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Use of the BRIEF and CBCL in Ugandan Children with HIV or a History of Severe Malaria

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Abstract

Objective—To assess the structural overlap between the Behavior Rating Inventory of Executive Function (BRIEF) and Achenbach Child Behavior Check List (CBCL) among children in Uganda.

Methods—Caregiver ratings for the BRIEF and CBCL were obtained for two independent samples of school-aged children: 106 children (5-12 years old, 50% males) with a history of severe malaria, and on 144 HIV-infected children (5-12 years old, 58% males) in Uganda. Exploratory factor analysis was used to evaluate the factor structure of the 8 sub-scales for the BRIEF and the 8 scales of the CBCL to determine correlation.

Results—Overall, children in the severe malaria group had higher (increased symptom) BRIEF and CBCL scores than children in the HIV-infected group. We identified 3 factors that provided a reasonable fit to the data and could be characterized as 3 specific domains: 1) Metacognition, which consisted of the scales in the BRIEF Metacognition domain; 2) Behavioral Adjustment, which was comprised of the scales in the BRIEF Behavioral Regulation domain and the Externalizing Symptoms scales in the CBCL; and 3) Emotional Adjustment, which mainly consisted of the Internalizing Symptoms scales in the CBCL. The BRIEF Behavior Regulation and

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CBCL Externalizing Symptoms scales, however, did overlap in terms of assessing similar behavior symptoms. These findings were consistent across the severe malaria and HIV-infected samples of children.

Conclusion—The BRIEF and CBCL instruments offer distinct, yet complementary, assessments of behavior in clinical pediatric populations in the Ugandan context, supporting the use of these measures for similar research settings.

Keywords

BRIEF; CBCL; psychological assessment; behavior; children; Sub-Saharan Africa

Increased survival of infectious diseases affecting the central nervous system (CNS) is often associated with corresponding increases in developmental delays, behavior problems, and learning disabilities [1]. More specific to the African context, the two major epidemics affecting the pediatric population, HIV/AIDS and malaria, affect a significant proportion of infants, with chronic neurobehavioral deficits resulting in impairments in cognition, and executive and adaptive functioning even when controlling for confounders such as weight for age, and nutritional status [234]

Recent research provides evidence of behavioral problems in children surviving malaria or with HIV. A study looking at several hundred children in Blantyre Malawi suggests that cerebral malaria in children is a significant risk factor for the development of disruptive behavior disorders and disabilities characterized by motor, sensory, or language deficiencies [56]. HIV-infected school-age children frequently exhibit behavioral problems associated with attention-deficit/hyperactivity disorder (i.e. such as impulsivity, hyperactivity and difficulties concentrating) [1] and affective disorders (i.e. depression and anxiety) [7]. Additionally, compromised executive function and slowed information processing have also been reported [8]. Such findings underscore the importance of examining behavior and neurocognitive functions, in addition to global cognition in these conditions.

Given the well-documented role of behavioral problems and cognitive impairment on social and academic achievement, it is critical to have specific psychometric tools to evaluate behavioral areas that are known to be affected. For example, Bangirana and colleagues [9] conclude that a Lugandan version of the parental-report version of the CBCL in school-age children is a reliable measure of behavioral problems in Ugandan children surviving cerebral malaria. The CBCL seemed especially sensitive in documenting depressive symptoms and thought problems, as likely behavioral outcomes of cerebral malaria in surviving children [9]. The CBCL was also useful in documenting the emotional benefits of computerized cognitive rehabilitation training (CCRT) in Ugandan school-age children surviving cerebral malaria [9].

The Behavior Rating Inventory of Executive Function (BRIEF) [10] and the Achenbach Child Behavior Check List (CBCL) [11] are useful measures to assess behavioral, emotional, social, and functional problems in school age children. The BRIEF was designed to screen for emotional and behavioral aspects of a child's executive functioning as assessed by the responses of the principal caregiver or parent. The Achenbach CBCL was designed to more broadly screen for emotional and psychiatric symptoms in children.

