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ORIGINAL CONTRIBUTION

T.S. Nøvik

Validity of the Child Behaviour Checklist in a Norwegian sample

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T.S. Nøvik (✉)
Centre for Child and Adolescent Psychiatry
University of Oslo
P.O. Box 26 Vinderen
0319 Oslo
Norway

Abstract The purpose of the study was to test the applicability of the Child Behaviour Checklist for assessing behaviour problems and competencies in Norwegian children and adolescents. Information was obtained by mailing checklists to parents of random sampled children and adolescents in a mixed rural/semirural area and the urban Oslo area. High-scoring children and random samples of normal-scoring children in two different age groups were clinically assessed in the second part of the study. The results support the predictive validity of the CBCL as judged by its ability to distinguish between children with psychiatric disorders and psychiatrically non-disordered children. Differences pertaining to sex, age, SES, and degree of urbanisation confirm findings of earlier studies across cultures.

Key words CBCL – behaviour problems – epidemiology – screening

Introduction

In the course of the last decade the Child Behaviour Checklist (CBCL) (1) has become one of the most widely used instruments for assessing child and adolescent emotional and behavioural problems in a variety of settings, including epidemiological research (21). Numerous studies have provided evidence of the instrument's stability of psychometric properties. Moreover, cross-cultural comparisons have yielded relatively small differences in rates of problems and syndrome structure (20). These comparisons have also shown similarity in associations of problems with sex and socio-economic status (SES), and similar correlations between reports by different types of informants. The CBCL, therefore, seems to possess the necessary features to satisfy assessment needs in child psychiatry. It provides a measure encompassing different psychopathological syndromes, which is sensitive to their changing presentation during development and which can be included in clinical assessments and research protocols (8).

However well established the psychometric properties of the CBCL, it is still necessary to investigate these further when the instrument is used in a new setting. First, it is required to pay careful attention to the translation/back translation and pilot testing to capture the instrument's contents. Second, the instrument should be applied to representative samples in order to obtain norms for the specific population and to test its reliability and validity. Within sample comparisons should be performed with respect to variables that may influence the scores such as age, sex, clinical status, type of informant, and SES (20).

The present study is the first to provide CBCL scores across a wide age range in a sample representative of the Norwegian population. The aims of the study were the following; (1) report prevalence data on competence, behavioural and emotional problems in a sample of Norwegian children and adolescents aged 4–16 years; (2) identify differences related to demographic variables, presuming that children living in rural and urban settings would show the same level of behaviour problems; (3) assess the predictive validity of the CBCL as judged by its ability to distinguish between psychiatrically disordered/nondisordered children.

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Methods

Subjects

The municipalities of Lofoten in Northern Norway and the City of Oslo were chosen as the two study sites. The former is characterized by a mixture of rural and semirural areas with diverse economic activities such as farming, fishing and small industries. With its 500 000 inhabitants, Oslo, the capital of Norway, is the largest city in Norway. The two areas compare well with the rest of the country. Five thousand two hundred children and adolescents aged 4–16 years were sampled by means of a stratified random sampling procedure. The Office of the National Registrar drew the sample from the Central Population Register. Every second child on the list was selected to the final sample. In case of an unknown address, the next eligible child on the list was selected. Families with a name indicating a non-Norwegian background were omitted from the sample because of the mailing procedure and possible language difficulties. The final sample included 2600 children, 50 boys and 50 girls in each of the 13 age groups, in each site.

Protocol and instruments

The classical two-stage procedure was used with a first screening of all children by using the CBCL. In the second stage all screen positive children 8–9 years old and 13–14 years old, and random samples of screen negative children in these age groups, were selected for a more detailed diagnostic assessment.

The CBCL and its related instrument, the Youth Self Report (YSR), are standardized instruments for assessing a broad array of psychopathological manifestations in children. The CBCL and YSR were designed to tap problems and competencies reported by parents of children aged 4–18 years and adolescents aged 11–18 years. The CBCL includes 20 competence items which obtain parents' reports on amount and quality of their children's participation in sports, hobbies, games, activities, jobs and chores, and friendships; how well the child gets along with others; and school functioning. A total score of social functioning can be derived; lower scores indicate poorer functioning. The 118 behavioural items (and two open-ended items), scored on a three-step response scale (0–2), produce a total score that ranges between theoretical limits of 0 and 240. The 1991 version of the scoring programme generates eight syndrome scale scores: the syndrome scales Withdrawn, Somatic Complaints, and Anxious/Depressed are grouped under the name Internalizing Problems, and the scales Delinquent Behaviour and Aggressive Behaviour are grouped under the name Externalizing Problems. The internalizing score and the externalizing score are the sum score of the Internalizing and the Externalizing scales respectively. A careful translation and back-translation of the 1983 version of the CBCL (2) into Norwegian was carried out in connection with a pilot study which has been described elsewhere (14).

