

## M E T H O D O L O G Y

# Detecting psychosocial problems among 5–6-year-old children in Preventive Child Health Care

## The validity of a short questionnaire used in an assessment procedure for detecting psychosocial problems among children

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**Background:** An extended re-assessment of the psychometric properties of the LSPPK, an instrument aimed at identifying children with emotional and behavioural problems. **Methods:** Data came from a national sample in the Netherlands of parents of 1248 children (aged 5–6 years) interviewed by child health professionals (CHP). Data were obtained regarding psychosocial problems, treatment status and scores on the LSPPK (Parent and CHP Index), and on the Child Behavior Checklist (CBCL). The scale structure, reliability, criterion and content validity and added value of the LSPPK were assessed using the CBCL and treatment status as criteria. **Results:** The scale structure corresponded with that found originally; the LSPPK improved the prediction of problems according to the CBCL, compared to predictions using readily available risk indicators alone. Reliability varied between 0.55 and 0.69. For the LSPPK Parent Index, sensitivity varied between 0.42 and 0.50. For the CHP Index sensitivity varied between 0.60 and 0.96, but specificity varied between 0.76 and 0.79. Both indices were very sensitive for attention and social problems, but less so for other problems. **Conclusion:** The LSPPK Parent Index cannot distinguish sufficiently between children with or without serious problems. Either too many children with problems remain unnoticed or too many children without problems are labelled as a case. The LSPPK CHP Index, reflecting the CHP's interpretation of the Parent Index after interviewing the parents does not compensate adequately for the weaknesses of the Parent Index. Better assessment procedures and strategies need to be developed.

**Keywords:** children, mental health, mass screening, questionnaire

A sizeable proportion of children suffers from behavioural and emotional problems without receiving treatment.<sup>1–3</sup> Such problems may have a negative impact on current functioning and future development. The persistence of such problems, until adulthood, has been well documented.<sup>4,5</sup> Durlak and Wells<sup>6</sup> showed that good screening procedures are essential for effective interventions. In the Netherlands, preventive Child Health Care (CHC) is one of the most important low-threshold services for the early detection of psychosocial problems in children. CHC is provided unasked to all children, from birth to 19 years, by community physicians and nurses (Child Health Professionals, CHP).<sup>7,8</sup> It

provides publicly funded preventive programmes (screening, general physical examinations, vaccinations, health education and promotion). Over 90% of all children undergo three to four assessments by a CHP during their school careers. Nearly all services offer assessments to children in grade 2 of primary school (mean age: 5–6 years).<sup>9</sup> These assessments include a general physical examination, standardized screening procedures, and an interview with parents concerning health status and (physical, emotional and behavioural) developmental problems. The assessments take approximately 15 to 30 minutes. At the end of the assessment, the CHP decides whether counselling, follow-up, or referral are required. If CHPs identify serious problems, they have to refer the child to other professional services as they do not offer actual treatment themselves.

Despite a growing awareness of the importance of psychosocial problems for a healthy development, CHC's involvement in individual and collective interventions on psychosocial problems was hampered for a long time by the lack of good, reliable and valid assessment

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procedures. Such procedures must be manageable in the actual practice of preventive CHC in the limited time available for each individual child. Recently, several procedures were developed<sup>10,11</sup> claiming to offer a good, reliable and valid way of detecting children in need because of psychosocial problems. One such procedure is based on a short questionnaire, the LSPPK (acronym for 'Landelijk Signaleringsinstrument Psychosociale Problematiek Kleuters', Dutch for 'National Checklist for Indicating Psychosocial Problems in Five/Six Year Olds').<sup>11</sup> The LSPPK is filled out by the parents before meeting the CHP (Parent Index, PI). Problems indicated by the parents are discussed with the CHP. After the meeting, the CHP indicates which problems are present in his/her view (Child Health Professional Index, CHPI) and which problems the parents still consider to be present. Many of the CHC institutes in the Netherlands adopted the LSPPK. An international publication on the LSPPK was published,<sup>11</sup> but as far as we know, the instrument is not yet used in other countries.

Bouchier *et al.*<sup>11</sup> evaluated the LSPPK. They asked CHPs to judge the usefulness of the questionnaire and compared the CHPI and PI. Furthermore, they evaluated the psychometric properties of the PI. Correspondence between the conceptual scale structure and the (varimax rotated) factor matrix was shown to exist. Internal consistency was moderate (0.66 for the PI). The authors calculated a PI cut-off point, distinguishing optimally between children referred to mental health services and those not. The overall correct classification rate was 83%. The authors suggested that CHPs should seriously consider referring children with a higher score. The number of problems indicated by CHPs after the interview is much lower than that indicated by the parents. Bouchier *et al.*<sup>11</sup> interpret this difference as the result of the CHPs being able to reassure the parents.

