CLINICAL ISSUES

Psychometric evaluation of the Turkish version of the Pediatric Symptom Checklist-17 for detecting psychosocial problems in low-income children

Semra Erdogan and Meryem Ozturk

Aims. To evaluate the usefulness of Pediatric Symptom Checklist-17 in identifying psychosocial problems in low-income, Turkish children.

Background. Epidemiological data indicate that 10–20% of children in primary care settings exhibit significant psychosocial problems. Early detection and treatment of these problems may lead to considerable health benefits. However, the brief and valid screening tool for children with psychosocial problems is not available in Turkey.

Design. Survey.

Methods. A sample of 306 parents with children between 6–16 years of age who were attending primary schools in Istanbul was included. The psychometric properties of the scale were established by examining the content, convergent, discriminant, construct validity and internal consistency and stability. Receiver operating characteristic analysis was conducted to estimate the optimal cut-off score of scale using the Child Behaviour Checklist as the criterion standard.

Results. Convergent validity was supported, and discriminant validity suggested that the scale successfully discriminated among the normal, borderline and clinical range groups. Although, exploratory factor analysis extracted three factors, confirmatory factor analysis did not meet the criteria for good model fit. Internal consistency was found to be 0·81; test–retest reliability was found to be 0·72. The area under curve was found to be 0·91 and optimal cut-off score was found to be 12 (sensitivity: 0·81; specificity: 0·86) for clinical range psychopathology.

Conclusion. The results provided an empirical support for extending the use of the Pediatric Symptom Checklist-17 in the primary care settings. The Turkish version of the Pediatric Symptom Checklist-17 showed an adequate reliability and validity for its use in low-income, Turkish children.

Relevance to clinical practice. Primary care providers can use the Pediatric Symptom Checklist-17 for early identification of childhood psychosocial problems in primary care settings. This easy-to-use tool can provide guidance to care providers for further assessment of children.

Key words: children, Pediatric Symptom Checklist–17, psychosocial problems, reliability, Turkey, validity

Introduction

Children's mental health is just as important as their physical health for their overall health. Mental illness affects all aspects of child's own life and the life of the family as a whole. Early detection and treatment of psychosocial problems may lead to considerable health benefits for the child and family (Riekert *et al.* 1999, Honeyman 2007, Essex *et al.* 2009). Failure to identify patients who display initially minor psychosocial problems may pose a greater risk as it may

Authors: *Semra Erdogan*, PhD, RN, Professor, Istanbul University Florence Nightingale School of Nursing, Istanbul, *Meryem Ozturk*, PhD, RN, Research Assistant, Istanbul University Florence Nightingale School of Nursing, Istanbul, Turkey
Correspondence: Meryem Ozturk, Research Assistant, Istanbul University, Florence Nightingale Hemşirelik Yüksekokulu, Abide-i Hürriyet Caddesi, 34381 Sisli/Istanbul, Türkiye. Telephone: +90 212 440 00 00/27120.
E-mail: meryempub@yahoo.com

contribute to the development of more serious and persistent psychosocial disorders. Furthermore, it may lead to negative treatment outcomes, higher health-care use rates and poorer adherence to medical recommendations (Lavigne *et al.* 1999, Riekert *et al.* 1999).

Current global epidemiological data indicate that 10–20% of children and adolescents seen in primary care settings exhibit significant behavioural and psychosocial problems that warrant clinical attention. These rates may be even higher in low-income populations (Jellinek *et al.* 1999, Bernal *et al.* 2000, Jutte *et al.* 2003), and up to 50% of all adult mental disorders have their onset in adolescence (Belfer 2008). In fact, of those children identified as having problems, fewer than half are expected to receive mental health services to address these problems (Murphy *et al.* 1996, Costello *et al.* 2003, Essex *et al.* 2009).

Psychosocial problem screening, with the use of standardised instruments, allows for the early identification of problem behaviour and the development of secondary prevention efforts. (Riekert *et al.* 1999, Honeyman 2007). The use of self-administered parent questionnaires has been shown to facilitate identification of child psychosocial problems in primary care settings, address parental concerns and require minimal cost and professional time (Stancin & Palermo 1997). The Pediatric Symptom Checklist (PSC) is a parent-completed scale developed as a measure of child functioning and subsequently used as a screen for symptoms of psychosocial problems in primary care settings (Jellinek *et al.* 1986, 1988, 1999). The Pediatric Symptom Checklist-17 (PSC-17) is a short form of the PSC with three subscales measuring common childhood attention, externalising (disruptive behaviour) and internalising (depression and anxiety) problems (Gardner *et al.* 1999). A positive PSC-17 total score has been shown to be a good predictor for some emotional and behavioural problems (Gardner *et al.* 2004). From a public health perspective, schools are ideal settings for the efficient detection of children and adolescents with unidentified mental health problems because they offer the opportunity to reach large numbers of children and young people (Farmer *et al.* 2003, Levitt *et al.* 2007). In fact, school-based mental health services provide the most easily accessed interventions for children with mental health problems (Puskar & Bernardo 2007).

