

Factor Analysis and Validity of the Conners Parent and Teacher Rating Scales in Childhood Cancer Survivors

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Objective To examine the factor structure of the Conners Parent Rating Scale—Revised: Short Form (CPRS-R:S) and the Conners Teacher Rating Scale—Revised: Short Form (CTRS-R:S) in children who are long-term survivors of acute lymphocytic leukemia (ALL) or brain tumors (BT) and who have received central nervous system directed treatment. **Method** Parents and teachers of 150 long-term survivors completed the CPRS-R:S or CTRS-R:S as part of a screening battery. The data were submitted to a maximum likelihood confirmatory factor analysis to test the construct validity of the scales and the forms were compared. The CPRS-R:S was also compared to selected subscales of the Achenbach Child Behavior Checklist (CBCL) for further validation. **Results** The analyses demonstrated an adequate fit of the original three-factor structure of the CTRS-R:S [oppositional, cognitive problems/inattention, hyperactivity]. The analyses of the CPRS-R:S suggested a less adequate fit of the original three-factor structure but principal components factor analysis yielded a three-factor solution with factors similar to those of Conners' original factor structure. Significant correlations were found between the CPRS-R:S and the selected subscales of the CBCL. **Conclusions** These findings support the similar construct validity of the original CTRS-R:S and CPRS-R:S. Although significantly correlated, the CPRS-R:S and CTRS-R:S are not interchangeable in the assessment of survivors of childhood cancer.

Key words conners; factor analysis; late effects.

It has been well demonstrated in the literature that survivors of childhood acute lymphocytic leukemia (ALL) and brain tumors (BT) are at significant risk for cognitive late effects of their treatment, primarily because of central nervous system-directed chemotherapy and cranial irradiation (Brown et al., 1998; Mulhern et al., 1999; Ris & Noll, 1994). A recent focus of studies in this population has centered on the importance of attentional abilities as critical functions within the learning process. Children and adolescents surviving treatment for ALL and BT have a higher incidence of cognitive dysfunction, including attentional problems, than their healthy age peers (Butler & Copeland, 2002; Lockwood,

Bell, & Colegrove, 1999; Thompson et al., 2001). These attentional problems are thought to be a result of brain damage acquired because of cancer treatment directed at the central nervous system, such as cranial radiation therapy and chemotherapy. Autopsy results as well as magnetic resonance imaging of the brains of living patients have confirmed treatment-related brain pathologies (e.g., mineralizing microangiopathy, leukoencephalopathy, and perturbations of normal brain development). Furthermore, the magnitude of some of these abnormalities is directly associated with the severity of attentional problems on behavioral measures originally developed to assist in the diagnosis of attention deficit/hyperactivity

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disorder (ADHD; Mulhern et al., 2004; Reddick et al., 1998; Reddick et al., 2003). Although the etiology and pathophysiology underlying attentional problems in ADHD and childhood cancer differ significantly, there are similarities between the two cognitive phenotypes. In particular, some children surviving cancer appear to exhibit elevated errors of omission and slowed reaction times on continuous performance tests, suggesting symptoms similar to those of children with the inattentive type of ADHD (Mulhern et al., 2004).

In the assessment of these attentional abilities, the standard of care within most clinical settings has been a multimethod approach that has included parental or teacher ratings of behavior along with psychometric measures (Noll et al., 1997). There have been many studies that have validated the use of parent and teacher reports within the ADHD population (Hale et al., 2001; Kumar & Steer, 2003; Luk & Leung, 1989; Moehle & Fitzhugh-Bell, 1989; Parker, Sitarenios, & Conners, 1996).

