

Development and Aging

Eyberg Child Behavior Inventory (ECBI): Normative data, psychometric properties, and associations with socioeconomic status in Finnish children

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Assessment of behavioral disorders is one of the most commonly encountered tasks in child psychiatry. The Eyberg Child Behavior Inventory (ECBI) is a widespread measurement tool used for assessing conduct problems, though the psychometric properties of the tool have varied in different samples. In this study, the ECBI was evaluated in a Finnish population based sample of children aged 4 to 12 years ($n = 1,715$). Factor structure and internal consistency of the ECBI and associates of behavioral problems in Finnish children were evaluated. The results showed that a unidimensional one-factor solution for the ECBI intensity scale was the best fit for the data. The ECBI mean scores were considerably higher in our sample compared to other Nordic countries. Boys scored higher than girls on both ECBI scales, and the mean scores decreased with child's age. Socioeconomic status (SES) was weakly connected to the ECBI scores. Our results highlight the need for country specific reference norms in order to improve the clinical utility of evidence-based measures for assessing conduct problems.

Key words: Children, conduct problems, questionnaire, assessment.

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INTRODUCTION

Disruptive behavior problems form a notable category in the field of child psychiatry today. It has been estimated that conduct disorder (CD) and oppositional defiant disorder (ODD) combined make up about half of all child and adolescent psychopathology (Scott, 2015). Disruptive behaviors cause significant stress for families, as well as costs for the society (see Romeo, Knapp & Scott, 2006; Scott, Knapp, Henderson & Maughan, 2001). Not all children with behavior problems grow up as antisocial adults, but children with serious, early-onset disruptive behavior are at risk for diverse adverse outcomes such as criminal behavior (Fergusson, Horwood & Ridder, 2005; Sourander, Jensen, Davies *et al.*, 2007), substance abuse (Fergusson *et al.*, 2005), psychiatric disorders (Fergusson *et al.*, 2005; Loth, Drabick, Leibenluft & Hulvershorn, 2014; Odgers, Moffitt, Broadbent *et al.*, 2008; Sourander *et al.*, 2007), increased mortality (Jokela, Ferrie & Kivimäki, 2009), difficulties with education and employment (Bierman, Coie, Dodge *et al.*, 2013; Burke, Rowe & Boylan, 2014), and problems in social relationships and parenthood (Burke *et al.*, 2014; Fergusson *et al.*, 2005; Odgers *et al.*, 2008). Thus, early identification, exact evaluation, and treatment of children with disruptive behavior problems are crucial for avoiding individual suffering and costs for the society.

Several instruments have been used in identifying and defining disruptive behavior problems in children. However, surprisingly few of them have been properly standardized and validated (Axberg, Johansson Hanse & Broberg, 2008; Reedtz, Bertelsen,

Lurie, Handegård, Clifford & Mørch, 2008). The Eyberg Child Behavior Inventory (ECBI) (Eyberg & Ross, 1978; Robinson, Eyberg & Ross, 1980) is a comprehensive, standardized, and well-validated instrument for assessing parent-reported behavior problems in 2- to 16-year-old children. It can be used for screening behavior problems in children, for setting specific treatment goals and monitoring the efficacy of treatment, as well as for research purposes (Eyberg & Ross, 1978).

Previous research investigating psychometric properties of the ECBI has shown that it has good internal consistency, test-retest reliability, as well as good convergent and divergent validity with other measures of childhood conduct problems (Abrahamse, Junger, Leijten, Lindeboom, Boer & Lindauer, 2015; Axberg *et al.*, 2008; Gross, Fogg, Young *et al.*, 2007). The ECBI's validity in differentiating children with clinically relevant externalizing symptoms from other children has proved to be good (Abrahamse *et al.*, 2015; Eyberg & Ross, 1978; Robinson *et al.*, 1980; Weis, Lovejoy & Lundahl, 2005). Nevertheless, results considering the factorial structure of the ECBI are contradictory. Unidimensional structure was supported in early studies among different age groups (Eyberg & Robinson, 1983; Robinson *et al.*, 1980), and has gained support in subsequent studies in different populations (Abrahamse *et al.*, 2015; Colvin, Eyberg & Adams, 1999; Gross *et al.*, 2007). However, Burns and Patterson (1991) suggested that ECBI's items form three separate clusters, representing ODD-, CD-, and attention-deficit hyperactivity disorder (ADHD) –types of symptoms. In their later

study with the same data, Burns and Patterson (2000) found further evidence for the multidimensional structure of the ECBI, suggesting that the ECBI contains three clinically meaningful factors (Oppositional Defiant Behavior toward Adults, Inattentive Behavior, and Conduct Problem Behavior), plus one factor that does not represent a meaningful dimension. This shorter, three-dimensional 22-item version of the ECBI has been tested and supported by some subsequent research (Axberg *et al.*, 2008; Hukkelberg, 2016). Because previous results are contradictory, more research in different populations is needed to explore the factor structure of the instrument further.

Earlier research has shown that the prevalence of conduct problems is higher among boys than girls and the prevalence of problems diminishes over time (e.g., Weeland, Aar & Overbeek, 2018). Thus, gender and age-specific norm scores are needed. Furthermore, there are considerable cultural differences in the rates of parent-reported childhood behavior problems measured by the ECBI: mean scores have been significantly lower in northern Europe than in the United States, Spain, and the Netherlands (Abrahamse *et al.*, 2015; Axberg *et al.*, 2008; García-Tornel, Calzada, Eyberg *et al.*, 1998; Reedtz *et al.*, 2008; Weeland *et al.*, 2018).

