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Validation of the Pediatric Symptom Checklist in HIV-Infected Batswana

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Results—The Setswana PSC has high internal consistency (Cronbach's alpha 0.87 for the parent-completed version). Comparing PSC scores to parental reports of concern and childreported depression symptoms, a cut-off score of 20 on the PSC and PSC-Y maximised the sensitivity and specificity.

Conclusions—The PSC performed well in Setswana-speaking children and is a promising screening tool for paediatric psychosocial problems in busy clinical settings. Screening with the PSC may allow for early detection and treatment of psychosocial problems. This is likely to be of particular value for HIV+ children for whom HIV treatment non-adherence may result from untreated psychosocial dysfunction.

Keywords
Pediatric Symptom Checklist, HIV positive, Depression Inventory, Anxiety Scale

Disciplines
Diseases | Immune System Diseases | Medicine and Health Sciences | Mental and Social Health

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Abstract

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Conclusions—The PSC performed well in Setswana-speaking children and is a promising screening tool for paediatric psychosocial problems in busy clinical settings. Screening with the PSC may allow for early detection and treatment of psychosocial problems. This is likely to be of particular value for HIV+ children for whom HIV treatment non-adherence may result from untreated psychosocial dysfunction.

Background

Psychosocial dysfunction contributes greatly to morbidity among children and adolescents (Kelleher and Wolraich 1996, Prince *et al.* 2007). Most psychosocial problems are unrecognized and untreated, even among young people attending clinics for other healthcare

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needs (Costello *et al.* 1988, Navon *et al.* 2001). Screening for psychosocial dysfunction is not routinely done in most health centres since such screening can be extremely time-consuming and most screening modalities require special training (Chambers *et al.* 1985, Jellinek and Murphy 1990). However, children and adolescents presenting for chronic medical care are particularly likely to have psychosocial co-morbidities (Prince *et al.* 2007, Saini *et al.* 2007). Children and adolescents infected with and affected by HIV are at particularly high risk of suffering from psychosocial problems (Pao *et al.* 2000, Scharko 2006, DeLaMora, Aledort and Stavola 2006, Fielden *et al.* 2006, Bauman *et al.* 2007, Cluver, Gardner and Operario 2007, Lee *et al.* 2007, Rao *et al.* 2007, Mellins *et al.* 2008, Hazra, Siberry and Mofenson 2010). Since most HIV-infected children, even in resource-limited settings, attend clinic regularly for their HIV-related medical care, clinic staff members have the opportunity to screen for and address psychosocial concerns in this vulnerable population.

Despite impressive improvements in preventing mother-to-child transmission of HIV in Botswana, the burden of HIV among children and adolescents in this country is large (Stover *et al.* 2008). UNAIDS estimates that about 16 000 children aged 0–14 years are infected with HIV (UNAIDS 2011). Successful treatment programmes have allowed children infected with HIV around the time of birth to survive through adolescence, even in resource-limited settings such as those found in Botswana (Kline *et al.* 2004, Bolton-Moore *et al.* 2007). HIV-infected children have variable needs for psychosocial support as they grow older. Generally, these needs are higher among HIV-infected children than among uninfected children in the same populations (UNICEF 2010).

Screening for psychosocial dysfunction among children and adolescents seeking routine medical care can be facilitated using brief screening questionnaires (Eisert, Sturner and Mabe 1991, Sturner 1991). The Pediatric Symptom Checklist (PSC) was developed to allow for rapid identification of individuals between the ages of 6 and 16 years who would benefit most from further services to evaluate and treat emotional and behavioural problems (Jellinek, Murphy and Burns 1986, Jellinek and Murphy 1990). The PSC consists of 35 items that are rated as never, sometimes or often present (scored 0, 1 or 2). A 17-item version of the PSC (PSC-17) has also been used successfully to detect youth with psychosocial impairment (Gall *et al.* 2000, Borowsky, Mozayeny and Ireland 2003, Duke, Ireland and Borowsky 2005, Gardner *et al.* 2007). Both versions are scored by simply adding the scores on each individual item. No special training is required for scoring or interpretation. The PSC is typically completed by a parent, however, a youth self-report version (PSC-Y) is also available (Pagano *et al.* 1996). Like the parent-completed version of the PSC, results of the PSC-Y correlate well with more comprehensive measures of psychosocial dysfunction. However, children identified as at risk through the PSC-Y are frequently not identified as at risk when measured concurrently with the PSC (Pagano *et al.* 1996).

