick et al. (2010) in which anxiety can exacerbate ODD symptoms, the lack of inhibitory control and impulsivity characteristic of ODD+AD

comorbidity could precipitate children into conflict situations, since on the one hand, anxiety may lead them to interpret ambiguous situations as hostile, and a lack of control does not allow them to stop and choose appropriate types of behavior. Children with comorbid ODD+AD will have more difficulties in following rules, will present more impairment at school, and will receive more punishment; which in turn will generate more anger and frustration. Thirdly, reactive aggression and anxiety symptoms are related to ODD+AD comorbidity (Bubier & Drabick, 2009). For example, children with ODD+AD comorbidity and in an ambiguous situation construed as threatening first attempt to flee, rather than initiating conflict with verbal aggression. It is therefore more likely that the type of aggression in children with comorbid ODD+AD is more physical than verbal in nature.

Longitudinally, temperament characteristics at age 3 were differentially predictive of comorbidity in comparison with the individual disorders. It may be that underlying processes trigger a behavioral activation system in which reward-seeking behavior, when impeded, increases the likelihood of internalizing and externalizing problems for some children (Deater-Deckard et al., 2010). Therefore, interventions aimed at regulating frustration and anger may be more effective if they also address the management of approach behavior.

A temperament with a tendency to experience fear is also predictive of ODD+AD comorbidity. The association was moderated by sex, with fear being a protective factor for girls and a related factor for boys. In line with a socialization hypothesis (Maccoby & Jacklin, 1974), the expression of fear is more acceptable for girls than for boys, which can mean that for fearful boys, hostile situations that are better coped with by adopting an aggressive response. The Smiling and Laughter scale in this study assessed the amount of positive affect in response to changes in stimulus intensity, rate, complexity, and incongruity. The low level on this scale could also be explained by the interaction with parents, since, as indicated by Fraire and Ollendick (2013), emotional expression in parents of children with ODD+AD

comorbidity is less positive than in parents of children without ODD+AD comorbidity. One possible explication of why children with ODD+AD comorbidity smile and laugh less frequently than children without this comorbidity might be that the internal discomfort of having two disorders together leads to less smiling probably because they are less happy than children who do not suffer from any disorders. Along similar lines, comparing ODD only and AD only, the ODD+AD group at age 5 had lower positive affect than at age 3. It is possible that this is a developmental pathway to depression (De Pauw & Mervielde, 2010). This suggests that low positive affect predicts depression and so does ODD and anxiety. Both high approach and low positive affect were linked to comorbid ODD+AD. A positive affect when accompanied by an intense, impulsive approach is associated with externalizing disorders (Stifter, Putnam, & Jahromi, 2008) and AD could exacerbate ODD symptoms (Drabick et al., 2010).

#### *Parental psychopathology and parental practices*

The psychopathology of the fathers is becoming increasingly important in relation to the mental health of their children at age 3, but few studies have data on parents due to their lower participation. In a study into parental depression, Kane and Garber (2004) found that only the father's depression, compared with the mother's depression, was associated with internalizing and externalizing problems in children. In our study, there is evidence that the psychopathology of the father is associated with comorbid ODD+AD and AD when compared with ODD only. Studies on family systems recognize the importance of parental influence on children and family (Bell et al., 2007), but despite this there is still much less research about fathers. Bögels and Phares (2008) found that fathers might have an even greater influence than mothers on the development of children's social anxiety, and a possible explanation for this would be in the role played by the father in socializing their children. That is, parental anxiety may cause the relationship of parents with their offspring to be less affectionate and

more conflictual, which would lead children to be at risk for anxiety symptoms. Recent findings have suggested that the father's psychopathology can be associated with an increased risk of problems for children, regardless of maternal psychiatric wellbeing (Ramchandani & Psychogiou, 2009). In other studies, the impact of paternal psychopathology on child outcomes appears modest but given the constraints of the time factor, as fathers spend less time with their children compared to mothers, this could make it seem that mothers have more effect on their children (Pilowsky et al., 2014). Regarding the influence of mothers, the association of maternal aggression and ODD+AD comorbidity can be explained by shared genes or by modelling that favors similar personalities and types of behavior (Wahl & Metzner, 2011). Mothers of aggressive children can therefore model a hostile attribution because of the tendency to view the ambiguous actions of others as hostile, increasing the probability of responding with aggression (MacBrayer, Milich, & Hundley, 2003).

