

Turkish validity and reliability study of the Weiss Functional Impairment Rating Scale-Parent Report

Mahmut C. Tarakçıoğlu · Nursu Çakın Memik ·
Nesligül N. Olgun · Ömer Aydemir ·
Margaret D. Weiss

Received: 16 July 2014 / Accepted: 18 November 2014 / Published online: 27 November 2014
© Springer-Verlag Wien 2014

Abstract Attention deficit hyperactivity disorder (ADHD) is seen frequently in childhood and leads to marked impairment in functioning. There is no scale in Turkey with documented validity and reliability that assesses ADHD-specific functional impairment (FI). This study aimed at adapting the Weiss Functional Impairment Rating Scale-Parent Report (WFIRS-P), which assesses ADHD-related FI, for use in Turkey, and examining psychometric aspects of the scale. The study included 250 children diagnosed with ADHD and 250 healthy children and their parents. Internal consistency and test–retest methods were used to test the reliability of the scale. Validity was tested with exploratory and confirmatory factor analyses and convergent and discriminant validity analyses. Since all six questions of the WFIRS-P were scored 0, analyses were conducted for the original scale questionnaire consisting of 50 items and the questionnaire consisting of 44 items where the six questions scored 0 were not included. The Cronbach’s alpha coefficient was 0.93 for the whole scale. The Spearman’s correlation coefficient was 0.93 for test–retest reliability. The

exploratory factor analysis run on the 44-item questionnaire showed that the scale items were best represented in a 7-factor structure, but some items were placed in different subdomains than those of the original scale. In the confirmatory factor analysis, the root mean square error of approximation was 0.061, and the comparative fit index was 0.95 for the whole model. Therefore, the Turkish WFIRS-P is valid and reliable in testing functional impairment in children with ADHD.

Keywords ADHD · Functioning · Validity · Reliability · Scale · Quality of life

Introduction

Attention deficit hyperactivity disorder (ADHD) is a widely seen (Pastor and Reuben 2008) neurobehavioral disorder that begins in early childhood and progresses with symptoms that negatively affect daily living functions in many aspects (Goldman et al. 1998). For a diagnosis of ADHD, functional impairment (FI) related to the symptoms must occur in at least two settings (at home and at school or work; American Psychiatric Association 2013).

Impairments occur in many areas of functioning in ADHD and may continue through adulthood (Barkley et al. 2002). The FI experienced by patients with ADHD in school, social abilities, and family relationships negatively affect patients, their families, and the community (Haack and Gerdes 2011).

Assessing an individual’s functioning is critical in differentiating the disorder from a temporary or small problem, designing a treatment plan for the patient, identifying treatment targets, and estimating future adaptive functions and prognosis (Haack and Gerdes 2011).

M. C. Tarakçıoğlu (✉)
Child and Adolescent Psychiatry Department, Bakırköy Dr. Sadi Konuk Education and Research Hospital, Istanbul, Turkey
e-mail: mtarakcioglu@hotmail.com

N. Çakın Memik · N. N. Olgun
Child and Adolescent Psychiatry Department, University of Kocaeli Medical School, Izmit, Turkey

Ö. Aydemir
Psychiatry Department, University of Adnan Menderes Medical School, Aydın, Turkey

M. D. Weiss
Weiss Clinic for ADHD Care, West Vancouver, BC, Canada

In addition to symptom assessment, systematic evaluation of functioning by specialists who work in the field of ADHD is also important. The lack of a comprehensive and practical functional impairment scale for ADHD makes it difficult to assess not only ADHD but also appropriate treatments (Haack and Gerdes 2011). Although general functional impairment scales, which evaluate functional impairment, are used all over the world, in Turkey, few scales that evaluate disease-related functional impairment are available. The Weiss Functional Impairment Rating Scale (WFIRS) measures functional impairment in ADHD, is valid in an ADHD sample, and has been used in randomized controlled studies (Maziade et al. 2009; Stein et al. 2011; Hantson et al. 2012; Coghill 2011; CADDRA 2011). There is no scale in Turkey with documented validity and reliability that assesses ADHD-specific functional impairment that can be used in childhood and adolescence. The availability of a valid and reliable scale measuring ADHD-related functioning in Turkey is important. This study aims at conducting a validity and reliability study with Turkish children to adapt the Weiss Functional Impairment Rating Scale-Parent Report (WFIRS-P) for use in Turkey.

Methods

Sample

The study sample consisted of two groups. The first group included patients who presented to the Child and Adolescent Mental Health and Diseases Clinic of Kocaeli University and were diagnosed with ADHD. The second group included healthy students who formed the control group. The children and adolescents in both groups and their parents were given information about the study by having them read the information form; they were also asked to read the informed consent form and sign it.

Selecting the ADHD group

Children attending Grades 1 through 8 who presented to the Child Mental Health and Diseases Clinic of Kocaeli University Faculty of Medicine between September 2011 and June 2012, who were diagnosed with ADHD for the first time, and who agreed to participate in the study and their parents comprised the study group. Children who had been diagnosed with a mental disease other than ADHD and oppositional defiant disorder (ODD), which usually accompanies ADHD, who had used psychotropic drugs within the last 2 months, and whose parents did not have sufficient reading and writing skills to fill out the scale were excluded from the study. ADHD was diagnosed by

two clinicians according to the DSM-IV ADHD diagnostic criteria. The study conductor administered the Kiddie Schedule for Affective Disorders and Schizophrenia for School-Aged Children-Present and Lifetime Version (KSADS-PL-T) to the patients and one of their parents, and scores were given for the Children's Global Assessment Scale (CGAS) and Clinical Global Impressions-Severity Scale (CGI-S).