Parent-completed questionnaires such as the PSC are more routinely recommended than child-completed questionnaires such as the PSC-Y for screening school-aged children for psychosocial problems (Conner 1979). However, there are a few reasons to consider utilising child-report questionnaires in addition to or instead of parent report questionnaires for screening HIV+ children. While parents can generally report accurately about behaviour problems, they are less aware of children's dysphoria and anxiety than the children themselves (Weissman, Orvaschel and Padian 1980, Herjanic and Reich 1982, Wren, Bridge and Birmaher 2004). In addition, the parent or guardian who knows the child best may not be the same person who routinely brings the child to clinic for routine HIV-related follow-up. For example, a child's primary caregiver might be the grandmother, but an uncle who lives in a different household might be the most available to take the child to clinic

appointments. Adults who do not know the child well are likely to be limited in their ability to accurately report on the child's psychosocial health.

For assessment of depressive symptoms in children in sub-Saharan Africa, the Children's Depression Inventory has been used by several research groups (Cluver and Orkin 2009, Ndetei *et al.* 2009, Ruiz-Casares *et al.* 2009, Bach and Louw 2010). The Revised Children's Manifest Anxiety Scale has also been used extensively in sub-Saharan Africa to evaluate anxiety symptoms in children (Pela and Reynolds 1982, Cluver *et al.* 2007). Because of the lack of validated standards for the measurement of depression and anxiety symptoms among Batswana children, we chose tools that have been trusted for use in similar populations. Both these scales are based on the children's self-report of their symptoms.

The PSC is completed by parents and the PSC-Y is completed by the children themselves. A positive score on either version of the PSC suggests the need for further evaluation. Data from early studies with the PSC indicate that about two out of three children who have a positive score on the PSC will have been correctly identified as having a moderate or serious impairment in psychosocial functioning (Walker, LaGrone and Atkinson 1989). A score of 28 or higher is considered positive when the English language PSC is used in US populations of school-going age (Jellinek *et al.* 1999). For the PSC-17, a cut-off score of 15 is recommended (Gardner *et al.* 2007).

The original English language version of the PSC has been validated against various criterion standards, including longer diagnostic questionnaires and extensive diagnostic interviews (Jellinek *et al.* 1995, Anderson *et al.* 1999, Simonian and Tarnowski 2001, Gardner, Kelleher and Pajer 2002, Gardner *et al.* 2007). Prior studies have suggested that similar populations are identified when responses to single question screens are compared with extensive diagnostic interviews (Pagano *et al.* 1996, Cuijpers and Smit 2001, Miller *et al.* 2008). Thus, while single question screens are less sensitive than more comprehensive screening methodologies for the identification of at-risk children, they can be helpful for establishing score cut-offs in new populations for tools previously validated by rigorous criterion standards in other populations.

A single question asking the parent or child to indicate if the child has a problem for which (s) he needs help has been a part of PSC screening for nearly two decades (Murphy *et al.* 1996, Pagano *et al.* 1996). It is included for the express purpose of allowing a preliminary exploration of the validity of the screen when it is used in a new population. In an outpatient paediatric sample using the parent rating of whether the child had a problem as the 'gold standard', PSC case classifications were in categorical agreement 91% of the time (Hacker *et al.* 2006). In a school based health centre, the same question was associated with an 86% rate of agreement with the PSC-Y (Gall *et al.* 2000). In an outpatient child psychiatry clinic where presumably all children had significant problems, 80% of parents answered yes to this question on the PSC (Murphy unpublished data). Recent work by members of our group has also found a high degree of association (88%) between a single question screen and the United State Department of Agriculture's 18 item Food Security Measure of hunger (Kleinman *et al.* 2007, Miller *et al.* 2008).