With regard to parental practices, the results of this study indicate that low levels of punitive parenting predict ODD+AD comorbidity, given that children with comorbid ODD+AD or AD alone are spanked less than children with ODD alone. This suggests that anxiety may have a mitigating effect on the expression of the comorbid disorder and it is for this reason that children are punished less.

In terms of the stability of ODD+AD comorbidity, preschoolers with ODD are likely to continue to exhibit the disorder, with increasing comorbidity with anxiety disorders. Our study into the stability of ODD+AD comorbidity from ages 3 to 5 was weak: from the  $n=17$  children who presented the comorbid ODD+AD at baseline, only 4 children met diagnostic criteria for these both concurrent conditions two years later (3 other children progressed to ODD only, 2 progressed to AD only, 2 progressed to other disorders different to ODD and AD, 4 extinguished the disorders and were classified into the healthy group, and 2 dropped-out the study). And considering the  $n=15$  children who met criteria for ODD+AD comorbidity

at the end of the follow-up (age 5 years-old), 4 children had been chronic comorbid since age 3, 4 children presented ODD only at age 3, 1 child presented AD only, 4 had presented some disorder different to ODD and AD, and 2 children were into the healthy group at baseline. These results are not consistent with other reported in the literature, such as Lavigne et al. (2001) who found that ODD+AD stability in preschoolers was moderate to high. One possible reason to explain this discrepancy is that our study has been performed in a community sample (our data is representative to the general population), where the stability of the psychiatric conditions tends to be fewer than stability reported in clinical settings. It should also be aware that although the sample of children in this study is large, the origin of the participants (general population) leads a relatively small group of comorbid ODD+AD children and the statistical power to accurately assess the time stability of this condition is small. Longer stability studies with larger samples with different precedence (general and clinical populations) are necessary in order to draw conclusions about the question of the stability of ODD+AD.

We expected that anxiety may exacerbate ODD, but our results do not necessarily support this argument. For instance, at age 3 the ODD+AD and ODD groups only differed on total father's psychopathology, whereas the ODD+AD and AD groups differ on several variables. This suggests that it is the addition of ODD that seems to be related to more problematic characteristics. Thus, ODD is likely to be the more impairing problem at age 3. Based on these findings, very few differences emerge when the comorbid group is compared with the ODD only group, which suggests that the ODD is contributing to the impairment, not the addition of the AD. We were hoping that AD exacerbates ODD but it could be the addition the ODD diagnosis which implies further impairment in children. It is true that children with ODD+AD comorbidity are less verbally aggressive compared to children with anxiety, but when aggression is recognized in all its forms, children with ODD+AD

comorbidity are more aggressive than children who only meet the anxious diagnosis. So it may be that anxiety decreases a particular type of aggressiveness in children with ODD.

### *Limitations*

The sample from which this study's diagnostic subtypes are drawn is very large, and therefore, since it is a general population, the size of the subtypes for ODD, AD and ODD+AD comorbidity is reduced, which is to be expected. This study provides no direct information from children, even though at this age parents are one of the best sources of information and also have information for teachers. In addition, significant associations were found that have important practical implications. Finally, it must be considered that although some studies have found moderate reliability (homotypic and heterotypic comorbidity) in the presence of some psychiatric disorders during the preschool age (Bufferd et al., 2012), the validity of psychiatric diagnoses in young children is as yet debated in the scientific literature and the potential lack of stability for ODD and AD symptoms during the preschool period analyzed in this work could affect the variables retained in the predictive models.

### *Implications*

The main contributions of this work are the inclusion of a large set of potential variables that could influence the presence of the comorbid ODD+AD condition, the availability of a large community sample of young children, the prospective longitudinal design (follow-up between ages 3 to 5), and the analysis of measures including questionnaire and diagnostic structured interview data.

This work promotes a greater understanding of the presence of the comorbid condition ODD+AD at very young ages, its prevalence and main risk factors. Our results underline the relevance of assessing the relationships between children at high risk of externalizing and



internalizing symptoms and their caregivers. The negative consequences of having comorbid ODD+AD and the considerable influence of comorbidity on treatment efficacy (Rapee et al., 2013) highlight the importance of studying the factors that facilitate these partnerships in order to direct tasks of early prevention more accurately. We should be alert to certain temperament traits in preschoolers that may indicate a risk of developing ODD+AD comorbidity, with the negative consequences that this entails and the high risk of further psychopathology during school age and even adolescence (Leadbeater & Homel, 2015).

