

## Original paper

# Cross-cultural validation: Sinhala versions of pediatric symptom checklists for screening adolescent psychosocial problems

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### Abstract

#### Background

Psychosocial problems can significantly impact adolescents' personal and social functioning. Early identification of these problems through a brief checklist can alter the life trajectory of an individual. The Pediatric Symptom Checklist (PSC) and the Youth Self-reported Pediatric Symptom Checklist (PSC-Y) are screening tools commonly used to assess psychosocial problems among children and adolescents.

#### Aims

This study aimed to evaluate the validity and reliability of the Sinhala versions of these tools; S-PSC and S/PSC-Y, in identifying psychosocial problems among adolescents of army war widows.

#### Methods

The PSC and the PSC-Y, 35-item screening tools originally developed and validated in the United States were initially translated, culturally adapted using modified Delphi process and tested for judgmental validity. The PSC and PSC-Y criterion validity was appraised against clinical diagnoses by a consultant child and adolescent psychiatrist, with 156 purposively selected adolescents aged 10-19 years from the Western Province of Sri Lanka.

The study used the test-retest method and internal consistency analysis to assess reliability.

#### Results

The judgmental validity testing of both tools revealed good psychometric properties across all items. The overall Sinhala version of the PSC demonstrated a sensitivity of 87.5% (95% CI=71.0-96.5) and a specificity of 91.9% (95% CI=85.7-96.1). The overall Sinhala version of the PSC-Y demonstrated a sensitivity of 84.4% (95% CI=67.2-94.7) and a specificity of 70.2% (95% CI=61.3-78.0). Both tools showed satisfactory internal consistency with Cronbach's alpha values of 0.88. Correlation coefficients for the Sinhala version of PSC ranged from 0.75 to 0.90, and for the Sinhala version of PSC-Y, from 0.71 to 0.79.

#### Conclusions

The Sinhala versions of the PSC (S-PSC) and PSC-Y (S/PSC-Y) are valid and reliable tools for screening psychosocial problems among 10-19-year-olds in Sri Lanka.

**Keywords:** pediatric symptom checklist; validation; psychosocial problem; adolescents; army war widows

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## Introduction

Psychosocial problems, especially those involving emotional and behaviour issues, are more prevalent during adolescence than at any other period during childhood (1). When these problems become severe and frequent, adolescents should be evaluated for a psychological disorder by a mental health professional. Failure to recognize these issues early can result in negative consequences, affecting not only the individual but also their family, friends, and society as a whole (2).

Comparing research findings on psychosocial problems can be challenging because the definition of this term is determined by the scope of a study and available resources. To obtain more uniform and comparable results, researchers worldwide have adopted the approach of defining psychosocial problems based on carefully designed screening tools (3-8). Therefore, the term "psychosocial problem" is often operationalized as emotional and behavioural issues identified through a comprehensive screening tool rather than attempting to provide an exhaustive definition that may not be comparable across studies.

Psychosocial problems are quantifiable despite their complexity, and the use of screening instruments that meet psychometric and feasibility standards can aid in early identification and intervention for those affected (9). After reviewing widely used measures and other relevant measures of mental health outcomes among children and adolescent populations, the parent-reported version (PSC) and youth self-reported version (PSC-Y) of the Pediatric Symptom Checklist were chosen to identify psychosocial problems among children and adolescents of Sri Lankan army war widows.

Effective tools for screening or early detection of psychosocial problems in Sri Lankan children are currently limited. Given the success of the PSC in other countries, we hypothesized that a Sinhala version of the PSC and PSC-Y could be a useful tool for the early detection of psychosocial problems in children and adolescents of army war widows in Sri Lanka. This study aims to assess the validity and reliability of Sinhala versions of the PSC and PSC-Y screening tools (S-PSC and S/PSC-Y, respectively) for detecting psychosocial problems among adolescents of Sri Lankan army war widows.

## Methods

The study adopted the PSC and PSC-Y screening tools to assess psychosocial problems among adolescents of army war widows in Sri Lanka. The culturally adapted tools were validated using triangulation method which included criterion validity, and their reliability was evaluated.