There are some indications that the prevalence of parent reported psychiatric problems might be higher in Finnish children compared to other Nordic countries. In the international norms for ASEBA-questionnaires, including the widely used Child Behavior Checklist, Finnish 6–18-year-olds are considered by their parents to have more problems than their Swedish, Norwegian, and Icelandic counterparts (<http://www.aseba.org/products/societies.html>). The established risk and protective factors for conduct disorder, such as the level of available parental support or the level of social welfare, as well as identifying and reporting children's behavioral problems might differ considerably even when comparing geographically and culturally proximate countries (e.g. Borg, Kaukonen, Joukamaa & Tamminen, 2014; Weeland *et al.*, 2018). Thus, acquiring country specific norms for questionnaires used in child psychiatry is important (e.g. Borg *et al.*, 2014; Weeland *et al.*, 2018).

The aim of this study was to investigate psychometric properties and explore the factorial structure of the ECBI in a Finnish population based sample of 4–12-year-old children. Another aim was to report the prevalence of conduct problems in these children as reported by parents and introduce Finnish age- and gender-specific norms for the ECBI, so that it can be used more reliably in screening and assessing Finnish children with disruptive behavior problems. We also examined the associations of age, gender, and socioeconomic status (SES) of the family with the ECBI scales in our sample, assuming that children from families with lower SES might score higher on the ECBI scales.

METHOD

Participants and procedure

This study is part of a large epidemiological study concerning children's behavior, emotions, and sleep in Finland. Five thousand letters were randomly distributed to parents (primarily mothers) or caregivers of 4–11-year-old children, with Finnish as their native language, living in Helsinki

and the surrounding municipalities. The municipalities were grouped in three groups by size. Group one included major cities (population over 150,000), group two included middle-sized cities (population less than 100,000), and group three included small cities, towns or villages (population less than 10,000). Two thousand questionnaires were sent to both major and middle-sized cities, and 1,000 questionnaires were sent to small cities, towns or villages. Inside the groups the number of questionnaires sent in each city was adjusted by the population. Questionnaires (ECBI and family background questionnaire) were filled in using an internet-based interface (Digium), but it was possible to order paper versions of the questionnaires as well. Complete answers were obtained from 1,673 parents who filled in the questionnaires on the internet and 42 parents who filled in the paper version, resulting the total of 1,715 answers. Since the letters were sent primarily to mothers, we assume that a large majority of the respondents were mothers. Response rate was 34%, which is rather low. However, the study sample represented the original sample well regarding age, gender, and size of home municipality (see Table 1).

The mean age of children in the sample was 7.4 years ($SD = 2.3$). Some children turned 12 before their parents responded to the survey, resulting in the inclusion of eighteen 12-year-old children in the study. A total of 50.7% ($n = 870$) of the children were girls and 49.3% ($n = 845$) were boys. A total of 38.5% of the children lived in major cities, 43.0% lived in middle-size cities, and 18.4% lived in small cities or villages. A total of 84.8% of the children had one or more siblings living in the same household. The biological parent, living with the child, with higher employment status was chosen to represent the socioeconomic status of the family. The distribution of SES in the sample is presented in Fig. 1.

Measures

The Eyberg Child Behavior Inventory (ECBI; Eyberg & Ross, 1978; Robinson *et al.*, 1980) measures parent-reported disruptive behavior problems in 2–16-year-old children. It consists of 36 problem behaviors typically reported by parents of children with disruptive behaviour problems. The items describe specific problem behaviors such as “Dawdles in getting dressed”, “Refuses to go bed on time”, and “Physically fights with sisters and brothers”. The inventory has two scales that measure the intensity of different problem behaviors on the one hand (Intensity Scale), and the number of behaviors that parents find problematic on the other hand (Problem Scale). Parents are asked to choose how often each behavior occurs with their child on a scale from 1 (never) to 7 (always). These ratings are summed to constitute the total intensity score, ranging from 36 to 252 points. For the Problem Scale, the parents are asked to choose if each behavior is a problem for them or not. The number of behaviors identified as a problem constitute the total problem score, ranging from 0 to 36.

Background questionnaire included information on child's gender and age, people living in same household with child (mother, father, sibling(s), stepmother, stepfather, grandparent, others), parents' marital status (married, divorced/separated, living together but not married, other), mother's and father's education (primary/elementary school, high school, vocational school, polytechnic school, university), mother's and father's employment status (pensioner, student, blue-collar worker, entrepreneur, lower level white-collar worker, upper level white-collar worker, director/manager), current residence of the child (home, foster home, orphanage, other), child's current health state (does child have some permanent or chronic illness or disability), and support in day care/school (does child receive some special support in day care/school).

Statistical analyses

SPSS versions 22 and 25 were used for the statistical analyses. Distributions of the ECBI scales as well as individual intensity scale items were first investigated with histograms, descriptive statistics, and Kolmogorov-Smirnov-tests of normality. Reliability of the ECBI Intensity and Problem Scales was examined with Cronbach's alpha coefficients and

Table 1. Number of returned and sent questionnaires in each age, gender, and municipality group.

Numbers of questionnaires returned and sent. Percentages in parenthesis are percentages of the total number of questionnaires returned ($n = 1,715$) or sent ($n = 5,000$).				
	Major cities	Medium-size cities	Small cities/towns	Total
Preschool ^a girls				
Returned	136 (7.9%)	136 (7.9%)	67 (3.9%)	339 (19.8%)
Sent	390 (7.8%)	390 (7.8%)	195 (3.9%)	975 (19.5%)
School age ^b girls				
Returned	195 (11.4%)	230 (13.4%)	105 (6.1%)	530 (30.9%)
Sent	650 (13.0%)	650 (13.0%)	325 (6.5%)	1,625 (32.5%)
Preschool boys				
Returned	129 (7.5%)	138 (8.0%)	61 (3.6%)	328 (19.1%)
Sent	360 (7.2%)	360 (7.2%)	180 (3.6%)	900 (18.0%)
School age boys				
Returned	199 (11.6%)	233 (13.6%)	84 (4.9%)	516 (30.1%)
Sent	600 (12.0%)	600 (12.0%)	300 (6.0%)	1,500 (30.0%)
Total				
Returned	659 (38.4%)	737 (43.0%)	317 (18.5%)	1,713 (99.9%) ^c
Sent	2,000 (40.0%)	2,000 (40.0%)	1,000 (20.0%)	5,000 (100.0%)

Note: ^aPreschool age: 4–6 years.

