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Factor Structure of Scores from the Conners' Rating Scales–Revised Among Nepali Children

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Abstract

This study used exploratory and confirmatory factor analyses to examine the structures of scores from the Conners' Teacher and Parent Rating Scales–Revised (CTRS-R and CPRS-R, respectively; Conners, 1997). The scales were administered to 1,835 parents and 1,387 teachers of children in Nepal's Sarlahi district – a region where no other measures of child psychopathology have been studied. With a Nepali sample, the findings indicate that reduced two factor models for the Conners' scales are superior to the models identified in the scale development research. The hyperactivity and inattention factors were comparable to what has been identified in prior research, while other factors (e.g., social problems) differed substantially. Implications for use of the Conners' scales in Nepal and cross cultural issues in the assessment of ADHD symptoms are discussed.

Keywords

Conners' Rating Scale–Revised; CPRS-R; CTRS-R; Nepal; ADHD; factor analysis

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Attention Deficit Hyperactivity Disorder (ADHD) is a psychiatric disorder, characterized by symptoms of inattention, hyperactivity, and impulsivity, that results in significant educational and social impairment (Barkley, 2006). Disagreement exists regarding whether ADHD is primarily the result of cultural or neurobiological influences (e.g., Durston, 2003; Timimi & Taylor, 2004). According to Rohde et al. (2005), factor analytic studies of ADHD rating scales in novel cultural contexts may enhance our understanding of the cultural and neurobiological underpinnings of the disorder. The identification of similar symptom patterns in different cultural settings would serve as evidence against claims that ADHD is culturally bound and would be supportive of a neurobiological etiology.

Cross cultural, factor analytic studies have largely indicated a bidimensional structure for ADHD symptoms with inattention and hyperactivity factors, and these findings are regarded as evidence of the neurobiological nature of ADHD symptoms (see Bauermeister, Canino, Polanczyk, & Rohde, 2010 for a review). However, studies examining inattention and hyperactivity in developing nations are sparse but crucial. In light of claims that ADHD may be a byproduct of Western culture and access to modern amenities (Timimi et al., 2004), research on ADHD symptoms in developing and non-Western nations is warranted. Nepal, a developing, South Asian nation, represents a new frontier in ADHD research. This study examined the structure of scores from Nepali versions of the Conners' Teacher and Parent Rating Scales– Revised (CTRS-R and CPRS-R, respectively) provided by teachers and parents of seven to nine-year-old children living in Nepal's Sarlahi district.

Cultural Context

Nepal is a predominantly agrarian nation. Most citizens live in patriarchal, extended family units and are employed in subsistence farming (Central Intelligence Agency, 2010). Interdependent relationships are vital for family and community functioning in Nepal, and independence is not as highly valued as it is in the US and other Western nations. Broadly, Nepali culture is relatively collectivist; Nepalis value conformity, social harmony, and deference to authority, and these values are reflected in adult expectations for children's behavior at home and at school (Cole, Walker, & Lama-Tamang, 2006). Moreover, self-discipline and self-control are idealized, which may relate to the influence of Hinduism in Nepali society (Cole et al., 2006). Findings from studies in the US and Europe suggest that childhood attention and hyperactivity problems are often related to poor behavioral inhibition and self-control (see Barkley, 2006); thus, inattentive and hyperactive symptoms might interfere with a child's ability to conform to Nepali cultural values as is necessary for academic and social success. Study of the structural validity of scores from the Conners' scales in a Nepali context may (a) illuminate Nepali parents' and teachers' perceptions of behaviors that are believed to reflect problems with inattention or hyperactivity in the US, (b) contribute to scientific discourse regarding the degree to which childhood attentional disorders have a neurobiological versus a cultural basis, and (c) facilitate the development of psychometrically sound measurement of ADHD symptoms among Nepali children.

