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Laboratory Investigation

Validation of Pediatric Functional Assessment of Cancer Therapy Questionnaire (Version 2.0) in Brain Tumor Survivor Aged 13 Years and Older (Parent Form) (PedsFACT-BrS Parent of Adolescent)

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Objective : The aim of this study was to evaluate the reliability and validity of the Pediatric Functional Assessment of Cancer Therapy Questionnaire Brain Tumor Survivor (version 2.0) Aged 13 years and older (Parent Form) (pedsFACT-BrS parent of adolescent).

Methods : The pedsFACT-BrS parent of adolescent was translated and cross-culturally adapted into Korean, following standard Functional Assessment of Chronic Illness Therapy (FACIT) methodology. The psychometric properties of the pedsFACT-BrS parent of adolescent were evaluated in 170 brain tumor patient's mothers (mean age=43.38 years). Pretesting was performed in 30 mothers, and the results indicated good symptom coverage and overall comprehensibility. The participants also completed the Child Health Questionnaire Parent Form 50 (CHQ-PF-50), Neuroticism in Eysenck Personality Questionnaire, and Karnofsky score.

Results : In validating the pedsFACT-BrS parent of adolescent, we found high internal consistency, with Cronbach's α coefficients ranging from 0.76 to 0.94. The assessment of test-retest reliability using intraclass correlation coefficient revealed satisfactory values with ICCs ranging from 0.84 to 0.93. The pedsFACT-BrS for parent of adolescent also demonstrated good convergent and divergent validities when correlated with the Child Health Questionnaire Parent Form 50 (CHQ-PF-50) and the Neuroticism in Eysenck Personality Questionnaire. The pedsFACT-BrS parent of adolescent showed good clinical validity, and effectively differentiated between clinically distinct patient groups according to the type of treatment, tumor location, shunt, and Karnofsky score of parent proxy report.

Conclusion : We confirmed that this reliable and valid instrument can be used to properly evaluate the quality of life of Korean adolescent brain tumor patients by their parents' proxy report.

Key Words : Quality of life · Adolescent brain tumor patient · pedsFACT-BrS parent of adolescent · Validity.

INTRODUCTION

Parents are recognized as one of the main sources of emotional support for children with cancer[15]. Many children with cancer currently receive a large proportion of their treatment at home, placing an added burden of care on family members[9]. Unlike adult measures of quality of life (QOL) in the patients, which rely on self-reporting, measures of QOL in children may use self-reporting, proxy reporting, or both[20]. Clinicians often rely on parents for guidance regarding their child's health-related quality of life (HRQOL) as they play an important role in medical decision making[8]. Even when a child's responses are available, the perspective of parent has an important bearing a health care decision with respect to the child[8]. Although parents don't always concur on all aspects of the child's HRQOL, they are more reliable than other proxies such as teachers and health professionals[21]. For these reasons, parallel reporting is increasingly recommended in studies involving the assessment of health outcomes in child populations with analogous questionnaires for children and their parents being developed[8].

In case of child brain tumor (BT) patients, many health outcome studies in pediatric psycho-oncology have excluded child BT patients from study participation, as their experiences were

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considered atypical to that of the majority of pediatric survivors[1,11,18], and because none were designed specifically for survivors of childhood brain tumors[11]. In 2007, Palmer and co-workers[17] presented the 24-item PedsQLTM BT module, and Lai and colleagues[11] also developed the 34-item Patient and Parent Version (ages 7-12 years; grade school) of the Pediatric Functional Assessment of Cancer Therapy-BT Survivor (pedsFACT-BrS) for assessing HRQOL of child BT patients, and has been extended to adolescent for both patient and parent since then.

Tao and Parsons[22] suggested that brevity, instrument practicality (e.g., length of questionnaire; language suitability; age-appropriateness), and ease of administration is needed particularly in busy clinical settings, when selecting a HRQOL instrument for a study, and the pedsFACT-BrS has the advantage of these criterions.