^bSchool age: 7–12 years.

^cTwo respondents did not report their home municipalities.

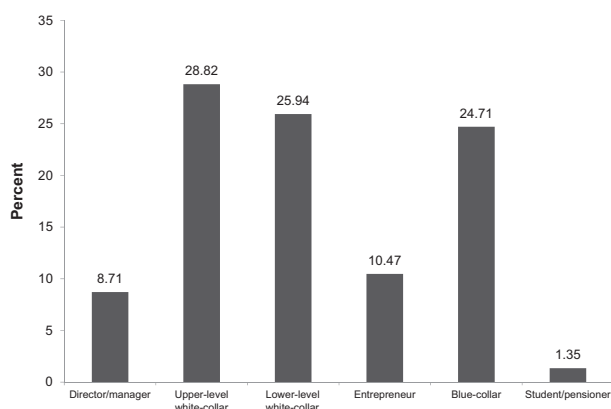


Fig. 1. Distribution of socioeconomic status in families participating to the study ($n = 1,700$).

item-total correlations. Multiple linear regression analysis was conducted to analyze the associations of gender and age with the Total Intensity and Total Problem scores. One-way ANOVA was used to examine if SES was connected to ECBI Total Intensity and or Total Problem scores.

There was a considerable number of extreme values on the right end of both ECBI Intensity and Problem scales. We decided to retain these outliers in the data since they were all within the range of possible scores for the scales, and probably represented a genuine group of cases with extremely high symptom levels. Because of the great number of outliers in our data, we also examined the 5% trimmed means when calculating mean values for the scales.

When analyzing parents' ranking of problem behaviors, a Swedish study (Axberg *et al.*, 2008) included only the cases where the intensity rating for a given behavior was at least 3 (upper level of seldom). This way would arguably give a more accurate picture of which problem behaviors parents find problematic when present. However, in most other studies (e.g., Reedt *et al.*, 2008; Robinson *et al.*, 1980) the percentages of parents endorsing each item as a problem have been calculated with the whole data, so to be able to compare our results with other studies, we decided to keep all the cases in our analyses.

Factor analyses were performed on the Intensity scale only because the Problem scale is constructed of categorical variables (i.e., a “yes” or “no” answer for each item). Since previous research about the factor structure of the ECBI has revealed mixed results, exploratory factor analysis was chosen instead of a confirmatory factor analysis. Analysis was conducted with principal axis factoring and oblique (direct oblimin) rotation. Principal axis factoring was chosen as an extraction method because it is recommended when the data are non-normally distributed (see Costello & Osborne, 2005), which was the case with items on the ECBI Intensity Scale in our data. Oblique rotation was chosen over orthogonal rotation because we expected the extracted factors to correlate considerably with each other (see Costello & Osborne, 2005).

RESULTS

Reliability of ECBI

Cronbach's alpha coefficient for the ECBI intensity scale was 0.95. For the problem scale the Cronbach's alpha coefficient was 0.94. Most corrected item-total correlations were strong ($r > 0.30$) on both scales, but items 36 (“Wets the bed”; $r = 0.18$ on the intensity scale; $r = 0.16$ on the problem scale) and 21 (“Steals”; $r = 0.26$ on the intensity scale; $r = 0.29$ on the problem scale) correlated more weakly with the total score. Corrected item-total correlations for each item on the intensity scale are presented on Table 2.

Item statistics of ECBI

The mean frequency ratings for different problem behaviors ranged from 1.1 to 3.8. None of the Intensity Scale items were normally distributed (Kolmogorov-Smirnov $p < 0.001$); all but one of the items were positively skewed. The most frequently observed behavioral problem, and the only intensity scale item that was negatively skewed, was “Verbally fights with sisters and brothers” ($M = 3.8$, $SD = 1.6$; skewness = -0.38). Next frequently observed behavioral problem was “Gets angry when