Although the two instruments are often used together in that they are designed to assess essentially different behavioral domains (executive function versus psychiatric symptoms), the extent of overlap between the BRIEF and CBCL is unclear. Extensive use of these assessments through translated versions represents testing opportunities with children of diverse backgrounds, but it remains critical to empirically determine the structure of the scales in the clinical and research settings where they are commonly used.

One way to address the structure of the association of these two scales is by assessing the patterns of correlations with exploratory factor analysis [12]. Exploratory factor analysis [12] can be used to empirically test theoretical questions about the underlying structure of psychological phenomena. Factor analyses describe a collection of observed variables in terms of a smaller collection of (unobservable) latent variables or factors. These factors are constructed to explain variation that is common to the observed variables. When EFA is applied to correlations among ratings of scale items, we can obtain patterns of cooccurring items that can be interpreted as dimensions or domains of that scale.

The objective of this study was to assess the structural overlap of the CBCL and BRIEF scales using EFA in two independent clinical samples of Ugandan school-age children: HIV-infected and with history of a severe malaria episode. We hypothesized that the sub-scales comprising the two global domains for each of the two instruments will load into separate factors, in accordance with the general dimensions of emotional versus behavioral adjustment problems.

METHODS

This secondary analysis included baseline data from two samples of children aged 5 to 12 years. The use of two samples was intended to provide an opportunity to see if the overlap of CBCL and BRIEF scales was similar across two independent groups of children.

The fist sample of children in this analysis included the baseline data of 106 children with a history of severe malaria that were enrolled in a randomized-controlled trial exploring the effects of a Computerized Cognitive Rehabilitation Training (CCRT) program. Children surviving a severe malaria episode (either severe malaria anemia or cerebral malaria) were recruited between 2010 and 2013 from a cohort of severe malaria study children admitted at Mulago Hospital in Kampala, Uganda. Clinical characteristics of the children are described fully by Bangirana and colleagues [13] and were enrolled in the CCRT study after completing a two-year post-illness follow-up and if they were 5 years of age or older. Cerebral malaria was defined as: 1) coma (Blantyre Coma Score ≤ 2 or Glasgow coma scale score ≤8) 2) *Plasmodium falciparum* on blood smear; and 3) no other known cause of coma (e.g. hypoglycemia-associated coma reversed by glucose infusion, meningitis, or prolonged postictal state. Severe malaria anemia was defined as presence of *Plasmodium falciparum* on blood smear in children with hemoglobin level <5mg/dL. Exclusion criteria included known chronic illness requiring medical care, known developmental delay, evidence of central nervous system disease at screening physical examination or history of coma, head trauma, malnutrition, or cerebral palsy.

The second sample included 144 HIV-infected children enrolled for a feasibility study of a caregiver training program to enhance child development (Mediational Intervention for Sensitizing Caregivers - MISC) carried out in Kayunga district (80km northeast of Kampala). Children who were perinatally-infected and confirmed as HIV-positive with Western Blot and ELISA tests were evaluated and enrolled from 2010 to 2013. Children were excluded from the MISC study if they had a medical history of serious birth complications, severe malnutrition, bacterial meningitis, encephalitis, cerebral malaria or other known brain injury or disorder requiring hospitalization or which could overshadow the developmental benefits of the parenting intervention. At the time of the MISC study, 63 children (44%) were on triple-combination anti-retroviral therapy (Trimune: d4T/3TC/nevirapine). Details on the immunological profile of the sample can be found elsewhere[26].

Procedures

Written consent was obtained from the parent/guardian and assent from children seven years and older. After administering informed consent, child testing and caregiver questionnaires were done in Luganda, the local language spoken in Kampala and Kayunga districts in a private, quiet setting in the project's office. The Institutional Review Boards of Michigan State University, University of Michigan, and the School of Medicine Research Ethics Committee at Makerere University, and the Ugandan National Council for Science and Technology approved the severe malaria and pediatric HIV CCRT studies.

