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PedsQL™ Cognitive Functioning Scale in Pediatric Liver Transplant Recipients: Feasibility, Reliability and Validity

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Abstract

Objective—The PedsQL™ (Pediatric Quality of Life Inventory™) is a modular instrument designed to measure health-related quality of life and disease-specific symptoms. The PedsQL™ Cognitive Functioning Scale was developed as a brief generic symptom-specific instrument to measure cognitive functioning. The objective of the present study was to determine the feasibility, reliability, and validity of the PedsQL™ Cognitive Functioning Scale in pediatric liver transplant recipients.

Methods—The 6-item PedsQL™ Cognitive Functioning Scale and the PedsQL™ 4.0 Generic Core Scales were completed by pediatric liver transplant recipients ages 8–18 years (n = 215) and parents of pediatric liver transplant recipients ages 2–18 years (n = 502). Both patient self-report and parent proxy-report were available for 212 cases. The 72-item Behavior Rating Inventory of Executive Function (BRIEF), a widely validated measure of executive functioning, was completed by 100 parents and 56 teachers on a subset of patients.

Results—The PedsQL™ Cognitive Functioning Scale demonstrated minimal missing responses (0.0%, child report, 0.67%, parent report), achieved excellent reliability ($\alpha = 0.88$ child report, 0.94 parent report), distinguished between pediatric patients with liver transplants and healthy children supporting discriminant validity, and was significantly correlated with the PedsQL™ 4.0 Generic Core Scales and the BRIEF supporting construct and concurrent validity, respectively. Pediatric liver transplants recipients experienced cognitive functioning comparable to long-term pediatric cancer survivors.

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Competing Interests: Dr. Varni holds the copyright and the trademark for the PedsQL™ and receives financial compensation from the Mapi Research Trust, which is a nonprofit research institute that charges distribution fees to for-profit companies that use the Pediatric Quality of Life Inventory™.

Conclusions—The results demonstrate the feasibility, reliability, discriminant, construct and concurrent validity of the PedsQL™ Cognitive Functioning Scale in pediatric liver transplant recipients.

Keywords

Cognitive functioning; PedsQL™; liver transplant; pediatrics; executive functioning; quality of life

Introduction

Life expectancy for pediatric liver transplant patients has significantly improved over the last decade, with patient perceived health-related quality of life (HRQOL) assuming greater importance in determining the quality of the enhanced survival of these pediatric patients [1]. In the largest multicenter study published to date, involving 873 pediatric liver transplant patients ages 2 to 18 years surviving liver transplantation at least 12 months, pediatric liver transplant patients evidenced significantly lower generic HRQOL compared to a matched healthy sample, with the largest differences demonstrated in school functioning [2].

Chronic liver disease and the liver transplantation process may specifically impact cognitive functioning in pediatric recipients since the child is exposed to numerous risk factors during a crucial stage of brain development including hepatic encephalopathy, malnutrition resulting from chronic liver disease, exposure to neurotoxic medications, and portal systemic shunting [3-6]. Previous studies with pediatric liver transplant recipients, using lengthy and complex standardized cognitive and intelligence testing batteries, have demonstrated that pediatric patients with liver transplants are at increased risk for cognitive impairments following liver transplantation [3-6]. A recent multicenter study, for example, examined the prevalence of cognitive and academic delays in children following liver transplant [7]. One hundred and forty-four patients 2 years post-liver transplant performed significantly below test norms on standardized intelligence quotient (IQ) and achievement measures. Twenty-six percent of patients had mild to moderate IQ delays and 4% had serious delays. Reading and/or math scores were weaker than IQ in 25%, suggesting learning disability. These results, along with others, demonstrate a higher prevalence of cognitive and academic delays, and learning problems in pediatric liver transplant recipients compared to the normal population.

Taken together, these findings suggest the importance of routine serial measurement of cognitive functioning in pediatric liver transplant recipients. However, standardized cognitive functioning batteries require the time, expense and the expertise of licensed psychologists, which may serve as a significant barrier to the routine measurement of cognitive functioning in this at risk population during regularly scheduled medical office and clinic visits, as well as for multisite national and international clinical trials. This prior literature underscores the need for a brief, reliable and valid cognitive functioning measure that can be completed by pediatric patients and their parents.