The Conners' Rating Scales have long been popular tools for the clinical assessment of childhood attentional problems with separate parent and teacher checklists specific to home or school situations, respectively (Conners, 1969). For the most recent version of these measures an evaluation of the factor structure produced seven subscales (oppositional, cognitive problems/inattention, hyperactivity, anxious-shy, perfectionism, social problems, and psychosomatic). From these subscales Conners developed the Conners Rating Scales—Revised: Short Form (CRS-R:S) from the three most relevant subscales for both the Conners Parent Rating Scale—Revised: Short Form (CPRS-R:S) and the Conners Teacher Rating Scale—Revised: Short Form (CTRS-R:S) (Conners, 1997). To confirm the three-factor model (oppositional, cognitive problems/inattention, hyperactivity subscales) for CPRS-R:S and CTRS-R:S, Conners (1997) tested the items (CPRS-R:S—18 items and CTRS-R:S—17 items) using confirmatory maximum likelihood factor analysis. Based on expert recommendations, (Anderson & Gerbing, 1984; Cole, 1987; Marsh et al., 1988), the goodness-of-fit criteria used to test the model were the Goodness-of-Fit Index > 0.850 (GFI; Joreskog & Sorbom, 1986), the Adjusted GFI > 0.800 (AGFI; Joreskog & Sorbom, 1986), and the Root Mean-Square Residual < 0.100 (RMS; Joreskog & Sorbom, 1986). For the CPRS-R:S the GFI (0.936), AGFI (0.928), and RMS (0.042) met the criteria for adequacy of fit to the three-factor model. For the CTRS-R:S the GFI (0.907), AGFI (0.877), and RMS (0.062) also met the criteria for adequacy of fit to the three-factor model. Other studies employing both exploratory and confirmatory factor

analyses with varied samples have been conducted with the Conners Rating Scales—Revised (CRS-R) and Conners Rating Scales—Revised: Short Form (CRS-R:S), and several of the confirmatory factor analyses have replicated the factor structure originally proposed by Conners in 1997 (Conners, Sitarenios, Parker, & Epstein, 1998a, 1998b; Miller, Koplewicz, & Klein, 1997; Parker et al., 1996). The validation of the Conners Rating Scales has been primarily on healthy children. Several studies in the pediatric oncology literature have also used the Achenbach Child Behavior Checklist (CBCL; Achenbach & Edelbrock, 1991) as a standard to explore social competence and behavior problems in this population (Duval, Braun, Daigneault, & Montour-Proulx, 2002; Fossen, Abrahamsen, & Storm-Mathisen, 1998; Martinson & Bossert, 1994; Mulhern, Carpentieri, Shema, Stone, & Fairclough, 1993; Noll et al., 1997; Noll et al., 1999; Schulze-Bonhage et al., 2004; Verrill, Schafer, Vannatta, & Noll, 2000). To our knowledge, however, no studies have confirmed the factor structure of the CRS-R:S among children with chronic illness and, more specifically, among long-term survivors of childhood cancer or compared the parent and teacher versions of the CRS-R:S. We are also unaware of any studies that have validated the CRS-R:S with the CBCL in this population.

This study examines the factor structure of the CPRS-R:S and CTRS-R:S, the correlations with specific subscales of the Achenbach CBCL (Achenbach & Edelbrock, 1991), and compares the parent and teacher versions of the CRS-R:S. Because of the similarities between attentional problems in children with ADHD and children experiencing late effects of their cancer treatment, we expect both the CPRS-R:S and CTRS-R:S to demonstrate an adequate fit to the factor structure found by Conners (1997). We also expect the CPRS-R:S to compare favorably with the relevant CBCL subscales.

Method

Participants and Procedures

One hundred fifty participants with complete CPRS-R:S and CTRS-R:S data at screening were chosen from a larger sample of subjects who were participating in an IRB-approved study of learning impairments in children who were long-term survivors of ALL or a malignant BT and had received central nervous system-directed treatment (Table I). The sample size of 150 was chosen to meet the criteria of at least a 4 : 1 ratio of subjects to variables in the confirmatory factor analysis (CFA) model as proposed by MacCallum, Widaman, Preacher,

Table I. Demographic and Medical Variables for the Sample ($n = 150$)

Variable	Mean (SD)	Range
Years of age at exam	11.73 (3.23)	6–18
Grade at exam	6.02 (3.28)	K–12
Years off-treatment	5.22 (0.27)	1–13.6
	Frequency	Percent
Male gender	69	46.0
Diagnoses		
Acute lymphocytic leukemia	76	50.7
Brain tumor	74	49.3
Race		
Caucasian	131	87.3
African American	13	8.7
Other	6	4.0
Treatment intensity		
Mild intensity	56	37.3
Moderate intensity	24	16.0
High intensity	70	46.7
Age when treatment began		
Under 4 years of age	57	38.0
4 years of age and older	93	62.0