When filling in the CBCL forms, parents indicate their educational background and present occupation. Of the responding parents, 98.2% reported the occupation of at least one of the parents. A seven-point scale of type of work from the Nordic standard classification system of socio-economic status was used to classify occupation (15). If both parents worked in a profession, the higher status occupation was used in the analyses.

During the second stage of the study the children were interviewed by one of four child psychiatrists using the Child Assessment Schedule (CAS) (11). After the interview a short version of the WISC-R (four subtests known by previous research to have a high correlation with the total score of the test) was administered (18). Psychiatric diagnosis was based on the CAS and recorded according to the DSM-III-R (4). Upon completion of the child interview the psychiatrists scored the Children's Global Assessment Scale (CGAS) (16), an index of global impairment of psychological functioning. They also scored global psychiatric functioning in the following way: 1 = no disorder; 2 = mild disorder; 3 = moderate disorder; 4 = severe disorder (3 and 4 indicated a need for treatment). Parents were interviewed by a psychiatric social worker or a child psychiatrist using a slightly modified version of the Parental Account of Children's Symptoms (PACS) (19) to obtain information on the children's behaviour and emotional problems as seen by the parents. Before conducting the interviews, the interviewers scored several videotapes of the CAS and PACS.

Procedures

The study was conducted from 1991 to 1992, a few interviews were carried out in 1993. Consent was obtained from the Norwegian Data Inspectorate and the Regional Ethics Committee for Medical Research. A letter stating the purpose of the study and the CBCL were mailed to the families. Adolescents aged 15 years and above received a separate letter. The parents were asked to return the CBCL together with a signed letter stating their consent to participate. Families with adolescents aged 11 years and above were asked to return the YSR. The Norwegian Data Inspectorate permitted only one reminder. However, nonresponders listed in the telephone directory could be reminded by telephone.

In the second clinically oriented part of the study all children from the age groups 8–9 years and 13–14

years with a total behaviour problem T-score > 60 (the 82nd percentile) according to the American norm, and a random sample of children with a T-score < 60, were invited to take part in a more detailed assessment. A T-score of 60 corresponded to the 91st percentile of the frequency distribution for children 8–9 years and the 95th percentile for children 13–14 years old. The children and parents were interviewed with a mean interval of 13 months after the screening. The participants shortly before the clinical interviews filled out another CBCL and YSR. One parent interview was conducted by telephone. One adolescent refused to accompany his parents to the interview. The scoring in this case was, therefore, based on the information of one informant. Before assigning the final scores the child and family interviewers had a brief clinical discussion and reached a consensus regarding the final scoring of the child. A child psychiatrist, blind to other measures in the assessment, scored 20 videotapes of CAS interviews. The intraclass correlations (ICC I.I) (17) for the total CAS symptom scores and CGAS were 0.94 and 0.86 respectively. The kappa coefficient for agreement of global psychiatric functioning was 0.66. Fourteen randomly selected PACS interviews were scored by raters blind to other information. The correlation coefficients for PACS scales were 0.97 on the Emotional Problems scale, 0.96 on the Defiance scale and 0.97 on the Hyperactivity scale. Caseness was determined by obtaining both a DSM-III-R diagnosis and a CGAS score below 71 (5).

Statistics

The 1991 version of the CBCL scoring program was used to calculate the sum scores of the CBCL and YSR scales (1). The statistical package SPSS for Windows, release 6.1, was used for the analyses. The VALIDROK program (24) was used for the ROC-analysis.