Despite the nationwide studies about childhood psychosocial problems are limited in Turkey. Some epidemiological studies have revealed that 9–22% of school aged children and 12% of toddlers have emotional and behavioural problems or other mental health problems (Baysal *et al.* 2004, Erol *et al.* 2005, Simsek *et al.* 2008). One study in a school setting demonstrated that mental health problems constituted 12% of all health problems (Baysal *et al.* 2004). The growing rates of emotional and behavioural morbidity put forward the need of early detection of problems with screening tools that can be applied easily. In addition, to our knowledge, no study to date has explored a brief and valid screening tool for children with psychosocial problems in Turkey. The main aim of the study was to establish the utility of the PSC-17 for early identification of psychosocial problems specifically in low-income, Turkish children. For this purpose, cultural adaptation was performed and its psychometric properties were evaluated.

Methods

Participants

The study was conducted during the year 2008 in Istanbul, Turkey. Data were collected from two elementary schools in different semi-urban areas where families with low socio-economical status (SES). We used a convenience sample of families with children ages 6–16 years who were attending to primary school. A total of 352 families were identified as eligible to be included in the sample of the study. Fifteen parents reported that they were not willing to participate. Nine parents were excluded because their children had an established diagnosis of mental illness or treatment, and 22 parents reported they had not enough time to complete the questionnaires. Finally, 306 (87%) parents agreed to participate in the study and completed the questionnaires without missing any of the questionnaire items.

Procedure

First, we obtained ethical and administrative approval from the directorate of national education in the city. Next, we obtained permission from the directors of the schools to pursue the study. Research assistant approached eligible families by mail or telephone, informed them about the study details and obtained written informed consent if they agreed to participate. Parents of children aged 6–16 completed the following survey forms in the school settings: Demographic Questionnaire (DQ), The Pediatric Symptom Checklist (PSC-17) and Child Behaviour Checklist (CBCL). Research assistant guaranteed parents that their identities and answers would be kept confidential. They were encouraged to complete the questionnaire unaided and in private. Researchers administered the questionnaires verbally when parents were not able to complete. The administration of the data collection tools took an average of 30 minutes if not faced with any difficulties.

Translation process

The PSC-17 was translated using the back translation technique. The back translated and original forms of the scale were compared with each other and found to be highly similar in meaning. Content validity was ascertained by an expert panel (eight academicians specialising in child and adolescence psychiatry) whose members were asked to review the 17 items of PSC. They were asked to review and rate the relevance of each item using a four-point rating scale ranging from 1 (not relevant) – 4 (very relevant and succinct). The content validity index (CVI) score was computed by summing the percentage agreement scores of all items that were given by the experts a rating of '3' or '4'. The criterion for retaining an item was at least 80% agreement among the experts at the agree or strongly agree level of relevance to the construct (Pierce 1995). The Turkish PSC-17 total CVI score was calculated to be 98·5%, which indicated satisfactory agreement among the experts. Finally, the PSC-17 was revised by using the results of the content validity. The final version of the PSC-17 was pretested on 20 parents and was seen to be efficient.

Measures

Pediatric Symptom Checklist-17 (PSC-17)

The PSC is a brief, widely used, parent-completed questionnaire with 35 items that screens for childhood psychosocial problems in primary care. It has been well studied in a range of settings and with samples that vary by ethnic and socioeconomic status (Jellinek *et al.* 1999, Jutte *et al.* 2003, Reijneveld *et al.* 2006). The PSC screens for attention problems, hyperactivity, depression, conduct disorder, anxiety, etc. A shortened version, the PSC-17, was developed based on the PSC and consists of 17 symptoms where parents rate each symptom as occurring 'often' (2 points), 'sometimes' (1 points), or 'never' (0 points) (Gardner *et al.* 1999). Using cross-validated factor analysis, three conceptually coherent clusters of items were identified: Internalising, Externalising and Attention (I, E and A respectively). In original study, these subscales had high internal consistency ($\alpha \geq 0·79$) and strong agreement with diagnoses based on the Screen for Child Anxiety Related Emotional Disorders (SCARED) and Inattention/Overactivity with Aggression (IOWA) Conners parent report instruments. The receiver operating characteristic (ROC) curves had also good area under the curve (AUC) statistics (range 0·82–0·90), with good sensitivities (0·77–0·87) and specificities (0·68–0·81) at the optimal cut off points (5 for I, 7 for E, 7 for A and 15 for total).