Measures

Child Behavior Checklist (CBCL)—The CBCL is a paper-pencil parent/caregiver report on child behavior consisting of 120 items scored on a three-point Likert scale (0=absent, 1=occurs sometimes, 2=occurs often). The time frame for the item responses is the past six months. The instrument is organized in 8 syndrome scales (Anxious/Depressed, Depressed, Somatic Complaints, Social Problems, Attention Problems, Thought Problems, Rule-breaking Behavior, Aggressive Behavior) that group into two higher order factors-Internalizing and Externalizing Problems, or into one summary score; Total Problems (summation of all items). The 2014 revision also added 6 DSM-V oriented scales consistent with DSM diagnostic categories: Depressive Problems, Anxiety Problems, Somatic Problems, ADHD, Oppositional Defiant Problems, and Conduct Problems. It has been widely used as rating scale in different contexts [14] including Ugandan children. The Luganda version of the CBCL was previously translated and adapted by Bangirana and colleagues (2009) in a two-step process. First the CBCL was translated and back-translated by two different research assistants fluent in Luganda and English. Second, a psychiatrist fluent in both Luganda and English compared the two English versions and resolved any discrepancies by editing the translated version to match the original English version. The test-retest and internal reliability of the CBCL in Ugandan children was assessed and reported between 0.64 and 0.83, respectively [9].

Behavior Rating Inventory of Executive Function (BRIEF)—Caregivers were also interviewed with the Behavior Rating Inventory of Executive Function (BRIEF) for school-age children (5-12 years). This instrument is specifically designed to measure the range of executive function behaviors in children and adolescents with 86-items in 8 non-overlapping

clinical scales (Inhibit, Shift, Emotional Control, Initiate, Working Memory, Plan/Organize, Organization of Materials, and Monitor). The BRIEF is divided into two broad indexes, each of which is derived from specific clinical scales: Meta-Cognition (Monitor, Organization of Materials, Plan/Organize, Working Memory, Initiate) and Behavioral Regulation (Emotional Control, Shift, Inhibit), and a Global Executive Composite score which takes into account all clinical scales and represents the child's overall executive function [10]. Publisher copyright permission was obtained for the BRIEF and was translated into Luganda, the local language (forward and backward translation) as specified by the publisher (PAR, Inc.), and the final version was approved by one of the test authors (Peter Isquith).

The BRIEF was added as measure for these studies because it should prove sensitive to the more pervasive executive function and higher-order neurocognitive disabilities that typify the encephalopathy associated with even clinically stable pediatric HIV disease[15,16] Further, this test should be well suited to detect more subtle brain injury and executive function deficits if they occur among ARV-exposed infants.

Statistical analyses

Demographic characteristics and symptom endorsement frequencies were calculated for both samples and comparisons were done contrasting means and proportions using *t*-tests and χ^2 tests, respectively. Internal consistency of the BRIEF and CBCL scales were evaluated using Cronbach's α coefficient [17].

We used EFA with principal factor estimation to explore the factor structure of the BRIEF with 8 sub-scales included the two global domains (Behavioral Regulation Index, Metacognition Index), with either: a) the 8 sub-scales comprising the two principal problem (syndrome) domains of the CBCL (Internalizing and Externalizing symptoms), or b) the 6 DSM-V oriented sub-scales (Depressive, Anxiety, Somatic, ADHD, Oppositional/Defiant, and Conduct Problems) of the CBCL in the HIV-infected and malaria survivor samples, separately.