Implicitly they assume that the professional's indication of problems is more accurate than parental assessment. Literature not always supports this view;<sup>12</sup> yet, it may be true. However, the authors did not present data to support this assumption. Their evaluation was also contaminated by the fact that their criterion (referral) is dependent on the information elicited using the LSPPK.

The aim of the current study was to replicate and to enhance the original psychometric evaluation in a large national sample. The LSPPK was validated on criteria that are independent from the LSPPK itself: is the child in question currently being treated by a mental health service, and a clinical score on the Child Behavior Checklist 4–18 (CBCL).<sup>13</sup> One of the primary objectives of CHC is to identify children with problems not yet being treated. Therefore, the relationship between CBCL and LSPPK was analysed for the group as a whole and for children not under treatment. Furthermore, as the original authors seem to consider the CHP's perception as more indicative of real problems than the perception of the parents, the current study extended the validation to include the CHPI.

## METHODS

### Sample

The sample was obtained using a two-stage selection procedure. In the first stage, a random sample was taken, consisting of 19 of the 63 Child Health Care Services, after stratification by region and degree of urbanization of their district. In the second stage, each service provided about 75 cases in the first grade of primary education by inviting all parents of children in three school classes to take part. Of all parents, 91% (n=1419) participated. Complete data for the crucial variables in this study (CBCL Total Problem score, PI, CHPI and being under treatment) were available for 1248 children (80%). Analyses were restricted to this group to make interpretation easier. Response was non-selective, details have been presented elsewhere.<sup>1</sup> Exclusion of children with incomplete data sets, however, resulted in the removal of relatively more children with serious problems. From the 63 children whose treatment status was not known, 22% had a higher than cut-off point score, compared to only 7% of those with known treatment status ( $p < 0.001$ ). From those children with an unknown CBCL Total score, 15% (n=3) had a higher than cut-off point score on the PI, compared to 8% of those with a known CBCL Total score ( $p < 0.05$ ). Known or unknown scores on the PI or CHPI were not related to differences to CBCL and treatment status.

Details of the working sample are presented in *table 1*.

### Procedures and measures

The LSPPK and CBCL were sent to the parents along with the invitation to the regular check-up. At the time of the check-up, the CHP filled in a study-specific questionnaire, covering demographics and being under treatment. The LSPPK<sup>11</sup> is a nine-item instrument, covering three domains (behavioural, cognitive-developmental and emotional problems). Parents indicate whether problems described in the items (*table 2*) are present, selecting one of three categories ('not worried', 'worried a bit', 'very worried'). They submit the form to the CHP and problems indicated are discussed. Following the check-up, the CHP indicates which problems are present in his or her view. A more detailed description of the instrument has been published by the original authors.<sup>11</sup> This study re-evaluated the PI cut-off point calculated by Bouchier *et al.*<sup>11</sup> For the CHPI no cut-off point was calculated. The authors informed us (written communication) that they felt that any problem indicated on the CHPI was an indication of a serious problem. This study therefore used a cut-off point of 0 vs. higher for the CHPI.

The CBCL was used to assess the parent's report of the child's behavioural and emotional problems during the preceding six months.<sup>14</sup> The good reliability and validity of the CBCL established by Achenbach were confirmed for the Dutch translation.<sup>13</sup> The CBCL consists of 20 competence items and 120 problem items. Here only the problem items were used. Parents indicate the presence of problems, choosing one out of three categories (no

problem, sometimes / a bit, often / a lot). Nine syndrome scales, two broadband groups of syndromes, designated Internalizing and Externalizing, and a Total Problem score were computed (see table 5). Internalizing includes the Withdrawn, Somatic Complaints, and Anxious/Depressed syndrome scales, and Externalizing includes the Delinquent and Aggressive Behavior syndrome scales. Cases were subsequently allocated to a normal or a clinical range of the scoring distributions in the Dutch normative sample.<sup>13</sup> Cut-offs were set at the 97th percentile for the syndrome scales and at the 90th percentile for the Total Problem and broadband scales. CHPs participating in the study were not aware of the parents' answers on the CBCL.

The CHP registered whether or not a child was currently being treated by a mental health service, using both CHC files and information obtained during the check-up: 2% of all children were currently under treatment in various types of mental health services that offer counselling, psychological and/or psychiatric therapy, support for developmental problems and so on. We did not register the specific reasons for which they were being treated, but these vary from strictly psychological and psychiatric problems (e.g. lack of self-confidence or ADHD) to suffering from stressful circumstances (e.g. being bullied).