Assessment of ADHD

Broadband and narrowband behavior rating scales are important components of ADHD assessments and have been shown to enhance diagnostic accuracy (Johnson & Murray, 2003). Broadband scales measure general symptom levels across types of psychopathology. In ADHD evaluations, broadband scales are used to screen for alternative or co-occurring explanations for inattention or hyperactivity (Barkley, 2006), whereas narrowband rating scales are used to document the number and severity of specific symptoms (e.g., the number of inattentive symptoms). Scores from narrowband scales have been shown to discriminate clinical from non-clinical groups but generally do not differentiate children with ADHD from clinical controls (Pelham, Fabiano, & Massetti, 2005).

Conners' Rating Scales–Revised

The Revised Conners' Rating Scales (Conners, 1997) are behavior rating scales that are commonly used to assess behaviors related to ADHD and other disorders in children (Koonce, 2007). The developers described the long forms of the CTRS-R (57 items) and CPRS-R (80 items) as broadband scales that tap ADHD symptoms and other constructs. The CTRS-R and CPRS-R contain six and seven subscales, respectively, that were derived through factor analysis. Oppositional, cognitive problems/inattention, hyperactivity, anxious-shy, perfectionism, and social problems subscales are included on both parent and teacher versions, plus a psychosomatic subscale for the parent version. In addition, both versions of the Conners' scales have five rationally derived subscales based on theory and prior research: the ADHD index, Conners' global index [CGI] restless-impulsive, CGI emotional lability, DSM-inattentive, and DSM-hyperactive/impulsive.

Psychometric Research on the Conners' Rating Scale–Revised

Exploratory factor analysis (EFA; principal axis extraction [PAF] with varimax rotation) and confirmatory factor analysis (CFA) were used in the CTRS-R and CPRS-R development (Conners, 1997). Through these analyses, a six factor solution was identified for the CTRS-R and a seven factor solution for the CPRS-R. Notably, some of the techniques used in the scale development research are no longer considered best practice and can lead to over-factoring (e.g., use of varimax rotation with correlated factors, retaining factors based on eigenvalues > one, determining goodness of fit based on GFI >.85, AGFI > .80, and RMSEA < .01; see Henson & Roberts, 2006 and Kline, 2005 for reviews of current best practices in EFA and CFA, respectively). To our knowledge, the factor structures of the long forms of the CTRS-R and CPRS-R have never been re-examined.

Present Study

According to guidelines from the International Test Commission (ITC, 2010), "test developers/publishers should provide information on the evaluation of validity in all target populations from whom the adapted (test) versions are intended (pg. 1)." The broad objectives of this study were to provide a preliminary examination of the validity of the construct of ADHD within a Nepali setting and to evaluate the structural validity of scores from the Conners' Rating Scales – Revised among Nepali children as well as the linguistic

equivalence of the English and Nepali forms (Peña, 2007). Specifically, the purpose of this study was to use best practice factor analytic criteria to investigate the structure of scores from the CTRS-R and CPRS-R in seven- to nine-year-old children living in the Sarlahi district of Nepal. Because some procedures used in the development of the Revised Conners' scales are associated with factor over-extraction (Zwick & Velicer, 1986), it was hypothesized that a reduced structure would be identified. As recommended by Jeanrie and Bertrand (1999), both statistical procedures and complementary systematic judgments were used to evaluate the appropriateness of the Conners' items in a Nepali context.

Method

Participants

Data were drawn from a larger project investigating the effects of prenatal and early childhood micronutrient supplementation on cognitive outcomes conducted in the Sarlahi district of Nepal (see Christian et al., 2010). Sarlahi is a large district in the southern plains of Nepal. The larger project employed a community based sample of seven- to nine-year-old children (N = 1,927) who participated in supplementation trials. From the larger study, CPRS-R data were available from 1,835 parents and 1,387 teachers of Nepali children. Most parent respondents were mothers (90%) and the rest other caregivers (e.g., fathers, grandparents). Fifty percent of the children in the CPRS-R sample and 46% in the CTRS-R sample were female. All children in the teacher rated sample attended school. In the parent sample, most children (81%) had started school, but 19% had never attended school. Eighty-three percent of mothers of children in this sample reported that they were illiterate. Individuals from all four Hindu castes were represented: 59% Vaishya, 13% Shudra, 9% Chhetri, and 8% Brahmin. The remaining 10% of children were non-Hindu. Nepalis also distinguish individuals whose families come from the middle hills of the nation (Pahadis) from those with origins in the southern plains (Madhesis); 71% of children were Madhesi and 27% were Pahadi.

