

## DISCRIMINATIVE CAPACITY OF CBCL/1½-5 –DSM5 SCALES

**The discriminative capacity of CBCL/1½-5 –DSM5 scales to identify disruptive and internalizing disorders in preschool children.****Abstract**

This paper studies the discriminative capacity of CBCL/1½-5 (Achenbach & Rescorla, 2000) DSM5-scales Attention-Deficit and Hyperactivity Disorder (ADHD), Oppositional Defiant Disorder (ODD), Anxiety and Depressive Problems for detecting the presence of DSM5 (APA, 2013) disorders, ADHD, ODD, Anxiety and Mood disorders, assessed through diagnostic interview, in children aged three to five. Additionally, we compare the clinical utility of the CBCL/1½-5 DSM5 scales with respect to analogous CBCL/1½-5 syndrome scales. A large community sample of 616 preschool children was longitudinally assessed for the stated age group. Statistical analysis was based on ROC procedures and binary logistic regressions.

ADHD and ODD CBCL/1<sup>1/2</sup> – 5-DSM5 scales achieved good discriminative ability to identify ADHD and ODD interview's diagnoses, at any age. CBCL/1<sup>1/2</sup> – 5-DSM5 Anxiety scale discriminative capacity was fair for unspecific Anxiety Disorders in all age groups. CBCL/1½-5 –DSM5 depressive problems scale showed the poorest discriminative capacity for mood disorders (including depressive episode with insufficient symptoms), oscillating into the poor-to-fair range. As a whole, DSM5-oriented scales generally did not provide evidence better for discriminative capacity than syndrome-scales in identifying DSM5 diagnoses.

CBCL/1½-5 –DSM5 scales discriminate externalizing disorders better than internalizing disorders for ages 3 to 5. Scores on the ADHD and ODD CBCL/1½-5-DSM5 scales can be used to screen for DSM5 ADHD and ODD disorders in general populations of preschool children.

## DISCRIMINATIVE CAPACITY OF CBCL/1½-5 –DSM5 SCALES

**Keywords:** CBCL/1½-5, disruptive disorders, DSM5-oriented scales, internalizing disorders, preschoolers.

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## Introduction

Given the need for evidence-based studies of emotional and conduct problems in child psychopathology, the instruments of the Achenbach System of Empirically Based Assessment (ASEBA; Achenbach, 2009) have become the most widely used both in clinical and research settings in many countries and languages. The ASEBA assesses competencies, adaptive functioning, and behavioral, emotional and social problems from the age of 1½ to over 90, using a combination of exploratory and confirmatory factor analyses to empirically derive syndromes.

The preschool forms of the questionnaire span the ages of 1½-5 (Achenbach & Rescorla, 2000). Specifically, the Child Behavior Checklist (CBCL/½-5) is addressed at parents or caregivers. This instrument has been proven to provide strong psychometric properties across cultures (Ivanova et al., 2010; Rescorla et al., 2007). The empirically derived scales for the preschooler version include Emotionally Reactive, Anxious/Depression, Somatic Complaints, Withdrawn, Sleep Problems, Attention Problems and Aggressive Behavior (Rescorla, 2005). A second order-factor analysis yields the two global groupings labeled “Externalizing” and “Internalizing”, which are similar to those found in the earlier children’s versions. A total score for the items is also derived as a measure of global-problem behavior.

Besides accumulated empirical evidence from empirically derived scales, the lack of utility in the measurement of particular diagnoses as proposed in the DSM system has been considered a limitation. In order to provide a perspective with closer linkage to the DSM nosology, the DSM oriented scales were developed (Achenbach & Dumenci, 2001; Achenbach, Dumenci, & Rescorla, 2003). Unlike the originals, these scales were not empirically derived but, rather, were created through consensus among sixteen specialists from ten cultures (Rescorla, 2005). They rated each item as not consistent (0), somewhat