Child Behaviour Checklist (CBCL/6-18)

The CBCL is a parent-completed diagnostic tool that reports the children's problems over the preceding six months (Achenbach & Rescorla 2001). It has been used extensively in both clinical and research settings to identify psychopathologic disorders in children (Berube & Achenbach 2004). The CBCL includes items for rating competencies and 113 items for behavioural and emotional problems. Respondents rated items on a three-point scale where 0 was 'not true', 1 was 'somewhat or sometimes true' and 2 was 'very true or often true'. There are eight syndrome scales based on the problem items. The sum of all problem item scores gives total problems score; the sum of Anxious/Depressed, Withdrawn/Depressed, Somatic Complaints syndrome scores gives Internalisation problems score and the sum of Rule- Breaking Behaviour and Aggressive Behaviour scores gives Externalisation problems score. The test–retest reliability of the Turkish CBCL is 0·84 for total problems and 0·88 for internal consistency (Erol *et al.* 1995, Erol & Simsek 2000). In the validity study, with confirmatory factor analysis (CFA), 99% of the items were found to measure behavioural problems significantly, positively and sufficiently (Dumenci *et al.* 2004). In our sample, internal consistency for total problems was 0·94. To identify a screen result as positive, we used the T scores of 64 or higher which define the clinical range and the T-scores from 60 to 63 which remain within the borderline clinical range.

Demographic questionnaire

This questionnaire obtained information about the sex and age of the child, parent's education, family income, parent's employment status, insurance status, parental marital status and the number of individuals living in the home.

Statistical analysis

We used descriptive statistics for children who were in clinical range according to PSC-17 and CBCL. The reliability analysis of the PSC-17 was performed using standardised α coefficient and test–retest reliability. Test–retest reliability was established by using the intraclass correlation coefficient (ICC) between PSC-17 scores obtained at the first measurement and after four weeks. To test reliability, α coefficient and ICC of at least 0·70 were taken as the criteria values (Burns & Grove 2009). Item to total scale correlations were computed for each item using Pearson's correlation coefficient. The validity of the scale was measured through construct, convergent and discriminant validity. Spearman's correlation coefficients were calculated between the PSC-17 scores and T scores for the CBCL Total, Internalising and Externalising scales to reflect the convergent validity.

Discriminant validity was used to differentiate among the normal, borderline and clinical range groups by using the PSC-17. As noted, the clinical and non-clinical subjects were grouped according to their CBCL scores. ANOVA test was performed to put forward the differences between the groups. Construct validity was tested by using exploratory factor analysis (EFA) and CFA. Kaiser–Meyer–Olkin (KMO) index and Bartlett's test of sphericity were used to test the factorability of the item correlation matrix. The optimal number of factors were determined by using eigenvalues (> 1·0) and screeplot. Item loadings should exceed 0·30. The CFA was conducted to confirm the exploratory model. In this study, three models were tested: (1) one factor model which all 17 items loaded on a factor, (2) two factor model which five internalising items loaded on first factor and other 12 items loaded on second factor, and (3) three-factor model which items loaded on factors were reported by Gardner *et al.* (1999). The criteria for the model to be accepted as fit were as follows: comparative fit index (CFI), goodness of fit index (GFI) and adjusted GFI (AGFI) > 0·90; root mean square error of approximation (RMSEA) < 0·06. The model was deemed to show moderate fit if RMSEA < 0·08. Lastly, chi-square (χ^2) test, where the fit is best if the chi-square is insignificant, was used (Hu & Bentler 1999). The ROC analysis was used to estimate the optimal sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) for the PSC-17 using CBCL as 'gold standard'. Probability levels of 0·05 were considered significant. Statistical analyses were carried out using SPSS for windows 11.5 (SPSS Inc., Chicago, IL, USA) and LISREL (Scientific Software International Inc., Lincolnwood, IL, USA).

Results

Characteristics of participants

The mean age of the children was 10·6 (SD 2·4), 59·2% were boys, 6·9% were from single-parent households and the mean household size was 4·7. There was ample evidence for the low SES of these families with low family education (75·1% of the mothers and 57·9% of the fathers had less than five grade education), low income (72·6% of the families earned at most 5514 Euro/year) and one parent with paid employment (87·6%). Two hundred and forty families (78·9%) were covered by health insurance.

Construct validity

The KMO index (0·82) and Bartlett's test (χ^2 = 1321·019, df = 136, *p* < 0·0001) indicated that the sample size was adequate and the extracted factors accounted for substantial observed variance. The EFA using principal component method with varimax rotation adjusted the three factors based on examination of the screeplot and eigenvalues greater than 1·0. These three factors explained 46% of the total amount of variance in the PSC-17 items. The factor pattern containing the item-to-factor loadings (≥0·30), summary of eigenvalues and per cent explained variances are described in Table 1. Factor 1 (*Internalising subscale*; 7·3% of observed variance) consisted of five items (item numbers 2, 6, 9, 11, 15) that were related to Internalising symptom. Factor 2 (*Externalising subscale*; 12·8% of observed variance) consisted of six items (item numbers 4, 5, 8, 10, 12, 16) that were related to Externalising symptom. Factor 3 (*Attention subscale*; 25·9% of observed variance) consisted of four items (item numbers 1, 3, 13, 17) that were related to Attention problems. Two items did not load on the factor that they were suggested to measure. Item 14 (*teases others*) was loaded on factor 3, and item 7 (*has trouble concentrating*) was retained on factor 1.