The 6-item PedsQL™ Cognitive Functioning Scale was designed as a brief and easy to administer patient self-reported and parent proxy-reported generic symptom-specific instrument to measure cognitive functioning across pediatric populations, originally developed in a pediatric cancer population [8]. Subsequently, the PedsQL™ Cognitive Functioning Scale has been demonstrated to be significantly associated with the 72-item Behavior Rating Inventory of Executive Function (BRIEF), a widely validated measure of executive functioning, in a pediatric head trauma sample [9]. Executive functioning encompasses a constellation of higher-order neurocognitive processes reflective of sustained

attention, selective attention, working memory, planning, organizing, inhibition, initiation, response selection, reasoning, and problem-solving [10]. In the pediatric head trauma sample, the PedsQL™ Cognitive Functioning Scale correlated highly not only with individual subscales of the BRIEF, but also with the BRIEF summary scores ($r_s = -.67, -.70$, and $-.55$ for the Global Executive Composite, Metacognition Index, and Behavioral Regulation Index, respectively) [9], suggesting that the PedsQL™ Cognitive Functioning Scale may be measuring important aspects of executive functioning.

Although originally imbedded in the PedsQL™ Multidimensional Fatigue Scale [8], with demonstrated reliability and validity across multiple pediatric chronic health conditions [8; 9; 11-20], the PedsQL™ Cognitive Functioning Scale has emerged more recently as a separate symptom-specific instrument in pediatric populations with known or suspected impairments in cognitive functioning [9; 21]. However, the feasibility, reliability, and validity of the PedsQL™ Cognitive Functioning Scale have not been previously reported in the pediatric liver transplant population.

Consequently, the objective of the present study was to examine the feasibility, reliability, discriminant, construct, and concurrent validity of the PedsQL™ Cognitive Functioning Scale in pediatric patients with liver transplants. We hypothesized that the PedsQL™ Cognitive Functioning Scale would distinguish between pediatric patients with liver transplants and healthy children based on previous findings with other pediatric chronic health conditions, supporting discriminant validity [8; 9; 11-20]. We further expected that more impaired cognitive functioning as measured by the PedsQL™ Cognitive Functioning Scale would be significantly correlated with more impaired generic HRQOL as measured by the PedsQL™ 4.0 Generic Core Scales, with medium to larger effect sizes, based on the conceptualization of symptoms as causal indicators of generic HRQOL, supporting construct validity [22]. We also expected the PedsQL™ Cognitive Functioning Scale to be significantly correlated with parent and teacher reported patient executive functioning as measured by the BRIEF in a subsample of pediatric patients, supporting concurrent validity [9]. Finally, we explored comparisons between the PedsQL™ Cognitive Functioning Scale in pediatric patients with liver transplants with long-term pediatric cancer survivors to determine the relative impact of cognitive functioning in comparison to a pediatric chronic health condition known to manifest significant cognitive impairments subsequent to chemotherapy and cranial radiation [23-26].

Methods

Participants

Liver Transplant Sample—Participants were pediatric liver transplant recipients ages 8–18 years ($n = 215$) and parents of pediatric liver transplant recipients ages 2–18 years ($n = 502$). Both patient self-report and parent proxy-report were available for 212 cases. For child self-report, the average age of the 120 girls (55.8%) and 95 boys (44.2%) was 12.69 ± 3.07 years. For all participants combined, the average age of the 273 girls (54.4%) and 229 boys (45.6%) was 8.71 ± 4.24 years. With regard to race/ethnicity, the sample contained 310 (61.8%) White non-Hispanic, 77 (15.3%) Hispanic, 72 (14.3%) Black non-Hispanic, 21 (4.2%) Asian/Pacific Islander, 4 (0.8%) American Indian or Alaskan Native, and 18 (3.6%) Other or Missing. The mean interval from liver transplant to survey administration was 4.26 ± 2.50 years.