Table 1. Demographic and clinical characteristics of 170 adolescent brain tumor patients and their parent

Variables	Mean (SD, %)
Parents of adolescent brain tumor patients	
Mean age of parent	43.98 (3.54)
Mean age of education	12.97 (2.08)
Marital status	
Married	168 (98.8)
Divorced	2 (1.2)
Occupation status	
Homemaker	165 (97.1)
Full time	3 (1.8)
Part time	2 (1.1)
Adolescent brain tumor patients	
Sex	
Male	99 (58.2)
Female	71 (41.8)
Mean age (SD)	15.34 (2.26)
Mean age of education (SD)	13.14 (2.32)
Pathology	
Medulloblastoma/PNET	25 (14.7)
Malignant glioma	22 (12.9)
Low-grade glioma	33 (19.4)
Other low grade neoplasm	44 (25.9)
Germ cell tumor	46 (27.1)
Treatment received	
Surgery only	73 (42.91)
Surgery+chemotherapy+radiotherapy	48 (28.2)
Surgery+radiotherapy	49 (28.8)
Location	
Supratentorial	111 (65.3)
Infratentorial	59 (34.7)
Shunt	
Yes	33 (19.4)
No	137 (80.6)
Currently receiving treatment	
Yes	38 (22.4)
No	132 (77.6)

PWD : physical well-being, SFWB : socal/family well-being, EWB : emotional well-being and illness experience, BTS : brain tumor survivor-specific concerns, PSF : psychosocial function (SFWB+EWB), pedsFACT-Brs : pedsFACT-Brs total score

Until now, we had finished the validation studies of the brain tumor-specific tool for measurement of childhood BT survivors' QOL, the patient's version of both the pediatric functional assessment of cancer therapy questionnaire (version 2.0) in brain tumor survivors aged 7-12[26], and aged 13 years and older[25], and then we found that these tools could be reliable and valid instruments.

The value of proxy reporting is still controversial[19]. Before we started the validation study of pedsFACT-BrS parent form, we investigated the agreement between self-report from pediatric brain tumor patients and proxy reports from their parents whether it would be necessary to perform the validation study of both pedsFACT-BrS age 7-12 and aged 13 years and older(parent form) or not[26]. According to the result of Yoo et al.[26], the proper use of the pedsFACT-BrS for their parent proxies had provided clinicians with valid information about the overall QOL of child and adolescent BT patients, including their general health and their brain tumor specific well-being, so we have performed the validation study of pedsFACT-BrS aged 7-12 and aged 13 and older parent proxy version individually. This study was at first to evaluate the reliability and validity of the Pediatric Functional Assessment of Cancer Therapy Questionnaire Brain Tumor Survivor (version 2.0) Aged 13 years and older (Parent Form) (pedsFACT-BrS parent of adolescent) before investigation of the long-term follow-up HRQOL study for adolescent BT patients.

MATERIALS AND METHODS

Subjects

We enrolled 170 adolescent brain tumor patients' mothers (Table 1). The patients were recruited from Asan medical center (n=72), Severance children's hospital (n=62), Seoul National university hospital (n=24), and National cancer center (n=12). All mothers with patients returning for routine follow-up appointments were consecutively asked to enroll between December 2006 and December 2009. Parents were excluded if they had pre-existing cognitive impairment, psychiatric disorders, or hearing loss. Informed consent was obtained from all participants. As previous childhood studies contained only small numbers of cases, we decided to perform a multicenter study. As was in Yoo et al.'s[25] result, the patients' frequencies of tumor pathologic subtypes in this study were similar to those reported for the American population[1,7] and for earlier Korean populations[10], except that the proportion of germ cell tumor patients (27.1%) was particularly high in our sample. We considered the incidence in the East was between 2.1-9.4%, which seemed noticeably higher than in the West, and in particular, the incidence of Korea and Japan was much higher than that of other eastern countries[3].