Based on findings of EFA and original conceptualisation of the PSC-17, we conducted CFA to test specified number of factors in this study with one-, two- and three-factor models. The criteria to identify models fit are illustrated in Table 2. All of the fitness indices indicated that one- and two-factor models did not provide an acceptable fit to the data. The three-factor model represented a partially acceptable model fit for several criteria (RMSEA = 0·076, GFI = 0·900, χ^2/df = 2·519), while others did not meet the criteria for an acceptable fit (AGFI = 0·850, CFI = 0·860, $\chi^2_{108\ df}$ = 272·10, *p* < 0·001).

Convergent validity

Convergent validity focused on the relationship between the PSC-17 score and the CBCL Total, Internalising and Externalising scores, using spearman's correlation coefficient. It was expected that the PSC-17 would positively correlate with these measures. Not surprisingly, significant positive high correlations were found between the PSC-17 and CBCL Total, Internalising and Externalising scores (*r* = 0·82, 0·50 and 0·79 respectively; *p* < 0·01), indicating satisfactory convergent validity.

Discriminant validity

The discriminant validity of the PSC-17 was assessed by examining whether the PSC-17 could discriminate among the normal, borderline and clinical ranged children. The mean scores of three groups were compared using ANOVA test,

Table 1 Principal component analysis (varimax rotation) of the Pediatric Symptom Checklist -17 (*n* = 306)

Items	Factor 1	Factor 2	Factor 3
Internalising factors			
2. Feels sad, unhappy	**0·564**	0·344	−0·119
6. Feels hopeless	**0·479**	0·505	−0·007
9. Is down on him or herself	**0·625**	−0·049	0·016
15. Worries a lot	**0·579**	−0·191	0·218
11. Seems to be having less fun	**0·522**	0·419	−0·284
Externalising factors			
8. Fights with other children	0·018	**0·408**	0·563
12. Does not listen to rules	0·415	**0·541**	0·155
5. Does not understand other people's feelings	0·127	**0·542**	0·213
14. Teases others	0·210	0·272	**0·529**
10. Blames others for his or her troubles	0·281	**0·366**	0·452
4. Refuses to share	−0·024	**0·631**	0·063
16. Takes things that do not belong to him or her	−0·031	**0·640**	0·133
Attention factors			
1. Fidgety, unable to sit still	−0·058	−0·016	**0·828**
3. Daydreams too much	0·208	0·092	**0·380**
17. Distracted easily	0·579	0·186	**0·333**
7. Has trouble concentrating	**0·529**	0·403	0·279
13. Acts as if driven by a motor	−0·082	−0·027	**0·836**
Eigenvalue	1·25	2·18	4·40
% Variance	7·3%	12·8%	25·9%

Σ = 46.
Significant values are in bold.

Table 2 Goodness of fit indices statistics for the Pediatric Symptom Checklist-17 factor models (*n* = 306)

Model	χ^2	df	χ^2/df	CFI	GFI	AGFI	RMSEA
Restricted one factor	585·64	119	4·921	0·620	0·800	0·740	0·120
Restricted two factors	476·33	118	4·036	0·700	0·820	0·770	0·110
Restricted three factors	272·10	108	2·519	0·860	0·900	0·850	0·076

CFI, comparative fit index; GFI, goodness of fit index; AGFI, adjusted GFI; RMSEA, root mean square error of approximation.
CFI, GFI, AGFI > 0·90 and RMSEA < 0·08 indicate moderate fit.

which showed statistically significant differences ($p < 0.001$) among the groups (Table 3).

Reliability

The Cronbach's alpha for the total scale was 0·81. The Internalising, Externalising and Attention subscales of PSC-17 had alpha ranging from 0·62–0·74. The item-total correlation coefficients were positive and ranging from 0·33–0·67 for all of the items. Cronbach's alpha did not increase when any of the items were deleted. The test–retest reliability was also high, with an ICC of 0·72 (*n* = 37), *p* < 0·01. Taken together, the results showed that the PSC-17 scale had satisfactory reliability.

Table 3 Comparison of the Turkish version of PSC- 17 by child behaviour checklist total, internalising and externalising problem scores (*n* = 306)

	n (%)	PSC-17 Mean	*p*-value
CBCL total			
Normal	149 (48·7)	6·3	<0·001*
Borderline clinical range	40 (13·1)	10·1	
Clinical range	117 (38·2)	16·0	
CBCL internalising			
Normal	104 (34)	6·9	<0·001*
Borderline clinical range	53 (17·3)	9·7	
Clinical range	149 (48·7)	13·3	
CBCL externalising			
Normal	182 (59·5)	7·0	<0·001*
Borderline clinical range	43 (14·0)	13·2	
Clinical range	81 (26·5)	17·0	

PSC-17, Pediatric Symptom Checklist-17; CBCL, child behaviour checklist.
Normal = T score ≤59, Borderline clinical range = T score 60–63, Clinical range = T score ≥64.
*ANOVA test.