Healthy Sample—The healthy children sample was derived from two previously conducted studies [8; 17]. A healthy sample was randomly matched by age, gender, and race/ethnicity to the pediatric liver transplant sample separately for child self-report and parent proxy-report given the age differences between these two samples. For child self-

report, the average age of the 83 boys (46.9%) and 94 girls (53.1%) was 12.89 ± 2.62 years; there were 110 (62.1%) White non-Hispanics, 33 (18.6%) Hispanics, 13 (7.3%) Black non-Hispanics, 10 (5.6%) Asian/Pacific Islanders, and 11 (6.2%) Other or Missing. For all participants combined, the average age of the 60 boys (53.1%) and 53 girls (46.9%) was 9.01 ± 3.44 years; there were 75 (66.4%) White non-Hispanics, 23 (20.4%) Hispanics, 6 (5.3%) Black non-Hispanics, 3 (2.7%) Asian/Pacific Islanders, and 6 (5.3%) Other or Missing.

Long-Term Pediatric Cancer Survivors Sample—The long-term pediatric cancer survivors sample was derived from the PedsQL™ Multidimensional Fatigue Scale field test in pediatric cancer [8] and consisted of patients ages 2 to 18 years in remission and off cancer treatment (i.e., radiation and/or chemotherapy) for greater than 12 months. The comparison to long-term pediatric cancer survivors was selected because the disease course for cancer survivors is similar to that of pediatric survivors of liver transplantation. In both cases, children are faced with an immediate life-threatening illness in which treatment, either medical or surgical, is associated with cognitive risk. The long-term outcome is not certain, but may be associated with adverse events of initial therapy. The cancer sample was randomly matched by age to the pediatric liver transplant sample separately for child self-report and parent proxy-report given the age differences between these two samples. For child self-report, the average age of the 43 boys (67.2%) and 21 girls (32.8%) was 12.26 ± 3.03 years; there were 19 (29.7%) White non-Hispanics, 32 (50.0%) Hispanics, 1 (1.6%) Black non-Hispanics, 3 (4.7%) Asian/Pacific Islanders, and 8 (12.5%) Other or Missing. For all forms combined, the average age of the 44 boys (57.9%) and 32 girls (42.1%) was 8.74 ± 3.19 years; there were 17 (22.4%) White non-Hispanics, 38 (50.0%) Hispanics, 4 (5.3%) Black non-Hispanics, 5 (6.6%) Asian/Pacific Islanders, and 11 (14.5%) Other or Missing.

Measures

PedsQL™ Cognitive Functioning Scale—The PedsQL™ Cognitive Functioning Scale includes 6 items (“It is hard for me to keep my attention on things;” “It is hard for me to remember what people tell me;” “It is hard for me to remember what I just heard;” “It is hard for me to think quickly;” “I have trouble remembering what I was just thinking;” “I have trouble remembering more than one thing at a time.”), and was developed through focus groups, cognitive interviews, pre-testing, and field testing measurement development protocols [8]. The format, instructions, Likert scale, and scoring method are identical to the PedsQL™ 4.0 Generic Core Scales, with higher scores indicating better HRQOL (fewer cognitive problems).

The PedsQL™ Cognitive Functioning Scale is comprised of parallel child self-report and parent proxy-report formats. Child self-report includes ages 5-7, 8-12, and 13-18 years. Parent proxy-report includes ages 2-4 (toddler), 5-7 (young child), 8-12 (child), and 13-18 (adolescent), and assesses parent’s perceptions of their child’s cognitive functioning. For the purposes of the larger multisite study in which these data were derived, both child self-report and parent proxy-report were obtained for pediatric liver transplant patients ages 8-18 years, while parent proxy-report alone was obtained for pediatric liver transplant patients ages 2-7 years. The items for each of the forms are essentially identical, differing in developmentally appropriate language, or first or third person tense. The instructions for the standard version ask how much of a problem each item has been during the past one month. The English and U.S. Spanish standard versions were utilized for this investigation. A 5-point response scale is utilized across child self-report for ages 8-18 and parent proxy-report (0 = never a problem; 1 = almost never a problem; 2 = sometimes a problem; 3 = often a problem; 4 = almost always a problem).