The sociodemographic characteristics of the 250 children and adolescents who were included in the study were assessed using a sociodemographic questionnaire prepared by the investigator. The parents were administered the WFIRS-P, Turgay's DSM-IV-based ADHD and Disruptive Behavior Disorders Screening Scale (T-DSM-IV-S), the Conners Parent Rating Scale-Short Form (CPRS-48), and the pediatric quality of life inventory (PedsQL). To evaluate the test-retest reliability of the WFIRS-P, it was administered again to 50 parents who agreed to fill out the questionnaire again 2 weeks after the first administration.

Selecting the control group

The children in the control group were selected from two schools attended by children from high and low socioeconomic backgrounds. All Grade 1 through 8 students were given the sociodemographic questionnaire, CPRS-48, and WFIRS-P to be completed by their parents. Those who had no history of mental or chronic physical disease in themselves or their siblings, who did not report any lesson failure or attention problems, and who received a score lower than the cutoff score on the CPRS-48 form were included in the study in the control group. The control group of 250 children was formed by random sampling in such a way that they would be similar in age and gender to the patient group.

Scales

Weiss Functional Impairment Rating Scale

This scale evaluates ADHD-related functional impairment. It was developed by Dr. Margaret Weiss and included in the guidelines of the Canadian ADHD Association (CADDRA). The scale has parent and self-report versions (CADDRA 2011).

The parent form of the scale (WFIRS-P) consists of 50 items to be filled out by parents. The subdomains included in the scale are family, school, life skills, child's self-concept, social activities, and risky activities. It is a 4-choice Likert-type scale scored from 0 to 3 (CADDRA 2011).

The Cronbach's alpha coefficient was 0.8. Domains were verified through factor analysis, and the school domain was divided into two domains: learning and

behavior. The scale has moderate convergent validity with the other functionality scales (CADDRA 2011).

Kiddie Schedule for Affective Disorders and Schizophrenia for School-Aged Children-Present and Lifetime Version

The KSADS-PL is a semi-structured interview scale that was developed by Kaufman et al. 1996 to rate mental disorders in children and adolescents between 6 and 18 years of age in accordance with the DSM-III-R and DSM-IV diagnostic criteria. The scale's validity and reliability in Turkey were tested (Gökler et al. 2004).

The Children's Global Assessment Scale

The CGAS is a frequently used, single-dimension general FI scale that is assessed by clinicians (Shaffer et al. 1983). The scale's validity and reliability in Turkey were tested (Gökler et al. 2004).

Clinical Global Impressions-Severity Scale

The CGI-S is a three-dimensional scale that was developed to assess the severity and prognosis of psychiatric disorders and the side effects associated with drug therapies for clinical research purposes (Guy 1976). The CGI-S that assesses the global severity of the disease was used in the present study.

Turgay's DSM-IV-based ADHD and Disruptive Behavior Disorders Screening Scale

The T-DSM-IV-S was developed by Turgay based on the DSM-IV diagnostic criteria; it rates disruptive behavior disorders. It consists of 41 questions to be answered by either parents or teachers (Turgay 1997). The scale was tested for validity and reliability in Turkish by Ercan et al. (2001).

Conners' Parent Rating Scale-Short Form

The CPRS-48 was developed for parents to rate their children's behaviors. It contains items related to hyperactivity, learning, and behavioral problems as well as psychosomatic problems and frustration. The scale contains 48 items, five on attention deficit, four on hyperactivity, four on oppositional defiant disorder, 11 on conduct disorder and 24 on other problems (Goyette et al. 1978). The scale was adapted to Turkish (Dereboyl et al. 2007).

Pediatric quality of life inventory

The PedsQL is a general quality of life scale that evaluates health-related quality of life in children and adolescents

aged between 2 and 18 (Varni et al. 2001). The scale has been tested for validity and reliability in Turkish (Uneri et al. 2008; Çakın Memik et al., 2007, 2008). The inventory includes 23 items. The items are scored between 0 and 100. Scores are given in three areas. First, the total score is calculated, then the physical health total score, and finally the psychosocial health total score, which is the sum of the scores of the items that rate emotional, social, and school functionality.

Translation process

To confirm the validity and reliability of the WFIRS-P in Turkish, written permission was obtained from Dr. Margaret Weiss who developed the scale. After ethics committee approval was obtained, the questionnaire was translated into Turkish by a researcher and an academician who had a good command of English and was working at the child mental health department; then, the questionnaire was reviewed by another academician. The reviewed text was translated back from Turkish to English by an academician who had a good command of English; the translated text was compared with the original scale by a different academician. Since there was no major difference in meaning, the scale was administered to 15 parents. Questions that were not understood or were inconsistent were reviewed and revised by the study staff, and the questionnaire was administered to the parents again. After the final revisions, the study was initiated.

Statistical analysis

The study data were analyzed using the Statistical Package for Social Sciences (SPSS) 17.0 for Windows and LISREL 8.54 statistical package programs. The results were assessed at the 95 % confidence interval and significance at $p \leq 0.05$.