Table 2. Item statistics of ECBI

Item	Percentage of parents endorsing item as a problem	Frequency rating		Corrected item total Correlation (Intensity Scale)
		<i>M</i>	<i>SD</i>	
1. Dawdles in getting dressed	29.8	3.3	1.5	0.54
2. Dawdles or lingers at mealtime	24.7	3.1	1.5	0.53
3. Has poor table manners	15.4	2.5	1.2	0.61
4. Refuses to eat food presented	22.9	3.0	1.4	0.45
5. Refuses to do chores when asked	20.1	3.1	1.3	0.56
6. Dawdles in getting bed	21.0	3.2	1.4	0.49
7. Refuses to go to bed on time	17.1	2.7	1.3	0.50
8. Does not obey house rules on his/her own	19.2	2.9	1.2	0.68
9. Refuses to obey until threatened with punishment	23.8	3.0	1.4	0.69
10. Acts defiant when told to do something	24.0	3.0	1.4	0.73
11. Argues with parents about rules	19.1	3.2	1.3	0.71
12. Gets angry when doesn't get his/her own way	20.2	3.5	1.3	0.70
13. Has temper tantrums	16.4	2.4	1.3	0.66
14. Sasses adults	19.9	3.4	1.3	0.70
15. Whines	22.0	3.3	1.4	0.66
16. Cries easily	8.2	2.9	1.2	0.45
17. Yells or screams	16.9	2.9	1.3	0.68
18. Hits parents	8.3	1.5	0.9	0.51
19. Destroys toys and other objects	4.7	1.5	0.9	0.56
20. Is careless with toys and other objects	19.1	3.0	1.5	0.54
21. Steals	2.3	1.1	0.5	0.26
22. Lies	11.3	2.0	1.0	0.49
23. Teases or provokes other children	14.8	2.5	1.2	0.58
24. Verbally fights with friends his/her own age	6.3	2.4	1.1	0.52
25. Verbally fights with sisters and brothers	31.4	3.8	1.6	0.38
26. Physically fights with friends his/her own age	4.6	1.7	0.9	0.44
27. Physically fights with sisters and brothers	26.6	3.0	1.6	0.42
28. Constantly seeks attention	10.8	2.9	1.4	0.64
29. Interrupts	19.5	3.4	1.3	0.61
30. Is easily distracted	13.1	2.8	1.4	0.64
31. Has short attention span	10.3	2.5	1.2	0.62
32. Fails to finish tasks or projects	13.0	2.8	1.2	0.64
33. Has difficulty entertaining him/herself alone	6.7	2.1	1.2	0.42
34. Has difficulty concentrating on one thing	6.3	2.2	1.1	0.56
35. Is overactive or restless	10.8	2.2	1.3	0.65
36. Wets the bed	4.5	1.3	1.0	0.18

Note: $n = 1,715$.

doesn't get his/her own way" ($M = 3.5$; $SD = 1.3$). The least frequently observed behavioral problems, that were most strongly skewed to the right, were "Steals" ($M = 1.1$, $SD = 0.5$, skewness = 4.45) and "Wets the bed" ($M = 1.3$; $SD = 1.0$, skewness = 3.80). Other items that were extremely rare in our sample, that is strongly skewed to the right, were "Hits parents" ($M = 1.5$; $SD = 0.9$; skewness = 2.03), "Destroys toys and other objects" ($M = 1.5$; $SD = 0.9$; skewness = 2.20), and "Physically fights with friends his/her own age" ($M = 1.7$; $SD = 0.9$; skewness = 1.53). The behaviors most frequently considered as a problem by parents were "Verbally fights with sisters and brothers" (31.3%) and "Dawdles in getting dressed" (29.8%). The behaviors least frequently considered as a problem were "Steals" (2.3%) and "Wets the bed" (4.5%). Item-means, standard deviations, and percentages of parents considering each item as a problem are presented in Table 2.

Normative data. The total intensity scale was moderately positively skewed (skewness = 0.7) and the total problem scale

was strongly skewed to the right (skewness = 1.4). Neither of the scales was normally distributed (Kolmogorov-Smirnov $p < 0.001$). This was expected since the scales measured problem behaviors in normal population. Also, in large samples, such as in this study, linear regression can be applied despite skewness (Lumley, Diehr, Emerson & Chen, 2002). The mean intensity scale total score for the whole sample was 96.2 ($SD = 26.8$) and the mean problem scale total score was 5.7 ($SD = 7.1$). The 5% trimmed means were 95.1 for the intensity scale total score and 4.9 for the problem scale total score.

Linear regression analyses revealed that age was negatively associated with Total Intensity ($\beta = -0.23$; $p < 0.001$) and Total Problem ($\beta = -0.08$; $p < 0.01$) scores, so that older children had lower mean scores on both scales. Furthermore, boys scored higher than girls on both Total Intensity Scale ($\beta = 0.12$; $p < 0.001$) and Total Problem Scale ($\beta = 0.08$; $p < 0.01$). Age and gender combined explained 6.7% of the variance of Total Intensity Scores ($R^2 = 0.067$; $F(2, 1,712) = 61.08$; $p < 0.001$) and 1.3% of the variance of Total Problem Scores ($R^2 = 0.013$;

$F(2, 1,712) = 11.10; p < 0.001$). Since age and gender had significant effects on both ECBI Total problem score and Total intensity score, different normative data, and cut points for different age groups as well as for boys and girls were considered necessary. Age and gender specific mean values, standard deviations, and 90% clinical cut points for ECBI total intensity and total problem scales are presented in Tables 3 and 4.

One-way ANOVA indicated that there was a statistically significant difference in ECBI Intensity scores for different SES groups ($F(5, 1,694) = 2.55; p < 0.05$). However, the effect size was small; SES explained only 0.7% of the total variation in the intensity scores ($\eta^2 = 0.007$; 90% CI [0.0005; 0.0130]). Blue-collar workers' children seemed to have slightly higher intensity scores ($M = 99.8$; $SD = 30.2$) than in other groups, but in post hoc analyses using the Dunnett's T3, the difference was statistically significant only when compared to lower level white-collar workers ($M = 93.6$; $SD = 25.7$). The magnitude of difference in the means between blue collar workers and lower level white collar workers was 6.2 (95% CI [0.56; 11.8]; $p < 0.05$). Similar pattern could be seen with SES and Total Problem scores: there was a statistically significant difference in ECBI Problem scores for different SES groups ($F(5, 1,694) = 2.37; p < 0.05$), but the effect size was equally small ($\eta^2 = 0.007$; 90% CI [0.0002; 0.0122]). Compared to the Intensity Scale, differences between different SES groups were even smaller on the Problem Scale and none of them reached statistical significance in post-hoc analyses.