1 consistent (1) or very consistent (2) with nine DSM diagnostic categories. Agreement of at  
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3 least 10 out of 16 specialists was required in order to validate that an item was consistent for  
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5 inclusion in the DSM-oriented scales. The nine initial categories were finally reduced to five,  
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7 due to overlaps in DSM diagnostics or the problem items. The five DSM-oriented scales and  
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9 the corresponding DSM5 diagnoses they were meant to represent were: Depressive Problems  
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11 (including Major Depressive Disorder, MDD and Dysthymic Disorder, DD); Anxiety  
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13 Problems (Generalized Anxiety Disorder, GAD; Separation Anxiety Disorder, SAD; Specific  
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15 Phobia, SSP and Social Phobia, SP); Attention-Deficit and Hyperactivity Problems (including  
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17 Hyperactive-Impulsive and Inattentive types); Oppositional Defiant Problems (Oppositional  
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19 Defiant Disorder and Conduct Disorder) and Pervasive Developmental Problems (including  
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21 Asperger's Disorder). Compared to the syndrome scales, these showed similar psychometric  
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23 properties with regard to consistence, reliability and cross-informant agreement (Achenbach  
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25 et al., 2003; Nakamura, Ebesutani, Bernstein, & Chorpita, 2009).  
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33 Recently, in order to adapt the scales to the new DSM5 (APA, 2013), the CBCL-DSM  
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35 oriented scales have been reformulated (Achenbach, 2013). The former Pervasive  
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37 Developmental Problems has been replaced by the new Autism Spectrum Problems scale,  
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39 which comprises items identified by experts as highly consistent with DSM5 criteria for  
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41 Autism Spectrum Disorder. The revised Anxiety Problems scale comprises age-appropriate  
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43 items identified by the experts as highly consistent with DSM5 criteria for GAD, SAD, SSP  
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45 and Social Anxiety Specific Phobia (SASP). The other scales are left unchanged from the  
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47 DSM-IV to DSM5 version. There is little knowledge of the psychometrical properties in the  
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49 CBCL-DSM scales or of their incremental validity over the syndrome scales (Ebesutani et al.,  
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51 2010). This is especially true for the preschool form of the questionnaire (Kristensen, Solvejg  
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53 Henriksen, Tine Bilenberg, Niels, 2010) and for the DSM-oriented externalizing scales  
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55 (Oppositional Problems and Conduct Problems scales), as well as for the Attention  
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1 Deficit/Hyperactivity Problems scale (Ebesutani et al., 2010). Present-day data are completely  
2 inexistent for any version of the new DSM5. To our knowledge, no study has reported on  
3 DSM-Oriented scales in preschool ages with large community samples. There is an essential  
4 need to contrast the clinical utility of the widely used instruments.  
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10 Studying a clinical sample with the school form of CBCL/6-18, Ferdinand (2008)  
11 obtained a moderate predictive validity for the anxiety scale with respect to the corresponding  
12 SAD, GAD or SPP DSM-IV disorders, and good validity for the affective problems scale  
13 when predicting MDD or DYS DSM-IV diagnoses obtained with a semi-structured interview.  
14 Furthermore, using CBCL/6-18 in a clinically referred sample Ebesutani et al., (2010)  
15 concluded that DSM-oriented scales did not add incremental clinical utility to the syndrome  
16 scales with respect to corresponding diagnoses when also using a semi-structured interview  
17 answered by parents. The former was true for all scales except for Anxiety Problems  
18 compared to the Anxious/Depressed syndrome scale. Furthermore, a study of a clinically  
19 referred sample of 8-17 year-old children (Ebesutani et al., 2010; Lacalle, Ezpeleta, &  
20 Domenech, 2012) concluded that DSM-oriented scales were a useful tool for estimating  
21 DSM-IV disorders; they also obtain better results for DSM-scales when referring to  
22 Disruptive Disorders. These conclusions were the same as those obtained by (Bellina et al.,  
23 2013) in a sample of 6-16 year old referred children. Good convergent and discriminative  
24 validity was found by (Nakamura et al., 2009) in a clinical sample of adolescents.  
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48 The purpose of this study was to test the discriminative capacity of CBCL/1½-5  
49 (Achenbach & Rescorla, 2000) DSM5 scales for identifying the DSM5 disorders ADHD,  
50 ODD, Anxiety and Mood disorders in children aged three to five, and to compare its clinical  
51 utility with the analogous CBCL/1½-5 syndrome scales. The fact that the DSM5-oriented  
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1 scales are shorter than the originals would make them more suitable for screening purposes if  
2 they showed the expected good discriminative capacity.  
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## 9 **Method**