Receiver operating characteristic (ROC) curves

Sensitivity, specificity, PPV and NPV

We have summarised the performance of the Turkish version of PSC-17 in screening for childhood psychosocial problems across various cut off scores, as measured by the CBCL Total
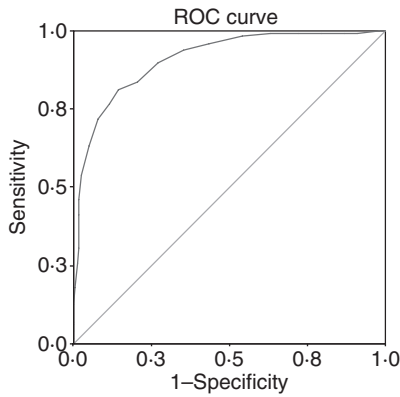
Figure 1 The receiver operating characteristic curve of Turkish version of the Pediatric Symptom Checklist-17.

score (Fig. 1). ROC analysis indicated a high degree of accuracy in the use of PSC-17 Total score to predict psychosocial problems, where AUC was 0·91 (95% confidence interval: 0·88–0·94) which is considered satisfactory. As shown in Fig. 1, higher cut-off scores on the PSC-17 yielded lower sensitivity, higher specificity, higher PPV and lower NPV. The PSC-17 at the cut-off score of 15 will miss 36·8% of children with psychosocial problems, but 5% of children without psychosocial problems will be alarmed by a false-positive report. Reducing the cut-off score to 12 raises the false-positive reports to 14%, whereas it reduces the missing down to nearly 18·8%. Using the both cut-off scores from the ROC curves, a cut-off score of 12 (15 in original literature) was found to be the most discriminator with a sensitivity of 81·2%, specificity of 86%, efficiency of 83·9% and PPV and NPV were 77·8% and 88%, respectively ($\chi^2 = 134·95$, $\kappa = 0·66$, $p < 0·001$) (Table 4).

In the study sample ($n = 306$) total mean scores were 59·85 (SD10·17) and 10·5 (SD 6·2) for the CBCL and PSC-17, respectively. As presented in Table 5, 39·9% of all children had an elevated PSC-17 score (12 or higher). This percentage was almost equal to the per cent of children with clinical

levels of psychosocial problems (38·2%) as determined by CBCL total scale.

Discussion

Our main purpose was to provide a practical and validated Turkish tool to enhance assessment for childhood psychosocial problems in primary care settings. We choose the PSC-17 as the target scale for translation and validation as it was a time-efficient screening tool for mental health problems of suburban low-income populations. First, a rigorous multi-stepped translation and back-translation process was undertaken in developing the Turkish PSC-17. We applied a revised approach to increase efficiency, strengthen the integrity of the translation process and to achieve the goals of cultural and functional equivalence (Burns & Grove 2009). Second, the psychometric properties of the tool were evaluated.

In the current study, the Cronbach's alpha for the total scale (0·81) was similar to the reliability of the original study of PSC-17 (0·89) (Gardner *et al.* 1999). However, the Turkish version of the scale had moderate reliability for all subscales. While the reported values of the original study were greater than 0·79 and ranged between 0·79–0·83 (Gardner *et al.* 1999), in our study these values were over 0·62 and ranged between 0·62–0·74. As would be expected, all item-to-total correlations for the PSC-17 were within the recommended 0·30–0·70 range (DeVellis 2003). The test–retest reliability for the total scale was 0·72, which is accepted as efficient. Moreover, convergent validity was generated from the correlations between two different tools, Turkish PSC-17 and CBCL, both of which measured the same trait (Burns & Grove 2009). The PSC-17 was able to discriminate effectively among the normal, borderline and clinical ranged children to determine those who might be at risk for psychosocial problems.

The construct validity of the scale showed a three-factor structure explaining approximately 46% of the total variance

Table 4 Sensitivity, specificity, PPV, NPV and AUC for the PSC- 17 at cut-off 12 and 15, using CBCL total, internalising and externalising problems as criteria ($n = 306$)

	Cut-off 15				Cut-off 12				
	NPV	Sensitivity	Specificity	PPV	NPV	Sensitivity	Specificity	PPV	AUC (% 95 CI)
CBCL									
Total	0·632	0·950	0·891	0·807	0·812	0·860	0·778	0·880	0·911 (0·878–0·944)
Internalising	0·423	0·870	0·759	0·614	0·584	0·780	0·713	0·663	0·755 (0·702–0·809)
Externalising	0·667	0·870	0·650	0·878	0·889	0·780	0·590	0·951	0·899 (0·863–0·934)

CBCL, child behaviour checklist; PSC-17, Pediatric Symptom Checklist-17; PPV, positive predictive value; NPV, negative predictive value; AUC, area under curve.