Factor structure. Kaiser-Meyer-Olkin Measure of Sampling Adequacy (KMO) and Bartlett's test of sphericity indicated that the data were well suited for factor analysis (KMO = 0.94; $\chi^2(630) = 34,015.62, p < 0.001$). The first exploratory analysis resulted in eight factors with eigenvalues greater than one. These factors explained a total of 64.46% of variance. However, two items had communalities lower than 0.2 and were removed from further analyses. These items were "Wets the bed" and "Steals". After this, seven factors had eigenvalues greater than one. These factors together explained 64.18% of variance. As assumed, there were considerable correlations among factors (see Table 5). The

Table 3. Age and gender specific mean values (M), standard deviations (SD), and 90% clinical cut points for ECBI total intensity scale

Age	Gender	n	M (SD)	90 th percentile
4-6	Girls	340	99.7 (24.1)	129.0
	Boys	328	104.7 (26.0)	142.0
	Total	668	102.2 (25.2)	134.0
7-9	Girls	320	91.3 (25.3)	126.7
	Boys	306	98.7 (27.7)	139.3
	Total	626	94.9 (26.7)	133.6
10-12*	Girls	210	85.4 (27.5)	124.9
	Boys	211	92.1 (27.2)	127.6
	Total	421	88.8 (27.5)	125.0
Total	Girls	870	93.2 (26.0)	128.0
	Boys	845	99.4 (27.4)	138.0
	Total	1,715	96.2 (26.8)	132.0

Note: *There were eighteen 12-year-old children in the sample. The oldest children were 12 years and 1 month old.

first factor was dominant, explaining 37.75% of the variance. Percentage of variance explained by the other six factors ranged from 3.01 to 6.91. Examination of the scree plot (Fig. 2) also revealed a very strong first factor, and relatively small differences between factors after that. Because the differences between factors after the first, dominant factor were small, we decided to examine all factor solutions from two to seven.

The seven-factor solution, showing all factors with eigenvalues greater than one, is presented in Table 6. In this solution, the first factor was mostly consisted of items describing oppositional, defiant behavior, and the second factor consisted of negatively loading ADHD-type items. However, several factors in this solution were too "specific" and did not describe diagnostically meaningful categories (e.g., items 19: Destroys toys and other objects and 18: Hits parents loaded on their own factor, separately from other conduct problem behaviors). There were three factors (factors 3, 4, and 7) with only two items loading on them, and factors with less than three item-loadings are considered weak and unstable (Costello & Osborne, 2005). For these reasons, the seven-factor solution was found unsatisfactory.

In six- and five-factor solutions, there were still several factors that were too specific, with only two items loading on them. In four-factor solution (Table 7), items describing oppositional defiant behavior were divided between factors 1 and 4, and items describing conduct problem behavior were divided between factors 1, 2, and 3. The second factor was composed of both ADHD-type items (e.g., "Has short attention span") and items

Table 4. Age- and gender-specific mean values (M), standard deviations (SD), and 90% clinical cut points for ECBI total problem scale

Age	Gender	n	M (SD)	90 th percentile
4-6	Girls	340	5.2 (6.4)	14.0
	Boys	328	6.8 (7.3)	18.0
	Total	668	6.0 (6.9)	16.0
7-9	Girls	320	5.2 (6.8)	17.0
	Boys	306	6.4 (7.9)	20.0
	Total	626	5.8 (7.4)	18.0
10-12*	Girls	210	4.8 (6.8)	15.0
	Boys	211	5.0 (6.9)	16.0
	Total	421	4.9 (6.9)	16.0
Total	Girls	870	5.1 (6.6)	15.0
	Boys	845	6.2 (7.5)	18.0
	Total	1,715	5.7 (7.1)	17.0

Note: *There were eighteen 12-year-old children in the sample. The oldest children were 12 years and 1 month old.

Table 5. Correlations among factors in seven-factor solution ($n = 1,715$)

Factor	1	2	3	4	5	6	7
1	–						
2	–0.51	–					
3	0.43	–0.28	–				
4	0.41	–0.35	0.24	–			
5	0.46	–0.51	0.34	0.22	–		
6	0.53	–0.50	0.23	0.37	0.31	–	
7	0.30	–0.15	0.24	0.17	0.23	0.16	–

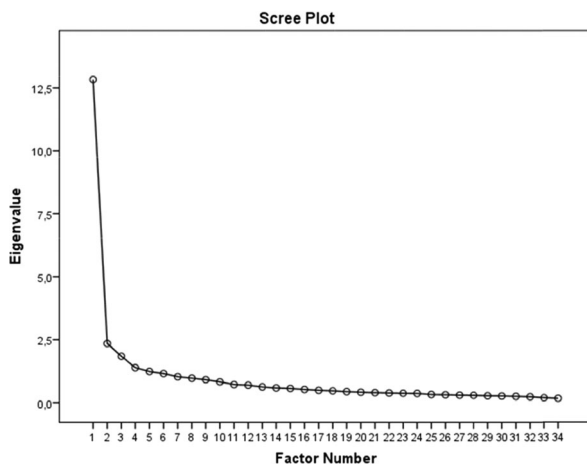


Fig. 2. Scree plot (Principal axis factoring, ECBI intensity scale).

describing conduct problem behaviors (e.g., “Lies”). In summary, the four-factor solution in our data was very different from the four-factor model found by Burns and Patterson (2000), and our four factors did not represent clinically or diagnostically meaningful categories.