Scale Translation

The scales were translated into Nepali by a team of bilingual researchers in Nepal and back-translated into English by a Nepali graduate student in the US who was unfamiliar with the original version. Subsequently, the items were reviewed by an expert panel comprised of five US psychologists. Expert reviewers rated the original and back-translated item pairs for similarity in wording, meaning, and perceived construct reflection using a procedure comparable to that suggested by Brislin (1970). Based on the expert ratings, most items were identified as adequately translated. However, 13 items were problematic in at least one domain and were flagged in all analyses. Notably, nine of the items that were flagged as poorly translated (and eventually removed from analyses) came from the perfectionism and social problems subscales, as well as the rationally derived subscales. The inattentive and hyperactive factors were largely intact with only two items removed from the cognitive problems/inattention subscale and one from the hyperactivity subscale. All teacher scales and most parent scales were administered in Nepali. However, for the parent scales, interviewers occasionally used Maithili as a supplement to the Nepali administration. Also, a Maithili version of the scale was developed and administered to a small number of parents

(less than five percent based on interviewer report) at the discretion of the project interviewer. All teacher respondents and the vast majority of parent respondents spoke Nepali fluently. Project staff members were local and fluent in both Nepali and Maithili. In the Sarlahi region of Nepal, Maithili and Nepali are often spoken interchangeably. As such, it would have been awkward for the project interviewers to use only one language throughout the entire interview.

Procedure

Trained local project interviewers obtained written informed consent from teachers and verbal consent from parents. Due to high rates of illiteracy among Nepali women (76%; Central Bureau of Statistics, 2005), the scales were administered as structured interviews in Nepali. Project interviewers read the items verbatim to the respondents and recorded the responses. Project interviewers also provided clarification or additional explanation of item content as needed.

Data Management and Analysis

Cases with missing data (CTRS-R n=6; CPRS-R n=14) and extreme outliers (CTRS-R n=7; CPRS-R n=13) were deleted listwise (Roth & Switzer, 1999; Tabachnick & Fidell, 1996), leaving 1,374 viable cases in the teacher sample and 1,808 in the parent sample. Randomly selected independent subsamples were used for EFA (CTRS-R n=374; CPRS-R n=555) and CFA (CTRS-R n=1,000; CPRS-R n=1,253). Item level correlation matrices, descriptive statistics, and findings from additional analyses are available through the first author. EFA and CFA were conducted twice: once using criteria identical to those employed in the scale development research and again using current best practices. The findings were highly similar. Thus, only findings from analyses using best practice criteria described below are reported.

EFA criteria—Common factor analysis was selected over principal components analysis (PCA) to better identify latent factor structures (Fabrigar, Wegener, MacCallum, & Strahan, 1999). PAF (Promax rotation, k=4) was used because of its tolerance of multivariate non-normality (Briggs & MacCallum, 2003). Parallel analysis (PA; Horn, 1965), minimum average partials (MAP; Velicer, 1976), and a visual scree test (Cattell, 1966) were used to determine the number of factors for retention and rotation (Henson & Roberts, 2006). Criteria for determining factor adequacy were established a priori: pattern coefficients ≥ 0.40 were considered salient (Stevens, 2002), and items with salient coefficients on multiple factors were not used (Thurstone, 1947). Factor structures were considered adequate for interpretation if each factor met the following criteria: (a) ≥ four items with salient pattern coefficients, (b) internal consistency ≥ 0.70, and (c) a theoretically meaningful pattern.