Assessment tool

pedsFACT-BrS parent of adolescent

The pedsFACT-BrS adolescents consisted of 37 items: 25 generic concerns [7 on physical well-being (PWB), 13 on emotional well-being and illness experiences (EWB), 5 on social/family well-being (SFWB)], and 12 brain tumor survivor-specific concerns (the BTS questions)[11] (http://www.facit.org).

Development of the Korean pedsFACT-BrS parent of adolescent

The pedsFACT-BrS parent of adolescent was translated employing standard FACIT methodology[2]. A provisional version of the instrument was pre-tested on 30 mothers in total, 5 mothers each according to their children's age between 13 to 18 years during their follow-up clinic visits. Participants were asked to self-administer the questionnaires. Subjects were asked to write their opinions on the questions below that had made to clarify what and how many items made subjects discomfort.

1) Would you please tell me which items were difficult to understand and why they were difficult? Also, could you suggest a better way to phrase these items?

2) Would you please tell me which items were not relevant or were offensive, and why? Also, could you suggest a better way to phrase these items?

3) Is there anything else that should have been included related to your children's condition? Would you please tell me what should be added?

Reliability

Internal consistency coefficients were calculated for each subscale. We performed test-retests at intervals of 7-10 days in 30 mothers among the 170 subjects who agreed to complete the questionnaire twice.

Clinical validity

We determined discrimination of the pedsFACT-BrS parent of adolescent by comparing the pedsFACT-BrS parent of adolescent scores to Karnofsky scores, pathology, treatment type, tumor location, shunt, and treatment on/off status.

Convergent and divergent validity

Convergent and divergent validity were assessed by comparing patient responses with those on the neuroticism in EPQ[6,13] and mental health (MH), self-esteem (SE), physical functioning (PF) in Child health questionnaire[12,23].

Eysenck Personality Questionnaire[6,13]

We used the Korean version[13] of the short form of the EPQ[6] (KEPQ). The KEPQ-short form is composed of a total of 48 items, consisting of four scales [psychoticism (P), extraversion-introversion (E-I), neuroticism (N), and lying (L)] with 12 items each. Respondents were asked to check "yes" or "no" for each item, and each of the scales were summed. The Cronbach's alpha coefficients were 0.71 for P, 0.82 for E-I, 0.85 for N, and 0.80 for L. In this study, we analyzed only the N score.

Child health questionnaire-Parent version[12,23]

The CHQ, a multidimensional generic health-related quality of life instrument, was constructed to measure the physical and psychosocial well-being of children 5 years of age and older[12]. The CHQ-PF 50 is completed by the parent as proxy for the child[12,23]. This questionnaire provides thirteen separate scale scores : physical functioning (PF), role/social limitations-physical (RP), general health perception (GH), bodily pain (BP), family activities (FA), role/social limitation/emotional/behavioral (REB), time impact on parent (PT), emotional impact on parent (PE), self-esteem (SE), mental health (MH), behavior (BE), family cohesion (FC), and change in health (CH). We analyzed only the PF (α=0.78), MH (α=0.82), SE (α=0.74) in this study.

N, MH, and SE scores were used as measures of related concept (emotion). And PF was used as related concept (physical function), too. It was expected that correlations with N, MH, and SE should be stronger for EWB answers, moderate to low for PWB and BTS answers, because these are measures of emotion. And correlation with PF was expected to be stronger for PWB answers, moderate to low for SFWB and BTS, because PF is measure of physical function. According to Dawson et al.[5] a coefficient correlation value of 0.60-0.79 indicated a strong correlation and 0.40-0.59 a moderate correlation.

Procedures

The pedsFACT-BrS parent of adolescent questionnaire was administered verbally by research nurses to ensure that questions were always posed in the same manner. A research assistant was available to answer questions raised by participants during completion of the self-administered instruments at the outpatient clinic.