The PSC has been used in several different cultural contexts and has been translated into other languages including Dutch (Reijneveld *et al.* 2006), German (Thun-Hohenstein and Herzog 2008), Japanese (Ishizaki 2000) and Spanish (Jutte *et al.* 2003). Translated versions have been tested in the appropriate ethnic groups with different score cut-offs proving more appropriate in different settings. For the Japanese version of the PSC, a cut-off score of 17 is recommended (Ishizaki 2000); for the German form, the recommended cut-off is 24 (Thun-Hohenstein and Herzog 2008); and for the Dutch version, a cut-off of 25 is recommended

(Reijneveld *et al.* 2006). To date, no reports have been published on use of the PSC on the African continent and its validity as a screening tool for African youth has not been previously demonstrated.

We assessed the test properties of a Setswana version of the PSC in a population of HIV-infected Batswana children and adolescents. The purpose of our study was to determine whether the PSC is likely to contribute to the early detection of psychosocial problems among African children and adolescents in treatment for HIV infection.

Methods

Translation, cultural adaptation and piloting

The PSC and PSC-Y were translated into Setswana by a University of Botswana linguist. Two Batswana paediatric healthcare professionals back-translated the tools into English. A group of eight professionals who are fluent in both English and Setswana and whose work involves mental health support or research related to children and adolescents was then assembled to finalise the wording of the tool. The goal of this group was to ensure that the tools would be easily understood by the local population and that the original meaning of the items was maintained. Finally, the tools were piloted in a group of Batswana children aged 8 to 16 years and further minor modifications were made based on their input. The final English version used is identical to the previously published English version (Jellinek *et al.* 1988, Jellinek *et al.* 1990, Jellinek *et al.* 1991, Pagano *et al.* 1996, Anderson *et al.* 1999, Reijneveld *et al.* 2006). The Setswana version is available for free download at http://www2.massgeneral.org/allpsych/psc/psc_home.htm.

Study population and administration of tools

The PSC and PSC-Y were administered separately to the parent/guardian (parent) of HIV-infected children aged 8 to 16 years and the children themselves in infectious disease clinics in Nyangabgwe Hospital in Francistown and Letsholathebe Hospital in Maun, Botswana. These two public clinics are the largest HIV treatment sites in north-east and north-west Botswana respectively, where both English and Setswana are official national languages. Combined, they treat approximately 9 000 HIV-infected patients of all ages with highly active antiretroviral therapy. The only exclusion criteria for the study were severe cognitive limitations, prohibiting the child from being able to answer simple questions or presentation to the clinic without a parent or guardian who could give consent for study participation. All eligible children presenting for care at the sites during the recruitment period were enrolled. Only Botswana nationals were eligible for treatment in public HIV treatment clinics in Botswana therefore children and adolescents from other countries were not included.

The tools were administered by a research assistant in order to overcome literacy issues and minimise missing data. Administration of each tool typically took 5 to 10 minutes. Subjects completed the tools in whichever language (English or Setswana) they were most comfortable. Demographic information and clinical data were collected for each subject and the children also completed the Children's Depression Inventory (CDI) (Kovacs 1992) and the Revised Children's Manifest Anxiety Scale (RCMAS) (Reynolds and Richmond 1978). The CDI and RCMAS went through the same process described above for translation, cultural adaptation and piloting. Parents and clinic staff were also asked to state whether or not they thought each child had emotional or behavioural problems for which they needed help. A single research assistant administered all tests to each subject and parent during a single session. The research assistant was therefore not specifically blinded to the reference standards. However, the research assistant was instructed to ask the questions in a uniform way and did not participate in test scoring.

Data analysis

Cronbach's alpha was calculated as a measure of the internal consistency of each tool. Cut-off scores for the Setswana versions of the PSC, PSC-Y, PSC-17 and PSC-17-Y were derived using receiver operator characteristic (ROC) analyses (Hanley and McNeil 1982). Areas under the curves (AUC) with standard errors were derived and the sensitivity and specificity with binomial exact 95% confidence intervals were compared at each cut-point. For the PSC and PSC-17, ROC curves were generated by comparing scores to the dichotomised parent and clinic staff reports of concern about the child. For the PSC-Y and PSC-17-Y, ROC curves were generated using scores on the CDI and the RCMAS as comparators. Test scores were compared by age and sex using two-sample t-tests. The per cent of subjects who achieved each cut-off score was determined and Pearson's chi-square test was used to evaluate for differences between demographic groups: boys vs. girls, older vs. younger children (≥10 years vs. < 10 years), higher vs. lower school level (≥ standard 5 vs. < standard 5), at appropriate school grade level vs. >2 years behind, orphans vs. non-orphans. All analyses were done using Stata 11 (StataCorp LP, College Station, TX).