Future research into developing appropriate measurement instruments to easily identify this comorbid condition at young ages, and new studies on the etiology and developmental trajectories are needed in order to further prevention and treatment strategies, and to verify the effectiveness of the existing therapy protocols.

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Table 1. Final predictive multinomial models for the diagnostic subtype.

Comparison →	ODD+AD / ODD		ODD+AD / AD		AD / ODD	
	OR	95% CI (OR)	OR	95% CI (OR)	OR	95% CI (OR)
<b>Model 1. AV=age 3; Diag=age 3. (<math>R^2_a=.580</math>)</b>						
CBQ: Anger-Frustration	2.33	(0.48; 11.4)	<b>41.3</b>	<b>(3.67; 465)</b>	<b>0.06</b>	<b>(0.01; 0.45)</b>
CBQ: Fear	1.47	(0.59; 3.68)	0.50	(0.13; 1.83)	<b>2.96</b>	<b>(1.02; 8.62)</b>
CBQ: Inhibitory control	1.18	(0.30; 4.67)	<b>0.10</b>	<b>(0.01; 0.96)</b>	<b>11.62</b>	<b>(1.70; 79.3)</b>
CBQ: Shyness	1.12 <sup>F</sup>	(0.20; 6.36)	0.15 <sup>F</sup>	(0.02; 1.08)	<b>7.70<sup>F</sup></b>	<b>(2.06; 28.8)</b>
	7.63 <sup>M</sup>	(0.92; 63.0)	10.5 <sup>M</sup>	(0.92; 120)	0.73 <sup>M</sup>	(0.17; 3.17)
CAS: Verbal aggression	0.97	(0.95; 1.00)	<b>0.97</b>	<b>(0.95; 0.99)</b>	1.00	(0.99; 1.01)
APQ: Inconsistent discipline	0.63	(0.37; 1.07)	1.00	(0.50; 2.00)	0.63	(0.37; 1.07)
ASR-Mother: aggressive behavior	1.13	(0.80; 1.60)	<b>2.52</b>	<b>(1.36; 4.65)</b>	<b>0.45</b>	<b>(0.26; 0.78)</b>
ASR-Father: Total Score	<b>1.20</b>	<b>(1.04; 1.38)</b>	1.00	(0.87; 1.16)	<b>1.19</b>	<b>(1.04; 1.37)</b>
<b>Model 2. AV=age 3; Diag= age 5. (<math>R^2_a=.433</math>)</b>						
CBQ: Approach-Positive Anticipation	<b>31.3</b>	<b>(1.86; 528)</b>	<b>18.7</b>	<b>(1.23; 283)</b>	1.68	(0.51; 5.50)
CBQ: Fear	<b>0.01<sup>F</sup></b>	<b>(0.00; 0.25)</b>	<b>0.01<sup>F</sup></b>	<b>(0.00; 0.21)</b>	1.24 <sup>F</sup>	(0.52; 2.95)
	<b>11.9<sup>M</sup></b>	<b>(1.34; 106)</b>	<b>13.6<sup>M</sup></b>	<b>(1.47; 125)</b>	0.88 <sup>M</sup>	(0.29; 2.64)
CBQ: Smiling/Laughter	<b>0.02</b>	<b>(0.00; 0.35)</b>	<b>0.02</b>	<b>(0.00; 0.46)</b>	0.71	(0.27; 1.86)
CAS: Total Score	1.05	(0.98; 1.14)	<b>1.11</b>	<b>(1.02; 1.20)</b>	<b>0.95</b>	<b>(0.92; 0.99)</b>
APQ: Punitive parenting	<b>0.13</b>	<b>(0.03; 0.64)</b>	0.46	(0.10; 2.12)	<b>0.28</b>	<b>(0.11; 0.68)</b>

Note. Results obtained in multinomial regression adjusted by the sex covariates and the presence of comorbidities other than ODD and AD.

$R^2_a = R^2$  coefficient adjusted to covariates. Bold: significant parameters (.05 level).

ODD: Oppositional Defiant Disorder. AD: Anxiety Disorder. ODD+AD: ODD+AD comorbidity.

OR: Odds ratio. CI: Confidence Interval.