Statistical analyses

Descriptive statistics [means, standard deviation (SD), and frequencies] were calculated for all variables, and group differences were assessed using analysis of covariance, controlling statistics for mother age, and mother's educational age. Internal consistency reliability was assessed using Cronbach's alpha. The intraclass correlation coefficient (ICC) (Two-way random effect model absolute agreement definition) was used to assess instrument's test-retest reliability. Pearson product moment correlation was used to determine the convergent and divergent validities of pedsFACT-BrS parent of adolescent, including assessment of the overall scale, subscales. We classified patients into three groups based on Karnofsky score assessed by patient's mother; Karnofsky score of 100, 90, or 80.

The independent sample t-test and one-way ANOVA were employed to determine whether the test was able to discriminate across Karnofsky score assessed by patient's mother, shunt, tu-

mor location, type of treatment, and receiving-treatment status. Statistical analysis was conducted using standard SPSS Statistical Analysis System Version 16.0 software (SPSS Inc, Chicago, IL).

RESULTS

Pre-testing

All 30 mothers had reported that there were no difficult, irrelevant, or offensive items in pedsFACT-BrS parent of adolescent reported. And, they had no item that had been included related to their conditions. Cronbach's α coefficient showed acceptable internal consistency (0.7)[4], suggesting that translated items performed were well in association with other items in the same subscale.

Reliability

All Cronbach's α coefficients were ranging from 0.76 to 0.94 that exceeded Nunally's criterion[16] of 0.7 for modest reliability. The assessment of test-retest reliability using ICC revealed satisfactory values with ICCs ranging from 0.84 to 0.93 (Table 2). An ICC value of 0.7 or greater was considered to indicate acceptable reliability[4,14].

Validity

None of age, age of education showed significant associations with total QOL. Pathological diagnosis was not significantly associated with total QOL.

Convergent and divergent validity

We hypothesized that the EWB was strongly correlated with MH and SE scores (convergent validity), whereas SFWB and BTS were associated to a lesser degree with such assessments (divergent validity). It was hypothesized that the PWB was strongly correlated with PF scores (convergent validity), whereas SFWB and BTS were associated to a lesser degree with such assessments (divergent validity). Correlations greater than 0.40 have been considered to be satisfactory convergent validity. Conversely, for adequate divergent validity, scales measuring different constructs should show low correlations, well under 0.40.27) Correlations between EWB and N (r=-0.72), between EWB and MH (r=0.60), and between EWB and SE (r=0.62) were stronger that we had expected, reflecting measurement of the same phenomenon. In contrast, correlations between SFWB and MH (r=0.32), between BTS and MH (r=0.14), between BTS and SE (r=0.29) were low, indicating that different phenomena were being addressed. Correlations between PWB and PF (r=-0.78) was stronger than we had predicted, reflecting measurement of the same phenomenon. In contrast, correlations between BTS and PF (r=0.26) was low, indicating that different phenomenon was being addressed (Table 3).

Known group comparison

Overall questionnaire data (p<0.001) and subscale results (p<0.001) enabled discrimination by Karnofsky score. Analysis by treatment type revealed significant differences in PWB (p<0.001), SFWB (p<0.01), EWB (p<0.05), PSF (p<0.05), and overall scores (p<0.05) except BTS. Significant differences between tumor location (supratentorial vs. infratentorial) and between shunt-yes and shunt-no were seen in PWB (p<0.001), EWB (p< 0.05), PSF (p<0.05), and overall scores (p<0.05). Finally, significant differences between treatment-on and treatment-off status were also seen in PWB (p<0.001), SFWB (p<0.05), EWB (p<0.01), BTS (p<0.05), PSF (p<0.01), overall scores (p<0.001) (Table 4).