In the three-factor solution, the first factor was composed of items describing oppositional defiant behavior. However, as regards content, the solution was unsatisfactory, since the second factor was a mixture of ADHD- and conduct problem items, and the third factor was composed of just three items which were “Physically fights with sisters and brothers”, “Verbally fights with sisters and brothers”, Teases or provokes other children”. The two-factor solution resulted in one giant factor, composed of oppositional defiant and conduct problem items, and a second, smaller factor that was composed of ADHD-type items. So in the two-factor solution there was a meaningful distinction between ADHD-type items and other items. However, these two factors combined explained only 44.66% of the total variance of items, so the two-factor solution cannot be seen as a satisfactory fit for the data. Considering the unsatisfactory results of factor solutions from two to seven, a strong first factor explaining 37.75% of the total variance and small differences in percentages of variance between other factors, and a high reliability coefficient of the whole scale, we concluded that the unidimensional one-factor solution of the ECBI intensity scale was the best fit for our data.

DISCUSSION

The main purpose of this study was to examine psychometric properties of the Eyberg Child Behavior Inventory in the Finnish population, and to establish norm values for different age groups. Both the mean intensity scale score and the total problem scale score were considerably higher than have previously been found in other Nordic countries. The mean intensity scale total score for the Finnish sample was 96.2 ($SD = 26.8$). In a Norwegian sample of 4,063 children aged between 4 and 12 years (see Reedtz *et al.*, 2008), the mean intensity score was 89.9 ($SD = 24.6$). In a Swedish sample of 841 children aged between 3 and 10 years (see Axberg *et al.*, 2008), the mean intensity score was 88.2 ($SD = 26.0$). For the total problem scale the mean value in the Finnish sample was 5.7 ($SD = 7.1$), which is again considerably

higher than in Norway ($M = 3.1$; $SD = 4.5$) and Sweden ($M = 3.1$; $SD = 5.0$). Because of the great number of extreme values on the right end of both Intensity and Problem scales in the Finnish sample, we also examined the 5% trimmed means for both scales. Trimmed means were 95.1 for the intensity scale total score and 4.9 for the problem scale total score. These are somewhat lower than the means for the whole sample but still considerably higher than Swedish and Norwegian mean values, which means that the difference between Finland compared to Sweden and Norway cannot be explained by a group of parents evaluating their children as having extremely high symptom levels in the Finnish sample. A recent Dutch study also found significantly higher scores on the intensity scale compared to Norwegian and Swedish norm scores (Weeland *et al.*, 2018).

There are several possible explanations for the finding. It is possible that Finnish parents perceive and report their children’s behaviors differently compared to other Nordic countries, and that they have lower tolerance and greater concern about misbehavior. Supporting this hypothesis, previous research has demonstrated that Finnish parents emphasize traditional values, including politeness, obedience, and diligence more than Swedish parents (Tulviste, Mizera, De Geer & Tryggvason, 2007). Furthermore, in a previous study, under-reporting or under-recognition of emotional problems by Norwegian adults compared to parents of British children was reported (Heiervang, Goodman & Goodman, 2008). It is also known that social desirability predicts parents’ score on the ECBI intensity scale (Brestan, Eyberg, Algina, Johnson & Boggs, 2003), which is another possible source of cross-cultural reporting effects. Alternatively, it is possible that behavior problems are in fact more common in Finnish children compared to neighboring countries. However, studies conducted thus far do not allow for direct cross-national comparisons. Also, it should be borne in mind that cross-national differences in questionnaire items such as ones reported here do not necessarily reflect comparable differences in conduct disorder rates, and caution is warranted when estimating the prevalence of child psychiatric diagnoses based on brief questionnaires (Goodman, Heiervang, Fleitlich-Bilyk *et al.*, 2012).

In previous studies, getting angry when not getting his/her own way, being slow when getting ready for bed, interrupting, and verbally fighting with sisters and brothers have been repeatedly among the problem behaviors most frequently observed by the parents (Axberg *et al.*, 2008; Reedtz *et al.*, 2008; Robinson *et al.*, 1980). In a similar vein, the two most common parent-reported behavior problems in our study were verbally fighting with sisters and brothers and getting angry when not get his/her own way, closely followed by interrupting, sassing adults, whining, dawdling in getting dressed, dawdling in getting to bed, and arguing with parents about rules. The least frequently observed behavioral problems were stealing and wetting the bed – these same items also had the lowest item-total correlations. When comparing the behaviors that parents most often endorse as problems, the results between different studies have been more inconsistent, partly because of methodological differences in calculating the percentage of parents endorsing each behavior as a problem. Verbally fighting with sisters and brothers and dawdling in getting dressed were the two behaviors that parents most often found problematic in our study. The two behaviors least

Table 6. Seven-factor solution of an exploratory factor analysis with principal axis factoring and oblique (direct oblimin) rotation on the ECBI Intensity Scale items*