The criteria variables are, of course, empirically related. Of those currently under treatment, 46% has a clinical CBCL Total score. For those not under treatments this percentage is 7% ( $p < 0.001$ ).

*Analysis*

The psychometric properties of the LSPPK and its added value in identifying psychosocial problems were assessed. The procedures used by the original authors were first replicated.<sup>11</sup> To re-assess the correspondence between the conceptual domains and the scale structure, LSPPK's scale structure was assessed

using principal component analysis (PCA, Eigenvalue >1, varimax rotation). Internal consistency was computed for the subscales, PI and CHPI. Criterion validity was then assessed using clinical CBCL Total Problem score and being under treatment for psychosocial problems as criteria and calculating ROC (Receiver Operating Characteristic) parameters (sensitivity, specificity and area under curve). These analyses were carried out for all children and for those not receiving treatment in mental health institutions. Thirdly, the content validity of the LSPPK Indices was assessed by

**Table 1** Description of study group on demographic and family characteristics and problem indicators used in the study

	Boys n=644 %	Girls n=604 %	Total n=1248 %
Gender	52	48	100
Age			
4/5 years	64	68	65
6/7 years	36	32	35
Member of ethnic minority	6	5	5
Number of parents in family			
2	92	91	91
1	6	7	6
Other	1	3	2
Only child			
Yes	8	10	9
No	91	90	91
Unknown	1	0	0
Highest education completed by parents			
1st phase secondary education or lower	33	30	32
Higher	67	69	68
Unknown	1	1	1
Employment status breadwinner			
Unemployed or <17 hours a week	6	7	7
Employed >16 hours a week	93	93	93
Unknown	1	0	0
Urbanization			
Living in (highly) urbanized area	70	69	69
Living elsewhere	29	30	30
Unknown	1	0	0
Being treated in mental health services			
No	92	95	94
Yes	2	2	2
Unknown	7	3	5
LSPPK Parent Index			
Mean 0-9 (sd)	1.3 (1.6)	1.1 (1.5)	1.2 (1.5)
% above cut-off point (>3)	9	6	8
LSPPK CHP Index			
Mean 0-9 (sd)	0.7 (1.3)	0.4 (1.0)	0.6 (1.2)
% above cut-off point (>0)	34	21	28
CBCL Total score			
Mean (sd)	17.1 (14.4)	15.1 (13.3)	16.1 (13.9)
% with a clinical score	8	8	8

NB Percentages do not always add up to 100% because of rounding.

calculating bivariate odds ratios of dichotomized LSPPK Indices with dichotomized CBCL syndrome and broadband scores. These analyses were performed for all children and for those with and without a clinical CBCL Total Problem score, to determine which kind of problems occur relatively frequently among false positive and false negative results. The analysis of the total group as a whole provides information on the type of problems that the LSPPK is able to detect, indicated by strong associations. The analyses in the two subgroups would hopefully yield few statistical significant effects. Among the subgroup of children with a CBCL Total score in the normal range, the absence of such effects would indicate that the chance of getting classified was not related to specific problem domains. Similarly, for the group with a clinical CBCL Total score, a significant effect would indicate that the absence of a specific problem enhances the chance of a case not being detected.

Turning to the added value of the LSPPK, the extent to which the LSPPK improved the prediction of psychosocial problems, after using readily available risk indicators, was assessed. First, a logistic regression was performed using demographic and family characteristics. Subsequently, the dichotomized PI and CHPI were added to the model and the model's improvement was determined (change in  $-2$  log likelihood and significance of change).

All analyses were conducted with SPSS 10.0. A significance level of 0.05 was used. Cases with missing values on the PI, CHPI and CBCL Total scales were excluded from the analysis. Cases with missing values on a predictor variable in the logistic regressions were included in the analysis by creating dummy variables.

The study was approved by the Medical Ethics Committee of TNO.

## RESULTS

### Scale structure

Both for the PI and CHPI, the results of the PCA (table 2) showed a remarkable resemblance to the results reported by the original authors.<sup>11</sup> Most items had a loading of 0.40 or higher on the first principal component. Three principal components with an eigenvalue  $>1.0$  were extracted and the loadings of the items on the varimax rotated factors resembled the conceptual scale structure.<sup>11</sup>

The PCA for the PI were based on the three-point items, as this was how Bouchier *et al.*<sup>11</sup> performed their analyses. Scale scores, however, are simple sum scores of dichotomized items. A replication of the analyses on dichotomous items showed a comparable factor structure, with slightly lower loadings. Cronbach's  $\alpha$  were also somewhat lower (table 2).