Table 2. Means, standard deviations, internal consistencies, and test-retest reliabilities

	Mean (SD)	Cronbach's α	Test-retest reliability (ICC, 95% CI)
PWB (7 questions)	20.99 (6.14)	0.86	0.84 (0.71-0.92)
SFWB (5 questions)	12.43 (3.81)	0.76	0.89 (0.78-0.94)
EWB (13 questions)	28.73 (7.21)	0.85	0.85 (0.70-0.93)
BTS (12 questions)	35.63 (9.45)	0.86	0.89 (0.78-0.95)
PSF (18 question)	42.12 (21.96)	0.89	0.91 (0.80-0.95)
Peds FACT-BrS (37 questions)	98.70 (9.91)	0.94	0.94 (0.88-0.97)

BTS : brain tumor survivor-specific concerns, EWB : emotional well-being and illness experiences, PWB : physical well-being, SFWB : social/family well-being, pedsFACT-BrS : pedsFACT-BrS total score, PSF : psychosocial function (SFWB+EWB)

Table 3. Correlations of pedsFACT-BrS answers with N, PF, MH, SE, and GH

variables	SFWB	EWB	BTS	Peds-FACT-BrS	N	PF	MH	SE
PWB	0.50	0.51	0.51	0.76	-0.52	0.78	0.30	0.51
SFWB	1	0.49	0.58	0.82	-0.46	0.45	0.32	0.50
EWB		1	0.53	0.81	-0.72	0.42	0.60	0.62
BTS			1	0.88	0.48	0.26	0.14	0.29
Peds-FACT-BrS				1	-0.71	0.56	0.34	0.58

PF : physical functioning, MH : mental health, SE : self-esteem, N : neuroticism

DISCUSSION

The results presented here show the good psychometric properties of the Korean version of the pedsFACT-BrS parent of adolescent, including internal consistency, test-retest reliability, good convergent and divergent validity, and known group validity. As expected, the correlations among EWB, N, MH, and SE subscales showed that essentially the same phenomenon (emotion) was being measured. N, MH, SE scores were correlated well with EWB scores (convergent validity) and poorly with SFWB and BTS (divergent validity). The correlations between PWB and PF subscales showed that essentially the same phenomenon (physical function) was being measured. PF score was correlated well with PWB scores (conver-

Table 4. Differences in pedsFACT-BrS scores according to Karnofsky scores, treatment type, location, shunt, and treatment on/off status

Variables	N	PWB	SFWB	EWB	BTS	PSF	PedsFACT-BrS
Karnofsky							
100	63	25.13 (3.09)	14.53 (2.42)	28.04 (6.61)	41.68	42.57 (7.51)	109.38 (14.71)
90	58	21.18 (4.26)	12.85 (3.08)	25.23 (5.87)	33.93	38.09 (8.10)	92.07 (17.53)
80	48	15.02 (6.61)	10.78 (3.62)	21.12 (7.06)	33.17	31.90 (9.64)	80.85 (19.63)
F-value		48.93***	16.52***	12.42***	16.01***	17.68***	30.61***
		(1>2>3)	(1>2>3)	(1>2,3)	(1>2,3)	(1>2>3)	(1>2>3)
Treatment type							
Surgery	73	23.49 (4.37)	13.42 (3.23)	26.17 (6.34)	36.12 (9.14)	57.85 (11.98)	99.21 (19.28)
S+R	48	18.91 (6.15)	11.75 (4.13)	23.80 (7.34)	36.12 (8.72)	52.11 (14.29)	90.58 (20.32)
S+R+C	49	19.58 (7.10)	11.73 (3.76)	23.76 (7.81)	34.29 (10.75)	51.49 (45.82)	88.86 (25.62)
F-value		13.43***	4.68**	2.82*	0.56	4.34*	4.42*
		(1>2,3)	(1>2,3)	(1>2,3)	(1,2,3)	(1>2,3)	(1>2,3)
Location							
Supratentorial	111	18.96 (4.67)	12.71 (3.99)	25.64 (6.79)	35.99 (9.46)	38.36 (9.51)	96.59 (21.49)
Infratentorial	59	15.45 (6.32)	11.86 (3.46)	23.10 (7.67)	34.71 (9.49)	34.97 (10.36)	88.13 (22.09)
T-value		4.26***	1.45	2.31*	0.87	2.23*	2.52*
Shunt							
Yes	33	18.45 (6.73)	11.86 (3.46)	23.11 (7.67)	34.71 (9.49)	34.97 (10.36)	88.14 (22.10)
No	137	22.37 (5.35)	12.71 (3.99)	25.64 (6.79)	35.99 (9.46)	38.36 (9.51)	96.60 (21.49)
T-value		4.04***	1.50	2.23*	0.84	2.18*	2.50*
Treatment							
On	38	18.24 (6.27)	11.71 (2.88)	22.96 (5.79)	33.27 (8.24)	50.76 (10.38)	86.18 (16.37)
Off	132	22.38 (5.47)	12.80 (4.04)	25.69 (7.45)	36.76 (9.59)	56.16 (14.96)	97.52 (22.57)
T-value		-4.25***	-2.01*	-2.65**	-2.48*	-2.79**	-3.79***