CFA criteria—CFAs (maximum likelihood robust estimation) were conducted on covariance matrices with raw data using EQS 5.8 for Windows. Goodness of fit was evaluated based on multiple criteria (Tanaka, 1993). The comparative fit index (CFI), non-normed fit index (NNFI), and incremental fit index (IFI; Bollen, 1989) with values ≥ 0.95; and root mean square error of approximation (RMSEA) with values ≤ 0.06 were considered indicative of good fit (Kline, 2005). Akaike Information Criterion (AIC; Akaike, 1987)

values were also examined. Satorra-Bentler χ^2 was not interpreted because of a high likelihood of error (Lei & Wu, 2007).

Results

Conners' Teacher Rating Scale – Revised

Initial EFA—Scores met the assumptions for EFA. Common factor analysis (PAF extraction and Promax rotation) was conducted on scores from all 59 CTRS-R items. As expected, the nine CTRS-R items that were identified as poorly translated had low pattern coefficients and communalities. As such these nine items were removed, and subsequent analyses were run without them (except where otherwise specified). In contrast to the six factor structure obtained with the normative sample (Conners, 1997), MAP suggested that four factors should be retained, PA indicated three factors, and the scree plot indicated two factors. Thus, six solutions were examined, starting with the six factor and ending with a one factor solution. Only the one and two factor solutions met criteria for factor adequacy. The two factor solution was retained for interpretation because (a) it demonstrated higher communalities and pattern/structure coefficients, (b) greater variance was accounted for (27.60%), and (c) over-factoring is preferable to under-factoring (Fabrigar, Wegener, MacCallum, & Strahan, 1999).

The two factor solution contained 33 items, of which 17 were salient on Factor I. Pattern coefficients for items on Factor I ranged from 0.48-0.74, and communalities ranged from 0.26-0.55. Examples of items on Factor I, labeled inattention/school problems, included "Inattentive/easily distracted," and "Poor in math." Factor I accounted for 16.63% of the total variance (α=0.91). Sixteen items were salient on Factor II. Pattern coefficients ranged from 0.40-0.78, and communality estimates ranged from 0.18-0.58. Examples of items on Factor II, labeled hyperactivity/oppositional, included, "Is restless/always on the go" and "Is spiteful/ vindictive." The hyperactivity/oppositional factor accounted for 8.73% of the total variance (α=0.88). Additional findings from these analyses are available through the first author.

Secondary EFA—Viability of scale structure is best achieved with an alternative models approach (MacCallum, Wegener, Uchino, & Fabrigar, 1993). The initial two factor solution was deemed insufficient for testing in CFA due to a low percentage of variance accounted for. As such, an alternative, stricter set of EFA solution criteria were used to retain items, based on the initial two factor structure, and identify the best possible CTRS-R model to be tested through CFA.

Items that met criteria in the initial solution were included in the secondary EFA only if they met additional rational and statistical criteria. Items were required to be adequately translated and strictly germane to the construct tapped by the associated factor. For example, items retained on Factor II, named hyperactivity, were directly related to hyperactivity (e.g., "Restless/overactive.") Items that appeared to reflect potentially separate constructs, such as oppositional behavior (e.g., "Argues with adults") were excluded. Additionally, items were required to meet more stringent statistical cutoffs (communalities > 0.30 and pattern coefficients > 0.55) than the minimum criteria used in the initial EFA. In total, 12 items

were included on the secondary model, and the model was deemed appropriate for CFA. A summary of this solution (pattern coefficients, communalities, percent of variance accounted for, and eigenvalues) is provided in Table 1.

CFA—Assumptions of CFA were met (Kline, 2005; Tomarken & Waller, 2005). Multivariate non-normality (determined based on Mardia's coefficient) was identified in all models, and Maximum Likelihood extraction (robust method) and the Satorra Bentler χ^2 statistic were used (Kline, 2005). CFAs were conducted on scores for three non-nested models: (a) the 12-item two-factor model and (b) two of the original models (a six factor model and an 11 factor one; Conners, 1997) identified in the scale development research. All fit statistics are reported in Table 2.

Two factor model—Goodness of fit indices provided strong support for the 12 item, two factor model (e.g., CFI=0.99; RMSEA=0.03). Standardized coefficients ranged from 0.48-0.87 and were statistically significant. The Satorra-Bentler χ^2 was not statistically significant. The correlation between the two factors was 0.33 ($p<0.001$).