Item	F1	F2	F3	F4	F5	F6	F7
14. Sassses adults	0.80	−0.06	−0.04	0.05	0.05	−0.04	−0.07
12. Gets angry when does not get his/her own way	0.74	−0.01	0.02	0.03	0.00	0.03	0.07
10. Acts defiant when told to do something	0.71	−0.03	0.05	0.09	−0.01	0.04	0.07
11. Argues with parents about rules	0.70	−0.06	0.02	0.19	0.05	−0.09	−0.02
17. Yells or screams	0.68	0.02	0.08	−0.03	0.05	0.03	0.14
13. Has temper tantrums	0.63	−0.01	0.00	−0.04	0.05	0.01	0.32
15. Whines	0.57	−0.05	0.06	−0.00	0.03	0.18	−0.08
9. Refuses to obey until threatened with punishment	0.45	−0.03	0.10	0.19	0.05	0.12	0.04
28. Constantly seeks attention	0.33	−0.18	0.06	−0.06	0.24	0.18	−0.12
8. Does not obey house rules on his/her own	0.31	−0.20	0.11	0.28	0.01	0.04	0.05
5. Refuses to do chores when asked	0.30	−0.15	0.13	0.26	−0.10	0.04	0.04
29. Interrupts	0.28	−0.24	0.04	−0.07	0.20	0.23	−0.20
16. Cries easily	0.27	−0.01	0.10	−0.07	0.05	0.24	−0.02
31. Has short attention span	−0.07	−0.91	−0.06	0.01	0.01	0.00	0.06
34. Has difficulty concentrating on one thing	−0.05	−0.88	−0.02	−0.03	−0.01	−0.04	0.01
32. Fails to finish tasks or projects	−0.00	−0.80	0.04	0.10	−0.05	−0.01	0.01
30. Is easily distracted	0.03	−0.77	−0.04	0.01	0.07	0.04	−0.04
33. Has difficulty entertaining him/herself alone	0.05	−0.51	−0.02	−0.09	−0.00	0.08	−0.03
35. Is overactive or restless	0.08	−0.50	0.03	0.03	0.16	0.06	0.08
20. Is careless with toys and other objects	0.07	−0.39	0.16	0.11	0.03	0.01	0.04
25. Verbally fights with sisters and brothers	−0.01	0.05	0.98	−0.03	−0.04	−0.01	−0.08
27. Physically fights with sisters and brothers	−0.04	0.03	0.83	−0.01	0.04	−0.01	0.08
7. Refuses to go to bed on time	0.00	0.01	−0.02	0.84	0.05	0.04	0.03
6. Dawdles in getting bed	0.04	0.02	−0.03	0.75	0.05	0.11	−0.06
24. Verbally fights with friends his/her own age	0.09	0.04	−0.05	0.03	0.79	0.03	−0.07
26. Physically fights with friends his/her own age	−0.11	−0.04	0.01	0.04	0.69	0.00	0.13
23. Teases or provokes other children	0.06	−0.06	0.28	0.02	0.49	−0.00	0.04
22. Lies	0.12	−0.20	0.09	0.09	0.30	−0.09	0.03
2. Dawdles or lingers at mealtime	−0.13	−0.00	−0.00	0.07	0.02	0.88	0.02
1. Dawdles in getting dressed	0.07	−0.08	−0.06	0.05	0.04	0.60	0.01
4. Refuses to eat food presented	0.07	−0.05	0.06	0.13	−0.08	0.40	0.09
3. Has poor table manners	0.10	−0.17	0.13	0.10	0.06	0.31	0.05
19. Destroys toys and other objects	0.05	−0.18	0.13	0.01	0.14	0.06	0.53
18. Hits parents	0.30	0.04	−0.03	−0.02	0.09	0.16	0.43
Eigenvalue	12.84	2.35	1.84	1.39	1.24	1.15	1.02
Percentage of Variance	37.75	6.91	5.41	4.08	3.63	3.39	3.01

Notes: $n = 1,715$. ECBI = Eyberg Child Behavior Inventory. Factor loadings greater than 0.29 are bolded.

*Two items with communalities < 0.20 were excluded from the analysis. These items were numbers 21 (Steals) and 36 (Wets the bed).

frequently endorsed as a problem in our study were stealing and wetting the bed, probably because these behaviors were so rare in the sample.

The reliability of both ECBI scales was excellent in our sample. Individual items correlated strongly with the total scales, except for two items, which were “Steals” and “Wets the bed”. These items have shown low item-total correlations in previous studies as well (see Axberg *et al.*, 2008; Reedtz *et al.*, 2008), and it is worth consideration if the scales would be more consistent without them. The explorative factor analyses of the Intensity Scale also supported the idea of removing these two items from the instrument, since they had low communalities with other items and thus were removed from the analyses. Moreover, in a recent prospective study among a community sample of 3–9-year old children, enuresis was not associated with oppositional defiant disorder (although it was associated with ADHD), instead internalizing psychopathology had a prominent role in preceding, and succeeding the development of enuresis (Kessel, Allman, Goldstain *et al.*, 2017). In light of the current evidence, evidence for association of enuresis with conduct problems is

weak, and parents of children who wet the bed benefit from understanding that enuresis is a commonly occurring childhood disorder with multifactorial etiology and a tendency to remit once the child gets older. Removal of the bedwetting item in order to increase the reliability and validity of the instrument has been recommended elsewhere as well (Weeland *et al.*, 2018).

Norm values and clinical cut points were established for boys and girls separately. Like in several previous studies (Abrahamse *et al.*, 2015; Reedtz *et al.*, 2008; Robinson *et al.*, 1980; Weeland *et al.*, 2018), the mean scores of both ECBI scales were higher for boys than for girls. Differences may reflect boys’ biological vulnerabilities, early differential socialization in child rearing where adults respond differently toward boys and girls who are defiant (Robinson *et al.*, 1980), or both. Also, ECBI includes few behaviors describing relational aggression (i.e., aggression aimed at causing others social harm, e.g., starting rumors or threatening to end a friendship), which is more common among girls. Child’s age has also been found to be associated with ECBI scores in some studies (e.g., Colvin *et al.*, 1999; Robinson *et al.*, 1980; Weeland *et al.*, 2018). In our study, parents reported less intense

Table 7. Four-factor solution of an exploratory factor analysis with principal axis factoring and oblique (direct oblimin) rotation on the ECBI Intensity Scale items*