Results

Sample characteristics

The overall response rate was 45%; 49.2% of the participants were boys, 50.8% were girls (a hypothesis test to compare the two proportions provided $z = 0.69$, Ns). Fifty percent of the parents in Oslo and 40% of the parents in Lofoten responded ($z = 5.0$, $p < 0.001$). The response rates in the urban and rural areas were: 62% and 64% in boys 4–5 years, 55% and 45% in boys 6–11 years, and 34% and 30% in boys 12–16 years, 65% and 51% in girls 4–5 years, 54% and 44% in girls 6–11 years and 44% and 27% in girls 12–16 years. A table of the response rates has been presented in an earlier report (14). Chi-square analysis for trend across all 13 age groups revealed a significant effect of age on participation (X^2 trend = 117.08, 1df, $p < 0.001$), but no significant interaction effects between survey area and gender (boys X^2 trend = 1.517, 1df, Ns; girls X^2 trend = 1.266, 1df, Ns). Sixty-three percent of the questionnaires were filled out by the mother, 23% by the father, and 14% by another person. In the second clinical stage 17 of 25 (68%) in the high-scoring group, and 60 of 87 (69%) in the low-scoring group agreed to participate ($z = 0.89$, Ns). Noncompliance was associated with problems of scheduling suitable interview times, particularly in the rural areas.

Table 1 presents the observed distributions of the responding fathers' occupations and the distributions of the background populations in the two areas. The responding fathers came from higher SES levels as compared with the background population. There was a higher frequency of high level employees and lower frequency of medium level employees among the responders (Oslo $X^2 = 39.360$, 1df, $p = < 0.001$ and Lofoten $X^2 = 9.072$, 1df, $p = < 0.01$). The proportion of skilled workers compared with nonskilled workers was increased in both areas; these differences were nonsignificant (Oslo $X^2 = 2.320$, 1df, Ns and Lofoten $X^2 = 1.420$, 1df, Ns).

CBCL scores in the general population

In the analysis of the CBCL scores, a four-point scale of educational level from the Nordic standard classification system was used to describe the SES (15). The four educational levels reflect the mean educational levels of the members of the occupations during the 1970 census in Norway. Level 1 corresponds to 9 years of education with no vocational training, level 2 corresponds to 12 years, level 3 to 16 years and level 4 to 18 years of education. If both parents worked outside the home the higher educational level was used in the analysis. Analysis of variance was used to analyze differences related to age and SES, and t-tests to analyze differences related to gender and location (Table 2). A modified LSD (Bonferroni) test with significance level 0.05 was applied in the comparison of more than two groups. All age differences in problem scores were significant except for the difference in total behaviour problems between the two youngest groups. The differences related to location were all nonsignificant. Boys were scored significantly higher on the Externalizing and girls higher on the Internalizing subscale. Children from the lowest SES group were scored significantly higher on total behaviour problems and Externalizing than all other groups, and significantly higher on the Internalizing subscale than children from the highest SES group. Children from the

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Table 1 Socio-economic groups. Oslo and County of Nordland general populations (men 24–64 years) and responding Olso and Lofoten fathers (%)

Socio-economic group	Oslo		Rural Lofoten	
	Men 25–54 yrs N = 104 000	Responding fathers N = 649	Men 25–54 yrs N = 50 000	Responding fathers N = 521
Workers				
Unskilled	13.0	5.7	19.0	5.4
Skilled	10.8	12.5	13.0	22.6
Employees				
Lower level	3.4	0.9	2.0	3.1
Medium level	47.7	13.7	24.0	13.8
Higher level	18.2	57.9	10.0	25.3
Self employed				
Farmers/Fisherman	0.0	0.2	8.0	17.1
Other Independents	7.9	1.8	6.0	2.5
Not employed				
Students	3.4	0.8	6.0	1.5
Working at home	0.0	0.2	0.0	0.2
Pensioners	4.5	0.5	6.0	2.1
Others	9.1	5.8	8.0	6.4
	X^2 = 1280.69 10df, $p < 0.001$		X^2 = 430.30 10df, $p < 0.001$	

highest SES group were scored significantly lower than children from the second highest group on total behaviour problems and Externalizing. On total social competence all SES group differences were significant except for the difference between the two intermediate groups. The difference in mean total behaviour problem scores related to SES accounted for 2.6% of the variance, and the difference in mean total competence scores for 8.3%.