Ethical approvals

The study was approved by the Botswana Health Research Development Committee Ethics Board, the Institutional Review Boards (IRBs) at the University of Pennsylvania and Children's Hospital of Philadelphia, and by the appropriate personnel at all recruitment sites.

Results

Sample

Five hundred and nine child-parent dyads completed the study, 455 from Francistown and 54 from Maun. Demographic data for the enrolled children are presented in Table 1. About half (50.2%) of subjects with pre-HAART CD4 counts available (N = 478) had a nadir CD4 count <200 cells/mm^3 or CD4 per cent <15%. Seventy-seven per cent of the children and 95% of those aged 12 or older had been informed of their HIV+ status. Of the subjects over the age of 12, 25% had taken part in a support group for HIV-infected teens. Only eight subjects had a previous psychiatric (five with depression) or substance abuse-related (three) diagnosis.

PSC

Cronbach's alpha for the 35 question PSC was 0.87. A total of 11.5% of parents reported that their child needs help for an emotional or behavioural problem. Figure 1a compares the parents' report of concern to scores on the PSC. The AUC was 0.85 with a standard error of 0.024. Using a cut-off score of 20 on the full-length PSC resulted in a sensitivity of 0.62 (95% confidence interval 0.58–0.66) and a specificity of 0.86 (95% confidence interval 0.83–0.89) for detecting children whose parents expressed concern about their psychosocial health. Table 2 outlines the sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of various PSC cut-off scores compared with parental concern. Based on clinic staff report, 11.5% of children were thought to need help for a psychosocial problem. However, only 3.5% of children were of concern to both parents and clinic staff. Clinic staff concern discriminated relatively poorly with PSC scores, having an AUC of 0.70 (95% confidence interval 0.65–0.74).

With scores of 20 or greater considered positive, 19.5% of children in our study were identified as at risk. Using a cut-off score of 28, only 8% of children would have tested positive. The latter cut-off score had a sensitivity of only 0.36 (95% confidence interval 0.32–0.40) for identifying children whose parents have concerns about their psychosocial health. The mean score on the PSC was 12.7 (SD = 9.1; range 0–58). Scores did not vary

significantly by sex ($p = 0.32$). The mean score for children under the age of 10 years was less than one point different from the mean score for children >10 years of age: 12.0 vs. 12.9, although this difference was statistically significant ($p < 0.01$). There was no significant difference in the proportion of subjects classified as testing positive when scores were stratified by sex ($p > 0.5$), age ($p = 0.14$), grade in school ($p > 0.5$), being within 2 years of their expected grade level ($p > 0.5$), or orphan status ($p > 0.5$). The highest 5th, 10th, 15th, 20th and 25th percentile scores were 31, 25, 22, 19 and 17 respectively.

PSC-17

Cronbach's alpha for the PSC-17 was 0.80. Figure 1b compares the parents' report of concern to scores on the PSC-17. The AUC was 0.84 with a standard error of 0.025. Using a cut-off score of 15 to indicate positivity on the PSC-17, only 5.5% of our population would have been considered to have tested positive and only 25% of children whose parents thought they needed help for emotional or behavioural problems would have tested positive. Using a cut-off score of 10 on the PSC-17 resulted in a sensitivity of 0.60 (95% confidence interval 0.56–0.64) and a specificity of 0.88 (95% confidence interval 0.85–0.91) for detecting children whose parents expressed concern about their psychosocial health. A score of 10 or greater on the PSC-17 correctly identified most subjects who would have been identified as positive using a cut-off of 20 or greater on the full-length PSC (PPV = 0.92). A score of <10 on the PSC-17 correctly excluded most subjects who would have been excluded as negative using a cut-off of <20 on the full-length PSC (NPV = 0.95). The mean score on the PSC-17 was 4.5 (SD = 4.5; range 0–24). The difference in mean scores for males vs. females was not clinically significant (5 vs. 4.6, although it was statistically significant, $p < 0.01$). The mean score for children under the age of 10 years was also less than half a point different from the mean score for children >10 years of age (4.5 vs. 4.9, $p < 0.01$). There was no significant difference in the proportion of subjects classified as testing positive when scores were stratified by sex ($p > 0.5$), age ($p > 0.5$), grade in school ($p > 0.5$), being within 2 years of their expected grade level ($p > 0.5$), or orphan status ($p = 0.47$). The highest 5th, 10th, 15th, 20th and 25th percentile scores were 15, 12, 10, 8 and 7 respectively.