Because outcomes of EFAs depend heavily on the number of factors retained and there are no established criteria to determine this procedure, a number of decision rules were applied examining several solutions before coming to a final conclusion [18]. The decision rules we used included assessing the eigenvalues (selecting factors with a value close to 1), graphically representing the eigenvalues to visually analyze the relative importance of the factors, where a sharp drop in the plot signals that subsequent factors are ignorable (scree plot), and a parallel analysis (comparing the number of real eigenvalues that are greater than the corresponding expected values from random data). We performed orthogonal transformations of the common factors and associated factor loadings to facilitate the interpretation of the factor analytical solution [19]. All analyses were performed in STATA version 12 [20].

RESULTS

Table 1 summarizes the distributions of the demographic characteristics of children included in the study and their neuropsychological scores from the BRIEF and CBCL. Children in the

severe malaria group were younger ($p<0.01$) and had a slightly larger proportion of males (61%) compared to the HIV-infected children ($p=0.08$). Overall, children in the severe malaria group had higher (increased symptom) BRIEF and CBCL scores than children in the HIV-infected group.

The reliability coefficient (Cronbach's alpha) of the BRIEF was high in both the severe malaria group ($\alpha=0.90$) and HIV+ group ($\alpha=0.88$). Internal consistency analyses of the CBCL showed similar Cronbach's alpha values for children surviving severe malaria (0.93) and children infected with HIV (0.90).

EFA combining the 8 BRIEF sub-scales and 8 CBCL sub-scales in each clinical sample separately resulted in 3 factors composed of CBCL and BRIEF sub-scales that could be characterized as: Metacognition, Behavioral Adjustment, and Emotional Adjustment. In the severe malaria group, these 3 factors jointly accounted for 97% of the variance in the analysis combining the BRIEF with the CBCL syndrome scales, and 93% of the variance when analyzing the BRIEF together with the CBCL DSM-IV scales. Among children HIV+, total variance explained by the 3 factors was lower in the model with the CBCL syndrome scales (63%), but comparable when using the CBCL DSM-IV scales (95%).

The relationship of each of the CBCL and BRIEF sub-scales to the underlying factors is expressed by the factor loading. As shown in Tables 2 and 3, factor loadings of a sub-scale assigned to a specific factor generally exceeded 0.40 (except for Withdrawn/Depressed, 0.38, and Somatic Complaints, 0.30, of the CBCL). Since factor loadings can be interpreted as standardized regression coefficients, another interpretation would be that most of the scales from the BRIEF and the CBCL displayed a strong correlation (>0.40) with their corresponding factor. The composition of these 3 factors was comparable across the two samples. The BRIEF Metacognition scales (i.e. Initiate, Working Memory, Plan/Organize, Organization of Materials, and Monitor) and the CBCL scales pertaining to Internalizing Symptoms (Emotional Adjustment- i.e. Anxious/Depressed, Withdrawn/Depressed, Somatic Complaints, Social Problems) were correlated with different factors (Metacognition and Emotional Adjustment, respectively) across both the HIV-infected and severe malaria clinical samples. The BRIEF Behavior Regulation Index sub-scales (i.e. Inhibit and Emotional Control) loaded with the CBCL Externalizing sub-scales (i.e. Rule-Breaking and Aggressive Behavior) into the Behavioral Adjustment factor in the HIV-infected group. For the severe malaria group, the BRIEF Behavior Regulation Index sub-scales (i.e. Shift and Emotional Control) loaded together with CBCL Internalizing Problems (Anxious/Depressed and Somatic Complaints) in the Emotional Adjustment factor.

In both HIV-infected and severe malaria groups, the DSM-oriented scales from the CBCL correlated with two factors; the Behavioral adjustment factor (i.e. ADHD Problems, Oppositional Defiant Problems, Conduct Problems), and the Emotional adjustment factor (i.e. Affective, Anxiety, Somatic Problems).

DISCUSSION

The BRIEF and the CBCL are parental-report measures of child behavior frequently used in research settings. Because the BRIEF was designed to screen for emotional and behavioral symptoms related to a child's executive functioning and the Achenbach CBCL assesses more general emotional and behavioral psychiatric symptoms, these measures are frequently used together. Our results suggest that both these instruments assess generally distinct dimensions of children's behavioral adaptation in the home and community in a consistent manner between two distinct clinical groups in the Sub-Saharan African context (HIV-infected and severe malaria survivors).