### *Cross-cultural adaptation*

The PSC and PSC-Y are 35-item screening tools that assess general psychosocial problems and functional assessments in areas such as attention, externalizing, and internalizing symptoms. The tools share the same questions, adapted for pronouns (PSC in the third person and PSC-Y in the first person) and utilize a self-administered 3-point Likert scale (never, sometimes, and often) to generate continuous scores scored as 0, 1, and 2, respectively.

The tools were translated into Sinhala using the forward-backward translation method (10-13). A panel of experts, including two child and adolescent psychiatrists, a community physician, two psychiatrists, a paediatrician, and a child psychologist, used the modified Delphi technique to culturally adapt the translated tools. They evaluated each item in the questionnaires for relevance in identifying psychosocial problems, appropriateness of wording, and acceptability in the local context. Afterwards, the tools were pre-tested with 20 adolescent-mother dyads. The clarity, intelligibility, coherence and comprehension of the items were assessed during the pre-test.

### *Assessment of validity of the tools*

The tools were evaluated for judgmental validity, including face, content, and consensual validity (14). Laypersons from the target group evaluated face validity, while an independent panel of multidisciplinary experts, consisting of psychiatrists, paediatricians, consultant community physicians, and a psychologist, assessed content and consensual validity. The panel was not involved in the process of translation or cultural adaptation.

A cross-sectional validation study was conducted to evaluate the criterion validity of the Sinhala versions of the tools on literate adolescents of army war widows aged 10-19 years from Colombo, Kaluthara, and Gampaha districts, who were proficient in Sinhala, and had literate mothers. The diagnosis made by a consultant child and adolescent psychiatrist was considered the gold standard in evaluating the criterion validity. Adolescents with major medical neurological disorders or psychoses, had stepfathers and were unable to visit Colombo South Teaching Hospital (CSTH) for assessment were excluded.

The sample size was calculated using the formula proposed by Hulley et al. (15). The expected sensitivity and specificity for both tools were determined based on previous validation studies by Navon et al. (16) and Chaurasia et al. (17), with 91% sensitivity and 68% specificity for PSC and 96% sensitivity and 79% specificity for PSC-Y. A precision level of 0.2 was set, and a non-response rate of 10% was assumed. As no literature was available on the prevalence of psychosocial problems among adolescents of army war widows, an approximate prevalence of 50% was used to calculate the sample size.

A total of 156 eligible adolescent mother dyads were purposively selected from an updated list of army war widows obtained from the Sri Lanka Army Preventive Medicine and Mental Health Services. Trained pre-intern medical graduates administered the culturally adapted Sinhala version of the PSC to the mother and the PSC-Y to the adolescent on scheduled clinic dates at CSTH. After completing the screening procedure, a clinical assessment was conducted by a consultant child psychiatrist who was blinded to their psychosocial status of the adolescents.

### *Data analysis*

The ROC curve was generated using SPSS. Various cut-off values were calculated for both total scales and subscales. The optimal cut-off points were determined using two commonly used methods: "the closest-to-(0,1) criterion" (distance to corner criterion) (18) and the "Youden index" (19).

The tools' reliability was assessed through internal consistency and test-retest reliability, by re-administering the S-PSC and S/PSC-Y to 10 mother-adolescent pairs after 2 weeks.

## Results

### *Cultural adaptation*

The third round of panel suggestions for the Sinhala translations of the PSC and PSC-Y assessment tools resulted in a consensus with a median score of 4 or higher for all items, showing agreement among panel members. Pre-testing with 10 mother-adolescent dyads found no items difficult to understand, and minor issues were addressed. The Sinhala versions of PSC, S-PSC, and S/PSC-Y were finalized for validation.

### *Validity*

Both the PSC and PSC-Y assessment tools were validated for face, content, and consensual validity on all 35 items. The multidisciplinary team confirmed validity for all items, with a median score of over four in all areas assessed.