Table 5 Number and percentages of children who are positive by CBCL Total, Internalising, Externalising scales and PSC-17 for clinically significant behaviour problems, for all children and by gender

Scales	Total (*n* = 306)	Girls (*n* = 125)	Boys (*n* = 181)
CBCL*			
Total	117 (38·2%)	40 (32%)	77 (42·5%)
Internalising	149 (48·7%)	62 (49·6%)	87 (48·1%)
Externalising	81 (26·5%)	25 (20%)	56 (30·9%)
PSC-17			
Using established cut-off†	83 (27·1%)	21 (16·8%)	62 (34·3%)
Using adjusted cut-off‡	122 (39·9%)	34 (27·2%)	88 (48·6%)

CBCL, Child Behaviour Checklist; PSC-17, Pediatric Symptom Checklist-17.
*The CBCL score include clinical scores or T score of 64 or higher.
†Established cut-off point is 15 or higher for children aged 6 to 18 years (original US cut-off).
‡Adjusted cut-off point is 12 or higher for children aged 6 to 18 years (adjusted Turkish cut-off).

that, although not extremely strong, can be accepted as satisfactory. These results were consistent with the previous US analysis where a three-factor solution was generated (Gardner *et al.* 1999). However, two items did not load predominantly on the subscale that they were proposed to measure. Only, the Internalising scale represented a robust factor consisting of five items with high loadings that did not cross-load significantly with the other factors. These findings showed that Attention and Externalising problem subscales were particularly problematic as reported by Kostanecka *et al.* (2008). The CFA results also affirmed these findings. Even though three-factor model proposed by original study provided a better description of data than alternative one- and two-factor models, it failed to meet the criteria for good model fitness.

A modification of the cutting score established with a low-income, Turkish population was necessary to enhance the utility of the PSC-17 for screening psychosocial problems. The ROC analysis confirmed the good functioning of the PSC-17 total score and indicated the proposed threshold scores. Using a cut-off score of 12 is recommended when screening for psychosocial problems, with a sensitivity of 81·2% and specificity of 86%. As suggested (Reijneveld *et al.* 2006, Gardner *et al.* 2007), we used lower screening cut-off scores to improve the sensitivity, but with a cost in specificity and PPV. However, some children with disorder would still be missed. The cut-off score of 12 correctly classified 95 of the 117 children who had been identified as positive by the CBCL. It also allowed for the correct classification of 163 of

the 189 children who had scored normal by the CBCL. The lower cut-off score is likely related to the exclusive focus on disadvantaged children. In fact, in the previous two studies (Simonian & Tarnowski 2001, Jutte *et al.* 2003) which were investigated, the disadvantaged children in US were found to have lower cut-off score for PSC.

Although the main aim of this study was to examine the validity of the tool, the findings also provided a risk profile of childhood psychopathological condition. Approximately 40% of the children were identified as having psychosocial problems. The possible explanation of this dramatic finding might be a reflection of low-income and low-educational status of the families. Turkish parents evidenced greater rates of behaviour symptom on both the PSC-17 and the CBCL. The impact of economic difficulty and its concomitant stressors on children and families may influence both paternal ratings of child behaviour and the frequency and intensity of behaviour problems in children. In fact, Jellinek *et al.* (1999) have pointed out the variability in prevalence of positive scores among different populations. The epidemiological studies showed that the rates of pediatric psychopathological conditions were 9–13% as measured by the 35-item PSC in US and Dutch children (Jellinek *et al.* 1999, Reijneveld *et al.* 2006) and 20–27% in low-income US children (Jellinek *et al.* 1999, Navon *et al.* 2001). However, these findings were lower than our rate and the findings of Simsek *et al.* (2008) who found that 18·3–47% of individuals screened positive by in disadvantaged Turkish children.

Among the strengths of our study is that children were recruited from and screened in primary care settings and our criterion measure was a widely accepted CBCL. The limitations of this study are first, the subjects in the present study were all from suburban schools and low-income families. Therefore, the generalisability of these data to other pediatric populations remains unknown. Second, when compared with the actual diagnoses to be made by psychiatrists, the self-reported PSC-17 might exaggerate the number of children classified as having psychosocial problems.

Conclusion

The present findings provide empirical support for extending the use of the PSC-17 to primary care settings. This study addressed the use of the PSC-17 total cut-off score of 12 to screen for probable psychosocial problems in low-income Turkish children. Although the three-factor structure proposed by Gardner and colleagues was meaningful, it was not performed well for screening Externalising and Attention problems. This indicates that some items of these subscales

should be studied in greater depth and questions may need to be re-formulated or added. Future studies should also replicate psychometric evaluations of PSC-17 with larger and more diverse socio-cultural groups in different geographical locations.