Treatment intensity is defined by mild, chemotherapy only; moderate, <24 Gy cranial irradiation (CRT) \pm chemotherapy; high, \geq 24 Gy CRT \pm chemotherapy.

and Hong (2001). Of these 150 participants, 90 completed the CBCL. Participants ranged in age from 6 to 18 years and were off-treatment for an average of approximately 5 years. Informed consent for each subject was obtained. The CPRS-R:S and CBCL were completed by one parent (82%, mothers; 15%, fathers, and 3%, other relative) while the subject was seen for screening assessment. Releases of information were obtained and each participant's teacher was contacted by telephone to complete the CTRS-R:S, according to Conners' guidelines for remote administration (1997).

Assessment Measures

The Conners' Rating Scales—Revised: Short Forms were developed from the most clinically useful subscales (oppositional, cognitive problems/inattention, hyperactivity) of the CRS-R:S for use when multiple administrations over time were desired. Each of the three subscales contains items with the highest loadings from an exploratory factor analysis of the items on the CRS-R:L (long form). A fourth subscale, the ADHD index, was also included for assessing children and adolescents with ADHD symptoms based on Diagnostic and Statistical Manual for Mental Disorders, Fourth Edition (DSM-IV) (American Psychiatric Association, 1994; Conners, 1997). This fourth subscale was not included in Conners' initial exploratory

factor analysis (EFA), but was later added to facilitate clinical diagnosis of ADHD. The CRS-R:S includes a 27-item parent (CPRS-R:S) and a 28-item teacher (CTRS-R:S) form. Sample items from the four subscales on the parent and teacher forms include "Defiant" and "Loses temper" (oppositional subscale); "Fails to complete assignments" and "Not reading up to par" (cognitive problems/inattention subscale); "Restless in the 'squirmy' sense" and "Excitable, impulsive" (hyperactivity subscale); and "Short attention span" and "Distractibility or attention span a problem" (ADHD index subscale; Conners, 1997). Each item is scored on a scale of 0–4 with 0 as "Not True at All" up to 4 as "Very Much True."

The Achenbach Child Behavior Checklist is a parent report checklist of social competency and behavior problems in children. It contains a competency domain that includes items related to the child's activities, social and school skills, and a problem behaviors domain. The problem behaviors domain includes items related to eight problem behavior areas: withdrawn, somatic complaints, anxious/depressed, social problems, thought problems, attention problems, delinquent problems, and aggressive problems. The competency scales yield a total social competency score and the problem behavior scales yield total scores for externalizing behaviors, internalizing behaviors, and total problem behaviors. Each item is scored on a scale of 0–2 with 0 as "Not True", 1 as "Somewhat or Sometimes True" and 2 as "Very True or Often True." (Achenbach & Edelbrock, 1991)

Statistical Analyses

The three-factor models for the 18 relevant items for the CPRS-R:S and the 17 relevant items for the CTRS-R:S, as used in Conners's (1997) initial exploratory and confirmatory analyses, were tested using separate confirmatory maximum likelihood factor analyses. Both analyses were conducted using LISREL 8.54 (Joreskog & Sorbom, 2002). Because the CPRS-R:S and CTRS-R:S are ordinal measures, the analyses were conducted using polychoric correlation and asymptotic covariance matrices created with the PRELIS preprocessing program (Joreskog & Sorbom, 2002). Multiple criteria identical to those employed by Conners's (1997) were used to assess the goodness-of-fit of the models: the GFI (Joreskog & Sorbom, 1986; 1989), the AGFI (Joreskog & Sorbom, 1986, 1989), and the Root Mean Square Residual (RMS; Joreskog & Sorbom, 1986). The GFI represents the overall amount of covariation among the observed variables that can be accounted for by the hypothesized model (Stevens, 2002). The AGFI adjusts for the number of degrees of freedom in the specified model. The RMS