CBQ: Children's Behavior Questionnaire. CAS: Children's Aggression Scale. APQ: Alabama Parenting Questionnaire. ASR: Adult Self-Report. RF: associated variables. <sup>F</sup>Single effects for girls (females). <sup>M</sup>Single effects for boys (males).

Model 1: associated variables (AV) and diagnostic group (Diag) measured at age 3 ( $n=103$ ).

Model 2: associated variables (AV) measured at age 3 and diagnostic group (Diag) at age 5 ( $n=106$ ).

Table A-material online

Distribution of prevalence and mean scores for the associated variables at age 3 and 5 years

	# items	$\alpha$	Age 3					$p$	Age 5					$p$
			ODD 1; n=44	AD 2; n=42	ODD+AD 3; n=17	HC 4; n=378	Other 5; n=141		ODD 1; n=31	AD 2; n=60	ODD+AD G3; n=15	HC 4; n=343	Other 5; n=125	
Male sex (%)			48.2	55.0	61.7	52.9	40.5	.119	49.0	55.2	52.9	47.4%	59.0%	.265
Low SES (%)			6.0	3.5	4.8	2.1 <sup>5</sup>	10.3 <sup>1</sup>	<b>.001*</b>	0.0	4.4	10.6	3.3%	3.6%	.727
<i>CBO: temperament</i>														
Activity Level	7	.74	4.67 <sup>2,4</sup>	3.73 <sup>1,5</sup>	4.40	3.91 <sup>1</sup>	4.22 <sup>2,4</sup>	<b>&lt;.001*</b>	4.24	4.04 <sup>5</sup>	4.48	3.84 <sup>5</sup>	4.50 <sup>2,4</sup>	<b>&lt;.001*</b>
Anger-Frustration	6	.73	4.97 <sup>4,5</sup>	4.52 <sup>3,4</sup>	5.60 <sup>2,4,5</sup>	4.07 <sup>1,2,3,5</sup>	4.37 <sup>1,3,4</sup>	<b>&lt;.001*</b>	4.82 <sup>4,5</sup>	4.34 <sup>3</sup>	5.23 <sup>2,4,5</sup>	4.11 <sup>1,3</sup>	4.31 <sup>1,3</sup>	<b>&lt;.001*</b>
Approach-Positive anticipa.	6	.48	4.98 <sup>4</sup>	4.69	4.84	4.67 <sup>1,5</sup>	4.94 <sup>4</sup>	<b>.003*</b>	4.76	4.79	5.25	4.69	4.83	<b>.069</b>
Attentional Focusing	6	.69	4.38 <sup>2,4,5</sup>	5.08 <sup>1</sup>	4.62	4.90 <sup>1</sup>	4.91 <sup>1</sup>	<b>.049*</b>	4.51 <sup>4</sup>	4.97 <sup>5</sup>	4.57	5.01 <sup>1,5</sup>	4.42 <sup>2,4</sup>	<b>&lt;.001*</b>
Discomfort	6	.68	4.06 <sup>2,3</sup>	4.71 <sup>1,4,5</sup>	5.13 <sup>1,4,5</sup>	4.14 <sup>2,3</sup>	4.17 <sup>2,3</sup>	<b>.002*</b>	4.40 <sup>5</sup>	4.42 <sup>5</sup>	4.74 <sup>5</sup>	4.22 <sup>5</sup>	3.82 <sup>1,2,3,4</sup>	<b>.001*</b>
Falling Reactivity-Sooth.	6	.63	4.44 <sup>4</sup>	4.78 <sup>3</sup>	3.91 <sup>2,4,5</sup>	4.99 <sup>1,3</sup>	4.81 <sup>3</sup>	<b>&lt;.001*</b>	4.23 <sup>2,4,5</sup>	4.96 <sup>1</sup>	4.46	4.95 <sup>1</sup>	4.92 <sup>1</sup>	<b>.008*</b>