Items are reverse-scored and linearly transformed to a 0-100 scale (0=100, 1=75, 2=50, 3=25, 4=0), so that higher scores indicate fewer cognitive problems. The Scale Score is computed as the sum of the items divided by the number of items answered (this accounts for missing data). If more than 50% of the items in the scale are missing, the Scale Score is not computed. This accounts for the differences in sample sizes for scales reported in the Tables. Although there are other strategies for imputing missing values, this computation is consistent with the previous PedsQL™ peer-reviewed publications, as well as other well-established HRQOL measures [27-29].

The PedsQL™ 4.0 Generic Core Scales—The 23-item PedsQL™ 4.0 Generic Core Scales encompass: 1) Physical Functioning (8 items), 2) Emotional Functioning (5 items), 3) Social Functioning (5 items), and 4) School Functioning (5 items) [27]. The Physical Health Summary Score (8 items) is the same as the Physical Functioning Scale. To create the Psychosocial Health Summary Score (15 items), the mean is computed as the sum of the items divided by the number of items answered in the Emotional, Social, and School Functioning Scales. The instrument takes approximately 5 minutes to complete [27].

Behavior Rating Inventory of Executive Function (BRIEF)—The BRIEF [30] consists of parent and teacher rating forms designed to assess executive functioning of children between the ages of 5 and 18 years in the home and school environments, and has been used in other pediatric populations at risk for cognitive impairments such as traumatic brain injury [31]. The BRIEF consists of 72 items that measure 8 domains of executive function: 1) Inhibit (10 items), 2) Shift (8 items), 3) Emotional Control (10 items), 4) Initiate (8 items), 5) Working Memory (10 items), 6) Plan/Organize (12 items), 7) Organization of Materials (6 items), and 8) Monitor (8 items). The Behavioral Regulation Index (first 3 subscales), Metacognition Index (remaining 5 subscales), and Global Executive Composite score (all 8 subscales) were generated from the eight non-overlapping clinical scales. The normative population has a mean T score of 50 and a standard deviation of 10, with higher T scores reflecting greater difficulties experienced by the individual.

As a separate aim of the larger multisite study, the BRIEF was completed by 100 parents and 56 teachers in a subset of participants ages 5 to 7 for a prospective, longitudinal study of executive function in young pediatric liver transplant recipients. This protocol was determined a priori by the larger multisite study. This age range was selected because school entry represents a time of significant new cognitive and learning challenges and because this age range limited participants to a select group who had received transplants very early in life (under age 5). This secondary analysis of the BRIEF data from this larger multisite study was included in the present study to test concurrent validity for the construct of “executive functioning”.

Procedures

The larger multisite project was conducted as an ancillary study to the Studies of Pediatric Liver Transplantation (SPLIT) Registry and included 22 of the registry centers that elected to participate in this data collection. Patients from the SPLIT registry at these centers, who were between 2 and up to 18 years of age, were recipients of liver transplantation, and who had survived at least 12 months following transplant were eligible. Eligible patients and parents/guardians were also required to be fluent in either English or Spanish. Children who were not maintaining regular medical follow-up with their transplant center and recipients of combined organ transplants, such as liver/small bowel or liver/kidney were also excluded. The study was approved by the Institutional Review Boards at participating centers and written informed consent was obtained from all parents or guardians, prior to participation. Assent was obtained from children older than age 11 as required by individual institutions.

Statistical Analyses

The feasibility of the PedsQL™ Cognitive Functioning Scale as an outcome measure for pediatric liver transplant patients was determined from the percentage of missing values for each item [32]. Scale internal consistency reliability was determined by calculating Cronbach's coefficient alpha [33]. Scales with reliabilities of 0.70 or greater are recommended for comparing patient groups, while a reliability criterion of 0.90 is recommended for analyzing individual patient scale scores [34].