Multiple linear regression analysis was applied to obtain estimates for the effects of age, location, sex, and SES on Total Problem score, Externalizing, Internalizing and Total Social Competence score (Table 3). A forward stepwise procedure was adopted. Female gender predicted a significant decrease in externalizing and increases in internalizing and total social competence. Age predicted a significant decrease in total behaviour problems from 7–11 years to 12–16 years, and a decrease

Table 2 Mean CBCL Total Behaviour Problems, Externalizing, Internalizing, and Total Social Competence Scores by age, sex, location, and SES in the general population sample

Variable	Total behaviour problem		Externalizing		Internalizing		Total social competence	
	Mean	(SD)	Mean	(SD)	Mean	(SD)	Mean	(SD)
Age group								
4–6	17.9	(12.4)	7.7	(5.9)	3.3	(3.4)		
7–11	16.4	(13.0)	6.1	(5.8)	4.4	(4.6)	18.4	(2.6)
12–16	13.6	(11.8)	4.6	(5.0)	4.4	(4.3)	18.4	(3.1)
p	< 0.001		< 0.001		< 0.001		n.s.	
Location								
Urban	16.2	(13.1)	5.9	(5.6)	4.3	(4.4)	18.6	(2.8)
Rural	15.6	(12.8)	6.2	(5.8)	3.9	(4.1)	18.1	(2.9)
p	n.s.		n.s.		n.s.		n.s.	
Sex								
Boys	16.5	(13.3)	6.6	(6.2)	3.8	(4.0)	18.2	(3.0)
Girls	15.4	(12.6)	5.5	(5.1)	4.4	(4.5)	18.6	(2.6)
p	n.s.		< 0.001		< 0.05		n.s.	
SES								
Lowest	19.9	(14.4)	7.9	(6.6)	4.7	(4.8)	16.9	(2.9)
Sec. lowest	15.9	(11.8)	5.9	(5.2)	4.0	(3.9)	18.0	(2.1)
Sec. highest	15.8	(13.3)	6.1	(5.7)	4.1	(4.3)	18.4	(2.9)
Highest	13.1	(10.2)	4.7	(4.4)	3.5	(3.5)	19.5	(12.7)
p	< 0.001		< 0.001		<= 0.05		< 0.001	

Table 3 Multiple regression of age, location (urban or rural), sex, and SES on the CBCL Total Behaviour Problems, Externalizing, Internalizing, and Total Social Competence Scores. General population sample (N = 1170)

Variable	Total behaviour problem			Externalizing			Internalizing			Total social competence		
	Coeff b	SE se(b)	p	Coeff b	SE se(b)	p	Coeff b	SE se(b)	p	Coeff b	SE se(b)	p
Age												
Age 1 (4–6 yrs)	0	–	–	0	–	–	0	–	–	–	–	–
Age 2 (7–11 yrs)	−1.427	0.909	0.117	−1.486	0.391	0.000	1.009	0.300	0.001	0	–	–
Age 3 (12–16 yrs)	−4.850	0.978	0.000	−3.204	0.421	0.000	0.859	0.323	0.008	−0.101	0.230	0.648
Location												
Location 1 (urban)	0	–	–	0	–	–	0	–	–	0	–	–
Location 2 (rural)	−2.308	0.785	0.003	−0.465	0.338	0.170	−0.664	0.259	0.011	0.056	0.230	0.808
Sex												
Boys	0	–	–	0	–	–	0	–	–	0	–	–
Girls	−0.919	0.744	0.217	−4.098	0.320	0.001	0.537	0.246	0.029	0.465	0.219	0.034
SES	−2.329	0.397	0.000	−0.975	0.977	0.000	−0.456	0.750	0.001	0.836	0.116	0.000
(Constant)	29.057	2.271	0.000	12.623	0.977	0.000	4.772	0.750	0.000	15.316	0.644	0.000
Multiple R^2		0.05			0.09			0.03			0.09	

in Externalizing Problems and an increase in Internalizing Problems across the three age groups. Rural location predicted a significant decrease in Total Behaviour Problems and Internalizing. An increase in SES predicted decreases in the problem scores and an increase in Total Social Competence.