Fear	6	.63	3.60 <sup>2</sup>	4.51 <sup>1,4,5</sup>	4.33 <sup>4</sup>	3.47 <sup>2,3</sup>	3.63 <sup>2</sup>	<b>&lt;.001*</b>	3.49	3.82	3.53	3.58	3.44	.437
High Intensity Pleasure	6	.65	4.96 <sup>4</sup>	4.53	4.56	4.33 <sup>1</sup>	4.52	<b>.026*</b>	4.45	4.56	4.59	4.30 <sup>5</sup>	4.71 <sup>4</sup>	<b>.009*</b>
Impulsivity	6	.61	4.82 <sup>2,3,4</sup>	3.92 <sup>1,4,5</sup>	3.90 <sup>1,5</sup>	4.34 <sup>1,2,5</sup>	4.54 <sup>2,3,4</sup>	<b>&lt;.001*</b>	4.84 <sup>2,4</sup>	4.23 <sup>1,5</sup>	4.28	4.31 <sup>1,5</sup>	4.59 <sup>2,4</sup>	<b>.009*</b>
Inhibitory Control	6	.61	4.02 <sup>2,4,5</sup>	4.85 <sup>1,3</sup>	4.15 <sup>2,4,5</sup>	4.88 <sup>1,3</sup>	4.87 <sup>1,3</sup>	<b>&lt;.001*</b>	4.33 <sup>4</sup>	4.75	4.56	4.94 <sup>1,5</sup>	4.53 <sup>4</sup>	<b>&lt;.001*</b>
Low Intensity Pleasure	8	.56	5.79	6.01	5.77	5.81	5.93	.209	5.81	6.04	5.96	5.84	5.78	.163
Perceptual Sensitivity	6	.69	5.42	5.60	5.57	5.47	5.60	.647	5.59	5.47	5.58	5.49	5.48	.986
Sadness	7	.50	3.79 <sup>2,3</sup>	4.30 <sup>1,4,5</sup>	4.39 <sup>1,4,5</sup>	3.72 <sup>2,3</sup>	3.84 <sup>2,3</sup>	<b>.001*</b>	3.96	3.89	4.34	3.80	3.67	.114
Shyness	6	.79	3.27 <sup>2,3</sup>	4.21 <sup>1,4,5</sup>	4.39 <sup>1,4,5</sup>	3.36 <sup>2,3</sup>	3.45 <sup>2,3</sup>	<b>&lt;.001*</b>	3.28 <sup>2</sup>	4.12 <sup>1,4,5</sup>	4.13 <sup>4,5</sup>	3.36 <sup>2,3</sup>	3.27 <sup>2,3</sup>	<b>&lt;.001*</b>
Smiling and Laughter	6	.56	5.51	5.27	5.40	5.62	5.52	.121	5.68	5.50	5.11	5.63	5.47	.073
<i>CAS: aggression</i>														
Verbal aggression	6	.73	82.7	52.3	34.3	47.2	62.9	.216	99.1 <sup>2,4</sup>	29.5 <sup>1,5</sup>	77.4	47.0 <sup>1</sup>	67.4 <sup>2</sup>	<b>.011*</b>
Physical aggression	8	.67	111.7	107.6	107.6	109.1	108.8	.698	116.6 <sup>2,4,5</sup>	106.1 <sup>1,5</sup>	111.0	108.4 <sup>1</sup>	110.2 <sup>1,2</sup>	<b>.002*</b>
Total	22	.82	272.4	263.0	264.1	265.1	266.2	.392	280.9 <sup>2,4,5</sup>	259.6 <sup>1,5</sup>	271.5	264.4 <sup>1</sup>	267.4 <sup>1,2</sup>	<b>&lt;.001*</b>
<i>APQ: parenting style</i>														
Positive parenting	6	.66	18.37	18.82	18.37	18.31	18.46	.906	18.37	18.21	18.89	18.26	18.88	.372
Father/mother involvement	8	.56	19.29	20.09	18.31	20.60	20.51	.514	19.13	19.87	20.56	20.56	20.98	.566
Poor monitoring-supervision	6	.20	12.63	12.98	13.61	12.91	12.89	.725	12.86	13.27	13.89	12.78	12.94	.201