### Criterion validity

Table 3 presents the ROC parameters for the PI and CHPI, in relation to being under treatment for psychosocial problems or not. The area under curve (AUC) for the PI was 0.89; sensitivity at the cut-off point calculated by the original authors was 0.50; specificity was 0.94. So, half of those under treatment scored under the cut-off point, but only 6% of those not under treatment had an elevated score. For the CHPI, the AUC was 0.92, sensitivity at a cut-off point of  $>0$  is high (0.96); specificity was 0.76.

For the second criterion – clinical CBCL Total problem score – the PI parameters were comparable (table 4). For the CHPI, AUC and sensitivity were lower, with 69% of those with a clinical CBCL Total problem score detected at cut-off point. For children currently not under treatment, sensitivity of the PI and CHPI was somewhat lower.

**Table 2** LSPPK's factor structure; first principal component extracted (PC), varimax rotated factors and Cronbach's  $\alpha$  for the LSPPK (sub) scales; Parent Index and CHP Index

	Supposed subscale <sup>a</sup>	Parent Index			CHP Index				
		First PC	Varimax rotated factors			First PC of 3 extr.	Varimax rotated factors		
			1	2	3		1	2	3
1 Does not play well with other children	B	0.59	0.55 <sup>b</sup>	0.26	0.17	0.53	0.49 <sup>b</sup>	0.08	0.36
2 Demands attention in annoying way	B	0.60	0.84 <sup>b</sup>	0.02	0.10	0.65	0.84 <sup>b</sup>	0.07	0.12
3 Stubborn	B	0.57	0.82 <sup>b</sup>	0.05	0.03	0.65	0.85 <sup>b</sup>	0.16	-0.01
4 Problems with schoolwork	C	0.51	0.20	0.06	0.76 <sup>b</sup>	0.52	0.25	0.08	0.71 <sup>b</sup>
5 Speech problem	C	0.40	0.04	0.05	0.76 <sup>b</sup>	0.38	-0.01	0.05	0.81 <sup>b</sup>
6 Needs parents presence	E	0.32	-0.05	0.65 <sup>b</sup>	-0.11	0.38	0.10	0.63 <sup>b</sup>	-0.18
7 Shy/withdrawn timid behaviour	E	0.52	0.04	0.55 <sup>b</sup>	0.36	0.40	-0.11	0.63 <sup>b</sup>	0.19
8 Lack of self-confidence	E	0.63	0.15	0.70 <sup>b</sup>	0.22	0.67	0.17	0.70 <sup>b</sup>	0.30
9 Worries, fears	E	0.58	0.24	0.70 <sup>b</sup>	-0.02	0.61	0.26	0.70 <sup>b</sup>	0.02
		0.55				0.57			
Cronbach's $\alpha$ (3 categories)		0.67	0.64	0.58	0.45				
Cronbach's $\alpha$ (2 categories)		0.63	0.57	0.54	0.36	0.69	0.67	0.49	0.59

a: B=Behavioural; C=Language/Educational; E=Emotional

b: Loading on factor corresponding with presupposed sub-domain.

Content validity

Table 5 presents the results of the evaluation of the content validity of the LSPPK using a clinical CBCL Total Problem score as a criterion. For the group as a whole clinical scores on all syndrome scales were related to a significantly higher chance of a PI score above cut-off point. By far the strongest relationship was found with clinical scores for Social Problems and Attention Problems. Clinical scores for Internalizing Problems were more closely related to a high PI score than Externalizing Problems.

Associations between the dichotomized CHPI and clinical CBCL scores are somewhat weaker. Here, the strongest relationship was found for Social Problems and for Anxious/Depressed. It should be noted that all children with a clinical score for Attention Problems had an elevated CHPI score. Therefore, Odds Ratio (OR) could not be calculated. Internalizing Problems were more strongly related to a CHPI score above the cut-off point than Externalizing Problems.

The analyses were replicated for children with a non-clinical CBCL Total Problem score (table 5, part B). This

**Table 3** ROC co-ordinates for LSPPK (Parent Index and CHP Index) with criterion 'currently being treated in mental health institutions'; sensitivity, 1-specificity and area under the ROC curve (AUC)