Overall, children in the severe malaria group had higher (increased symptom) BRIEF and CBCL scores than children in the HIV-infected group. Other studies have reported the emergence of behavior problems in children surviving cerebral malaria [6]. More recently, the severity of CBCL behavioral symptoms in Malawian cerebral malaria survivors has been related to severity of clinical indicators of illness during the acute phase [21].

Furthermore, ADHD-type symptoms have been documented with computerized continuous performance task measures in Ugandan cerebral malaria survivors at 6-month and two-year post-illness follow-up [222]. However, recent reviews of children with HIV have noted that as they emerge from middle childhood into adolescence, they are at higher risk for behavioral and psychiatric problems [4].

Across both severe malaria and HIV-infected samples, item loadings for each factor were substantial and each item had a substantial correlation with its factor (i.e. essentially above 0.4), suggesting that items were relevant in defining the factor's dimensionality. Lowest item loadings corresponded to the Withdrawn/Depressed (0.38) and Somatic Complaints (0.30) of the CBCL syndrome scales, and Somatic Problems (0.35) of the CBCL with DSM-V scales. In a review of the factor structure of the CBCL across 31 cultural settings, item loadings were more different for internalizing problems (i.e. Withdrawn/Depressed) and somatic complaints than on loadings for externalizing problems [23].

The 3 dimensions derived form factor analyses make theoretical sense based on previous findings on the factorial structure of the BRIEF [24] and the CBCL [23]; all factors could be reasonably named, and we were able to describe the items as indicative of their underlying factor. The model structure included Behavioral Regulation, Emotional Regulation, and Metacognition factors, supporting a 3-dimesional model as the most appropriate structure for the 9-scale BRIEF. It is possible that item redundancy could be one of the reasons why the factor structure holds together; the strength of the relationship could be due in part to the multiple scales correlating closely because they are responded in a similar way.

Our results are in support of a distinction between emotional and behavioral regulation domains of the BRIEF, as others have previously described [24,25]. In this view, our findings coincide with the notion that executive functions can be conceptualized as a collection of related, although distinct, abilities that direct and control goal-oriented tasks with behavioral, cognitive and emotional components. With these results, we are the first to

report on the dimensional structure of the BRIEF in a Sub-Saharan setting and in two clinical populations.

Concerns have been raised over the ability of the DSM-Oriented Scales of the CBCL to adequately measure DSM-oriented constructs, especially because of the few items included in the measure [26]. Findings from our study indicate that the DSM-oriented scales assessing overt behavioral problems (i.e. ADHD problems, Oppositional Defiant Problems) have a common underlying factor pertaining to Behavioral Adjustment, while those assessing emotional problems (i.e. Affective Problems, Anxiety Problems) group together under the Emotional Adjustment factor, providing preliminary evidence towards the psychometric properties of the DSM Scales. Additionally, the variance explained was comparable between analysis with the CBCL syndrome scales and the CBCL DSM-oriented scales. Further empirical scrutiny of the psychometric properties of the CBCL should be sought in future research.

In our EFA analyses, the Metacognition factor was entirely defined by BRIEF scales (Initiate, Working Memory, Plan/Organize, Organization of Materials, and Monitor), while the Behavioral Adjustment factor was composed of CBCL scales (i.e. Externalizing Problems from the syndrome scale and ADHD, Oppositional Defiant, and Conduct Problems from the DSM-IV derived scales). The BRIEF Behavior Regulation Index domain had scales that overlap with both the emotional and behavioral psychiatric symptom domains of the CBCL, represented in the Behavioral and Emotional Adjustment factors.