*$p<0.05$, **$p<0.01$, ***$p<0.001$. S+R : surgery+radiotherapy, S+R+C : surgery+radiotherapy+chemotherapy

gent validity) and poorly with BTS (divergent validity).

Known group validities were confirmed by Karnofsky score, type of treatment, tumor location, presence of shunt, and receiving-treatment status. The parent report in this study indicated that the surgery-only group showed the highest scores in all subscales and on overall pedsFACT-BrS parent of adolescent mean score except BTS, however there was no significant difference between surgery+radiotherapy group and surgery+radiotherapy+chemotherapy group .

We could not compare our results directly with any previous report because no studies on the QOL of adolescent-only BT patients have been conducted except our adolescent patient group's report[25]. Our results were very similar to those of adolescent BT patients[25] except SFWB. And, though our results were similar to those of Bhat and colleagues[1], we did not have a no-treatment group or a radiotherapy-only group in our study. Therefore, further research is needed to compare the QOL of BT patients according to their treatment type such as surgery-only, radiation-only, or other treatments.

In this study, tumor location and presence of shunt affected PWB, EWB, PSF, overall scores except SFWB, and BTS. Mothers with patients with infratentorial tumor or presence of shunt indicated that their children indicated lower physical function, psychosocial function, and overall HRQOL than mothers with patients with supratentorial or non-presence of tumor group. Our results were partially similar to those of Bhat and colleagues[1] study, because parents in their study reported that patients who had a shunt also indicated lower physical ($p<0.05$) and psychosocial functioning ($p<0.01$).

But, in Bhat et al.[1] study, parents reported that patients who had a shunt indicated decreased social functioning ($p<0.05$), which was different from our result. In tumor location, Bhat et al's[1] study didn't show the significant difference between supratentorial group and infratentorial group either in self-reports or parent proxy reports, and that children with infratentorial tumor had significantly more problems communicating issues related to their illness than children with supratentorial tumors.[1]

The difference between Bhat et al.[1] and our study was probably due to the difference of brain tumor patients' mean age level. Bhat et al's[1] patient mean age was 11.82 (SD=5.39) (child group), whereas the mean age of the patients in this study was 15.37 (SD=2.23) (adolescent group). These differences indicated that children and adolescent might have different concerns with respect to their HRQOL[25].

The limitation of the present study is exclusion of fathers in the parent group. Although Russell et al.[20] also revealed that no significant difference in QOL outcomes when maternal and paternal influences were considered[9], we tried to enroll fathers in this study at the start, but we concluded that caregivers of adolescent BT patients in Korea were mostly their mothers, not their fathers.

CONCLUSION

The present results suggest that the Korean translation of the pedsFACT-BrS parent of adolescent is a reliable and valid instrument for measuring the QOL of Korean adolescent BT patients. Further research is needed not only to determine whether the questionnaire remains efficient and sensitive to detect longitudinal QOL changes in adolescent BT parent overall, but also whether it is suitable for detecting longitudinal QOL changes within homogeneous patient groups, such as those with medulloblastoma, or according to treatment type. It is also needed that the validation study of pedsFACT-BrS aged 7-12 parent form also has to be performed in near future.

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