represents the average residual value derived from fitting the variance–covariance matrix to the data (Byrne, 1998). The rationale for using the same criteria as that of Conners' was to replicate his methodology as closely as possible with this sample. The goodness-of-fit of the models were judged adequate if all of the following criteria, as used by Conners's (1997), were satisfied: GFI > 0.85, AGFI > 0.80, and RMS < 0.10 (Anderson & Gerbing, 1984). After each model was tested, if the analyses did not fully demonstrate an adequate fit of the model, then exploratory principal components analyses with direct oblimin rotation were planned to determine whether there was a better fitting model. A similar approach was conducted by Kumar and Steer (2003) in their factorial validation of the CPRS-R:S with psychiatric outpatients. Scree plots and eigenvalues were analyzed. Factor loadings higher than 0.40 were considered to be significant and interpretable, and the number of factors was determined by the examination of scree plots, size of the eigenvalues, and the residual correlation matrix (Cattell, 1978; Kaiser, 1970; Tabachnick & Fidell, 2001).

Analyses to further test the validity of the CPRS-R:S were conducted by computing the Pearson product-moment correlations between the various subscale scores on this instrument and selected scale scores from the CBCL (Achenbach & Edelbrock, 1991). Specifically, correlations were conducted between the following subscales from the parent versions: CPRS-R:S cognitive problems/inattention scale with CBCL school competence scale; CPRS-R:S cognitive problems/inattention scale with CBCL attention problems scale; CPRS-R:S Hyperactivity scale with CBCL Attention Problems scale; CPRS-R:S oppositional scale with CBCL delinquent problems scale; CPRS-R:S oppositional scale with CBCL aggressive problems scale; and CPRS-R:S ADHD scale with CBCL attention problems scale. The researchers expected to find positive correlations between the CPRS-R:S cognitive problems/inattention and hyperactivity scales and the CBCL attention problems scale, and between the CPRS-R:S oppositional scales and the CBCL delinquent problems and aggressive problems scales. Negative correlation between the CPRS-R:S cognitive problems/inattention scales and the CBCL school competency scale was expected because lower scores on this CBCL scale represent less competency in school.

Results

Parent Version: CPRS-R:S

All three of the parameter estimates for the 18 items were significant, indicating that the items were reason-

able and important to the model. The parameter estimates for the relationships among the three CPRS-R:S factors were significant ($p < .05$) (oppositional with cognitive problems/inattention, 0.52; oppositional with hyperactivity, 0.68; cognitive problems/inattention with hyperactivity, 0.62). The path coefficients for each item are summarized in Table II. According to Conners' criteria (Conners, 1997) the RMS met the criteria for an adequate fit of the model to the data (RMS = 0.092). However the GFI (0.71) and the AGFI (0.61) failed to meet the criteria for an adequate fit. To fully explain the adequacy of the model, further exploration of the goodness-of-fit indices was conducted as recommended by Byrne (1998). The chi-square of 180.82 was significant ($p < .05$), indicating the hypothesized model was not entirely adequate. However other criteria indicated an adequate fit to the model. These criteria included the Root Mean Square Error of Approximation (RMSEA; Browne & Cudeck, 1993), which takes into account the error approximation (0.052; 90% confidence interval = 0.033–0.069); the Normed Fit Index (NFI; Bentler & Bonett,

Table II. LISREL Confirmatory Factor Analysis Model Path Coefficients for the Conners Parent Rating Scale–Revised: Short Form (CPRS-R:S) and Conners Teacher Rating Scale–Revised: Short Form (CTRS-R:S)

Item	CPRS-R:S			CTRS-R:S		
	^a OPP	^b COG	^c HYP	^a OPP	^b COG	^c HYP
Item 2	0.78			0.95		
Item 3		0.89				0.77
Item 4			0.67		0.78	
Item 6	0.70			0.78		
Item 7	NA	NA	NA			0.66
Item 8		0.84			0.85	
Item 9			0.79	NA	NA	NA
Item 10	NA	NA	NA	0.66		
Item 11	0.90					0.66
Item 12		0.79		NA	NA	NA
Item 13	NA	NA	NA		0.85	
Item 14			0.70	NA	NA	NA
Item 15	NA	NA	NA	0.85		
Item 16	0.92			NA	NA	NA
Item 17		0.90				0.81
Item 18			0.81		0.63	
Item 20	0.69			0.86		
Item 21		0.91				0.91
Item 22			0.79		0.79	
Item 24	0.52					0.84
Item 26			0.75	NA	NA	NA
Item 27	NA	NA	NA			0.86

NA, item not applicable to scale.