Correlations between variables were explored using the Pearson correlation analysis for parametric variables and the Spearman correlation analysis for nonparametric variables. In the reliability analyses, for internal consistency, Cronbach's alpha coefficient was calculated. For item (total score analyses and subscale) total score analyses, correlations were obtained for every item using Pearson's or Spearman's correlation analyses (DeVellis 2003). For test-retest reliability, the scores of the two measures were subjected to Pearson's or Spearman's correlation analyses. When statistically significant correlation coefficients were obtained, correlation coefficients between 0.10 and 0.29 had a low correlation, correlation coefficients between 0.30 and 0.49 had moderate correlation, and correlation coefficients equal to 0.50 and over had high correlation (Cohen 1988).

If the values of the floor percentage, which is defined as the percentage of those who had the lowest score obtainable from a scale as a whole or from any subdomain of it, and the ceiling percentage, which is defined as the percentage of those who had the highest score, exceeded the limit value of 20 %, then the floor effect and the ceiling effect are discussed (DeVellis 2003).

In the validity analyses, for construct validity, exploratory and confirmatory factor analyses were performed. In exploratory factor analysis, the Kaiser–Meyer–Olkin (KMO) test was used to assess the adequacy of the sample size. As the value obtained from the KMO test, the necessary sample size is perfect, and when it drops below 0.5, it is unsuitable. The Bartlett test was run to see whether the sample structure was suitable for factor analysis. Obtaining a statistically significant result from the Bartlett test indicates that the data are suitable for factor analysis. Factors with an eigenvalue of 1.0 or greater and items with a loading >0.4 were considered (Netemeyer et al. 2003). In the confirmatory factor analysis run on Lisrel 8.54, the fit of the model obtained from the exploratory factor analysis was evaluated. The root mean square error of approximation (RMSEA) and the comparative fit index (CFI) were calculated as the indicators of fit. An RMSEA value below 0.5 indicates a good fit, a value between 0.05 and 0.08 an acceptable fit, a value between 0.08 and 0.1 a weak fit, and a value higher than 0.1 no fit. If the CFI value, which ranges between 0 and 1, is larger than 0.9, then the fit is good (Schumacker and Lomax 2004). In the concurrent validity, correlation analyses between the WFIRS-P subscale scores and the subscales of other study scales such as PedsQL, CGI-S, and CGAS were performed. In the discriminant validity analysis, the ADHD group was divided into three groups—mild (those with a CGI-S score of 3), moderate (those with a CGI-S score of 4), and severe (those with a CGI-S score of 5, 6 or 7)—according to the CGI-S, by using the known group method (Tyrer and Methuen 2007), the capability of the WFIRS-P total and subscales to discriminate the four patient groups, that is, the control group and the mild, moderate, and severe ADHD groups.

Results

Sociodemographic and clinical characteristics

Looking at the sociodemographic and clinical characteristics of the ADHD and control groups, no statistically significant difference was found between the two groups in terms of sociodemographic characteristics. The CPRS subdomain and overall scores were significantly higher statistically in the ADHD group compared with the control group (Table 1).

Table 1 Mean age and gender in ADHD and control groups

	ADHD (<i>n</i> = 250)	Control (<i>n</i> = 250)
Age	9.61 ± 2.18	9.85 ± 2.12
Gender		
Male	193 (77.2 %)	193 (77.2 %)
Female	57 (22.8 %)	57 (22.8 %)
Disease type		
ADHD-C	194 (77.6 %)	
ADHD-IA	41 (16.4 %)	
ADHD-HI	15 (6 %)	
CPRS		
Conduct problem*	10.03 ± 7.25	2.24 ± 2.67
Impulsive/hyperactive*	7.24 ± 2.97	4.02 ± 2.49
Learning problem/attention*	6.55 ± 2.66	1.71 ± 1.51
Total*	48.59 ± 20.30	17.83 ± 9.25

ADHD-C Combined type, *ADHD-IA* Mostly inattentive type, *ADHD-HI* Mostly hyperactive and impulsive type, *CPRS* Conners' Parent Rating Scale-Short Form

* Mann–Whitney *U* Test, *p* < 0.01

Validity study

Exploratory factor analysis

The KMO test was used, and the coefficient was 0.877, which shows that the sample size was adequate. According to Bartlett's test, the WFIRS-P items were suitable for factor analysis ($p \leq 0.001$). The factor analysis for the WFIRS-P was carried out for 44 items without including item 5 in the school-behavior subdomain and items 3, 4, 5, 6, and 8 in the risky activities subdomain since they were scored 0 (never) by all of the parents in the ADHD group.

In the ADHD group, 11 factors with an eigenvalue above 1 were found in the exploratory factor analysis. Based on the scree plot curve, variance percentages explained by the factors, appropriate distribution of items against factors, and conceptual structure of the scale, a 7-factor structure was acceptable. Items whose factor loads were >0.3 were analyzed, and all items were included under a single factor with a factor load >0.3 (Table 2).

As a result of the exploratory factor analysis, item 6 in the school-behavior subdomain, items 7, 9, and 10 in the life skills subdomain, item 4 in the social activities subdomain, and item 1 in the risky activities subdomain were included in the subdomains where the items fitted better according to their factor loads. The items included in the factors that were formed after the changes made are shown in Table 3 with the eigenvalue and total variance percentages. The seven factors explain 54.5 % of the total variance.