Discriminant validity was determined utilizing the known-groups method. The known-groups method compares scale scores across groups known to differ in the health construct being investigated [32; 35]. In this study, independent samples *t*-tests were used to compare groups differing in known health status (pediatric liver transplant recipients and healthy children) on the PedsQL™ Cognitive Functioning Scale. We also explored comparisons between the Cognitive Functioning Scale for pediatric liver transplant patients and long-term pediatric cancer survivors using independent samples *t*-tests. In order to determine the magnitude of the differences between pediatric liver transplant patients and the healthy and cancer survivors samples, effect sizes were calculated [36]. Effect size as utilized in these analyses was calculated by taking the mean difference between the two samples being compared, divided by the pooled standard deviation. Effect sizes for differences in means are designated as small (.20), medium (.50), and large (.80) in magnitude [36].

Construct validity was examined through an analysis of Pearson's Product Moment Correlations among the PedsQL™ Cognitive Functioning Scale and the PedsQL™ 4.0 Generic Core Scales. Computing the intercorrelations among scales provides additional information on the construct validity of an instrument [37]. Concurrent validity was examined through an analysis of Pearson's Product Moment Correlations between the PedsQL™ Cognitive Functioning Scale and the BRIEF for the subset of participants ages 5 to 7 years who were administered the BRIEF as part of the larger study. Pearson's Product Moment Correlations effect sizes are designated as small (.10-.29), medium (.30-.49), and large (.50) [36].

For the 212 cases for which both child self-report and parent proxy-report were available, agreement was determined through Intraclass Correlation Coefficients (ICCs) [38]. The ICC provides an index of absolute agreement given that it takes into account the ratio between subject variability and total variability [38]. ICCs are designated as .40 poor to fair agreement, 0.41-0.60 moderate agreement, 0.61-0.80 good agreement, and 0.81-1.00 excellent agreement [39]. Statistical analyses were conducted using SPSS 16.0 [40].

Results

Feasibility: Missing Item Responses

For patient self-report and parent proxy-report, the percentage of missing item responses for the pediatric liver transplant sample on the PedsQL™ Cognitive Functioning Scale was 0.0% and 0.67%, respectively.

Internal Consistency Reliability

Internal consistency reliability coefficients for the PedsQL™ Cognitive Functioning Scale are presented in Table 1. Both the child self-report ($\alpha = 0.88$) and parent proxy-report ($\alpha = 0.94$) scales exceeded the minimum reliability standard of 0.70 required for group comparisons and approached or exceeded the reliability criterion of 0.90 recommended for analyzing individual patient scale scores.

Discriminant Validity

Table 1 presents the means and standard deviations of the PedsQL™ Cognitive Functioning Scale scores for patient self-report and parent proxy-report for pediatric liver transplant patients, healthy children, and pediatric cancer survivors. Pediatric liver transplant patients and their parents reported significantly lower cognitive functioning than healthy children. Effect sizes approached the medium range for child self-report and the large range for parent proxy-report. Pediatric liver transplant patients and their parents reported comparable cognitive functioning to pediatric cancer survivors.

Construct Validity

Table 2 shows the intercorrelations among the PedsQL™ Cognitive Functioning Scale and the PedsQL™ 4.0 Generic Core Scales for child self-report and parent proxy-report. More impaired cognitive functioning was significantly correlated with more impaired generic HRQOL. All correlations were in the large effect size range, with the exception of Physical Health which was in the medium range for both patient self-report and parent proxy-report.

Concurrent Validity

Table 3 presents the correlations between the PedsQL™ Cognitive Functioning Scale (parent proxy-report) and parent and teacher proxy-reported BRIEF scores. All Parent BRIEF scores were significantly correlated with the PedsQL™ Cognitive Functioning Scale, with the largest intercorrelations demonstrated on the Global Executive Composite (-0.71), Metacognition Index (-0.75) and Working Memory subscale (-0.73). Effect sizes were mainly in the larger effect size range. All Teacher BRIEF scores, with the exception of the Shift subscale, were significantly correlated with the PedsQL™ Cognitive Functioning Scale. Effect sizes were mainly in the medium effect size range.

Parent/Child Agreement

The ICC between pediatric liver transplant patients and their parents on the PedsQL™ Cognitive Functioning Scale was in the moderate agreement range (ICC = 0.57).