Punitive parenting	3	.42	1.62 <sup>4,5</sup>	1.16	1.48	0.99 <sup>1</sup>	0.97 <sup>1</sup>	<b>.039*</b>	2.25 <sup>2,4,5</sup>	0.96 <sup>1</sup>	1.47	0.94 <sup>1</sup>	1.13 <sup>1</sup>	<b>&lt;.001*</b>
Inconsistent discipline	3	.43	4.81 <sup>2</sup>	3.30 <sup>1,5</sup>	4.58	3.98 <sup>5</sup>	4.76 <sup>2,4</sup>	<b>.001*</b>	3.79	4.78	4.74	4.05	4.17	.198
Aggregated norms scale	6	.88	21.82	22.25	21.23	22.52	22.11	.169	22.51	22.22	21.94	22.45	22.12	.753
Aggregated autonomy scale	3	.81	8.56	9.37	9.81	9.63	9.57	.113	9.23	9.11 <sup>4</sup>	9.15	9.73 <sup>2,5</sup>	9.17 <sup>4</sup>	<b>.049*</b>
<i>ASR-Mother (psychopath.)</i>														
Anxious-depressed	18	.81	7.09 <sup>3</sup>	8.03 <sup>4</sup>	10.2 <sup>1,4,5</sup>	5.81 <sup>2,3,5</sup>	7.24 <sup>3,4</sup>	<b>&lt;.001*</b>	6.42 <sup>3</sup>	8.04 <sup>4</sup>	9.82 <sup>1,4,5</sup>	5.91 <sup>2,3</sup>	6.69 <sup>3</sup>	<b>&lt;.001*</b>
Withdrawn	9	.70	1.75 <sup>3</sup>	1.87 <sup>3</sup>	3.14 <sup>1,2,4,5</sup>	1.27 <sup>3,5</sup>	1.83 <sup>3,4</sup>	<b>&lt;.001*</b>	2.00	2.45 <sup>4,5</sup>	2.65 <sup>4,5</sup>	1.28 <sup>2,3</sup>	1.28 <sup>2,3</sup>	<b>&lt;.001*</b>
Somatic complaints	12	.74	2.15 <sup>3</sup>	2.85 <sup>4</sup>	3.92 <sup>1,4</sup>	1.68 <sup>2,3,5</sup>	2.57 <sup>4</sup>	<b>&lt;.001*</b>	2.67 <sup>3,4</sup>	3.20 <sup>3,4,5</sup>	5.36 <sup>1,2,4,5</sup>	1.54 <sup>1,2,3,5</sup>	2.27 <sup>2,3,4</sup>	<b>&lt;.001*</b>
Thought problems	10	.45	1.13 <sup>3</sup>	1.44 <sup>4</sup>	1.95 <sup>1,4,5</sup>	0.76 <sup>2,3,5</sup>	1.04 <sup>3,4</sup>	<b>&lt;.001*</b>	0.98	1.40 <sup>4</sup>	1.59 <sup>4</sup>	0.73 <sup>2,3,5</sup>	1.03 <sup>4</sup>	<b>&lt;.001*</b>
Attention problems	15	.77	5.15	5.52 <sup>4</sup>	5.63	3.94 <sup>2,5</sup>	5.03 <sup>4</sup>	<b>.004*</b>	4.15 <sup>2,3</sup>	6.18 <sup>1,4,5</sup>	6.84 <sup>1,4</sup>	3.91 <sup>2,3,5</sup>	4.79 <sup>2,4</sup>	<b>&lt;.001*</b>
Aggressive behavior	15	.80	5.38 <sup>3,4</sup>	4.21 <sup>3</sup>	7.71 <sup>1,2,4,5</sup>	3.63 <sup>1,3,5</sup>	4.77 <sup>3,4</sup>	<b>&lt;.001*</b>	4.19	4.81 <sup>4</sup>	6.13 <sup>4</sup>	3.67 <sup>2,3,5</sup>	4.69 <sup>4</sup>	<b>.006*</b>
Rule-breaking behavior	14	.49	1.42	1.56	1.96	1.13	1.24	.156	1.08 <sup>2</sup>	1.85 <sup>1,4,5</sup>	1.91 <sup>4</sup>	1.02 <sup>2,3</sup>	1.27 <sup>2</sup>	<b>.001*</b>