PSC-Y and PSC-Y-17

Like the PSC and the PSC-17, the youth self-report versions of these tests had high internal consistency. Cronbach's alpha for the 35 question PSC-Y was 0.86. For the PSC-17-Y, Cronbach's alpha was 0.78. For comparisons of the PSC-Y to the CDI, a cut-off score of 19 was considered positive on the CDI (Kovacs 1992). A total of 7.7% of our subjects met this threshold for severe depressive symptoms. Figure 2a compares the CDI scores (<19 vs. ≥19) to scores on the PSC-Y. The AUC was 0.81 with a standard error of 0.043. Using a cut-off score of 20 as positive on the PSC-Y had a sensitivity of 0.64 (95% confidence interval 0.60–0.68) and a specificity of 0.88 (95% confidence interval 0.85–0.91) for detecting children with a positive CDI. A cut-off score on the PSC of 28 had poor sensitivity (0.36; 95% confidence interval 0.32–0.40) for detecting children with a CDI score ≥19. Table 3 outlines the sensitivity, specificity, positive predictive value (PPV) and negative predictive value (NPV) of various PSC cut-off scores compared with CDI scores dichotomised at a score of 19.

For the comparison of the PSC-17-Y to CDI scores (<19 vs. ≥19), the AUC was 0.82 with a standard error of 0.040. Figure 2b compares the CDI scores (<19 vs. ≥19) to scores on the PSC-17-Y. Using a cut-off score of 9 on the PSC-17-Y had a sensitivity of 0.67 (95% confidence interval 0.63–0.71) and a specificity of 0.90 (95% confidence interval 0.87–0.93) for detecting children with a positive CDI. This cut-off compared favourably with cut-offs of 10 or 15 which had sensitivities of 0.55 and 0.31 respectively for detecting children with a positive CDI. A score of ≥9 on the PSC-17-Y correctly identified most subjects who

would have been identified as positive using a cut-off of ≥20 on the full-length PSC (PPV = 0.89). A score of <10 on the PSC-17-Y correctly excluded most subjects who would have been excluded as negative using a cut-off of <20 on the full-length PSC-Y (NPV = 0.96).

The highest 5th, 10th, 15th, 20th and 25th percentile scores on the PSC-Y were 31, 24, 20, 17 and 15 respectively. The highest 5th, 10th, 15th, 20th and 25th percentile scores on the PSC-17-Y were 14, 10, 8, 7 and 6 respectively. The difference in mean scores on the PSC-Y for males vs. females was not clinically significant (11.1 vs. 11.8, p<0.01). The difference in mean scores on the PSC-17-Y for males vs. females was also not clinically significant (4.31 vs. 4.36, although it too was statistically significantly different, $p = 0.05$). The mean score on the PSC-17-Y for children <10 years of age was 3.9 and that for children ≥10 years of age was 4.5 ($p < 0.01$). There was no significant difference in the proportion of subjects classified as testing positive when scores on the PSC-Y and PSC-17-Y were stratified by sex, age, grade in school or orphan status ($p > 0.5$ for all comparisons). Children who were at least two grade levels below their expected grade level were significantly more likely to have positive scores on the PSC-17-Y ($p = 0.02$), but not on the PSC-Y ($p = 0.14$).

Using the recommended cut-off score of 19 as positive on the RCMAS (Reynolds *et al.* 1978), 42% of subjects met the threshold for high anxiety symptom scores. The top 10% of scores on the RCMAS were >25. The AUC for the ROC curve comparing the top 10% of scores on the RCMAS to PSC-Y values was 0.81 with a standard error of 0.028. The AUC for the ROC curve comparing the top 10% of scores on the RCMAS to PSC-17-Y values was 0.78 with a standard error of 0.029. The PSC-Y and the PSC-17-Y have poor sensitivity for detecting children with the top 10% of scores on the RCMAS. Only 51% of subjects with an RCMAS score >25 also had a PSC score >20. Only 39% of subjects with an RCMAS score >25 also had a PSC-17-Y score >10.