Table 2 Factor loads of WFIRS-P items in factor analysis (for 44 items)

	Factor load
Factor 1	
Family 1	0.47
Family 2	0.56
Family 3	0.69
Family 4	0.71
Family 5	0.60
Family 6	0.64
Family 7	0.70
Family 8	0.69
Family 9	0.61
Family 10	0.42
Factor 2	
Social activities 1	0.64
Social activities 2	0.75
Social activities 3	0.79
Social activities 5	0.67
Social activities 6	0.74
Social activities 7	0.61
Risky activities 1	0.45
Factor 3	
School-learning 1	0.82
School-learning 2	0.86
School-learning 3	0.81
School-learning 4	0.78
Factor 4	
School-behavior 6	
Life skills 1	0.54
Life skills 2	0.74
Life skills 3	0.74
Life skills 4	0.75
Life skills 5	0.32
Life skills 6	0.45
Life skills 8	0.32
Social activities 4	
Factor 5	
Life skills 10	0.31
Child's self-concept 1	0.66
Child's self-concept 2	0.69
Child's self-concept 3	0.67
Factor 6	
School-behavior 1	0.48
School-behavior 2	0.69
School-behavior 3	0.47
School-behavior 4	0.72
Factor 7	
Life skills 7	0.40

Table 2 continued

	Factor load
Life skills 9	
Risky activities 2	0.41
Risky activities 7	0.67
Risky activities 9	0.50
Risky activities 10	0.57

The items written in bold are placed in the subdomains where they fit the best according to factor loads

Table 3 WFIRS-P factor values (for 44 items)

Factor	Items included	Eigenvalue	Variance explained (%)
Factor 1	F1, F2, F3, F4, F5, F6, F7, F8, F9, F10	4.966	11.29
Factor 2	SA1, SA2, SA3, SA5, SA6, SA7, RA1	4.843	11.01
Factor 3	SL1, SL2, SL3, SL4	3.267	7.43
Factor 4	SB6, LS1, LS2, LS3, LS4, LS5, LS6, LS8, SA4	3.242	7.37
Factor 5	LS10, CSC1, CSC2, CSC3	2.924	6.65
Factor 6	SB1, SB2, SB3, SB4	2.668	6.06
Factor 7	LS7, LS9, RA2, RA7, RA9, RA10	2.072	4.71

F Family, SA Social activities, RA Risky activities, SL School-learning, SB School-behavior, LS Life skills, CSC Child's self-concept, WFIRS-P Weiss Functional Impairment Rating Scale-Parent Report

Confirmatory factor analysis

As a result of the confirmatory factor analysis, the CFI for the whole scale was 0.95, and the RMSEA was 0.061 for the WFIRS-P model.

Convergent validity analyses

When the correlation coefficients between the WFIRS-P total and subdomain scores and the T-DSM-IV-S scales in the ADHD group were examined, statistically significant correlations ranging from 0.28 to 0.50 were found between the WFIRS-P total and subdomain scores and the T-DSM-IV-S attention deficit score ($p \leq 0.01$; Table 4). Statistically significant correlations ranging from 0.23 to 0.48 were found between the WFIRS-P total and subdomain scores and the T-DSM-IV-S hyperactivity-impulsiveness score ($p \leq 0.01$; Table 4). Statistically significant correlations ranging from 0.30 to 0.59 were found between the WFIRS-P total and subdomain scores and the T-DSM-IV-S ADHD total score ($p \leq 0.01$; Table 4).

When the correlation coefficients between the WFIRS-P total and subdomain scores and the PedsQL scores in the ADHD group were examined, statistically significant correlations ranging from -0.13 to -0.33 were found between the WFIRS-P total and subdomain scores and the PedsQL physical health score ($p \leq 0.05$, $p \leq 0.01$; Table 5). Statistically significant correlations ranging from -0.40 to -0.64 were found between the WFIRS-P total and subdomain scores and the PedsQL psychosocial health total score ($p \leq 0.01$; Table 5). Statistically significant correlations ranging from -0.39 to -0.61 were found between the WFIRS-P total and subdomain scores and the PedsQL total score ($p \leq 0.01$; Table 5).

When the correlation coefficients between the WFIRS-P overall and subdomain scores and the CGI-S score in the ADHD group were examined, statistically significant correlations ranging from 0.49 to 0.71 were found between the WFIRS-P total and subdomain scores and the CGI-S score ($p \leq 0.01$; Table 5). Statistically significant correlations ranging from -0.41 to -0.63 were also found between WFIRS-P total and subdomain scores and the CGAS score ($p \leq 0.01$; Table 5).

Table 4 Correlations between WFIRS-P and T-DSM-IV-S

WFIRS-P	T-DSM-IV-S domains		
	Attention deficit	Hyperactivity-impulsiveness	ADHD Total
Family			
r_s	0.34	0.43	0.47
p	0.001**	0.001**	0.001**
School			
r_s	0.48	0.30	0.46
p	0.001**	0.001**	0.001**
Life skills			
r_s	0.40	0.31	0.41
p	0.001**	0.040*	0.001**
Child's self-concept			
r_s	0.28	0.23	0.30
p	0.001**	0.001**	0.001**
Social activities			
r_s	0.34	0.44	0.48
p	0.001**	0.001**	0.001**
Risky activities			
r_s	0.37	0.41	0.48
p	0.001**	0.001**	0.001**
Total			
r_s	0.50	0.48	0.59
p	0.001**	0.001**	0.001**

T-DSM-IV-S Turgay's DSM-IV-based ADHD and Disruptive Behavior Disorders Screening Scale-Parent, WFIRS-P Weiss Functional Impairment Rating Scale-Parent Report

r_s Spearman's correlation coefficient, ** $p \leq 0.01$

Discriminant validity analyses

Based on the CGI-S, the ADHD group was divided into three groups: mild (those with a CGI-S score of 3), moderate (those with a CGI-S score of 4), and severe (those with a CGI-S score of 5, 6, or 7). The WFIRS-P total and subdomain scores were significantly different statistically in the control group and the mild, moderate, and severe patient groups ($p \leq 0.01$).