Cut-off <	Parent Index				CHP Index			
	Sensitivity	95% CI	1-Specificity	95% CI	Sensitivity	95% CI	1-Specificity	95% CI
1	0.95	0.75–1.00	0.52	0.49–0.51	0.96	0.75–1.00	0.24	0.21–0.26
2	0.91	0.69–0.98	0.29	0.26–0.31	0.86	0.64–0.69	0.13	0.11–0.15
3	0.77	0.54–0.91	0.14	0.12–0.16	0.59	0.37–0.63	0.05	0.04–0.07
4	0.50	0.28–0.71	0.06	0.04–0.07	0.36	0.18–0.59	0.02	0.01–0.03
5	0.46	0.25–0.67	0.03	0.02–0.04	0.27	0.12–0.50	0.01	0.01–0.02
6	0.32	0.15–0.59	0.01	0.01–0.02	0.18	0.06–0.41	0.00	0.00–0.01
7	0.23	0.19–0.46	0.00	0.00–0.01	0.09	0.02–0.31	0.00	0.00–0.01
8	0.05	0.00–0.25	0.00	0.00–0.01	0.00	0.00–0.19	0.00	0.00–0.00
9	0.05	0.00–0.25	0.00	0.00–0.00	0.00	0.00–0.19	0.00	0.00–0.00
10	0.00	0.00–0.00	0.00	0.00–0.00	0.00	0.00–0.00	0.00	0.00–0.00
AUC	0.89	0.82–0.96			0.92	0.86–0.98		

**Table 4** ROC co-ordinates for LSPPK (Parent Index and CHP Index) with criterion 'clinical CBCL Total score'; sensitivity, 1-specificity and area under the ROC curve (AUC); for all children and those currently not under treatment

Cut-off <	Parent Index				CHP Index			
	Sensitivity	95% CI	1-Specificity	95% CI	Sensitivity	95% CI	1-Specificity	95% CI
All children								
1	0.95	0.88–0.98	0.51	0.46–0.52	0.69	0.59–0.78	0.24	0.22–0.27
2	0.87	0.78–0.93	0.27	0.25–0.30	0.59	0.49–0.69	0.13	0.11–0.15
3	0.72	0.62–0.80	0.13	0.11–0.15	0.43	0.33–0.53	0.05	0.40–0.06
4	0.49	0.39–0.59	0.04	0.03–0.06	0.22	0.15–0.32	0.02	0.01–0.03
5	0.32	0.23–0.42	0.02	0.01–0.03	0.16	0.10–0.25	0.01	0.00–0.01
6	0.19	0.12–0.28	0.01	0.00–0.01	0.09	0.04–0.17	0.00	0.00–0.01
7	0.11	0.06–0.19	0.00	0.00–0.01	0.05	0.02–0.12	0.00	0.00–0.00
8	0.04	0.01–0.11	0.00	0.00–0.00	0.01	0.00–0.06	0.00	0.00–0.00
9	0.01	0.00–0.06	0.00	0.00–0.00	0.00	0.00–0.00	0.00	0.00–0.00
10	0.00	0.00–0.00	0.00	0.00–0.00	0.00	0.00–0.00	0.00	0.00–0.00
AUC	0.87	0.83–0.91			0.77	0.71–0.83		
Children not under treatment								
1	0.94	0.85–0.98	0.49	0.46–0.52	0.60	0.48–0.71	0.21	0.19–0.24
2	0.84	0.74–0.91	0.25	0.22–0.27	0.49	0.38–0.61	0.10	0.08–0.12
3	0.66	0.54–0.76	0.11	0.08–0.13	0.35	0.25–0.49	0.03	0.02–0.04
4	0.42	0.31–0.53	0.03	0.02–0.04	0.14	0.08–0.25	0.01	0.01–0.02
5	0.22	0.14–0.33	0.01	0.01–0.02	0.09	0.04–0.18	0.00	0.00–0.01
6	0.10	0.05–0.20	0.00	0.00–0.01	0.04	0.01–0.12	0.00	0.00–0.01
7	0.05	0.02–0.13	0.00	0.00–0.01	0.03	0.00–0.10	0.00	0.00–0.00
8	0.01	0.00–0.08	0.00	0.00–0.00	0.00	0.00–0.05	0.00	0.00–0.00
9	0.00	0.00–0.05	0.00	0.00–0.00	0.00	0.00–0.05	0.00	0.00–0.00
10	0.00		0.00	0.00–0.00	0.00		0.00	0.00–0.00
AUC	0.86	0.82–0.91			0.73	0.67–0.89		

analysis allowed for a comparison between true negative and false positives, using a clinical CBCL Total Problem score as the criterion. For the PI a clinical score for Attention Problems is very strongly related to a higher risk of belonging to the false positives. Internalizing Problems also enhance this risk, though to a far smaller extent. Clinical scores on Thought Problems and to a lesser extent Internalizing and Externalizing are related to an increased risk of getting an elevated CHPI score, despite a CBCL Total Problem score in the normal range. All children with a clinical score on this scale had an elevated CHPI-score, despite a non-clinical CBCL Total Problem score. Part C of the table compares false negatives to true positives, again using the CBCL Total Problem score as

the criterion. The likelihood of an elevated PI score was related to clinical Social Problems and Attention Problem scores. In other words, a non-clinical score on these scales is significantly related to a lower likelihood of an elevated PI score, despite a clinical CBCL Total Problem score. For the CHPI no significant relations were found. Once again, for the Attention Problems scale, an OR could not be calculated.