Relevance to clinical practice

The study is significant in that it encourages the use of PSC-17. However, the majority of children suffering from psychosocial problems in Turkey receive no treatment and many go undetected. In the future, PSC-17 might be included in the school screening programs to assist the early detection and treatment of psychologically impaired children.

Contributions

Study design: SE, MO; data collection and analysis: MO, SE and manuscript preparation: SE, MO.

Conflict of interest

None.

References

Achenbach TM & Rescorla LA (2001) *Manual for the ASEBA School-Age Forms & Profiles*. University of Vermont, Research Center for Children, Youth and Families, Burlington.

Baysal SU, Özmen B, Parman P, Sahip Y, Bulut A & Gökçay G (2004) A mental health screening project in Istanbul, Turkey. *Journal of School Health* **74**, 341–343.

Belfer ML (2008) Child and adolescent mental disorders: the magnitude of the problem across the globe. *Journal of Child Psychology and Psychiatry* **49**, 226–236.

Bernal P, Estroff DB, Aboudarham JF, Murphy M, Keller A & Jellinek MS (2000) Psychosocial morbidity: the economic burden in a pediatric health maintenance organization sample. *Archives of Pediatrics & Adolescent Medicine* **154**, 261–266.

Berube RL & Achenbach TM (2004) *Bibliography of Published Studies Using ASEBA Instruments*, 2004 edn. Research Center for Children, Youth and Families, University of Vermont, Burlington.

Burns N & Grove SK (2009) *The Practice of Nursing Research: Appraisal, Synthesis and Generation of Evidence*. Saunders, USA.

Costello EJ, Mustillo S, Erkanli A, Keeler G & Angold A (2003) Prevalence and development of psychiatric disorders in childhood and adolescence. *Archives of General Psychiatry* **60**, 837–844.

DeVellis RF (2003) *Scale Development: Theory and Applications*. Sage, Thousand Oaks, CA, USA.

Dumenci L, Erol N, Achenbach TM & Simsek Z (2004) Measurement structure of the Turkish translation of the child behavior checklist using confirmatory factor analytic approaches to validation of syndromal constructs. *Journal of Abnormal Child Psychology* **32**, 335–340.

Erol N & Simsek Z (2000) Mental health of Turkish children, behavioral and emotional problems reported by parents, teachers and adolescents. In *International Perspectives on Child and Adolescent Mental Health* (Singh NN, Leung JP & Singh AN eds). Elsevier, London, pp. 223–247.

Erol N, Arslan BL & Akçakin M (1995) The adaptation and standardization of the child behavior checklist among 6-18 year-old Turkish children. In *Eunethydis, European Approaches to Hyperkinetic Disorder* (Sergeant J ed.). Fotoratar, Zurich, pp. 97–113.

Erol N, Simsek Z, Öner O & Munir K (2005) Behavioral and emotional problems among Turkish children at ages 2 to 3 years. *Journal of American Academy of Child and Adolescent Psychiatry* **44**, 80–87.

Essex MJ, Kraemer HC, Slattery MJ, Burk LR, Boyce WT, Woodward HR & Kupfer DJ (2009) Screening for childhood mental health problems: outcomes and early identification. *Journal of Child Psychology and Psychiatry* **50**, 562–570.

Farmer EMZ, Burns BJ, Phillips SD, Angold A & Costello EJ (2003) Pathways into and through mental health services for children and adolescents. *Psychiatric Services* **54**, 60–66.

Gardner W, Murphy JM, Childs G, Kelleher K, Pagano M, Jellinek M, McInerny TK, Wasserman RC, Nutting P & Chiappetta L (1999) The PSC-17: a brief Pediatric Symptom Checklist with psychosocial problem subscales. A report from PROS and ASPN. *Ambulatory Child Health* **5**, 225–236.

Gardner W, Campo J & Lucas A (2004) Validation of the PSC-17 in a primary care sample. *Pediatric Research* **55**(Suppl.), 242A–243A.

Gardner W, Lucas A, Kolko DJ & Campo JV (2007) Comparison of the PSC-17 and alternative mental health screens in an at-risk primary care sample. *Journal of the American Academy of Child & Adolescent Psychiatry* **46**, 611–618.

Honeyman C (2007) Recognising mental health problems in children and young people. *Paediatric Nursing* **19**, 38–44.

Hu L & Bentler PM (1999) Cutoff criteria for fit indexes in covariance structure analysis: conventional criteria versus new alternatives. *Structural Equation Modeling: A Multidisciplinary Journal* **6**, 1–55.

Jellinek MS, Murphy JM & Burns BJ (1986) Brief psychosocial screening in

outpatient pediatric practice. *Journal of Pediatrics* **109**, 371–378.