When the capability of the WFIRS-P overall and subdomain scores to discriminate the groups was explored through paired comparisons, the scores had the following distribution: control group < mild ADHD < moderate ADHD < severe ADHD ($p \leq 0.001$; Table 6). Unlike the other subdomain scores, there was no statistically significant difference in the child's self-concept and risky activities subdomain scores between the healthy control and the mild group ($p > 0.05$; Table 6).

Reliability analyses

Internal consistency analysis

The internal consistency analysis of the WFIRS-P with 50 items revealed that the Cronbach's alpha coefficients were between 0.56 and 0.93 (Table 7).

WFIRS-P subdomain and total score correlations in ADHD group

The correlations of the WFIRS-P subdomain with each other and with the total scale were between 0.34 and 0.85 ($p \leq 0.01$; Table 8).

Test-retest reliability

The test-retest correlations obtained after the WFIRS-P was administered to 54 parents in the ADHD group twice with an interval of 4 weeks were between 0.79 and 0.93 in the WFIRS-P total and subdomains ($p \leq 0.01$).

Discussion

General evaluation of the scale

In this study, the validity and reliability of the WFIRS-P in Turkish children were assessed. The results were compared with the results in Weiss et al.'s (2007) study.

When we examined the score distributions of the WFIRS-P items in the ADHD group, question 5 in the school-behavior subdomain (suspended or expelled from school), question 3 in the risky activities subdomain (doing

Table 5 Correlations between WFIRS-P and PedsQL, CGI-S and CGAS

WFIRS-P	PedsQL			CGI-S	CGAS
	Physical health <i>r_s</i>	Psychosocial health <i>r_s</i>	Total <i>r_s</i>		
Family	-0.26**	-0.47**	-0.46**	0.55**	-0.53**
School	-0.13*	-0.53**	-0.49**	0.54**	-0.48**
Life skills	-0.31**	-0.40**	-0.43**	0.50**	-0.47**
Child’s self-concept	-0.18**	-0.44**	-0.39**	0.49**	-0.41**
Social activities	-0.32**	-0.56**	-0.55**	0.51**	-0.41**
Risky activities	-0.28**	-0.51**	-0.49**	0.59**	-0.50**
Overall	-0.33**	-0.64**	-0.61**	0.71**	-0.63**

WFIRS-P Weiss Functional Impairment Rating Scale-Parent Report, PedsQL Pediatric Quality of Life Inventory, CGI-S Clinical Global Impressions-Severity scale, CGAS Children’s Global Assessment Scale

r_s Spearman’s correlation coefficient, * *p* ≤ 0.05; ** *p* ≤ 0.01

Table 6 Investigation of WFIRS-P discriminant validity in different groups

WFIRS-P	Distribution of scores in groups*
Family	a < b < c < d***
School	a < b < c < d***
Life skills	a < b < c < d***
Child’s self-concept	a, b** < c < d***
Social activities	a < b < c < d***
Risky activities	a, b** < c < d***
Total	a < b < c < d***

WFIRS-P Weiss Functional Impairment Rating Scale-Parent Report, a Control group, b Mildly ill as per CGI-S, c Moderately ill as per CGI-S, d Severely ill as per CGI-S

* Post hoc test: Mann–Whitney *U* test with Bonferroni correction; since seven subdomain scores were compared in four groups, the *p* value was taken as 0.05/28 = 0.00179 after the Bonferroni correction

** *p* > 0.05; *** *p* ≤ 0.001

Table 7 Internal consistency in WFIRS-P domains

	<i>N</i>	<i>α</i>
Family	10	0.89
School-learning	4	0.88
School-behavior	6	0.73
Life skills	10	0.76
Child’s self-concept	3	0.82
Social activities	7	0.87
Risky activities	10	0.56
Total	50	0.93

n Number of items, *α* Cronbach’s alpha coefficient, WFIRS-P Weiss Functional Impairment Rating Scale-Parent Report

things that are illegal), question 4 (being involved with the police), question 5 (smoking cigarettes), question 6 (taking illegal drugs), and question 8 (causing injury to others) were marked “never” by all participants, producing 0

points. These outcomes showed that these questions in the school-behavior and risky activities subdomains could not attain sufficient success in assessing ADHD-related functional impairment in our study sample. Looking at the contents of the questions that were scored low, they tested functional impairment that might develop in connection with serious behavioral problems that accompany ADHD. The majority of the sample group consisted of patients who were in the latent period and had recently been diagnosed with ADHD. Since ADHD-related serious behavioral problems and comorbid conduct disorders are seen more frequently in patients with undiagnosed and untreated ADHD in the middle or late adolescence period, it was expected that children who are in the latent and early adolescence period score lower on the school-behavior and risky activities subdomains as was the case in this study sample. Since question 5 in the school-behavior subdomain and questions 3 through 6 and 8 in the risky activities subdomain individually have considerable clinical value and may give different results in different sample groups, retaining these questions in the Turkish version of the WFIRS-P was appropriate.

Reliability of the scale

To test the reliability of the WFIRS-P, the scale’s internal consistency, the correlations of the subdomains with each other and with the overall score, and the test–retest correlations were investigated.