Intrusive	6	.58	1.44	1.19	1.52	1.15	1.11	.713	0.95 <sup>2</sup>	1.68 <sup>1,4,5</sup>	1.85	1.07 <sup>2</sup>	1.18 <sup>2</sup>	<b>.017*</b>
Internalizing	39	.87	11.00 <sup>3</sup>	12.68 <sup>4</sup>	17.26 <sup>1,4,5</sup>	8.83 <sup>2,3,5</sup>	11.64 <sup>3,4</sup>	<b>&lt;.001*</b>	11.09 <sup>3</sup>	13.65 <sup>4,5</sup>	17.83 <sup>1,4,5</sup>	8.81 <sup>2,3</sup>	10.24 <sup>2,3</sup>	<b>&lt;.001*</b>
Externalizing	35	.83	8.23 <sup>4</sup>	6.94 <sup>3</sup>	11.19 <sup>2,4,5</sup>	5.91 <sup>1,3,5</sup>	7.14 <sup>3,4</sup>	<b>.001*</b>	6.22 <sup>3</sup>	8.32 <sup>4</sup>	9.89 <sup>1,4</sup>	5.78 <sup>2,3,5</sup>	7.12 <sup>4</sup>	<b>.001</b>
<i>ASR-Father (psychopath.)</i>														
Anxious-depressed	18	.79	5.46 <sup>3</sup>	4.97 <sup>3</sup>	8.23 <sup>1,2,4,5</sup>	4.86 <sup>3,5</sup>	5.71 <sup>3,4</sup>	<b>.016*</b>	6.97 <sup>4</sup>	6.18 <sup>4</sup>	4.97	4.65 <sup>1,2</sup>	5.43	<b>.005</b>
Withdrawn	9	.69	2.12	1.88	3.22	1.92	2.21	.240	2.88	2.27	1.78	1.95	1.97	.262
Somatic complaints	12	.66	1.00	1.43	2.06	1.49	1.57	.646	2.00	1.80	1.41	1.48	1.32	.522
Thought problems	10	.63	0.76	0.92	2.06	0.86	1.06	.087	1.66 <sup>4,5</sup>	1.69 <sup>4,5</sup>	1.07	0.81 <sup>1,2</sup>	0.75 <sup>1,2</sup>	<b>&lt;.001*</b>
Attention problems	15	.79	4.47 <sup>3</sup>	4.42 <sup>3</sup>	7.54 <sup>1,2,4,5</sup>	3.97 <sup>3,5</sup>	4.99 <sup>3,4</sup>	<b>.005*</b>	5.83	5.11	5.13	3.98	4.20	.065
Aggressive behavior	15	.81	3.44	3.40	5.96	3.45	3.63	.195	4.53	4.41	3.79	3.35	3.48	.180
Rule-breaking behavior	14	.54	1.19	1.68	1.80	1.38	1.70	.382	1.78	2.45 <sup>3,4,5</sup>	1.07 <sup>2</sup>	1.34 <sup>2</sup>	1.37 <sup>2</sup>	<b>.002*</b>
Intrusive	6	.63	0.83	1.01	1.91	1.31	1.43	.239	1.32	2.00 <sup>4,5</sup>	1.07	1.30 <sup>2</sup>	1.14 <sup>2</sup>	<b>.037*</b>
Internalizing	39	.86	8.61	8.32	13.51	8.27	9.25	.071	11.86 <sup>4,5</sup>	10.32 <sup>4</sup>	8.16	7.98 <sup>1,2</sup>	8.76 <sup>1</sup>	<b>.014*</b>
Externalizing	35	.86	5.47	6.12	9.67	6.15	6.76	.227	7.62	8.87 <sup>4,5</sup>	5.92	6.00 <sup>2</sup>	6.00 <sup>2</sup>	<b>.013*</b>
Number of life events			3.82 <sup>2,4,5</sup>	2.81 <sup>1,3</sup>	4.01 <sup>2,4,5</sup>	2.58 <sup>1,3</sup>	2.79 <sup>1,3</sup>	<b>&lt;.001*</b>	2.51 <sup>3</sup>	2.59 <sup>3</sup>	4.48 <sup>1,2,4,5</sup>	2.53 <sup>3</sup>	2.86 <sup>3</sup>	<b>.003*</b>