Jellinek MS, Murphy JM, Robinson J, Feins A, Lamb S & Fenton T (1988) Pediatric Symptom Checklist: screening school-age children for psychosocial dysfunction. *Journal of Pediatrics* **112**, 201–209.

Jellinek MS, Murphy JM, Little M, Pagano ME, Comer DM & Kelleher KJ (1999) Use of the Pediatric Symptom Checklist to screen for psychosocial problems in pediatric primary care: a national feasibility study. *Archives of Pediatrics & Adolescent Medicine* **153**, 254–260.

Jutte DP, Burgos A, Mendoza F, Ford CB & Huffman LC (2003) Use of the Pediatric Symptom Checklist in a low-income, mexican american population. *Archives of Pediatrics & Adolescent Medicine* **157**, 1169–1176.

Kostanecka A, Power T, Clarke A, Watkins M, Hausman CL & Blum NJ (2008) Behavioral health screening in urban primary care settings: construct validity of the PSC-17. *Journal of Developmental & Behavioral Pediatrics* **29**, 124–128.

Lavigne JV, Gibbons RD, Arend R, Rosenbaum D, Binns HJ & Christoffel KK (1999) Rational service planning in pediatric primary care: continuity and change in psychopathology among children enrolled in pediatric practices.

Journal of Pediatric Psychology **24**, 393–403.

Levitt JM, Saka M, Romanelli LH & Hoagwood K (2007) Early identification of mental health problems in schools: the status of instrumentation. *Journal of School Psychology* **45**, 163–191.

Murphy JM, Ichinose C, Hicks RC, Kingdon D, Crist-Whitzel J, Jordan P, Feldman G & Jellinek MS (1996) Utility of the Pediatric Symptom Checklist as a psychosocial screen to meet the federal Early and Periodic Screening, Diagnosis and Treatment (EPSDT) standards: a pilot study. *Journal of Pediatrics* **129**, 864–869.

Navon M, Nelson D, Pagano M & Murphy M (2001) Use of the Pediatric Symptom Checklist in strategies to improve preventive behavioral health care. *Psychiatric Services* **52**, 800–804.

Pierce AG (1995) Measurement. In *Principles and Practice of Nursing Research* (Talbot LA ed.). Mosby, St Louis, pp. 265–291.

Puskar KR & Bernardo LM (2007) Mental health and academic achievement: role of school nurses. *Journal for Specialists in Pediatric Nursing* **12**, 215–223.

Reijneveld SA, Vogels AGC, Hoekstra F & Crone MR (2006) Use of the Pediatric Symptom Checklist for the detection of

psychosocial problems in preventive child healthcare. *BMC Public Health* **6**, 197–204.

Riekert KA, Stancin T, Palermo TM & Drotar D (1999) A psychological behavioral screening service: use, feasibility and impact in a primary care setting. *Journal of Pediatric Psychology* **24**, 405–414.

Simonian SJ & Tarnowski KJ (2001) Utility of the Pediatric Symptom Checklist for behavioral screening of disadvantaged children. *Child Psychiatry and Human Development* **31**, 269–278.

Simsek Z, Erol N, Öztop D & Özcan ÖÖ (2008) Kurum bakımındaki çocuk ve ergenlerde davranış ve duygusal sorunların epidemiyolojisi; ulusal örneklemde karşılaştırmalı bir araştırma [Epidemiology of emotional and behavioral problems in children and adolescents reared in orphanages: a national comparative study]. *Türk Psikiyatri Dergisi [Turkısh Journal of Psychiatry]* **19**, 235–246.

Stancin T & Palermo TM (1997) A review of behavioral screening practices in pediatric settings: do they pass the test? *Journal of Developmental & Behavioral Pediatrics* **18**, 183–194.

The Journal of Clinical Nursing (JCN) is an international, peer reviewed journal that aims to promote a high standard of clinically related scholarship which supports the practice and discipline of nursing.

For further information and full author guidelines, please visit JCN on the Wiley Online Library website: http://wileyonlinelibrary.com/journal/jocn

Reasons to submit your paper to JCN:

High-impact forum: one of the world's most cited nursing journals and with an impact factor of 1·228 – ranked 23 of 85 within Thomson Reuters Journal Citation Report (Social Science – Nursing) in 2009.

One of the most read nursing journals in the world: over 1 million articles downloaded online per year and accessible in over 7000 libraries worldwide (including over 4000 in developing countries with free or low cost access).

Fast and easy online submission: online submission at http://mc.manuscriptcentral.com/jcnur.

Early View: rapid online publication (with doi for referencing) for accepted articles in final form, and fully citable.

Positive publishing experience: rapid double-blind peer review with constructive feedback.

Online Open: the option to make your article freely and openly accessible to non-subscribers upon publication in Wiley Online Library, as well as the option to deposit the article in your preferred archive.