Children selected for further investigation

Forty-one children and 36 adolescents were interviewed. All appeared to be of normal intelligence as judged by the WISC-R subtests. Ten children and six adolescents received a DSM-III-R diagnosis; six were diagnosed with overanxious disorder, three with separation anxiety disorder, two with dysthymia, two with conduct disorder, one with ADHD and one with adjustment disorder. One adolescent was moderately disturbed; however, it was difficult to make a precise diagnosis without additional assessment of the child. One child and one adolescent received a DSM-III-R diagnosis, but were scored above 70 on the CGAS. Thus, nine children and five adolescents were considered cases according to the criteria in the present study. The CBCL scores obtained shortly before the interviews were used in the analysis. Correlation between the CBCL total score and CAS total score was 0.51 ($p = 0.01$). Children and adolescents designated cases scored significantly higher than the noncases on the CAS (mean total score 40.5, S.D. 17.3 for the cases and mean total score 14.3, S.D. 8.3 for the noncases, $p < 0.001$). The cases were scored higher by their parents on Behaviour Problems than the noncases (CBCL mean total score 45.4, S.D. 25.4 (cases) and mean total score (noncases) 11.1, S.D. 11.9 respectively, $p < 0.001$), and somewhat lower in Social Competence (mean Social Competence score 16.7, S.D. 5.0 for the cases and 18.5, S.D. 2.2 for the noncases, $p = 0.09$).

Effectiveness of the CBCL as a screening instrument

The criterion-referenced validity of the CBCL for assessing psychopathology in children can be measured by its ability to identify correctly children who can be regarded as disordered and those who can be regarded as normal. Nine children and five adolescents were considered cases in the present study. When the 90th percentile of the frequency distribution for the CBCL Total Behaviour Problem score in the population (32) was used as cutoff, sensitivity was 71%, specificity 92% and misclassification rate 12%. Raising the cutoff to the 90th percentile of the American frequency distribution for the CBCL (a score of 44 was used as the best estimate for both sexes and age groups) lowered the sensitivity of the CBCL Total Score to 57% in this sample. Sensitivity and specificity were also considered when the adolescents were selected on the basis of their scores on both the CBCL and YSR. The YSR had a response rate in the population of 40% and a population mean of 28.8, S.D. 18.0, 90th percentile 51.5. A score equal to or above the 90th percentile of the frequency distribution on either the CBCL or the YSR or both was considered the criteria for a positive test. The sensitivity was raised to 79% with 92% specificity and a 10% misclassification rate.

In order to add to the analysis of estimating the best cutoff point for the CBCL Total Behaviour Problem score, a ROC-analysis was performed. The aim of the ROC analysis is to find the point at which sensitivity and specificity is optimal in relation to each other (8). Ideally separate curves should be provided for each sex and age

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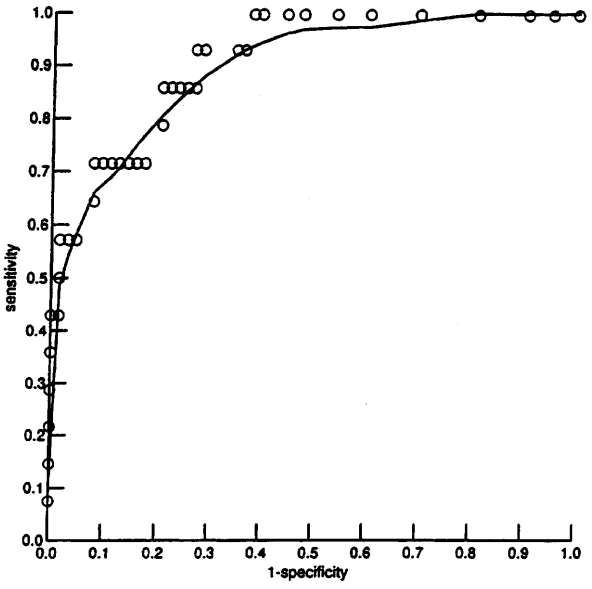

Fig. 1 ROC-curve of CBCL Total Behaviour Problem scores in 77 children and adolescents aged 9–16

group. As the number of interviewed children in the present study was small, only one curve was made based on the values for the 77 interviewed children and adolescents. The ROC curve displays graphically the family of 2×2 contingency tables derived from all possible cut-points of a scale. The analysis considered all cut-points from 0 to 99 (Fig. 1). The series of points in the figure represent pairs of sensitivity and specificity figures. Thirty-one to thirty-three are cut-points which are intuitively the best from inspection of the curve and which provide a sensitivity of 71% with a specificity of 92%. The area under curve (AUC) is the most commonly used measure of overall fit in the ROC analysis. It is intuitively interpreted as the probability of correctly classifying a randomly selected pair of subjects where one is normal and one is a case. The AUC was 0.91 (SE = 0.05). An AUC = 0.50 would correspond to the line of no information provided by the CBCL while an AUC of 1.0 would correspond to a perfect fit. Higher cutoff scores decrease sensitivity. A cutoff score as low as 20 yields equal sensitivity and specificity values of 78–79%.