Discussion

We have demonstrated that the Setswana versions of the PSC and PSC-Y are promising tools for screening HIV-infected children in Botswana for psychosocial dysfunction. Our subjects all completed the 35 question tools and our analyses were repeated limiting the data to only the questions included in the PSC-17 (Gall *et al.* 2000, Duke *et al.* 2005, Gardner *et al.* 2007) and PSC-17-Y. All four tools have strong internal consistency. The ROC analysis indicates that high scores on the PSC and PSC-17 help to discriminate between children with and without parent report of concern and identify some children not reported as being of concern based on a single-question screen. The PSC-Y and PSC-Y-17 show similarly good agreement with high scores on the CDI. Agreement with the RCMAS was less strong, not an unexpected finding given that only a single question on the PSC specifically addresses anxiety and prior studies have shown only moderate agreement between PSC scores and anxiety in children (DeMaso *et al.* 2000, Wren *et al.* 2004).

Cut-off score of 20 on the PSC and the PSC-Y and cut-off scores of 10 and 9 on the PSC-17 and PSC-17-Y identify 15–20% of children in our population as being at risk. In prior studies utilizing the PSC, between about 5% and 25% of children tested positive. Higher percentages of children test positive in populations which include children living in poverty and those with chronic illnesses (Anderson *et al.* 1999, Murphy *et al.* 1992, Navon *et al.* 2001, Stoppelbein *et al.* 2005). The sensitivity and specificity of the above thresholds for detecting children with suspected psychosocial dysfunction are similar to those reported previously for other translations of the PSC (Jellinek *et al.* 1986, Jellinek *et al.* 1988, Reijneveld *et al.* 2006).

We recommend that the scoring thresholds discussed above be considered for use in screening HIV+ Batswana children for psychosocial dysfunction. Our data and prior studies using the PSC suggest that most children scoring above these thresholds will have problems for which further evaluation and treatment would be of benefit. In some resource-limited settings, different thresholds might need to be chosen, taking into account the number of children the site has the capacity to screen further and treat for psychosocial problems. For example, a large clinic with a single child psychologist available to evaluate and treat children with severe psychosocial problems might decide to begin by screening all children who had not previously been referred to the psychologist and referring those with scores in the expected highest 5%.

The amount of time needed to complete the 35 question PSC and PSC-Y was only 5 to 10 minutes. However, our data suggest that the shorter PSC-17 and PSC-17-Y perform similarly to the longer versions of the tools and could reasonably be substituted for initial screening of Setswana-speaking children. Many of our subjects required assistance to complete the PSC due to literacy issues. Since some clinic staff time may be required for administration in busy clinical settings, use of the shorter version may be desirable.

There were several limitations to our study. We did not evaluate test-retest validity in this population. Because our study was limited to children between the ages of 8 and 16 years, we cannot comment on how well the tool would work in older and younger children. Likewise, since our population was limited to Batswana at two clinical sites and mainly in a single city, we cannot comment on the generalisability of the findings outside of these populations. Furthermore, since we did not do in-depth diagnostic interviews and studies to determine the per cent of subjects with high scores on the PSC who have true psychosocial problems, we cannot comment on how many children with psychosocial problems are likely to be missed by PSC screening alone. It was infeasible for us to perform in-depth assessments of psychosocial dysfunction. While there is precedent for use of a single question response (Pagano *et al.* 1996, Cuijpers and Smit 2001, Miller *et al.* 2008), in-depth assessments would have been a preferred ‘gold standard’.

Further studies are needed to determine what percentage of children with high scores on the Setswana PSC, PSC-17, PSC-Y and PSC-17-Y would be diagnosed with psychological problems using in-depth evaluations. The types of problems and their prevalence among HIV+ children and adolescents in Africa need to be elucidated to allow for targeted allocation of social support resources within HIV treatment programmes. If anxiety is found to be an important contributor to psychosocial morbidity among HIV+ children and adolescents, then a simple screening tool for anxiety should be considered as a supplement to the PSC for routine screening of HIV+ children and adolescents for psychosocial dysfunction.