Cronbach’s alpha coefficient was calculated when the internal consistency was analyzed. A Cronbach alpha coefficient of 0.70 and over is accepted as sufficient for internal consistency (Tavakol and Dennick 2011). In the internal consistency study of the 50-item WFIRS-P, a Cronbach alpha coefficient of 0.93 was obtained for the whole scale and acceptable internal consistency

Table 8 WFIRS-P subdomain and overall score correlations (for 44 items)

WFIRS-P	Total	Family	School	Life skills	Child's self-concept	Social activities	Risky activities
Total	–						
Family	0.85*	–					
School	0.69*	0.45*	–				
Life skills	0.70*	0.50*	0.34*	–			
Child's self-concept	0.64*	0.47*	0.39*	0.42*	–		
Social activities	0.76*	0.66*	0.38*	0.42*	0.40*	–	
Risky activities	0.72*	0.56*	0.53*	0.47*	0.46*	0.46*	–

WFIRS-P Weiss Functional Impairment Rating Scale-Parent Report

Spearman's correlation analysis, * $p \leq 0.01$

coefficients for the scale's subdomains although it was relatively low (0.56) for the risky activities subdomain. When the internal consistency coefficient was recalculated for the whole scale by taking out the scale items one by one, the internal consistency coefficient did not increase. This showed that each scale item, including the items in the risky activities subdomain, had a positive effect on the scale's internal consistency.

In the original validity study of the scale, the Cronbach's alpha coefficients ranged between 0.75 and 0.92, the reliability coefficient for the whole scale was 0.92, and the "risky activities" subdomain had the lowest reliability coefficient, 0.75 (Weiss et al. 2007). A general evaluation showed that in the present study and the original study the overall internal consistency of the WFIRS-P was high and the scale structure represented the whole well.

When we looked at the correlations between the WFIRS-P subdomain scores and the overall scale score, we found the correlation coefficients ranged between 0.64 and 0.85 between the subdomains and the total scale score. In the original scale study, the correlations between the subdomains and the total scale score were between 0.59 and 0.82 (Weiss et al. 2007). The subdomain that had the lowest correlation coefficient was the child's self-concept in this study and the original scale study (Weiss et al. 2007). Although the WFIRS-P subdomains generally consisted of questions that test the functional impairment concept, the child's self-concept subdomain, unlike the other subdomains, contains questions related to quality of life. Functional impairment is defined as an objective measurement that shows a deviation from the standard in functional areas. Quality of life is also associated with similar areas, but it assesses such areas subjectively (Danckaerts et al. 2010). Since quality of life and functional impairment are different concepts, it is understandable that the child's self-concept subdomain is less correlated with the whole scale than the other subdomains.

The correlation coefficients of the subdomains with each other were between 0.38 and 0.66. The original scale study reported that the correlation coefficients of the subdomains with each other were between 0.22 and 0.66 (Weiss et al.

2007). Similar to the original scale study, the WFIRS-P subdomain scores had a statistically significant correlation with each other and the whole scale.

When we looked at the test-retest correlations for WFIRS-P, adequate correlation coefficients ranging from 0.79 to 0.93 were found between the WFIRS-P total and subdomain scores. Because no information was given in the original scale study regarding test-retest reliability, we could not compare our results.

In conclusion, we found that the reliability of the WFIRS-P was adequate.

Validity of the scale

To test the validity of the WFIRS-P, exploratory and confirmatory factor analyses were performed. The sample size and adequacy of our study were examined with the KMO and Bartlett tests before the factor analysis, and the sample was suitable for factor analysis. In the analysis conducted after the six items that scored 0 on the WFIRS-P were removed, the scale items best fit in a 7-factor structure. This structure explained 54.5 % of the total variance. After the school-learning and school-behavior factors were combined under the school subtitle as in the original WFIRS-P scale, we obtained six subdomains: family, school, life skills, child's self-concept, social activities, and risky activities (CADDRA 2011; Weiss et al. 2007).

Following the exploratory factor analysis, some items were placed in different subdomains than those of the original scale. Unlike the original scale, item 6 in the school-behavior subdomain (missing classes or being late for school) was included in the life skills subdomain. This item might have been included in the life skills subdomain because going to school on time and sitting in classes requires life skills that relate to getting prepared for school on time.

Item 7 (getting hurt or injured) and item 9 (needing more medical care) in the life skills subdomain were included, again unlike the original scale, in the risky activities subdomain. These items might have been included in that subdomain because children with ADHD often

injure themselves due to their excessive activeness and impulsiveness and require medical assistance.

Item 10 in the life skills subdomain (having trouble taking medication, getting needles, or visiting the doctor/dentist) was included in the child's self-concept subdomain. This item might have been included in that subdomain because this item was perceived as an indicator of quality of life for having trouble reflects an emotion that is experienced subjectively.

Item 4 in the social activities subdomain [problems participating in after-school activities (sports, music, clubs)] was included in the life skills subdomain, which was also contrary to the original scale. This might be specific to our study sample.

Item 1 in the risky activities subdomain [easily being led by other children (peer pressure)] was included, contrary to the original scale, in the social activities subdomain. The phrase "easily being led by other children (peer pressure)" could have been perceived by the parents as difficulty experienced in friend relationships, and thus, this item might have been included in the social activities subdomain, which generally includes items related to difficulties in friend relationships.

To test whether the items included in different subdomains than those of the original scale are specific to our sample group, further studies must be conducted with various sample groups.

In the confirmatory factor analysis, the CFI and RMSEA values were 0.95 and 0.061, respectively. A CFI value more than 0.9 and an RMSEA value <0.08 indicate that the general model structure obtained from the exploratory factor analysis is appropriate.