Six and eleven factor models—Neither the six nor the eleven factor models were supported by these findings. On both the six and the eleven factor models, items on the social problems subscale had very little variance (e.g., $M=0$; $SD=0$). In other words, teachers almost never endorsed social problems (e.g., "Has no friends.") As such, all social problems items were removed, and the analyses were rerun on the remaining five and ten factor models. No notable improvements in model fit were observed.

Conners' Parent Rating Scale – Revised

Initial EFA—All assumptions for EFA were met, and common factor analysis (PAF extraction; Promax rotation) was used to examine scores from the 80 CPRS-R items. As expected, the 11 items that were poorly translated had extremely low communalities and pattern coefficients. As such these 11 items were removed from all subsequent analyses (except where otherwise specified). Again, each retention technique suggested retention of a different number of factors: MAP indicated seven factors, the scree plot one to four factors, and PA eight factors. Therefore, eight structures were examined starting with an eight factor and ending with the one factor solution.

Only the one and two factor solutions were adequate relative to a priori criteria. The two factor solution was retained because research suggests that over-factoring is preferable to under-factoring (Fabrigar et al., 1999) and because this solution had higher communalities, pattern coefficients, and structure coefficients, and accounted for relatively more variance (18.71%). The two factor solution contained 36 items, with half salient on each factor. For Factor I, pattern coefficients ranged from 0.41-0.67, and communalities ranged from 0.11-0.38. Factor I was labeled an inattention factor; it accounted for 15.45% of the total variance, and the score reliability estimate (α) was 0.83. On Factor II, pattern coefficients ranged from 0.40-0.62, and communality estimates ranged from 0.13-0.40. Factor II was labeled oppositional/ hyperactivity; it accounted for 3.26% of the total variance ($\alpha=0.88$). A summary table of findings from this initial EFA is available through the first author.

Secondary EFA—An alternative models approach was used to obtain maximum structure viability (MacCallum, Wegener, Uchino, & Fabrigar, 1993). Items that met criteria in the initial solution were included in the secondary EFA only if they met additional rational criteria. Items were required to be adequately translated and germane to the construct tapped by the factor. (Notably, the more stringent statistical criteria that were applied in EFA analyses of the teacher form could not be applied to the parent form because items on the parent form had much lower pattern coefficients and communalities overall). On Factor I, items designed to tap hyperactive and oppositional dimensions merged onto one factor that appeared to adequately represent both domains. Thus, 13 items retained on Factor I were associated with oppositional behavior or hyperactivity, e.g., “Loses temper” and “Restless in the squirmy sense.” However, items related to other constructs (e.g., “Cries often and easily”) were removed. The ten items retained on Factor II were related to inattention. Items that did not directly address inattention (e.g., “Spelling is poor”) were excluded. EFA findings for the CPRS-R are presented in Table 3.

CFA—Assumptions for CFA were met (Kline, 2006; Tomarken & Waller, 2005). Due to deviations from normality, maximum likelihood (ML) estimation (robust) and the Satorra-Bentler χ^2 statistic were used (Kline, 2006). CFAs were conducted on three non-nested models: (a) the 23 item, two factor model, and (b) the seven and twelve factor models identified in the development research.

Two factor model—The fit indices supported both the two factor extended and abbreviated models (e.g., CFI ≥0.90; RMSEA≤0.05). Standardized coefficients were comparable between models and ranged from 0.37 to 0.69. The interfactor correlations were moderate and statistically significant (R=0.61-0.63; p<0.001).