^aOPP, CRS-R:S oppositional subscale.

^bCOG, CRS-R:S cognitive problem/inattentive subscale.

^cHYP, CRS-R:S hyperactivity subscale.

1980) the Comparative Fit Index (CFI; Bentler, 1990), and Nonnormed Fit Index (NNFI; Bentler & Bonett, 1980), which compare the fit of the hypothesized model to the null model (NFI = 0.84; CFI = 0.86; NNFI = 0.83); and the Expected Cross-Validation Index (ECVI; Browne & Cudeck, 1989), which indicates the likelihood that the model cross validates across similar sample sizes (ECVI = 1.78, 90% confidence interval = 1.57–2.04).

Because these results were ambiguous, an exploratory principal components analysis was conducted. The first six consecutive eigenvalues were 7.63, 2.21, 1.48, 1.00, 0.80, and 0.69; these eigenvalues indicated that two or three factors should be extracted and inspected for simple structure. Initially, the findings suggested a two-factor solution based on the eigenvalues, but examination of both the scree plot for the change in direction of the slope and the residual correlation matrix for moderate to large residuals suggested a three-factor solution as the most parsimonious solution. The three factors together accounted for 62.9% of the variance. Factor 1 contained items related to hyperactivity, accounting for 42.4% of the variance. Factor 2 contained items related to difficulty completing assignments and trouble concentrating, accounting for 12.3% of the variance. Finally, Factor 3 contained items related to oppositional behaviors, accounting for 8.2% of the variance. Compared with the results of Conners' (1997) factor analyses, the Factors 1, 2, and 3 are similar to Conners' hyperactivity, cognitive problems/inattention, and oppositional factors, respectively with a single item related to "deliberately annoying others" loading on the factor related to hyperactivity in the analysis rather than the factor related to oppositional behavior as in Conners' original analyses.

Teacher Version: CTRS-R:S

A three-factor model for the 17 relevant items for the CTRS-R:S was tested using confirmatory factor analyses. The items were intercorrelated and the resulting asymptotic covariance matrix of the polychoric correlation coefficients was analyzed. All of the parameter estimates for the 17 items were significant indicating that each of the items were reasonable and important to the model. The parameter estimates for the relationships among the three CTRS-R:S factors were significant ($p < .05$) (oppositional with cognitive problems/inattention, 0.38; oppositional with hyperactivity, 0.62; and cognitive problems/inattention with hyperactivity, 0.44). The path coefficients for each item are summarized in Table II. With this sample all GFI indices met the criteria for an adequate fit of the model to the data (GFI = 0.94; AGFI =

0.92; RMS = 0.10). Further exploration of the GFI indices beyond those Conners used was conducted. The chi-square of 174.80 was significant ($p < .05$) and the other goodness-of-fit indices suggested a good fit to the model (RMSEA = 0.058, CI = 0.040–0.075; NFI = 0.93; CFI = 1.00; NNFI = 1.05; ECVI = 1.67, 90% CI = 1.46–1.94). Because all indices in the model suggest a good fit with the data, no follow-up exploratory analysis was conducted.

Comparison of Parent and Teacher Versions

Analyses were conducted to compare the t -scores of corresponding subscales of the CPRS-R:S and CTRS-R:S (Table III). All intercorrelations between the subscales were statistically significant ($p < .05$); however, the magnitudes of the correlations were modest, accounting for only 29% of shared variance among the subscales. Comparisons of the mean values on each subscale, using paired t -tests, indicated no significant differences ($p < .05$) between the cognitive problems/inattention and hyperactivity subscales. Although a significant difference was revealed on the oppositional subscale, the magnitude was quite small, equivalent to an effect size (d) of 0.17. Conners (1997) intercorrelations for each subscale (oppositional, 0.25; cognitive/inattention, 0.50; Hyperactivity, 0.35; ADHD Index, 0.49) were estimated by combining the male and female correlations (weighted by sample size for each group). These intercorrelations were generally comparable to those found in the analysis, suggesting that the findings were fairly consistent with the standardization sample findings.