### 10 **Participants**

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13 Data used in this work correspond to a longitudinal study of behavioral problems in  
14 preschool children (Ezpeleta, de la Osa, & Domènech, 2011). The research began with a two-  
15 phase design, with an initial random sample of 2,283 children selected from the census of  
16 preschoolers (3 years old) in Barcelona in the 2009-10 academic year.  
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26 The percentage of participants in the first phase (screening) was 58.7% ( $N=1,341$   
27 families) and no differences emerged for sex ( $p=.95$ ) when comparing participants and  
28 refusals. However, the proportion of refusals was statistically higher for families in low  
29 socioeconomic groups (Ezpeleta et al., 2011) ( $p<.001$ ). Screening for child inclusion in the  
30 second phase was carried out with the parents' version of the Strengths and Difficulties  
31 Questionnaire for 3 and 4 years old (SDQ<sup>3-4</sup>; (Goodman, 1997). A random sample including  
32 (a) 30% of children with negative scores in the screening and (b) all children with a positive  
33 screening score was invited to continue with the longitudinal research. The final second phase  
34 sample included 89.4% of the families asked to continue ( $N=622$  children) and no statistical  
35 differences were found when participants and refusals were compared for sex ( $p=.820$ ) or type  
36 of school ( $p=.850$ ). Children's mean age was 3.0 ( $SD = 0.16$ ); 310 were boys (49.8%).  
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53 The sample in this study corresponds to all preschool children with CBCL/1½-5  
54 questionnaire available at ages 3, 4 or 5 ( $N=616$ ). Specifically, at age 3, CBCL/1½-5 was  
55 available for  $n=616$  children, at age 4 for  $n=602$  and at age 5 for  $n=545$ . No statistical  
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1 differences as regard age ( $p=.063$ ) or sex ( $p=.163$ ) were found between those remaining in  
 2 the study and those dropping out of the second or third follow-up. Sociodemographical  
 3 variables for the  $N=616$  participants at intake and weighted prevalence of DSM-IV disorders  
 4 are described in Tables 1 and 2. Children showing intellectual disability, pervasive  
 5 developmental disorders, families with language difficulties, without a primary caretaker who  
 6 could report on the child, or were moving over the next year to another location were  
 7 excluded (75 individuals).  
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## 24 Measures

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 26 The *Child Behavior Checklist* (CBCL 1<sup>1/2</sup>-5; Achenbach & Rescorla, 2000) was used  
 27 to measure behavioral and emotional problems dimensionally. CBCL 1<sup>1/2</sup>-5 includes a set of  
 28 99 items with 3 response options (0: not true, 1: somewhat or sometimes true, 2: very true or  
 29 often true), plus one open-ended item for adding problems that are not listed on the form.  
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 31 Raw scores were analyzed for syndrome and DSM5-oriented scales, as well as for original  
 32 syndrome scales (Achenbach, 2013). Internal consistency in the sample covered the range  
 33 moderate to good (Table 3 includes alpha-coefficients for ages 3-4-5).  
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44 The *Diagnostic Interview of Children and Adolescents for Parents of Preschool*  
 45 *Children and Young Children (DICA-PPYC;* Ezpeleta, de la Osa, Granero, Domènech, &  
 46 Reich, 2011) was used to assess children's psychopathology according to DSM-IV-TR  
 47 taxonomy (American Psychiatric Association, 1994). Adaptation and validation for the  
 48 Spanish preschool population showed sound psychometric properties (Ezpeleta et al., 2011).  
 49 The diagnoses included in this study are presented in Table 2. With the information recruited  
 50 in the interview it was possible to generate the diagnosis of the following DSM5 disorders:  
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1 ADHD, ODD, CD, Major depression (including depressive episode with insufficient  
2 symptoms), SAD, GAD and specific phobias  
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## 5 6 **Procedure**