Seven and twelve factor models—The seven and twelve factor models were not supported by the findings. Findings revealed a relatively poor overall fit for the seven factor model (e.g., CFI= 0.75). Moreover, the original model (containing all 12 subscales and 80 items) could not be tested because the covariance matrix was not positive definite. Estimating start values based on prior research was ineffective. To determine the extent to which scale revision was needed to test a model containing as many of the original 80 items as possible, the following steps were taken: (a) removed two items identified as Heywood cases, (b) removed 15 multivariate outliers, (c) removed 11 poorly translated items, (d) removed 10 items that were either highly kurtotic or had R^2 values < 0.10, and (e) collapsed factors contributing to multicollinearity (r >0.90). Removing poorly translated and kurtotic items yielded two factors with fewer than three items; thus, all items on these factors (social problems and perfectionism) were removed. The changes reduced the 12 factor (80 items) model to four factors (57 items; n=1,238): hyperactivity/oppositional, inattention, anxious/shy, and psychosomatic. This four factor model was tested, but model fit was poor (RMSEA=0.05; CFI=0.69).

Discussion

This study used contemporary best practice factor analytic techniques to examine the structure of CTRS-R and CPRS-R long form ratings of Nepali children. In a Nepali context,

the scores reflected a narrower range of symptoms than was found in the scale development studies that employed a North American sample. On the teacher version, factors designed to tap ADHD symptoms (i.e., the inattention and hyperactivity subscales) were very similar to those identified in the scale development research. Conversely, factors intended to tap other dimensions (e.g., anxiety and social problems) did not emerge as expected. It is unclear whether other dimensions (e.g., perfectionism, anxiety, social problems) failed to emerge due to problems with item translation, cultural differences in the underlying constructs, or both. Regardless, the inattentive and hyperactivity dimensions were very similar to what has been identified in ADHD research throughout the world. On the parent version, the inattention factor identified in this study was similar to that reported in the original research, the hyperactivity and oppositional factors were merged, and the remaining factors (e.g., psychosomatic symptoms, anxiety) were not viable. These findings have important implications related to (a) our understanding of cultural influences on the nature and structure of ADHD symptoms, and (b) the assessment of ADHD symptoms in a Nepali context.

Cultural Implications

Inattention Symptoms—An inattention factor was identified on both the teacher and parent versions of the Revised Conners' Rating Scales. Behaviors included on the inattention factor are similar to the Diagnostic and Statistical Manual of Mental Disorders – Fourth Edition, Text Revision (DSM-IV TR) ADHD symptoms that have been validated throughout the world using many different measures (e.g., Bauermeister et al., 2010). These findings provide additional support for the cross cultural nature of inattentive symptoms. Moreover, they suggest that the structure of inattention symptoms in Nepal, an Eastern, developing nation, is comparable to that identified in developed nations in the West.

Oppositionality/Hyperactivity Symptoms—On the teacher form, the items on the hyperactivity factor were similar to those identified in the original research (Conners, 1997) and to the hyperactivity symptoms listed in the DSM-IV. This finding seems to suggest that, in the school setting, Nepali children engage in hyperactive behaviors that are comparable to their counterparts in the US and that those behaviors are viewed similarly by teachers. On the parent scale, the corresponding factor was comprised of items designed to tap both oppositionality and hyperactivity. The merging of intended oppositional and hyperactivity factors may relate to cultural differences between Nepali and North American parents in the way they perceive behavior.

ADHD symptoms are considered to be clinically significant because they interfere with the extent to which a child's behavior conforms to societal expectations. However, societal expectations and parental perceptions about children who fail to meet them vary across cultures (Livingston, 1999). In Nepal, school age village children report having clear beliefs about and explanations for how they should behave. They understand that they should conform to social norms and respect authority, and they experience a sense of shame if they do not (Cole et al., 2006). Yet hyperactive behaviors, by definition, are more active than expected in a particular situation. It is possible that Nepali parents view unusually active behavior (e.g., running and climbing excessively) as disobedient (i.e., defying social

expectations) or oppositional. The overlap in hyperactive and oppositional behaviors on a single factor could be explained by this different interpretation of child behavior.