Comparison of CPRS-R:S with the CBCL

Correlations between the subscales of the CPRS-R:S and the relevant subscales of the CBCL are summarized in Table III. As expected, there was a significant moderate negative relationship ($p < .001$) between the CPRS-R:S cognitive problems/inattention scale and the CBCL school competency scale. The analyses revealed significant ($p < .001$) positive relationships between the Conners scales and similar content scales of the CBCL, as expected. There was a significant positive relationship between the CPRS-R:S oppositional scale and the CBCL attention, delinquent, and aggressive problems scales; the CPRS-R:S cognitive problems/inattention scale and the CBCL attention scales; the CPRS-R:S hyperactivity scale and the CBCL attention, delinquent, and aggressive problems scales; and the CPRS-R:S ADHD index scale and the CBCL attention, delinquent, aggressive problems, and school competency scales. There was also a significant positive relationship between the CPRS-R:S

Table III. Paired *t*-tests and Correlation Coefficients for the Conners Parent Rating Scale—Revised: Short Form (CPRS-R:S), Conners Teacher Rating Scale—Revised: Short Form (CTRS-R:S), and the Achenbach Child Behavior Checklist (CBCL).

Conners Rating Scales	Mean (<i>SD</i>)	<i>t</i>	<i>r</i>	CBCL scales <i>r</i> (<i>N</i> = 90)			
				Attention problem	School competency	Delinquent problems	Aggressive problems
Oppositional							
Parent	51.34 (9.91)			0.47**	−0.13	0.48**	0.74**
Teacher	49.38 (8.34)						
Cognitive/inattention		−0.73	0.37**				
Parent	57.97 (12.43)			0.55**	−0.43**	0.31*	0.47**
Teacher	58.80 (12.51)						
Hyperactivity		0.99	0.31**				
Parent	55.09 (12.43)			0.47**	−0.15	0.39**	0.54**
Teacher	53.95 (11.51)						
ADHD index		1.25	0.54**				
Parent	57.35 (11.98)			0.63**	−0.35*	0.31*	0.56**
Teacher	56.20 (11.39)						

CRS *t*-values and *r* are derived from comparison of parent and teacher version of each subscale.

*Correlation is significant at the .05 level.

**Correlation is significant at the .001 level.

cognitive problems/inattention scale and the CBCL delinquent and aggressive problems scales.

Discussion

The results of this study support the construct validity of the original factor structure of the CTRS-R:S with a sample of survivors of childhood cancer who received central nervous system treatment. Although the CTRS-R:S factor structure was originally based on a sample of healthy school-aged children within the general population, the present analysis suggests that the CTRS-R:S subscale designations are also appropriate for the assessment of attentional and cognitive problems among school-aged children who are long-term survivors of cancer. On first examination, the results do not completely support the construct validity of the original factor structure of the CPRS-R:S. Conners' criteria produced a less than adequate fit, but further exploration of the various goodness-of-fit indices that are more robust for similar sample sizes and number of parameters as recommended in more recent literature, suggest that the fit to the hypothesized model may be adequate. Exploratory factor analysis suggested a different loading for a single item related to "annoying others" on the factor related to hyperactivity rather than the factor related to oppositional behavior as found in the original Conners' analyses. Therefore, differences in the findings may be explained by the degree of robustness in the various fit indices and their assessment of the model fit rather than in a truly less-than-adequate fit to the model.

The results demonstrated support for the validity of the CPRS-R:S as compared to the CBCL. Although the expected findings were supported, there were also significant correlations among the scales in other comparisons. The CPRS-R:S oppositional scale is moderately correlated with the CBCL attention problems scale. This may be due to similarities in some of the items related to hyperactivity and impulsivity on the two scales. Significant positive correlations were also found between the CPRS-R:S cognitive problems/inattention scale and the CBCL delinquent problems and aggressive problems scales. One possible explanation for this is that the children in this sample may be demonstrating externalizing behavior problems because of their frustrations with their cognitive and attention problems. These cognitive and attention problems may also be perceived by the parent as "stubbornness" and problems behaviors because of a lack of understanding of the nature of the difficulties the child is experiencing. Positive correlations were found between the CPRS-R:S hyperactivity and ADHD index scales and the CBCL delinquent problems and aggressive problems as well and this may be due to similarities in disruptive behaviors listed on each of the scales.