Discussion

The findings support the feasibility, reliability, discriminant, construct, and concurrent validity of the PedsQL™ Cognitive Functioning Scale as a patient self-report and parent proxy-report cognitive functioning measurement instrument for pediatric liver transplant recipients. In the iterative process of scale validation, these data further validate the PedsQL™ Cognitive Functioning Scale in a population at risk for cognitive impairments. To our knowledge, the PedsQL™ Cognitive Functioning Scale is the only empirically validated generic symptom-specific instrument to measure cognitive functioning across pediatric populations that spans a broad age range for child self-report and parent proxy-report while maintaining item and scale construct consistency. This consistency facilitates the evaluation of differences in cognitive functioning across and between age groups, as well as the tracking of cognitive functioning longitudinally when utilizing the PedsQL™ Cognitive Functioning Scale.

Items on the PedsQL™ Cognitive Functioning Scale had minimal missing responses. The PedsQL™ Cognitive Functioning Scale patient self-report and parent proxy-report internal consistency reliabilities exceeded the minimum standard of 0.70 for group comparison, and approached or exceeded an α of 0.90, recommended for individual patient analysis [34], making the Cognitive Functioning Scale suitable as a patient self-reported and parent proxy-report measure of cognitive functioning in clinical trials and other group comparisons.

Our finding that pediatric patients with liver transplants and their parents demonstrated moderate agreement is consistent with the empirical literature [41], suggesting that information provided by proxy-respondents is not equivalent to that reported by the patient. In the HRQOL measurement of children with and without chronic illness, imperfect agreement between self-report and proxy-report has been consistently documented, particularly for less observable or internal symptoms such as cognitive functioning [42]. While pediatric patient self-report should be considered the standard for measuring perceived HRQOL, there may be circumstances when the child is too young, too cognitively impaired, or too ill to complete a PRO instrument, and parent proxy-report may be needed in such cases [43].

Pediatric patients with liver transplants experienced cognitive functioning not only significantly lower than healthy children, but also comparable to long-term pediatric cancer survivors, a group of patients previously identified as evidencing significant cognitive impairments [23-26], demonstrating the relative severity of their cognitive functioning impairment. It is not known at this time if the decreased cognitive functioning in the pediatric liver transplant population results from severe illness during a time of active brain development, subtle neurocognitive effects from chronic liver disease, post transplant exposure to immunosuppressive medications, or other factors.

The PedsQL™ Cognitive Functioning Scale correlations with the BRIEF in the present study are very similar to the correlations found in the previous study of pediatric patients with traumatic brain injury [9]. In the study of traumatic brain injury patients ages 5 to 15 years [9], the PedsQL™ Cognitive Functioning Scale intercorrelations with the BRIEF were mostly in the large effect size range, similar to the present study. These concurrent validity findings suggest that the 6-item PedsQL™ Cognitive Functioning Scale, although very brief, measures important aspects of the executive functioning construct as measured by the widely validated 72-item BRIEF. Thus, while the BRIEF may provide a more comprehensive assessment of executive functioning through parent and teacher proxy-reporting, the current findings suggest that the PedsQL™ Cognitive Functioning Scale may be particularly useful in screening for executive functioning impairments. Additionally, the PedsQL™ Cognitive Functioning Scale includes self-report versions for ages 5-18 years. Future validation work should assess concurrent validity of the PedsQL™ Cognitive Functioning Scale across additional cognitive domains to determine whether other cognitive constructs in addition to executive functioning are measured by the PedsQL™ Cognitive Functioning Scale.

These findings have several potential limitations. Information on nonparticipants and participants' socioeconomic status (SES) were not available, which may limit the generalizability of the findings given the previous demonstration of the association of SES with HRQOL [44]. The comparisons between the liver transplant sample and the cancer sample were only matched on age and not on other sociodemographic characteristics including gender and race/ethnicity given the small sample sizes available for the cancer sample. However, the findings are consistent with the extant literature on cognitive functioning in pediatric patients with liver transplants. A subset of participants completed the U.S. Spanish version of the PedsQL™ Cognitive Functioning Scale; however, a breakdown of the numbers who completed the English version versus the U.S. Spanish version was not available from this large multisite study. Nevertheless, previous research has demonstrated the factorial invariance of the PedsQL™ across English and Spanish language forms [45].