ADHD—The bidimensional model of attention problems that emerged on the teacher scale was highly similar to what has been identified with many scales of attention problems throughout the world (Bauermeister et al., 2010). However, the structure identified on the parent scale differed somewhat. These differences may influence the conceptual appropriateness of the bidimensional (inattention and hyperactivity/impulsivity) model of ADHD in this setting and may illuminate potential cultural influences on symptom manifestation and perceptions thereof. A long standing debate exists in the literature over whether ADHD is best conceptualized as a neurobiological disorder or a cultural construct. Rohde et al. (2005) noted that factor analysis of ADHD measures in novel cultural settings could be used to examine the nature of ADHD. In theory, symptom patterns of a neurobiological disorder should remain relatively constant across cultures, while behaviors associated with a cultural construct may differ. Notably, hyperactivity is not found in all individuals with ADHD. Many girls and adults with ADHD display no or few hyperactive symptoms (Barkley, 2006). Given that (a) the inattention factor identified on both scales in this study was nearly identical to that found in studies conducted elsewhere in the world, and (b) the bidimensional structure of the teacher scale was comparable to findings from studies conducted worldwide, these findings provide tentative support for the neurobiological nature of inattention. However, when considered alongside findings from studies of other demographic groups, the findings tentatively suggest that hyperactive behaviors (or perceptions thereof) may be more susceptible to cultural or environmental influence within a Nepali context.

Assessment Implications

In a Nepali context, scores from the CTRS-R and CPRS-R two factor models may be useful for research and screening purposes. These findings support the use of the scores as narrowband measures of inattention (CTRS-R and CPRS-R) and hyperactivity (CTRS-R only) or hyperactivity/oppositionality (CPRS-R only). To our knowledge, this is the first behavior rating scale of any kind to be validated with Nepali children. If further research (e.g., studies of predictive validity) corroborates these findings, this scale could be highly useful for studying childhood attention and behavior problems in Nepal. In contrast, based on the poor fit to the data of the original models, the findings do not support the use of CTRS-R or CPRS-R scores as broadband measures of child psychopathology in a Nepali context. Therefore, additional measures will need to be developed (perhaps indigenously) to assess other forms of child psychopathology, such as depression, anxiety, and social problems, in Nepal. Notably, on the parent scale, Maithili was occasionally used to supplement Nepali administration of the items. The extent to which the use of Maithili may have influenced parent responses is unclear, and further research on the impact of bilingual administration on the structure of scores would be beneficial.

Strengths and Limitations

This study has several noteworthy strengths. It was the first to examine ADHD symptoms in a developing, non-Western, agrarian setting. Moreover, symptoms were assessed by raters

from both the home and school, which is important given that the diagnostic criteria for ADHD specify that symptoms must be present in more than one setting. The sample employed in this study was community based and very large (larger, in fact, than the CTRS-R and CPRS-R standardization samples). Additionally, the data analytic techniques used in this study were very conservative which may increase the likelihood of replicability.

Several limitations to the study are also present. The generalizability of these findings is limited by the demographic characteristics of the sample, and examination of the Revised Conners' Scales in other contexts is warranted. Additionally, this study did not examine the extent to which various behaviors (e.g., inattention and hyperactivity) are viewed as appropriate or acceptable in a Nepali context, and such information would allow for a more nuanced interpretation of the findings. Finally, a small number of parent participants did not speak Nepali as their first language. As such, some interviews were administered in Maithili per respondent preference. Differences in the translations may have introduced error into the items.

Future Directions

This study represents a crucial first step in evaluating the validity of CTRS-R and CPRS-R scores with Nepali children. Internal consistency and structural validity were evaluated, but research on criterion related validity, interrater reliability, stability, and differential item functioning (DIF) is warranted. Because this is the first study of the factor structure of all items included on the long forms of the CTRS-R and CPRS-R, no sample exists with which the findings can be compared directly. Further examination of the scale is needed for both Nepali and US children. In particular, further study of item equivalence across cultural groups using an item response theory or structural equation modeling approach is needed (International Test Commission, 2010; AERA, APA, & NCME, 1999). It will be important for future researchers to examine the Conners' scales with datasets that include both Nepali and North American participants so that differential item functioning (DIF) can be evaluated directly (Hambleton, Yu, & Slater, 1999). Also, prior research has identified differences in perceptions of ADHD and appropriate cutoff scores on ADHD rating scales between Chinese and US children (Norvilitis and Fang, 2005). Similar research examining differences in perceptions of ADHD and appropriate cutoff scores for US and Nepali children would be an interesting topic for future research. Moreover, research on ADHD symptoms, cultural differences in children's behaviors, and parental perceptions in a Nepali context using qualitative, anthropological, or sociological techniques, may be fruitful.