To assess the convergent validity of the WFIRS-P, the correlations of the WFIRS-P overall and subdomain scores with the T-DSM-IV-S, CGI-S, CGAS, and PedsQL-Parent scores were explored. Significant correlation coefficients ranging from 0.16 to 0.59 were found between the WFIRS-P overall and subdomain scores and the T-DSM-IV-S ADHD, T-DSM-IV-S attention deficit, and T-DSM-IV-S hyperactivity-impulsiveness scores. Correlation coefficients ranged from 0.16 to 0.44 between the WFIRS-P subdomains and the ADHD-Rating Scale (ADHD-RS) ADHD overall score in the original study (Weiss et al. 2007). Although the 18 ADHD criteria contained in the DSM-IV in the ADHD-RS scale used in the original study were scored by a clinician after interviews with parents, the T-DSM-IV-S scale used in our study was scored by the parents. Although an accurate comparison cannot be made since the ADHD symptom scales used in our study and in the original study are different, the correlations in our study support convergent validity between the scale measuring ADHD symptom severity and the WFIRS-P, which were similar to the results of the original scale study (Weiss et al. 2007).

Significant correlations ranged from 0.49 to 0.71 between the WFIRS-P overall and subdomain scores and the CGI-S scale score. Looking generally at the correlations in the scores of the CGI-S scale where the patient's overall functioning is assessed, the results support convergent validity. However, no significant correlation was found between the WFIRS-P subdomains and the CGI-S scale score in the original scale study (Weiss et al. 2007). The difference between our study and the original scale study may be specific to the sample groups. Further studies are needed.

Significant correlations ranged from -0.41 to -0.63 between the WFIRS-P overall and subdomain scores and the CGAS score. No significant correlation had been found in the original scale study between the WFIRS-P overall score and the score of the Global Assessment of Functioning (GAF), a scale similar to the CGAS (Weiss et al. 2007). Looking in our study at the correlations between the WFIRS-P and CGAS scores where the patient's general functioning is assessed by a clinician, the results supported convergent validity. The difference between our study and the original scale study may be specific to the sample groups. Further studies are needed.

Significant correlations ranged from -0.13 to -0.64 between the WFIRS-P overall and subdomain scores and the PedsQL-Parent total, PedsQL-Parent psychosocial health, and PedsQL-Parent physical health scores. Low correlation coefficients ranged from -0.13 to -0.33 between the PedsQL-Parent physical health overall score and the WFIRS-P subdomains. This result is similar to those of studies that reported that in children with ADHD, physical health-related quality of life is less impaired than other areas, but there is a marked impairment in psychosocial health (Varni and Burwinkle 2006; Klassen et al. 2004; Matza et al. 2004). In the original scale study, correlations ranged from -0.02 to -0.77 between the WFIRS-P subdomains and the subdomains of the Child Health and Illness Profile, a general quality of life scale similar to the PedsQL that is filled out by parents (Weiss et al. 2007). Although an accurate comparison cannot be made since the general quality of life scales used in our study and the original study are different, correlations support convergent validity between the general quality of life scales and the WFIRS-P in both studies.

To assess the discriminant validity of the WFIRS-P, the ADHD group was divided into three groups, mild ADHD (those with a CGI-S score of 3), moderate ADHD (those with a CGI-S score of 4), and severe ADHD (those with a CGI-S score of 5, 6, or 7), using the known group method. When evaluated in general, the scores of the control group were significantly lower statistically than those of the mildly ill, the scores of the mildly ill lower than those of the moderately ill, and the scores of the moderately ill

lower than those of the severely ill in nearly the entire scale domains. According to these results, the WFIRS-P can distinguish healthy children without an ADHD diagnosis and those with an ADHD diagnosis; the scale is also sensitive to the differences in the general functionality level as assessed in the ADHD group by a clinician.

In conclusion, the validity of the WFIRS-P was adequate.

Conclusions and recommendations

This study showed that the Turkish version of the WFIRS-P is valid and reliable and can be used in Turkey to assess ADHD-related functional impairment.

The study results are difficult to generalize since the structure of the study sample did not include all childhood ADHD cases in Turkey. Establishing a national database could be useful for future psychometric studies on the WFIRS-P.

Since the WFIRS-P focuses on areas where functioning is impaired in ADHD and does not include ADHD symptoms, the relationships between ADHD symptoms and functional impairment before and after treatment can be assessed. The WFIRS-P seems to be easily understood and filled out within a short period by parents, and the scale can be used widely in the diagnostic process of ADHD and in assessing ADHD treatment.

Conflict of interest Authors had not received any research fund or support for this study.