*Added value of the LSPPK*

In bivariate logistic regression analyses of all demographic and family characteristics presented in *table 1*, only family status and employment status showed a significant relationship to any of the psychosocial criteria. Adding PI in the analysis resulted in an OR of 20.65 (95%

**Table 5** Results of bivariate logistic regression of clinical scores on CBCL syndrome and broadband scales on LSPPK Parent Index (<4 versus >3) and CHP Index (0 versus >0); OR and 95% confidence intervals (CI); overall and by CBCL Total Problem score (non-clinical versus clinical)<sup>a</sup>

	Part A		Part B		Part C	
	All children		Non-clinical CBCL		Clinical CBCL	
	OR	95% CI	OR	95% CI	OR	95% CI
<b>LSPPK Parent Index</b>						
Clinical CBCL syndrome score						
Withdrawn	14.43	5.44–38.32				
Somatic complaints	6.24	2.46–15.85				
Anxious/depressed	21.66	7.69–60.99				
Social problems	240.87	31.68–1831.40			22.05	2.78–174.78
Thought problems	9.57	4.26–21.46				
Attention problems	60.11	19.77–182.81	71.61	7.31–701.71	6.40	1.71–23.98
Delinquent behaviour	4.70	1.64–13.47				
Aggressive behaviour	12.61	5.89–27.00				
Sexual problems	3.46	1.46–8.22				
Internalizing	15.18	9.23–24.95	7.80	3.17–19.19		
Externalizing	8.70	5.39–14.06				
n	1248		1148		100	
n (PI >3)	98		49		49	
<b>LSPPK CHP Index</b>						
Clinical CBCL syndrome score						
Withdrawn	6.42	2.25–18.36				
Somatic complaints	5.37	2.15–13.42				
Anxious/depressed	18.87	4.27–83.42				
Social problems	21.67	4.96–94.61				
Thought problems	4.31	1.94–9.59	7.95	1.53–41.20		
Attention problems	b		b		b	
Delinquent behaviour	3.31	1.30–8.46				
Aggressive behaviour	6.06	2.73–13.45				
Sexual problems	2.35	1.16–4.76				
Internalizing	6.04	3.79–9.61	4.29	2.06–8.96		
Externalizing	4.07	2.70–6.14	2.04	1.03–4.05		
n	1248		1148		100	
n (CHPI >0)	347		278		69	

a: Results are only reported when 95% CI does not include 1.

b: OR cannot be calculated because all children with a clinical Attention Problems score have a CHPI-score >0.

confidence interval (CI): 11.58–36.82) for this factor. Removing it would result in a significantly worse prediction ( $p < 0.001$ ). For CHPI the OR is lower (5.33 (CI: 3.29–8.64) but removal would again significantly worsen the model's predictive power ( $p < 0.001$ ).

## DISCUSSION

This study reassessed the psychometric properties of the LSPPK, a questionnaire-based procedure for detecting psychosocial problems among children aged 5 and 6. The factor structure clearly reflected the supposed conceptual structure. Adding the PI and CHPI to a predictive model, together with readily available demographic predictors, clearly improved the prediction. Cronbach's alpha varied between 0.55 and 0.69. The sensitivity of the PI at the cut-off point calculated by the original authors varied between 0.42 and 0.50. The sensitivity of the CHPI at the cut-off point suggested by the authors varied strongly, depending on the criterion variable used (0.60–0.96). Specificity varied between 0.76 and 0.79. Clinical scores on most CBCL syndrome scales are associated with a higher chance of elevated PI and CHPI scores, but Attention Problems and Social Problems seem to be weighted much more heavily than other problems.

The data on which this re-evaluation was based were collected in a representative sample from the target population of the LSPPK. Data collection, furthermore, took place in the same setting for which the LSPPK was developed. The results of these analyses, therefore, may be expected to be valid for the field in which the LSPPK is being used, the Dutch Preventive Child Health Care system.