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9 The project was approved by the ethics review committee at the authors' institution.  
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11 Families were recruited at the schools and gave written consent. All families of children in P3  
12 (first level of preschool school grade, 3-year-olds) at the participating schools were invited to  
13 answer the SDQ<sup>3-4</sup>. Families who agreed and met the screening criteria were contacted by  
14 telephone and interviewed at the school for each assessment. Interviewers were trained and  
15 were blind to screening group. After the interview, parents filled the CBCL/½-5.  
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## 28 **Statistical analysis**

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31 Analyses were carried out with SPSS20 for windows. Due to the multi-sampling  
32 design, Complex Samples system was used for statistical analysis, defining a project design  
33 with sampling weights inversely proportional to the probability of selection at stage two of the  
34 longitudinal project.  
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42 ROC procedures and binary logistic regressions (adjusted by covariate children's age  
43 and other comorbidities to those analyzed) measured the capacity of CBCL to discriminate  
44 the presence of DSM disorders assessed through diagnostic interview. The Area Under The  
45 Receiver Operator Curve (AUC) estimated the discriminative capacity of CBCL and the  
46 Nagelkerke's pseudo-R<sup>2</sup> estimated the predictive ability. According to the rough guide for  
47 classifying the accuracy of a diagnostic-screening test, AUC under 0.60 were considered fail,  
48 0.60-0.70 poor, 0.70-0.80 moderate, 0.80-0.90 good and 0.90-1 excellent. The diagnoses  
49 analyzed in this study have been generated using DSM5 criteria, as the information in the  
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interview allowed to do so. The DSM5-oriented scales and the (corresponding DSM5) diagnoses they are meant to represent included in the analysis were: Affective Problems (MDD), Anxiety Problems (GAD, SAD and SSP); ADHD and Conduct Problems (ODD and CD). In the former case, Oppositional Defiant Disorder scale was related to two different DSM diagnoses, ODD and CD. Each model was adjusted by sex and presence of any other diagnoses.

### Results

Table 3 shows the results for the discriminative capacity (measured through the AUC values) and the predictive ability (estimated through  $R^2$  coefficients) of the CBCL 1<sup>1/2</sup>-5 to identify DSM5 disorders measured through diagnostic interview, separately at 3-4-5 years of age. Results were obtained for binary logistic regressions adjusted by children's sex and the presence of other DSM5 comorbid disorders, defining the presence of DSM5 disorders as the outcome/criterion, and including the CBCL 1<sup>1/2</sup>-5-syndrome or CBCL 1<sup>1/2</sup>-5-DSM5 oriented scales as the incomes. As a whole, ADHD and ODD CBCL 1<sup>1/2</sup>-5 –DSM5-oriented scales scores obtained good to excellent discriminative accuracy at any age for ADHD (AUC between .836 and .901) and good for ODD (AUC between .854 and .881). The discriminative capacity for the parallel syndrome scales was within the range good to excellent (AUC from .819 to .905) and good (AUC .845 to .876) for the ADHD and ODD disorders. ODD DSM5-oriented scale also showed an excellent capacity to identify DSM5 Conduct Disorder diagnosis at ages 4 and 5 (AUC .920). Discriminative capacity of the anxiety scale was good (AUC from .710 to .801) for unspecific Anxiety Disorders in all age groups. The Depressive problems CBCL/1½-5–DSM5 scale showed poorest discriminative capacity for DSM5 Mood disorders (including depressive episode with insufficient symptoms), with AUC coefficients within the range poor (.630) to fair (.729). For CBCL/1½-5 -syndrome scales, Attention

1 problems at age 3 and 4, Aggressive behavior at age 4 for ODD and at any age for CD and  
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3 Anxious-depressed at age 5 discriminated better than the counterpart CBCL/1½-5DSM5-  
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5 scale.  
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8 Only CBCL/1½-5DSM5-Depressive Problems scale discriminated better than the  
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10 CBCL/1½-5-syndrome-Anxious-Depressed scale at ages 3 and 4. However, although the  
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12 different discriminative capacity, differences between the CBCL/1½-5-DSM5 scales and their  
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14 counterpart CBCL/1½-5 -syndrome scales were very small (differences in AUC were lower  
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16 than 0.10).  
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## 24 Discussion