References

- American Psychiatric Association (2013) Diagnostic and statistical manual of mental disorders, 5th edn. American Psychiatric Association, Washington
- Barkley RA, Fischer M, Fletcher K et al (2002) Persistence of attention deficit hyperactivity disorder into adulthood as a function of reporting source and definition of disorder. *J Abnorm Psychol* 111:279–289
- Çakın Memik N, Ağaoğlu B, Coşkun A, Üneri ÖŞ, Karakaya I (2007) The validity and reliability of the Turkish Pediatric Quality of Life Inventory for children 13–18 years old. *Turk Psikiyatri Derg* 18(4):353–363
- Çakın Memik N, Ağaoğlu B, Coşkun A, Karakaya I (2008) The validity and reliability of Pediatric Quality Of Life Inventory in 8–12 year old Turkish children. *Turk J Child Adolesc Ment Health* 5(2):87–98
- Canadian Attention Deficit Hyperactivity Disorder Resource Alliance (CADDRA) (2011) Canadian ADHD Practice Guidelines, 3rd edn. CADDRA, Toronto
- Coghill D (2011) Pragmatic measures in paediatric psychopharmacology-are we getting it right?. *Eur Neuropsychopharmacol* 21(8):571–583
- Cohen J (1988) Statistical power analysis for the behavioral sciences, 2nd edn. Erlbaum, Hillsdale
- Danckaerts M, Sonuga-Barke EJS, Banaschewski T et al (2010) The quality of life of children with attention deficit/hyperactivity disorder: a systematic review. *Eur Child Adolesc Psychiatry* 19(2):83–105
- Dereboy Ç, Şenol S, Şener Ş, Dereboy F (2007) Validation of the Turkish versions of the short-form Conners Teacher and Parent Rating Scales. *Turk Psikiyatri Derg* 18(1):48–58
- DeVellis RF (2003) Scale development: theory and applications, 2nd edn. Sage, Thousand Oaks
- Ercan ES, Amado S, Somer O et al (2001) Development of a test battery for the assessment of attention deficit hyperactivity disorder. *Turk J Child Adolesc Ment Health* 8:132–144
- Gökler B, Ünal F, Pehlivan Türk B (2004) Reliability and validity of schedule for affective disorders and schizophrenia for school age children-present and lifetime version-turkish version (K-SADS-PL-T). *Turk J Child Adolesc Ment Health* 11:109–116
- Goldman LS, Genel M, Bezman RJ et al (1998) Diagnosis and treatment of attention-deficit/hyperactivity disorder in children and adolescents. *JAMA* 279:1100–1107
- Goyette CH, Conners CK, Ulrich RF (1978) Normative data on revised Conners Parent and Teacher Rating Scales. *J Abnorm Child Psychol* 6(2):221–236
- Guy E (1976) Assessment manual for psychopharmacology. National Institute of Mental Health, Rockville
- Haack LM, Gerdes AC (2011) Functional impairment in Latino children with ADHD: implications for culturally appropriate conceptualization and measurement. *Clin Child Fam Psychol Rev* 14(3):318–328
- Hantson J, Wang PP, Grizenko-Vida M, Ter-Stepanian M, Harvey W, Joobar R et al (2012) Effectiveness of a therapeutic summer camp for children with ADHD: phase I clinical intervention trial. *J Atten Disord* 16(7):610–617
- Kaufman J, Birmaher B, Brent D et al. (1996) Kiddie-SADS-Present and Lifetime Version (K-SADS-PL), version 1.0 of October 1996 edn. University of Pittsburgh School of Medicine, Department of Psychiatry, Pittsburgh
- Klassen AF, Miller A, Fine S (2004) Health-related quality of life in children and adolescents who have a diagnosis of attention deficit/hyperactivity disorder. *Pediatrics* 114:e541–e547
- Matza LS, Rentz AM, Secnik K et al (2004) The link between health-related quality of life and clinical symptoms among children with attention-deficit hyperactivity disorder. *J Dev Behav Pediatr* 25:166–174
- Maziade M, Rouleau N, Lee B, Rogers A, Davis L, Dickson R (2009) Atomoxetine and neuropsychological function in children with attention-deficit/hyperactivity disorder: results of a pilot study. *J Child Adolesc Psychopharmacol* 19(6):709–718
- Netemeyer RG, Bearden WO, Sharma S (2003) Scaling procedures: issue and applications. Sage, California
- Pastor PN, Reuben CA (2008) Diagnosed attention deficit hyperactivity disorder and learning disability: United States, 2004–2006. *Vital Health Stat* 10(237):1–14
- Schumacker RE, Lomax RG (2004) A beginner's guide to structural equation modeling, 2nd edn. Lawrence Erlbaum Associates, London, pp 79–122
- Shaffer D, Gould MS, Brasic J et al (1983) A children's global assessment scale (CGAS). *Arch Gen Psychiatry* 40(11):1228–1231
- Stein MA, Waldman ID, Charney E, Aryal S, Sable C, Gruber R et al (2011) Dose effects and comparative effectiveness of extended release dexamethylphenidate and mixed amphetamine salts. *J Child Adolesc Psychopharmacol* 21(6):581–588
- Tavakol M, Dennick R (2011) Making sense of Cronbach's alpha. *Int J Med Educ* 2:53–55
- Turgay A (1997) Turgay's DSM-IV based ADHD and disruptive behaviour disorders screening scale. Integrative Therapy Institute Publication, Toronto

- Tyrer P, Methuen C (2007) *Rating Scales in Psychiatry*. RCPsych, London
- Uneri OS, Agaoglu B, Coskun A, Memik NC (2008) Validity and reliability of pediatric quality of life inventory for 2- to 4-year-old and 5- to 7-year-old Turkish children. *Qual Life Res* 17(2):307–315
- Varni JW, Burwinkle TM (2006) The PedsQL as a patient-reported outcome in children and adolescents with attention-deficit/hyperactivity disorder: a population-based study. *Health Qual Life Outcomes* 4:26
- Varni JW, Seid M, Kurtin PS (2001) The PedsQL 4.0: reliability and validity of the Pediatric Quality of Life Inventory version 4.0 generic core scales in healthy and patient populations. *Med Care* 39:800–812
- Weiss MD, Brooks BL, Iverson GL et al (2007) Reliability and validity of the Weiss functional impairment rating scale. World Psychiatry Association Conference, Shanghai