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Table 1

Pattern Coefficients from the CTRS-R Two Factor EFA Solution

Items	Factor I	Factor II	h^2
Avoids mental effort	**.78**	−.05	.59
Makes careless mistakes	**.75**	.07	.59
Fails to finish tasks	**.74**	.02	.56
Inattentive/easily distracted	**.69**	.06	.50
Forgets learned material	**.69**	−.09	.46
Difficulty organizing	**.66**	.01	.43
Lacks interest in school	**.62**	−.07	.37
Distractibility/attention problems	**.59**	.09	.38
Restless/always on the go	−.06	**.84**	.69
Restless/overactive	−.04	**.79**	.61
Fidgeting	.04	**.75**	.58
Interrupts/intrusive	.06	**.57**	.35
Eigenvalue	4.58	2.44	
% of variance	34.03	16.75	
Cronbach's Alpha	.88	.82	

Note. $N = 374$; h^2 = communalities. Salient loadings are denoted in **bold** font.

Table 2

Fit Indices for CFA (Maximum Likelihood, Robust) of CTRS-R and CPRS-R Models

Model	df	S-B χ^2	NNFI Robust	IFI Robust	CFI Robust	RMSEA Robust	RMSEA 90% CI	AIC
CTRS-R								
Two factor	53	88.54	.98	.99	.99	.026	.016 - .035	−17.46
Six factor	650	1,748.05*	.77	.79	.79	.041	.039 - .043	448.05
Eleven factor	1,584	4,034.27*	.68	-	.78	.041	.039 - .043	866.27
CPRS-R								
Two factor	151	628.29*	.89	.90	.90	.050	.046 - .054	326.29
Seven factor	1,518	3,671.91*	.73	.75	.75	.038	.036 - .039	635.91
Four factor (Modified Twelve factor)	1,377	4,937.95*	.68	.69	.69	.046	.045 - .047	2,183.95

Note. S-B χ^2=Satorra-Bentler chi-square; NNFI=Bentler-Bonnet Non-normed fit index; IFI=Bollen's fit index; AIC=Akaike's Information Criteria.

*$p < .001$.

Table 3

Pattern Coefficients from CPRS-R EFA Solution

Items	I	II	h^2
Irritable	**.67**	−.05	.42
Loses temper	**.64**	−.07	.36
Temper outbursts	**.63**	.03	.42
Interrupts/Intrusive	**.62**	.03	.41
Spiteful/vindictive	**.56**	−.01	.31
Runs/climbs excessively	**.55**	−.03	.28
Deliberately annoys others	**.55**	.08	.36
Fights	**.54**	.05	.33
Fidgeting	**.52**	.05	.30
Talks excessively	**.51**	−.15	.19
Restless/squirmy	**.49**	.07	.28
Argues	**.46**	.08	.25
Demanding/easily frustrated	**.41**	.05	.20
Avoids sustained mental effort	−.09	**.68**	.40
Difficulty finishing homework	−.06	**.65**	.39
Fails to finish things started	.03	**.65**	.44
Makes careless mistakes in work	−.03	**.63**	.37
Does not follow through on tasks	−.07	**.61**	.33
Inattentive/easily distracted	−.06	**.59**	.39
Fails to finish assignments	.07	**.56**	.36
Distractibility/attention problem	.08	**.53**	.34
Needs close supervision	−.01	**.44**	.19
Forgetful	−.09	**.43**	.23
Eigenvalue	6.62	2.26	
Percent of variance	25.93%	7.00%	
Cronbach's α	.85	.83	

Note. $N = 555$; h^2 =communalities. Salient loadings are denoted in **bold** font.