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27 The results allow us to conclude that CBCL/1½-5 –DSM5-oriented scales are  
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29 generally valid for discriminating related DSM5-diagnoses in preschool years. At ages three  
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31 to five, they better discriminate externalizing than internalizing disorders. These results are  
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33 consistent with those found by other researchers using the child and adolescent version  
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35 (CBCL 6-18) of the questionnaire and DSM-IV criteria (Bellina et al., 2013; Ebesutani et al.,  
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37 2010; Lacalle et al., 2012). Our results show that ADHD DSM5-oriented scales are not a  
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39 better predictor of ADHD diagnostic than the syndrome scale at preschool ages. This is  
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41 discordant with (Aebi, Metzke, & Steinhausen, 2010) studying a sample of 6-17 year-old  
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43 outpatients. Remarkably, the ODD DSM5- oriented scale better discriminates DSM5 Conduct  
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45 Disorder than Oppositional Defiant Disorder at ages four and five. Other authors have found  
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47 the same using CBCL/6-18 with clinically referred samples (Ebesutani et al., 2010). This  
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49 result, probably related to the comorbidity of certain symptoms between the two conditions  
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51 indicates that the DSM5-oriented scales cannot discriminate between the two categories. In  
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1 the presence of high scores in the ODD DSM5-oriented scale, a condition of Conduct  
2 Disorder should also be considered.  
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6 The anxiety scale fairly predicted unspecific Anxiety Disorders in all the groups. The  
7 depressive problems CBCL/1½-5 –DSM5 scale showed the poorest prediction ability for  
8 Mood disorders. Only the depressive Problems' DSM5-scale predicts better than the Anxious-  
9 Depressed syndrome scale at age 4. Different studies with older children (Ferdinand, 2008)  
10 have also questioned the validity of CBCL to indicate presence of anxiety problems in the  
11 manner of DSM nosology. Other authors have found associations between internalizing  
12 syndromes and DSM diagnosis pertaining to anxiety and depression to be weaker and less  
13 specific (Wolff, Vogels & Reijneveld, 2014). In the same sense and working with adults  
14 Dingle, et al., (2011) reported that the DSM-oriented scale Depression did not perform better  
15 than the empirical Anxious/Depressed scale in identifying young adults with DSM depressive  
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33 Scores on the ADHD and ODD CBCL/1½-5-DSM5 scales can be used to screen for  
34 DSM5 ADHD, ODD and CD in general populations of preschool children. DSM5-oriented  
35 scales generally did not provide evidence of performance superior to that of the syndrome-  
36 scales as regards correspondence with DSM5 diagnostics. In keeping with what occurs for  
37 older children and adolescents, DSM5-oriented scales do not add incremental clinical utility  
38 above the syndrome scales (Ebesutani et al., 2010). Although they do not represent a major  
39 advantage over the previous syndrome scales, the smaller number of items (just 44 for the  
40 DSM5-oriented scales) means that these scales would be a good screening tool, especially for  
41 externalizing disorders and making clinical tasks more efficient.  
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56 This is the first study to report on the discriminative capacity of CBCL/1½-5-DSM5  
57 scales in a large sample of preschoolers. We were unable to study the six scales in their  
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1 entirety due to the low prevalence of pervasive in the sample community. Further studies are  
2 required to gain fuller insight into about the utility of CBCL/1½-5-DSM5-directed towards  
3 referred samples, or the clinical differences between children detected by DSM scales vs.  
4 syndromes' scales, but our results support the idea that DSM5-oriented scales allow early  
5 identification in general population of children with behavioral-emotional problems, thereby  
6 enabling them to obtain the assistance that they need.  
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19 **Acknowledgments**  
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22 Funding was from the Spanish Ministry of Science and Innovation (grant PSI2009-07542)  
23 and the Spanish Ministry of Economy and Competitiveness (grant PSI2012-32695). We  
24 acknowledge all families and schools participating in the study.  
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## Discriminative capacity of CBCL/1½-5 –DSM5 scales

Table 1. Sociodemographics for sample ( $n=616$ ).