Note.  $\alpha$ = Cronbach's alpha. SES: socioeconomic status. \*Bold: significant factor. Super-index: group with a significant pairwise comparison.

ODD: Oppositional defiant disorder. AD: Anxiety disorder. ODD+AD: ODD+AD comorbidity. HC: healthy controls. Other: other disorders different to ODD and anxiety. CBO: Children's Behavior Questionnaire. CAS: Children's Aggression Scale. APQ: Alabama Parenting Questionnaire. ASR: Adult Self-Report.

Table B-material online

Correlation matrix for the main variables of the study

		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
<i>CBO: temperament</i>																				
Activity Level	1.	---	.27	<b>.44</b>	<b>-.46</b>	-.02	<b>.44</b>	<b>-.55</b>	.06	-.06	.02	.17	.23	.22	.11	.17	.16	.16	.08	.07
Anger frustration	2.	.23	---	.26	-.15	.28	.00	-.28	<b>.49</b>	.21	-.05	.07	.07	.08	.16	.21	.17	.18	.08	.09
Approach positive	3.	<b>.35</b>	.23	---	-.13	.04	<b>.30</b>	-.25	.26	-.01	.08	.05	.02	.02	.02	.14	.07	.13	.05	.02
Attentional focusing	4.	<b>-.45</b>	.03	-.02	---	.02	-.20	<b>.52</b>	.01	.06	.12	-.17	-.15	-.16	-.07	-.12	-.14	-.16	-.09	-.08
Fear	5.	.04	.29	.05	.08	---	-.20	-.03	<b>.37</b>	.28	-.11	-.05	-.07	-.07	.01	.06	.03	.10	-.04	-.07
Impulsivity	6.	<b>.46</b>	.01	<b>.39</b>	-.20	-.24	---	-.27	-.05	<b>-.42</b>	.20	.16	.21	.21	.04	.08	.00	-.03	.04	.05
Inhibitory control	7.	<b>-.64</b>	-.12	-.29	<b>.50</b>	.15	<b>-.45</b>	---	-.02	.04	.12	-.14	-.14	-.15	-.09	-.18	-.18	-.17	-.04	-.01
Sadness	8.	-.06	<b>.45</b>	.16	.21	<b>.49</b>	-.07	.09	---	.24	-.04	-.01	.01	-.01	.05	.07	.06	.10	-.01	-.02
Shyness	9.	-.26	.08	-.22	.18	.12	<b>-.56</b>	.25	.11	---	-.20	-.10	-.10	-.10	-.01	.04	.11	.20	.03	.04
Smiling and laughter	10.	.06	.06	.14	.15	-.06	.12	.12	-.08	-.25	---	.00	.02	.00	-.03	-.07	-.12	-.14	.01	-.01
<i>CAS: aggression</i>																				
Verbal aggression	11.	.13	.02	.02	-.12	-.03	.01	-.13	-.04	.07	-.10	---	<b>.62</b>	<b>.79</b>	.18	-.01	.07	.02	.08	.08
Physical aggression	12.	.25	.03	-.09	-.07	-.02	.07	-.19	-.09	-.07	.01	<b>.60</b>	---	<b>.93</b>	.20	-.05	.04	-.01	.01	.00
Total aggression	13.	.21	.00	-.06	-.10	-.03	.05	-.16	-.09	-.03	-.03	<b>.83</b>	<b>.91</b>	---	.20	-.06	.06	.00	.02	.02
<i>APQ: parenting</i>																				
Punitive	14.	.20	.01	.10	-.28	-.01	.20	-.14	.04	-.04	-.16	<b>.31</b>	<b>.31</b>	<b>.40</b>	---	.12	.20	.18	.08	.08
Inconsistent	15.	.22	.23	.15	-.24	-.07	.20	<b>-.31</b>	.15	-.11	-.19	.07	-.02	-.03	.26	---	.21	.23	.16	.15
<i>ASR: parents' psychopathology</i>																				
Aggression-mother	16.	.18	.04	.08	-.07	-.10	.10	-.14	.07	.13	-.22	.20	.18	<b>.31</b>	<b>.31</b>	.26	---	<b>.77</b>	.20	.27
Total score-mother	17.	.14	.04	.11	-.07	.00	.03	-.10	.14	.19	<b>-.32</b>	.09	-.02	.12	.25	.29	<b>.78</b>	---	.30	<b>.37</b>
Aggression-father	18.	.22	.18	.19	-.12	.05	.20	-.26	.07	.06	-.02	.11	.03	.06	.08	.20	.29	.24	---	<b>.79</b>
Total score-father	19.	.18	.17	.18	-.18	-.04	.16	-.24	-.03	.15	-.19	.21	.02	.13	.25	.18	<b>.41</b>	<b>.38</b>	<b>.83</b>	---

Note. CBO: Children's Behavior Questionnaire. CAS: Children's Aggression Scale. APQ: Alabama Parenting Questionnaire. ASR: Adult Self-Report.

Upper part of the table contains the correlations obtained in the whole sample of children at age 3 years-old ( $n=622$ ).

Lower part of the table contains the correlations for the subsample of children who met criteria for ODD only, AD only or ODD+AD comorbidity ( $n=103$ ).

Bold: correlation into the high range effect size ( $|r|>0.30$ ).