Differences in the mean scores on the CPRS-R:S and CTRS-R:S subscales were small and the intercorrelations were not substantial, which would suggest differences between the CPRS-R:S and CTRS-R:S in their construct validity in this population. One possible explanation may be that individual items on the CPRS-R:S and CTRS-R:S have dissimilar content for each of the subscales. Of the items in the analysis, the CPRS-R:S

contains 11 unique items and the CTRS-R:S contains 8 unique items. Several of the CTRS-R:S unique items are specific to academic performance in reading, spelling, and arithmetic, although the CPRS-R:S contains no items specific to these areas. Most of the items unique to the CPRS-R:S are related to the child's difficulty completing assignments and none of the relevant items on the CTRS-R:S address the child's difficulties in this area. Therefore, the lack of association between the two forms may be a result of a higher degree of specificity of the CTRS-R:S than the CPRS-R:S with regard to learning problems that long-term survivors are experiencing in the classroom.

Another explanation for the failure to find high correlations between the parent and teacher forms is that teachers may be more reliable informants for this population of children with cognitive problems and inattention due to their treatment. Loeber, Green, and Lahey (1990) found that practitioners generally agree that teachers are more useful informants than mothers regarding children's symptoms of hyperactivity/inattentiveness. This may be due to the increased demands and observability of these behaviors in the classroom as opposed to the home environment. Although other studies support the validity of parent report in the exploration of attentional problems (Power et al., 1998) in the study, several parents commented that they were unsure of the answers to some of the CPRS-R:S questions because they did not directly observe the behaviors in the classroom. Rather they relied on the child's teacher for information about the child's behavior. Exploration of the differences between the subscales also suggests that parents seem to observe more oppositional problems in these children at home than teachers observe in the classroom. Coupled with the slight difference in item loading this suggests that parents may also be observing different behaviors related to late effects in this sample than teachers.

Several limitations of this study should be noted, including a potentially limiting sample size. Although the use of confirmatory analyses with samples of approximately 150 is supported in the literature (Aleamoni, 1976; Loo, 1983; MacCallum et al., 2001), Jackson (2001) found an increase in sample size from 50 to 400 which yielded a 29% improvement in the GFI. However an additional 400 observations (for a sample size of 800) yielded only an additional 2.5%. Jackson also found that in small sample sizes several indices typically underestimate their expected values to a lesser degree, thus supporting the use of multiple fit indices when judging the

adequacy of the model. Given these findings, a larger sample may have yielded results with the CPRS-R:S more consistent with Conners's (1997) findings in the goodness-of-fit indices with the standardization sample. Another limitation is the generalizability of the results to other settings that serve long-term survivors of childhood cancer. Although the participants were from a variety of geographical regions and socioeconomic backgrounds, the sample was limited to children treated for ALL or a BT. These results therefore may not generalize to all children with other types of cancer who received central nervous system-directed treatment. These results may also be influenced by the diversity of the sample studied. A larger sample would allow for exploration of various age groups, such as those in Conners's (1997) standardization sample. Differences in various lengths of time since completion of treatment that may yield different results for different groups could also be explored with a larger sample.

In summary, these analyses of the Conners' CPRS-R:S and CTRS-R:S support the construct validity of the instruments for the assessment of cognitive and attention problems in children treated for cancer. Although the mean scores of parents and teachers did not differ greatly, the intercorrelations were not substantial. We conclude that both parent and teacher ratings contribute unique information in validating any suspicion of attentional and cognitive problems evidenced in long-term survivors of childhood cancer. These analyses support the use of the CRS-R:S as part of a multimethod neurocognitive and psychosocial assessment battery in identifying the magnitude and prevalence of attentional problems in long-term survivors of childhood cancer who may be experiencing late effects of their treatment.

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