Item	F1	F2	F3	F4
13. Has temper tantrums	0.82	-0.05	0.03	-0.07
17. Yells or screams	0.82	-0.07	0.06	-0.04
12. Gets angry when does not get his/her own way	0.81	-0.06	-0.01	0.06
14. Sasses adults	0.78	0.02	-0.06	0.05
10. Acts defiant when told to do something	0.77	-0.05	0.02	0.12
11. Argues with parents about rules	0.67	0.01	0.03	0.16
15. Whines	0.62	0.07	-0.01	0.09
18. Hits parents	0.57	-0.01	0.02	-0.01
9. Refuses to obey until threatened with punishment	0.51	0.03	0.10	0.25
28. Constantly seeks attention	0.42	0.32	0.04	-0.02
16. Cries easily	0.39	0.07	0.04	0.04
19. Destroys toys and other objects	0.33	0.20	0.21	-0.01
1. Dawdles in getting dressed	0.29	0.23	-0.14	0.28
31. Has short attention span	-0.11	0.91	-0.05	0.06
34. Has difficulty concentrating on one thing	-0.12	0.86	-0.02	0.02
30. Is easily distracted	-0.01	0.82	-0.04	0.06
32. Fails to finish tasks or projects	-0.09	0.75	0.04	0.18
35. Is overactive or restless	0.15	0.58	0.06	0.03
33. Has difficulty entertaining him/herself alone	0.05	0.53	-0.06	-0.01
29. Interrupts	0.34	0.38	-0.01	0.02
20. Is careless with toys and other objects	0.05	0.38	0.18	0.16
26. Physically fights with friends his/her own age	0.15	0.36	0.19	-0.13
24. Verbally fights with friends his/her own age	0.30	0.34	0.11	-0.13
22. Lies	0.17	0.31	0.19	-0.01
27. Physically fights with sisters and brothers	-0.04	-0.04	0.88	0.06
25. Verbally fights with sisters and brothers	-0.03	-0.08	0.84	0.07
23. Teases or provokes other children	0.23	0.29	0.39	-0.09
7. Refuses to go to bed on time	0.00	0.01	0.09	0.74
6. Dawdles in getting bed	0.00	0.01	0.05	0.73
2. Dawdles or lingers at mealtime	0.20	0.21	-0.11	0.37
5. Refuses to do chores when asked	0.26	0.06	0.13	0.34
8. Does not obey house rules on his/her own	0.30	0.16	0.14	0.34
4. Refuses to eat food presented	0.20	0.07	-0.00	0.33
3. Has poor table manners	0.22	0.25	0.11	0.25
Eigenvalue	12.84	2.35	1.84	1.39
Percentage of Variance	37.75	6.91	5.41	4.08

Notes: $n = 1,715$. ECBI = Eyberg Child Behavior Inventory. Factor loadings greater than 0.29 are bolded.

*Two items with communalities <0.20 were excluded from the analysis. These items were numbers 21 (Steals) and 36 (Wets the bed).

problem behavior for older children and also reported these behaviors as less problematic. As pointed out by Weeland *et al.* (2018), parents might have different expectations for behavior of older children compared to the behavior of younger children. Further research might investigate associations of individual items or clusters of items with child's gender, as well as age.

SES was associated with ECBI scores so that blue-collar families reported more behavior problems with their children than lower level white-collar families. This mirrors the results of several other studies (Blair, Leibenluft & Pine, 2014; Murray & Farrington, 2010) where lower SES has been found to be associated with more behavior problems. However, the connections in our sample were rather weak and did not reach statistical significance in any other comparisons (e.g., upper level white-collar workers versus blue-collar workers). One possible explanation is that Finnish society is so homogenous that the risk factors for child behavior problems are not over-presented in lower SES groups. Also, in our study SES was measured rather broadly, and more specific information could have been gathered if the background questionnaire would have included questions

about current employment status of the parent (unemployed or not) and/or annual income of the family.

The ECBI was initially constructed as a unidimensional measure of childhood conduct problems. The idea was to create an instrument that would comprehensively describe conduct problem behavior, with individual items revealing specific problem areas (Eyberg & Ross, 1978; Robinson *et al.*, 1980). Both unidimensional (Abrahamse *et al.*, 2015; Colvin *et al.*, 1999; Eyberg & Robinson, 1983; Gross *et al.*, 2007; Robinson *et al.*, 1980) and multidimensional structures (Axberg *et al.*, 2008; Burns & Patterson, 1991, 2000; Hukkelberg, 2016) have since gained support. In our sample the unidimensional one-factor solution of the ECBI intensity scale was the best fit for our data, supporting the original idea of the ECBI as a measure of estimating global externalizing symptom severity. One possible explanation for our results that did not replicate the findings of Burns and Patterson (1991, 2000) is that we used different extraction and rotation methods in our factor analyses. However, our methods were carefully selected, taking into consideration the non-normality of our data and relatively strong correlations

among the extracted factors. We chose not to try to replicate the multidimensional structure by changing our methods, since that would have meant an intentional effort to find a predetermined, multidimensional factor structure, and as noted, the previous findings about the dimensionality of the ECBI have been contradictory.

Several limitations must be taken into account when interpreting the results. First, our response rate of 34% limits the representativeness of the sample, although the rate is comparable to other studies with similar designs, and the study sample represented the original sample well regarding age, gender, and size of home municipality. Second, we were unable to compare questionnaire data with interview obtained data or with data from other informants than parents. Comparing self- or teacher-reported psychopathology with parent reports would be of interest. Finally, it cannot be assumed that the same norms will apply everywhere within a single country (Goodman *et al.*, 2012), thus the norms, for example, in rural and urban areas of Finland might be different as was recently found in the Netherlands (Weeland *et al.*, 2018).

In conclusion, this study provides information about prevalence of different parent-reported behavior problems in Finnish children. Information will be useful in planning the services and interventions for families struggling with these problems. Furthermore, the study emphasizes the need of deriving country specific norms for different age groups and genders in order to use questionnaire measures in reliable and clinically meaningful way in different contexts.

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