The majority of participants recruited for criterion validation were female (51.3%,  $n=80$ ). 46% ( $n=72$ ) of the adolescents were from Gampaha District and the sample had a mean age of 15.9 years ( $SD=2.2$ ). Only one adolescent (0.6%) had completed their schooling (Table 1). Out of 156 adolescents from army war widows clinically assessed, 20.5% ( $n=32$ ) had psychosocial problems. Of those, 8.3% ( $n=13$ ) had internalizing disorders, 3.2% ( $n=5$ ) had externalizing disorders, 5.1% ( $n=8$ ) had attention disorders, and 3.8% ( $n=6$ ) had multiple disorders.

### *Determination of optimal cut-off values for PSC*

The PSC effectively discriminates between individuals with and without psychosocial problems, with an overall ability of 96.0% (95% CI=92.4-99.5). It also shows high differentiation abilities for internalizing problems (80.7%, 95% CI=71.6-89.8), externalizing problems (83.4%, 95% CI=76.4-90.4), and attention problems (81.1%, 95% CI=72.7-89.4).

The optimum cut-off value for being positive for psychosocial problems on the PSC was  $>23$ , with a sensitivity of 87.5% and a specificity of 91.9%. The cut-off values for being positive for anxiety/depression, conduct, and attention problems were  $>2$ ,  $>1$ , and  $>3$  respectively, with varying levels of sensitivity and specificity (Table 2).

### *Determination of optimal cut-off values for PSC-Y*

The PSC-Y effectively discriminates between individuals with and without psychosocial problems, with an overall

Table 1. Socio-demographic profile of the validation study sample

Socio-demographic characteristics	Number	Percentage (%)
<b>Sex</b>		
Female	80	51.3
Male	76	48.7
<b>District</b>		
Colombo	48	30.7
Gampaha	72	46.2
Kalutara	36	23.1
<b>Age</b>		
10	0	0
11	0	0
12	14	9.0
13	13	8.3
14	21	13.5
15	19	12.2
16	27	17.3
17	8	5.1
18	34	21.8
19	20	12.8
<b>Grade</b>		
5	0	0
6	0	0
7	14	9.0
8	13	8.3
9	21	13.5
10	19	12.2
11	27	17.3
12	42	26.9
13	19	12.2
Completed	1	0.6
<b>Total</b>	<b>156</b>	<b>100.0</b>

ability of 82.7% (95% CI=74.4-91.0). It also shows moderate differentiation abilities for internalizing problems (68.6%, 95% CI=56.9-80.4), externalizing problems (66.9%, 95% CI=55.6-78.1), and attention problems (75.5%, 95% CI=65.5-85.5).

The PSC-Y cut-off value for being positive for psychosocial problems was  $>18$ , with a sensitivity of 84.4% and specificity of 70.16%. The cut-off values for anxiety/depression, conduct, and attention problems were  $>2$ ,  $>5$ , and  $>4$ , respectively, with varying levels of sensitivity and specificity (Table 3).

### *Reliability*

The internal consistency of both PSC and PSC-Y tools was found to be satisfactory as Cronbach's alpha values

exceeded Nunnally's criteria of 0.7 (20,21) with a value of 0.88 (22). The subscales of PSC had Cronbach's alpha values ranging from 0.65 to 0.68, while PSC-Y had values ranging from 0.68 to 0.71.

The correlation coefficient values for PSC ranged from 0.75 to 0.90, while for PSC-Y it ranged from 0.71 to 0.79.

All total and subscales, except for attention/depression subscale on PSC-Y, met the assumptions of Pearson's correlation. Since this subscale did not assume a normal distribution, the Spearman correlation coefficient was used (23). All correlations were statistically significant ( $p < 0.05$ ), and both PSC and PSC-Y demonstrated satisfactory reliability.