We believe that identification of HIV+ children and adolescents with psychosocial problems is critical for reducing morbidity and mortality. Numerous studies have demonstrated that failure to recognize and treat psychosocial problems can lead to more severe impairment with increased utilisation of health care services and increased cost to society (Koot and Verhulst 1992, Visser *et al.* 1999, Moffitt and Caspi 2001). For children and adolescents with HIV, psychosocial problems can increase their risk of HIV treatment failure (Mellins *et al.* 2004, DeLaMora *et al.* 2006, Williams *et al.* 2006, Rudy *et al.* 2009, Hazra *et al.* 2010). Successful treatment of mental disorders in low and middle income settings has been demonstrated (Patel *et al.* 2007). Recognising those children at highest risk during their routine clinic visits by using a simple tool such as the PSC can allow for targeting psychosocial support resources to improve both mental health and HIV treatment outcomes.

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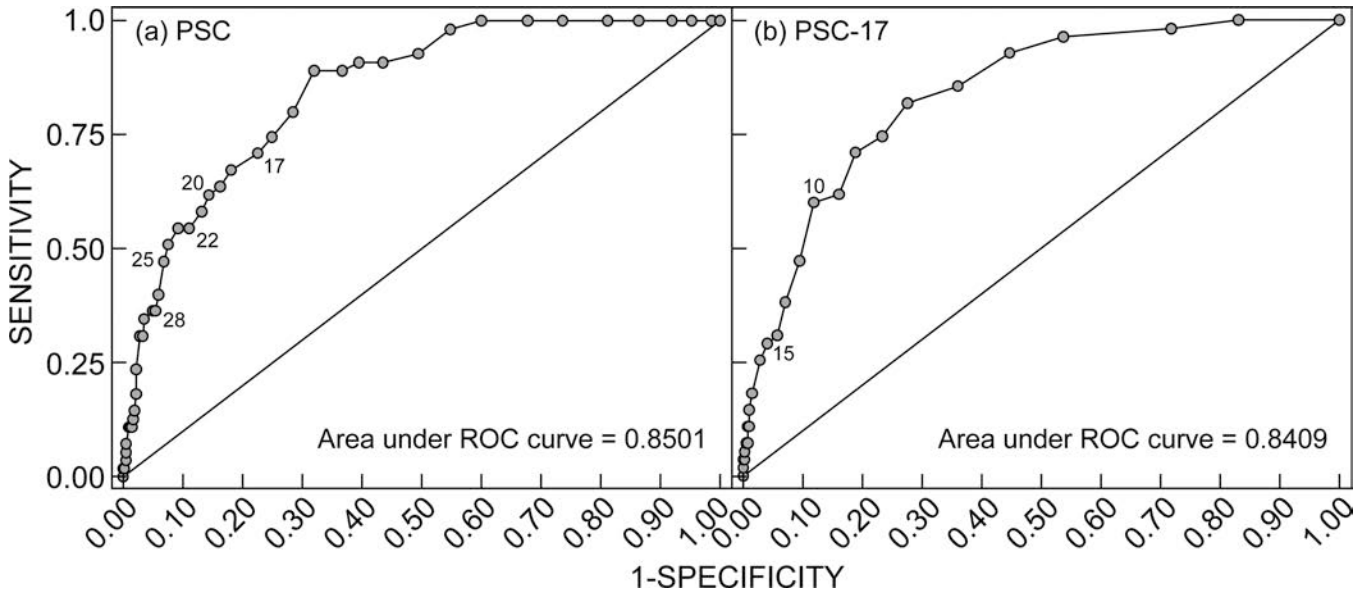

Figure 1.
ROC analysis of PSC vs. parent/caregiver report of psychosocial concerns