However, the overall picture from EFA suggest that the BRIEF and CBCL assess distinct dimensions of behavioral and emotional problems in school age children with infectious diseases that can have profound neurocognitive and psychiatric implications. This suggests that when used together, the BRIEF and the CBCL can provide for a distinct yet complementary emotional and behavioral profile of the adjustment of these at-risk children.

While the present findings provide insight to the extent of overlap between the BRIEF and CBCL, several limitations should be acknowledged. An inherent limitation of self-report measures is the tendency of participants to respond the same way to similarly worded items, also termed method variance. This may influence how items aggregate in construct factors. However, this effect is likely to have been comparable to other studies since we found similar results in the factor structure. In a recent report submitted by our group for publication, we have also documented that maternal depression can be significantly related to higher reported levels of behavior problems on the BRIEF scale for preschool-age Ugandan children with HIV. This same relationship was not significant in the HIV-exposed/non-infected cohort of children and caregivers [27]. Likewise, Boivin and colleagues [28] have reported higher levels of CBCL internalizing symptoms in Ugandan preschool children with HIV, reported by mothers with higher levels of depression on the Hopkins Symptoms Checklist. The relationship between caregiver depression and elevated symptoms reported on the BRIEF and on the CBCL in HIV-infected children could seriously bias the sensitivity and validity of these measures when used to compare individual scores. Because factor analysis' emphasis is on the patterns of correlations among items, this analytical technique is less influenced by a potential response bias related to maternal psychopathology.

Despite these limitations, findings from the analysis presented here demonstrating the cross-cultural consistency of the factor structure, suggest that the BRIEF and the CBCL can be adapted for use to assess behavioral and emotional problems in children in urban and rural areas of Uganda. What partly motivated this analysis were comments from caregivers remarking the redundancy of questions when assessed with the BRIEF followed by the CBCL. Since results suggest that both these instruments can be beneficial in a research context because they assess distinct dimensions of children's emotional and behavioral adaptation in a consistent manner, we recommend that they not be applied one after the other to reduce the possibility of acquiescence or uniform response bias.

We conclude that both the BRIEF and CBCL are useful as multi-dimensional measures of executive function and behavior problems, respectively, among clinical samples of school-age children in Uganda. Based on their structure and internal consistency, the dimensional models presented here coincide with theoretical models of executive function and behavioral problems in children and support the use of these measures in research contexts. Future studies in children with psychiatric diagnoses are needed to document the clinical validity of the BRIEF and CBCL in Uganda.

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Table 1

Demographic characteristics, BRIEF and CBCL scales scores across HIV+ (N=144) and survivors of severe malaria (N=106) children, Uganda.

Characteristic	HIV+ (N=144)	Severe malaria (N=106)	p-value*
Gender, n (%)			
Males	72 (50)	65 (61)	0.08
Females	72 (50)	41 (39)	
Age, mean (range), yrs	8.9 (6-12.7)	7 (5-12.8)	**<0.01**
BRIEF *T score, M (SD)*			
Behavioral Regulation Index	46 (9.3)	58.1 (12.3)	**< 0.01**
Metacognition Index	48.8 (10.1)	56.3 (12)	**< 0.01**
Global Executive composite	47.9 (10.3)	58 (12.5)	**< 0.01**
CBCL			
Syndrome scales T score, M (SD)			
Internalizing	60.9 (9.2)	62.8 (7.7)	0.08
Externalizing	58.9 (8.1)	62.8 (9.3)	**< 0.01**
DSM-Vderived scales T score, M (SD)			
Depressive Problems	61.5 (5.1)	61 (7.3)	0.52
Anxiety Problems	52.4 (3.9)	55.3 (6.5)	**< 0.01**
Somatic Problems	61.1 (8.3)	58.1 (6.6)	**< 0.01**
ADHD Problems	55.2 (6.7)	57.2 (7.2)	**0.02**
Oppositional defiant Problems	56.1 (7.2)	56.3 (10.7)	0.86
Conduct Problems	58 (8.6)	63.1 (9.9)	**< 0.01**
Total problems *T score, M (SD)*	46.1 (25)	47.2 (27)	0.74

p-value for the difference in estimate comparing HIV+ with severe malaria children

*Bold type indicates significance <0.05

Table 2

Factor loadings of the BRIEF and CBCL (syndromes scales) across HIV+ (N=144) and severe malaria (N=106) school-aged children in Uganda.