It has always been the intent of the PedsQL™ Measurement Model [46] to measure complex constructs with the fewest number of items empirically determined, for the broadest age

range possible, in order to reduce respondent burden. The utility of the 6-item PedsQL™ Cognitive Functioning Scale as an easy to administer and score, reliable and valid measure of executive functioning in pediatric liver transplant recipients is supported by the current findings, with potential implications for widespread use in this population at-risk for cognitive impairments.

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Table 1

PedsQL™ Cognitive Functioning Scale Scores for Pediatric Liver Transplant Sample and Comparisons with Long-Term Pediatric Cancer Survivors and Healthy Samples

	Liver Transplant Recipients ^a				Long-Term Cancer Survivors ^b			Healthy Sample ^c			Mean Difference	a vs. b Effect Size	a vs. c Effect Size
	n	α	Mean	SD	n	Mean	SD	n	Mean	SD			
PedsQL™ Cognitive Functioning Scale													
Child Self-Report	215	0.88	72.19	22.67	58	76.50	20.86	177	82.08	16.97	a<c***	0.19	0.49
Parent Proxy-Report	499	0.94	72.40	23.65	76	76.20	22.29	113	90.05	14.66	a<c***	0.16	0.79

Note:

* p<.05,

** p<.01,

*** p<.001.

Effect sizes are designated as small (.20), medium (.50), and large (.80).

Higher scores indicate better cognitive functioning.

α = Cronbach internal consistency reliability coefficient alpha.

Table 2

Intercorrelations among PedsQL™ Cognitive Functioning Scale and PedsQL™ 4.0 Generic Core Scales for Pediatric Liver Transplant Sample

	Patient Self-Report	Parent Proxy-Report
PedsQL™ 4.0 Generic Core Scales	PedsQL™ Cognitive Functioning Scale	PedsQL™ Cognitive Functioning Scale
Total Scale Score	0.67 ***	0.61 ***
Physical Health	0.42 ***	0.38 ***
Psychosocial Health	0.71 ***	0.67 ***
Emotional Functioning	0.60 ***	0.53 ***
Social Functioning	0.53 ***	0.59 ***
School Functioning	0.68 ***	0.59 ***

Note:

*
p<.05,

**
p<.01,

p<.001.

Effect sizes are designated as small (0.10), medium (0.30), and large (0.50) for Pearson's Product Moment Correlations.

Table 3

Intercorrelations between the PedsQL™ Cognitive Functioning Scale and Parent and Teacher BRIEF Scores

	Parent Proxy-Report		Parent Proxy-Report
Parent BRIEF Scores	PedsQL™ Cognitive Functioning Scale	Teacher BRIEF Scores	PedsQL™ Cognitive Functioning Scale
Behavioral Regulation Index	-0.55 ***	Behavioral Regulation Index	-0.33 *
Metacognition Index	-0.75 ***	Metacognition Index	-0.48 ***
Global Executive Composite	-0.71 ***	Global Executive Composite	-0.47 ***
Inhibit score	-0.57 ***	Inhibit score	-0.36 **
Shift score	-0.49 ***	Shift score	-0.04
Emotional Control score	-0.41 **	Emotional Control score	-0.32 *
Initiate score	-0.59 ***	Initiate score	-0.44 **
Working Memory score	-0.73 ***	Working Memory score	-0.48 ***
Plan/Organize score	-0.67 ***	Plan/Organize score	-0.44 **
Organization of Materials score	-0.42 ***	Organization of Materials score	-0.48 ***
Monitor score	-0.63 ***	Monitor score	-0.39 **

Note:

*
p<.05,**
p<.01,***
p<.001.

BRIEF = Behavior Rating Inventory of Executive Function.

Effect sizes are designated as small (0.10), medium (0.30), and large (0.50) for Pearson's Product Moment Correlations.