Table 2. Summary of indicators of diagnostic accuracy of the PSC and subscales, based on clinically validated cut-off values							
Subscale	Cut-off value	Sensitivity (95% CI)	Specificity (95% CI)	PPV	NPV	LR+	LR-
<b>PSC</b>	>23	87.50% (71.0-96.49)	91.94% (85.07-96.06)	73.70% (60.37-83.73)	96.60% (91.92-98.62)	10.85 (5.95-19.94)	0.14 (0.05-0.34)
<b>Subscales</b>							
Anxiety / depression	>2	68.75% (50.0-83.90)	76.61% (68.20-83.70)	43.10 (33.80-53.0)	90.50 (84.90-94.10)	2.94 (1.98-4.36)	0.41 (0.24-0.69)
Conduct (Externalizing)	>1	90.62% (75.0-98.0)	59.68% (50.50-68.40)	36.70 (31.30-42.50)	96.10 (89.30-98.70)	2.25 (1.77-2.86)	0.16 (0.05-0.47)
Attention	>3	81.25% (63.60-92.80)	65.32% (56.30-73.60)	37.70 (31.10-44.80)	93.10 (86.60-96.60)	2.34 (1.75-3.14)	0.29 (0.14-0.60)

Note. PPV = Positive Predictive Value, NPV = Negative Predictive Value, LR+ = Positive Likelihood Ratio, LR- = Negative Likelihood Ratio

Table 3. Summary of indicators of diagnostic accuracy of the PSC-Y and subscales, based on clinically validated cut-off values							
Subscale	Cut-off value	Sensitivity (95% CI)	Specificity (95% CI)	PPV	NPV	LR+	LR-
<b>PSC-Y</b>	>18	84.37% (67.21-94.72)	70.16% (61.29- 78.04)	42.2 (34.90-49.83)	94.6 (88.5-97.5)	2.8 (2.08-3.85)	0.22 (0.10-0.50)
<b>Subscales</b>							
Anxiety / depression (Internalizing)	>2	65.62% (46.80-81.40)	68.55% (59.60-76.60)	35.0 (27.30-43.60)	88.5 (82.5-92.7)	2.09 (1.45-2.99)	0.50 (0.31-0.82)
Conduct (Externalizing)	>5	31.25% (16.10-50.0)	95.16% (89.80- 98.20)	62.50 (39.60-80.90)	84.30 (80.90-87.2)	6.46 (2.54-16.44)	0.72 (0.57-0.92)
Attention	>4	75.0% (56.60-88.50)	66.13% (57.10 - 74.40)	36.4 (29.40-44.0)	91.1 (84.70-95.0)	2.21 (1.61-3.04)	0.38 (0.20-0.70)

Note. PPV = Positive Predictive Value, NPV = Negative Predictive Value, LR+ = Positive Likelihood Ratio, LR- = Negative Likelihood Ratio

Table 4. Cronbach's Alpha reliability of PSC and PSC-Y

Scale	Number of items	Cronbach's Alpha
<b>PSC</b>		
• Total scale	35	0.88
• Anxiety / depression (internalizing)	5	0.66
• Conduct (externalizing)	7	0.65
• Attention	5	0.68
<b>PSC-Y</b>		
• Total scale	35	0.88
• Anxiety / depression (internalizing)	5	0.70
• Conduct (externalizing)	7	0.68
• Attention	5	0.71

Table 5. Test-retest statistics of PSC and PSC-Y for total scores and subscale scores

Scale	Correlation Coefficient
<b>PSC</b>	
• Total scale	0.90
• Anxiety / depression (internalizing)	0.79
• Conduct (externalizing)	0.83
• Attention	0.75
<b>PSC-Y</b>	
• Total scale	0.76
• Anxiety / depression (internalizing)	0.75
• Conduct (externalizing)	0.79
• Attention	0.71

## Discussion

The study aimed to validate the PSC and PSC-Y tools for assessing psychosocial problems in adolescents of army war widows in Sri Lanka, filling an important research gap on war-affected adolescents worldwide. The Sinhala versions of the tools (S-PSC and S/PSC-Y) were found to be valid and reliable for this population.