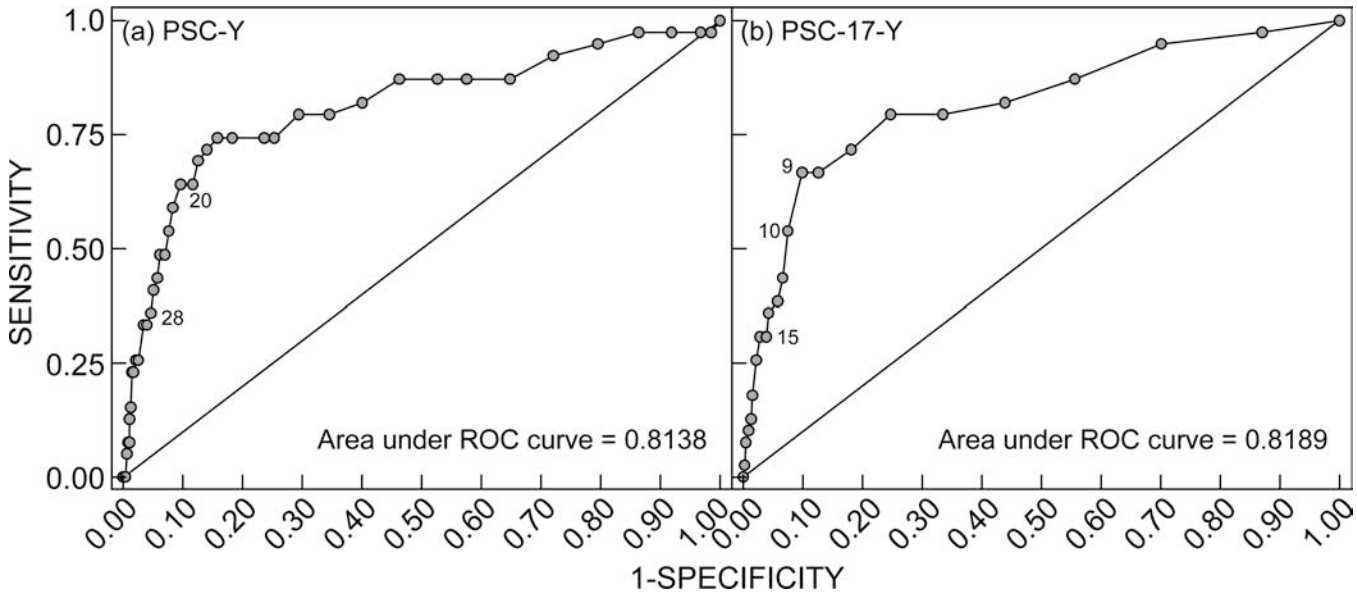

Figure 2.
ROC analysis of PSC-Y vs. Children's Depression Inventory Score (<19 vs. ≥19)

Table 1

Demographics (N = 509)

Age	**Year**
Median (IQR)	12.0 (10.2–13.8))
Percent >10 years	78.4
Sex	**Number (%)**
Female	267 (52.5)
Suspected mode of HIV-Infection	
Perinatal	458 (89.9)
Breastfeeding	2 (0.4)
Abuse	1 (0.2)
Other/Unknown	48 (9.4)
Orphan status	
Double orphans	73 (14.4)
Single orphans	200 (39.4)
Both parents living	234 (46.2)
Living in orphanage	
	16 (3.1)
Enrolled in school	
Yes	503 (98.8%)
Last grade in school completed	
Standard 1	29 (5.7)
Standard 2	77 (15.2)
Standard 3	84 (16.5)
Standard 4	95 (18.7)
Standard 5	77 (15.2)
Standard 6	59 (11.6)
Standard 7	48 (9.5)
Form 1	25 (4.9)
Form 2	11 (2.2)
Form 3	1 (0.2)
Never attended	2 (0.4)
Within 2 years of expected grade	
	439 (86.6)
Language preferred	
Setswana	498 (97.8)
English	11 (2.2)

Table 2

PSC cut-off scores compared with parental report of concern

PSC cut-off score	Per cent positive	Sensitivity	Specificity	PPV	NPV
15	35	0.80	0.71	0.27	0.97
20	19.5	0.62	0.86	0.36	0.95
22	15.9	0.55	0.89	0.39	0.94
25	11	0.47	0.93	0.47	0.93
28	8.5	0.36	0.95	0.49	0.92

Table 3

PSC-Y cut-off scores compared with high (≥19) CDI scores

PSC cut-off score	Per cent positive	Sensitivity	Specificity	PPV	NPV
15	27.7	0.74	0.63	0.21	0.97
20	15.9	0.64	0.88	0.31	0.97
22	12.4	0.59	0.92	0.37	0.96
25	9.6	0.49	0.94	0.39	0.96
28	7.3	0.36	0.95	0.38	0.95