The evaluation of questionnaires for emotional and behavioural problems is always hampered by the lack of a golden standard: there is simply no definitive indicator of such problems. This study therefore adopted a common strategy to overcome this problem: the use of different criterion variables and validation of a short questionnaire on a longer and widely accepted questionnaire. The following criteria were used: a (widely accepted and validated) clinical CBCL Total Problem score, receiving treatment from a mental health service and a clinical CBCL Total score whilst not under treatment. We could not use a psychiatric interview in this study, because of costs and burden for the parents. Such an interview might have added, though it is not always better than questionnaire-based information.<sup>15</sup>

The results of the analyses using these criteria were in general quite comparable, which suggests that the conclusions are robust. The high sensitivity of the CHPI for the criterion 'under treatment' is an exception, though. This high sensitivity is most likely to be explained by the low cut-off point used in the analysis, which leads to a quarter of the sample being labelled as a suspected case. This cut-off would also lead to 24% of the non-cases being labelled as suspected cases, resulting in enormous costs, both financial and psychological.

The analysis showed that at a group level the PI and the CHPI have added value in terms of distinguishing

between children with and without problems. However, Cronbach's  $\alpha$  values of the PI and CHPI were well below 0.90, the minimal value deemed necessary to justify scales as a selection instrument, e.g. for deciding whether individual children are in need of further attention or not.<sup>16</sup>

Due to the low cut-off point the sensitivity of the CHPI is higher than that of the PI, however, at the cost of specificity. This sheds doubt on the original authors' implicit assumption that the CHPI should be considered as the better indicator. The ROC parameters presented showed that simply increasing or decreasing the cut-off point is not a solution. Increasing the specificity by means of a higher cut-off point would lead to what Glascoe and Dworkin call a significant under-identification of children with behavioural and emotional problems.<sup>12</sup>

The high number of cases 'detected' by the LSPPK without a clinical CBCL Total score and without being under treatment might be due to the fact that the LSPPK covers a partially different domain of problems. This especially holds for its two items that relate to the Language/Education domain. To examine this possible explanation, we analysed whether these items had a high association with an elevated PI and CHPI score, among those with a normal range CBCL Total score. Results showed that this was not the case: among the three items with the strongest association in this subgroup, only one came from the Language/Education domain. Similar results were obtained within the group currently not being treated. The language / education domain in the LSPPK is therefore not to be held responsible for the high number of false positives.

The content evaluation showed that some problem areas, especially Social Problems and Attention Problems, were much more likely to be associated with elevated LSPPK scores than others. The same syndrome scales were associated with a higher likelihood of a false positive result and of a false negative result. This suggests that such problems may be reflected too heavily in the LSPPK. Similar results were obtained in analyses, not shown in this article, which used different cut-off points for the LSPPK-Indices.

Preventive Child Health Care needs a sensitive, valid, reliable and manageable assessment procedure for emotional and behavioural problems. Relying on the LSPPK Indices alone will lead to the detection of many children with Attention and Social Problems. Children with other problems, however, may very well remain unnoticed. In so far as the CHPI may be seen as the result of the interview between parents and CHP, the results presented here suggest that the interview, as it is conducted now, does not offer a sufficient solution.

It may be argued that the LSPPK does not perform significantly worse than other short questionnaires, such as the Strength and Difficulties Questionnaire.<sup>17</sup> This may be true, but it does not mean that the weakness of the procedure is acceptable. Glascoe<sup>18</sup> shows that children with false-positive scores on several screening tests perform significantly worse than true negatives and

that these children therefore need special attention. This may be true, but his argument does not take into account the possible negative effects and the costs involved. A large number of false positives in a population-based screening program will lead to huge financial costs. Furthermore, it may have negative impacts for all those involved; many parents will be unnecessarily worried; children might be stigmatized and health services referring many children without reason to other (mental) health services, will hamper good working relationships with those services. Finally, in the Netherlands as in many other countries, only those screening programmes are deemed permissible that meet the strictest criteria of sensitivity and specificity.

Therefore, in our view improvements in the quality of the detection are necessary. The content evaluation in this article suggests that an adaptation of the content of the items is advisable.

The literature suggests that using more sources (e.g. teachers, the child itself), wherever possible, really improves the accuracy of screening and detection procedures.<sup>17</sup> However, such a strategy is very time consuming and therefore less viable in situations where large groups of children are to be assessed. In our view two alternative strategies might be far more promising. The first strategy is a detection procedure in more phases. In the first phase, short and highly sensitive instruments should be used. In a second phase, suspected cases should be assessed more intensively. A second strategy, possibly in combination with the first one, is offered by new testing techniques, such as computerized adaptive testing and Item Response Theory<sup>18</sup>. Such testing techniques allow for sensitive and specific testing with just a few items being asked in each individual case. Essentially, this is done by choosing items to be offered based on the preceding answers. As far as we know, such techniques are absent in the field of emotional and behavioural problems and developing them would require investment. The cost of such an investment, however, will be far less than the financial and human costs of both under- and over-detection of social and behavioural problems.