The original recommended cut-off values for the PSC and PSC-Y were  $\geq 28$  and  $\geq 30$  (24,25), respectively, with subscale cut-off scores of 5, 7, and 7 for internalizing, externalizing, and attention problems (26,27). However, the present study found lower cut-off scores for the PSC-Y, which have also been observed in studies conducted in Mexico, Turkey and India, with proposed cut-off scores ranging from 12 to 26 (17,28-30). Differences in the way symptoms are expressed and emotional distress is somatised across cultures can lead to lower cut-off scores in psychometric tests (30-32). Cultural norms play a significant role in defining what is

perceived as “normal” emotional and behavioural states. This definition of normalcy affects the cut-off values of psychometric tools, resulting in lower scores.

### Measures of diagnostic accuracy

The S-PSC had 87.5% sensitivity (95% CI=71.0-96.5) and 91.9% specificity (95% CI=85.7-96.1) in this study, consistent with Lavigne et al.'s systematic review that reported mean sensitivity and specificity of 70.0% and 87.0%, respectively, for the PSC (30). The original authors reported a sensitivity of 95% and specificity of 68% against the CGAS, and a sensitivity of 87% and specificity of 89% against clinicians' psychiatric diagnosis (25). In another study by the original authors, the PSC had a sensitivity of 88.0% and specificity of 100.0% against comprehensive assessments made by clinicians (33). The specificity of the S-PSC in the current study (91.9%) was consistent with the higher specificity reported in both studies, compared to sensitivity. A study among Mexican American adolescents in the US reported sensitivity and



specificity values of 74.0% and 94.0%, respectively against another instrument (29) rather than clinical judgment. Sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) are all dependent on the gold standard used in clinical evaluation and can vary based on the clinical measures used and the cut-off selected (34). Therefore, differences in sensitivity and specificity can be attributed to the use of different criterion measures and study populations.

The current study found that the sensitivity measures for PSC subscales were 68.8% (95% CI=50.0-83.9) for internalizing, 90.6% (95% CI=75.0-98.0) for externalizing, and 81.3% (95% CI=63.6-92.8) for attention. The corresponding specificity values were 76.6% (95% CI=68.2-83.7), 59.7% (95% CI=50.5-68.4), and 65.3% (95% CI=56.3-73.6), respectively. Although there is no published literature assessing the diagnostic accuracy of each subscale of the PSC, literature is available on the diagnostic accuracy of the PSC-17 tool, which includes the 17 items in both the PSC and PSC-Y subscales. Gardner et al., reported lower sensitivity and specificity values than the present study (35), but comparable values were observed at alternative cut-off values lower than the standard cut-off scores. The PPV and NPV of individual subscales in the present study ranged from 36.7% to 43.1% and from 90.5% to 96.1%, respectively. These values differed from those obtained in the US study using standard cut-off scores, but were comparable with values obtained using alternative cut-off scores at a higher presumed prevalence of 15% instead of 5%. Population characteristics, such as disease prevalence, can impact NPV and PPV values of a test (36), which may explain why comparable values were obtained under a lower cut-off score in the current study compared to the US study.

Sensitivity and specificity measures for the overall S/PSC-Y is 84.4% (95% CI=67.2-94.7) and 70.2% (95% CI=61.3-78.0). Pagano, Cassidy, et al. found higher sensitivity and specificity values of 94.0% and 88.0%, respectively, using teacher reports as a criterion measure, while Chaurasiya et al. reported sensitivity and specificity values of 96% and 79%, respectively, using the Mental Health Inventory as the criterion (17,24). The difference in criterion measure may have contributed to the observed differences in sensitivity and specificity values between this study and others. In the current study, although the sensitivity and specificity values are relatively low, they are still considered acceptable for developmental screening tests. According to the literature, sensitivity and specificity levels of 70.0% to 80.0% are acceptable for mental health screening tests, as it enables early identification of children who may require intervention in the community or primary care setting (37-39).