	Metacognition		Behavioral adjustment		Emotional adjustment	
	HIV+	**Malaria**	**HIV+**	**Malaria**	**HIV+**	**Malaria**
BRIEF Scales						
Behavioral Regulation Index						
Inhibit	0.36	**0.57**	**0.72**	0.44	0.20	0.38
Shift	0.30	0.28	0.19	0.20	**0.53**	**0.74**
Emotional Control	0.35	0.36	**0.50**	0.24	0.49	**0.69**
Metacognition Index						
Initiate	**0.57**	**0.63**	0.39	0.38	0.09	0.22
Working Memory	**0.66**	**0.74**	0.26	0.34	0.22	0.22
Plan/Organize	**0.75**	**0.75**	0.21	0.09	0.26	0.32
Organize Materials	**0.65**	**0.59**	0.30	0.20	0.10	0.25
Monitor	**0.73**	**0.77**	0.30	0.17	0.07	0.14
CBCL Problem/Syndrome Scales						
Internalizing problems						
Anxious/Depressed	0.09	0.20	0.18	0.49	**0.73**	**0.68**
Withdrawn/Depressed	0.17	**0.38**	0.17	0.34	**0.63**	0.25
Somatic Complaints	0.26	0.13	0.21	0.27	**0.56**	**0.30**
Externalizing problems						
Rule-breaking	0.27	0.25	**0.63**	**0.80**	0.12	0.09
Aggressive Behavior	0.23	0.29	**0.77**	**0.70**	0.27	0.45
Social	0.13	0.42	0.41	**0.54**	**0.60**	0.46
Thought	0.37	0.01	**0.46**	**0.73**	0.20	0.39
Attention	0.44	0.48	**0.56**	**0.70**	0.24	0.18

*Bold type shows loading with which scale was assigned to a specific factor

Table 3

Factor loadings of the BRIEF and CBCL (DSM-IV scales) across HIV+ (N=144) and severe malaria (N=106) school-aged children in Uganda.

	Metacognition		Behavioral adjustment		Emotional adjustment	
	HIV+	**Malaria**	**HIV+**	**Malaria**	**HIV+**	**Malaria**
BRIEF Scales						
Behavioral Regulation Index						
Inhibit	0.34	**0.54**	**0.74**	0.49	0.21	0.38
Shift	0.25	0.28	0.28	0.23	**0.54**	**0.69**
Emotional Control	0.31	0.32	**0.56**	0.29	0.48	**0.70**
Metacognition Index						
Initiate	**0.54**	**0.58**	0.44	0.45	0.07	0.24
Working Memory	**0.65**	**0.71**	0.25	0.36	0.24	0.27
Plan/Organize	**0.76**	**0.73**	0.20	0.15	0.24	0.34
Organize Materials	**0.66**	**0.57**	0.30	0.34	0.14	0.24
Monitor	**0.73**	**0.74**	0.32	0.24	0.08	0.13
CBCL DSM-IV Scales						
Affective Problems	0.32	0.29	0.21	0.53	**0.63**	**0.36**
Anxiety Problems	0.01	0.30	0.36	0.54	**0.50**	**0.60**
Somatic Problems	0.18	0.08	0.06	0.13	**0.49**	**0.34**
ADHD Problems	0.38	0.48	**0.55**	**0.67**	0.18	0.32
Oppositional Defiant Problems	0.17	0.24	**0.74**	**0.71**	0.16	0.21
Conduct Problems	0.30	0.21	**0.73**	**0.77**	0.11	0.18