Sex (male); $n(\%)$		308	50.0%
Ethnicity; $n(\%)$	Caucasian	549	89.1%
	African	1	0.2%
	American-hispanic	39	6.3%
	Asian	6	1.0%
	Other	21	3.4%
<sup>1</sup> SES; $n(\%)$	High	202	32.8%
	Mean-High	194	31.5%
	Mean	88	14.3%
	Mean-Low	97	15.7%
	Low	35	5.7%

<sup>1</sup>Socioeconomic status (Hollingshead, 1975)

Table 2. Prevalence of DSM disorders for the sample.

	3 year-olds ( <i>n</i> =616)	4 year-olds ( <i>n</i> =602)	5 year-olds ( <i>n</i> =555)
	N; Weighted %	N Weighted %	N Weighted %
Any disorder	242; 34.4%	207; 31.8%	224; 37.0%
Disruptive disorders	87; 10.1%	71; 9.0%	65; 9.7%
Attention Deficit hyperactivity disorder	34; 3.7%	35; 5.1%	31; 4.5%
Oppositional Defiant disorder	61; 7.0%	49; 5.2%	43; 6.4%
Conduct disorder	10; 1.4%	2; 0.2%	5; 0.6%
Mood disorders (including depressive episode with insufficient symptoms)	22; 3.3%	12; 1.9%	12; 1.7%
Anxiety disorders	57; 7.5%	50; 7.4%	72; 11.8%
Separation anxiety	18; 2.2%	12; 1.4%	8; 1.3%
Generalized anxiety	1; 0.1%	1; 0.1%	5; 0.6%
Specific phobia	26; 3.5%	32; 5.2%	50; 8.3%

Table 3. The comparative discriminative capacity of CBCL-syndrome scales and CBCL-DSM5 scales for disruptive and anxiety disorders in preschool children.

DSM5 Disorders	CBCL-Syndrome	Internal consistency			CBCL-DSM5	Internal consistency			3 years-old (n=616)				4 years-old (n=602)				5 years-old (n=545)			
		Age3	Age4	Age5		Age3	Age4	Age5	CBCL-synd.		CBCL-DSM5		CBCL-synd.		CBCL-DSM5		CBCL-synd.		CBCL-DSM5	
		AUC	R <sup>2</sup>	AUC		R <sup>2</sup>	AUC	R <sup>2</sup>	AUC	R <sup>2</sup>	AUC	R <sup>2</sup>	AUC	R <sup>2</sup>	AUC	R <sup>2</sup>	AUC	R <sup>2</sup>	AUC	R <sup>2</sup>
ADHD	Attention problems	.654	.695	.725	ADHD	.735	.771	.792	.905	25.5	.901	30.0	.858	21.2	.836	19.4	.819	22.4	.847	25.2
ODD	Aggressive behavior	.861	.863	.885	ODD	.736	.747	.784	.845	21.3	.854	24.0	.876	35.8	.867	33.0	.851	32.7	.881	39.8
CD	Aggressive behavior				ODD				.860	11.2	.796	2.3	.981	29.3	.920	19.1	.938	24.1	.920	14.0
Anxiety	Anxious-depressed	.706	.712	.727	Anxiety	.646	.650	.648	.733	12.0	.746	14.2	.678	7.4	.710	6.5	.732	14.9	.801	19.2
Mood	Anxious-depressed				Depressive	.506	.512	.595	.645	5.0	.660	5.0	.687	4.6	.729	5.0	.679	1.1	.630	0.9
Mood	Withdrawn	.706	.681	.727	Depressive				.552	0.1	.660	5.0	.657	3.32	.729	5.0	.689	6.7	.630	0.9

ADHD: attention deficit hyperactivity disorder. ODD: oppositional defiant disorder.

AUC: Area under ROC curve. R<sup>2</sup> in percentage (%).

Results adjusted by children's sex and other comorbidity.

Supplementary Material

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Supplementary Material

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