The sensitivity values for the anxiety/depression, conduct, and attention subscales of the PSC-Y are 65.6% (95% CI=46.8-81.4), 31.3% (95% CI=16.1-50.0), and

75.0% (95% CI=56.6-88.5), respectively. The corresponding specificity values for these subscales are 70.2% (95% CI=61.3-78.0), 68.6% (95% CI=59.6-76.6), 95.2% (95% CI=89.8-98.2), and 66.1% (95% CI=57.1-74.4), respectively. Pagano, Cassidy, et al. reported that the overall PSC-Y had sensitivity of 56.0%-58.0% and specificity of 88%-90% in detecting anxiety and depression (24). Chaurasiya et al., found sensitivity of 82.0% and specificity of 63.0% for the PSC-Y (17). The use of different validity measures may account for the variation in results. There is no published literature that has compared diagnostic accuracy indices for each subscale of the PSC-Y.

### Reliability

The S-PSC in the current study had an internal consistency Cronbach's alpha coefficient of 0.88, consistent with previous findings for the original, Turkish, Setswana, Dutch, and Korean versions (0.86, 0.90, 0.87, 0.89 and 0.95 respectively) (25,28,33,40-46). The internalizing, externalizing, and attention subscales had lower Cronbach's alpha coefficients of 0.66, 0.65, and 0.68, respectively, compared to the original study values of 0.79-0.83(26). But the Turkish version had similar subscale values ranging from 0.62-0.74 (47) as the current study.

The test-retest reliability correlation coefficient of 0.90 for the total S-PSC after a two-week gap was comparable to the original authors' finding of 0.86 after a four-week gap (33,40). The US (48) and Korean studies (45) reported lower values in comparison (0.77 and 0.73) after a four-week interval. A satisfactory ICC reliability measure of 0.72 for the Turkish version of the PSC was reported after a four-week interval (49). The S-PSC subscales had coefficients of 0.79 (internalizing), 0.83 (externalizing), and 0.75 (attention). The electronic version of PSC-17 had good test-retest reliability (ICC=0.76 for internalizing, 0.83 for externalizing, and 0.82 for attention) after 8-14 days (27). The US study reported much lower ICC and Pearson correlation coefficient values for corresponding subscales after a six-month test-retest interval (50). Differences in test-retest intervals and the use of different correlation coefficients may have contributed to discrepancies between study findings.

The internal consistency of the S/PSC-Y was found to have a Cronbach's alpha coefficient of 0.88, which is consistent with previous validation studies conducted in India and Botswana (17,24,44). The internalizing, externalizing, and attention subscales had Cronbach's alpha coefficients of 0.75, 0.79, and 0.71, respectively, which were similar to the Spanish validation study results with the same item domains (51).

The S/PSC-Y had a test-retest reliability of 0.76, with correlation coefficients of 0.75 for internalizing, 0.79 for externalizing, and 0.71 for attention subscales. This

finding is supported by Chaurasiya et al., but is higher than the original English version of PSC-Y (0.45), where the test-retest interval was four months (24). The difference in test-retest intervals may have contributed to the discrepancy in the test-retest reliability values reported in these studies.

The literature suggests that a test-retest reliability correlation coefficient above 0.70 is reasonable in psychological testing (52), thus indicating satisfactory reliability for the two scales.

## Limitations

The S-PSC and PSC-Y were validated in Sinhala, limiting their use for non-Sinhala speakers. However, it's worth noting that during the war, the Sri Lankan Armed Forces were mostly Sinhalese (53), and no participants were encountered who couldn't speak or understand Sinhala. Due to cultural and social factors affecting mental health reporting findings should be cautiously generalized to other adolescent populations. However, involving a child and adolescent psychiatrist and using international criteria for clinical evaluations could help with cross-country comparisons.

## Conclusions

Our findings demonstrate that both the S-PSC and S/PSC-Y are appropriate screening tools for psychosocial problems in the adolescent population of army war widows. These instruments may be useful in identifying psychosocial issues in similar populations, and their application could help guide the development of targeted interventions to address these problems.

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## Statement of Contribution

DW, SP, YR, SS and TF were involved in the conception and design of the study. DW, YR and TF were involved in data collection. DW analysed and interpreted data. SP made substantial contribution to data analysis and interpretation. DW prepared the manuscript. SP, YR, SS and TF made substantial contribution to revise the manuscript. All authors read and approved the final manuscript.

## Declaration of interest

None.

## Conflicting interests

None.

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