The study was financially supported by the Ministry of Health, Welfare and Sports; the Praeventiefonds (grant nr 28-2628-2); and Zorg Onderzoek Nederland (grant nr 101004-12).

The authors wish to thank the members of the Committee on the Development of Questionnaires for the Early Detection of Psychosocial Problems in Children, Dutch Association of Municipal Public Health Services, among whom the developers of the LSPPK, for their comments on the manuscript.

## REFERENCES

- 1 Brugman E, Reijneveld SA, Verhulst FC, Verloove-Vanhorick SP. Identification and management of psychosocial problems by preventive child health care. *Arch Pediatr Adolesc Med* 2001;155:462-9.
- 2 Costello EJ. Child psychiatric disorders and their correlates: a primary care pediatric sample. *J Am Acad Child Adolesc Psychiatry* 1989;28:851-5.
- 3 Verhulst FC, Van der Ende J. Factor associated with child mental health service use in the community. *J Am Acad Child Adolesc Psychiatry* 1997;36:901-9.
- 4 Verhulst FC, Van der Ende J. The eight year stability of problem behavior in an epidemiologic sample. *Pediatr Res* 1995;38:612-7.
- 5 Ferdinand RF, Verhulst FC, Wiznitzer M. Continuity and change of self-reported problem behaviors from adolescence into young adulthood. *J Am Acad Child Adolesc Psychiatry* 1995;34:680-90.
- 6 Durlak JA, Wells AM. Evaluation of indicated preventive intervention (secondary prevention) mental health programs for children and adolescents. *Am J Community Psychol* 1998;26:775-802.
- 7 Hirasig RA, Van Zaal MAE, Meulmeester JF, Verbrugge HP. Child health in the Netherlands: facts and figures. Leiden: TNO Prevention and Health, 1997.
- 8 Verloove-Vanhorick SP. Maternal and child care in different public health programmes. XXII International Congress of Pediatrics. Amsterdam, 9-14 August 1998:47.
- 9 Burgmeijer RJF, Van Geenhuizen YM, Filedt-Kok Weimar T, De Jager AM. Op weg naar volwassenheid: evaluatie jeugdgezondheidszorg 1996 [On the route to adulthood: evaluation preventive child Health Care 1996]. Leiden/Maarsse: TNO Prevention and Health / KPMG Consultants, 1997.
- 10 Maarsingh EJ, Van Ede J, Bos CA. Reactie van de werkgroep KIVPA op het artikel 'Is landelijk gebruik van de KIVPA verantwoord?' [Reaction of the KIVPA working group on the article 'Is nationwide use of the KIVPA questionnaire sound?']. *Tijdschr Jeugdgezondheidszorg* 1999;31:67-8.
- 11 Bouchier CAM, De Rover CM, De Vries-Lequin I, Kroesbergen HT, Visee HT, Aben DJM. Improving prevention in Dutch health care in schools. *Eur J Public Health* 1999;9:200-4.
- 12 Glascoe FP, Dworking PH. The role of parents in the detection of developmental and behavioral problems. *Pediatrics* 1995;6:829-36.
- 13 Verhulst FC, Van der Ende J, Koot HM. Handleiding voor de CBCL/4-18 [Manual for the CBCL/4-18]. Rotterdam, the Netherlands: Erasmus Universiteit/ Dept of Child and Adolescent Psychiatry, Sophia Children's Hospital, 1996.
- 14 Achenbach TM. Manual for the Child Behavior Checklist/4-18 and 1991 Profile. Burlington: University of Vermont Department of Psychiatry, 1991.
- 15 Boyle MH, Offord DR, Racine YA, Szatmari P, Sanford M, Fleming JE. Adequacy of interviews vs checklists for classifying childhood psychiatric disorder based on parent reports. *Arch Gen Psychiatry* 1997;54:793-9.
- 16 Bland JM, Altman DG. *Statistics Notes: Cronbach's  $\alpha$* . *BMJ* 1997;314:572.
- 17 Goodman R, Ford T, Simmons H, Gatward R, Meltzer H. Using the Strength and Difficulties Questionnaire (SDQ) to screen for child psychiatric disorders in a community sample. *Br J Psychiatry* 2000;177:534-9.
- 18 Glascoe FP. Are overreferrals on developmental screening tests really a problem? *Arch Pediatr Adolesc Med* 2001;155(1):54-9.
- 19 Wainer H, editor. *Computerized adaptive testing, a primer*. Hillsdale, 1990.

Received 14 December 2001, accepted 5 June 2002