Discussion

The results of the present study provide evidence for a predictive validity of the CBCL as judged by its ability to distinguish between children with psychiatric disorders and children with no psychiatric disorders in a Norwegian population. We found differences related to socio-demographic variables that confirm findings of earlier studies on the CBCL.

Crijnen et al. compared the behavioural and emotional problems of more than 13 000 children from 12 cultures using the CBCL (7). The authors found cross-cultural consistencies in the tendencies for Total Problems and Externalizing to decrease with age, for Internalizing to increase with age, for boys to score higher on Total Problems and Externalizing and girls to score higher on Internalizing. In general these findings were replicated in this Norwegian sample. We found somewhat higher problem scores in children from lower SES particularly on Externalizing, which again is in agreement with findings across culture (20). The difference in the level of behaviour problems in the urban and rural areas was small. Similar to the results of the present study, urbanity was shown to produce an average increase on the CBCL of 2.8 points as estimated in American, Dutch, and Thai studies (3), while a French study of children 6–11 years of age failed to demonstrate urban/rural differences (9). We do not expect the low response rate to have significantly biased the within-group comparisons in the present study, with the exception of the comparison across age. The magnitude of the difference in the scores between the young children and adolescents may, therefore, be overestimated.

SES was high in the sample which, therefore, was not fully representative of the population in the target areas. Most important, the main weakness of the present study was the large attrition rate that may bias the results. Therefore, even though the levels of problem behaviour in the population were supported by the comparison with a Norwegian twin sample (10) and by the findings of a recent Swedish study (13), the prevalence cannot be generalized to the population. Several studies have shown that bias is likely to be introduced through nonresponse by the exclusion of parents who report higher levels of problems (6, 22). However, other studies have suggested that this may not always be the case. Vikan (23), in a study of 10-year old Norwegian children, found that the prevalence of problems among nonresponders, as assessed by school psychologists and public health nurses, did not differ from that of the responders. Effects of varying response rate were also reported in a study of behaviour problems in Sami and Norwegian adolescents (12). The group with a low response rate scored slightly higher on YSR Internalizing and Attention Problems than the group with a high response rate. Otherwise there was no significant effect of response rate.

The present study was the first Scandinavian study to test for the relationship between the CBCL and an independent clinical criterion for caseness in a general population sample. A satisfactory sensitivity for the CBCL was achieved with a high specificity, although some precaution must be made because a relatively small sample was interviewed. With this limitation in mind, a consequence of the low population scores was a rather efficient screening procedure with a high positive

predictive value. It has been shown that obtaining information from more than one informant increases the effectiveness of the screening procedure. Adding the YSR to the CBCL increased the sensitivity in our sample. The prevalence of disorder among the interviewed children of 18% is probably not far from a realistic population prevalence rate when less severe disorders are included. Thus, the selected cutoff point seems a reasonable choice in studies with the aim of detecting cases of child mental health problems in the community. It may be appropriate to adjust cutoffs for age and gender. We did not provide separate cutoffs because of sample limitations. One should bear in mind that the choice of an optimal cutoff point for the CBCL as judged by the ROC curve depends on the prevalence of disorder, the consequences of misclassification, and the distribution of scale scores in the actual samples in which a screening procedure is performed (8). The cutoff point may need adjustment to a higher level if the CBCL is to be used as a screening instrument in clinical samples. Preliminary findings of CBCL mean total problem scores are 47 in outpatients and 61 in inpatients in a regional centre in Norway (Sørbye, personal communication).

When assessing a particular child it is necessary to have appropriate local norms in order to interpret the child's individual pattern of scores. Norwegian norms cannot be produced based on the results of the present study. At present Norwegian clinicians and researchers must integrate our findings with current findings of cross-cultural variations in CBCL syndrome scores (7) and knowledge of individual characteristics of the child, when using the CBCL for assessment purposes. Norms from one of the other Scandinavian countries would be helpful, but ideally Norwegian norms based on a sample representative of the population should be established.

In conclusion, the findings provide evidence for the external validity of the CBCL and support earlier research in this field carried out in other countries. The findings demonstrate the applicability of the CBCL and its effectiveness as a screening instrument in a Norwegian population. New data from a sample representative of the population is warranted in order to provide definite Norwegian norms.

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