

ORIGINAL ARTICLE

The Turkish version of the Family Impact of Assistive Technology Scale: A validity and reliability study

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Abstract

Objective: The purpose of the current study is to estimate the preliminary measurement properties of the Turkish version of Family Impact of Assistive Technology Scale (FIATS-tr). **Method:** The validity and reliability of the scale was performed in two phases. Phase I focused on construction of the Turkish version of the instrument and pilot testing. The scale was translated using the back-translation technique. The comprehensiveness and clarity of the scale was assessed with 20 participants. Phase II included psychometric assessment of the scale using a classical test theory approach. The final version of the scale was pretested with Turkish-speaking parents (46 mothers, four fathers and five caregivers) of 55 chronically disabled children. **Results:** Test-retest reliability was found to be ICC = 0.931 (95% CI 0.881–0.960) for FIATS-tr total. Cronbach's alpha for the overall FIATS-tr was 0.858. Individual alpha values for FIATS-tr subscales ranged from 0.199 to 0.838. The FIATS-tr total was moderately correlated with the Functional Independence Measure for Children (WeeFIM) total ($r = 0.688, p < 0.001$). **Conclusions:** This study showed that overall FIATS-tr appears to have acceptable levels of validity and reliability when used to measure the functional impact of assistive devices. Further study of the constructs and homogeneity of its total and subscales may further improve the internal consistency, validity, and other measurement properties of the FIATS-tr.

Key words: self-help devices, Family Impact of Assistive Technology Scale, chronically disabled children, assistive technology

The increasing demand to establish cost effectiveness in healthcare services necessitates utilization of standardized outcome measurements in any field that is related to the concepts of health, functioning, and well-being. Thus, in the context of scarce funding for healthcare, it is important to understand the effectiveness of existing and emerging assistive technologies.

An assistive device (AD) can be defined as any item, piece of equipment, or product system that is used to increase, maintain, or improve functioning of people with disabilities (1,2). ADs are prescribed for children with impairments to increase age-appropriate functioning (3). These devices are commonly provided

to enable children to gain autonomy and require less assistance from caregivers, improve mobility and face-to-face communication, and enrich social interaction with peers and family members (4).

The extent to which an AD affects child functioning is influenced by a complex interaction of contextual and personal factors. A child may be affected by many environmental factors including other products and technologies used at home, school, and in the community, and the support and attitudes of parents and other family members. AD-induced changes in child functioning may similarly result in changes in the lives of friends and family members (3). Thus, the utilization of standardized outcome measures to investigate

and determine child and familial impact may provide valuable information on the effectiveness of ADs (3,4). For this reason measuring the impact of ADs on the health and well-being of caregivers may be an important way to understand the factors that are associated with positive outcomes in children (5).

Quantification of the impact of ADs on family functioning is a multivariate challenge as the outcome may be due to many other factors such as the age and functional level of the child, progression of the disability, socioeconomic status of the caregivers, and even social role expectations of the caregivers. The outcome measurement tool, therefore, has to be chosen carefully as valid and reliable measurement is a cornerstone in clinical research (6).

It has been implied by Aslan and colleagues that multiplication of similar outcome health measurement scales may lead to development of a huge number of scales lacking comparison of populations cross-culturally (6). Thus, we preferred to adjust and adopt existing scales for the Turkish-speaking population. In this respect, we identified the Family Impact of Assistive Technology Scale (FIATS) as a sound measure of the influence of ADs on the lives of children with disabilities and their families (2).

The purpose of the current study is to estimate the preliminary measurement properties of the Turkish version of FIATS.

Material and methods

Translation process

We used the cross-cultural adaptation designs proposed by Guillemin and colleagues and Ruperto and associates during the translation process (7,8). Two

forward translations were carried out from English to Turkish by translators whose native language was Turkish. One of the translators was blind to the purpose of the study and the concepts being examined in the questionnaire. The other translator, who was a professional experienced in treating children with disabilities, was given information about the purpose of the study and the concepts being quantified. The two translations provided two preliminary Turkish versions from both clinical and literal perspectives.

A meeting was held with the two translators and two other physiotherapists experienced in pediatric rehabilitation to compare the two versions. A consensus was reached which was then back translated into English by two native English speakers who did not know the purpose of the study but had acquired the necessary reading and writing skills in Turkish. Each of the two translations was then compared with the original version. A bilingual team consisting of the four translators and two physiotherapists involved in the first meeting reviewed the Turkish version of the questionnaire in order to make the cross-cultural equivalence and to achieve semantic, idiomatic, experimental, and conceptual equivalence. None of the statements was changed or altered. The translation method is schematized in Figure 1. For clarity, we herein refer to the Turkish version of the Family Impact of Assistive Technology Scale as FIATS-tr.

Participants

This study included Turkish-speaking parents (46 mothers, four fathers and five caregivers) of 55 chronically disabled children between the ages of two years and 15 years (mean \pm SD = 8.17 \pm 3.52 years). Parents were eligible if they had a disabled

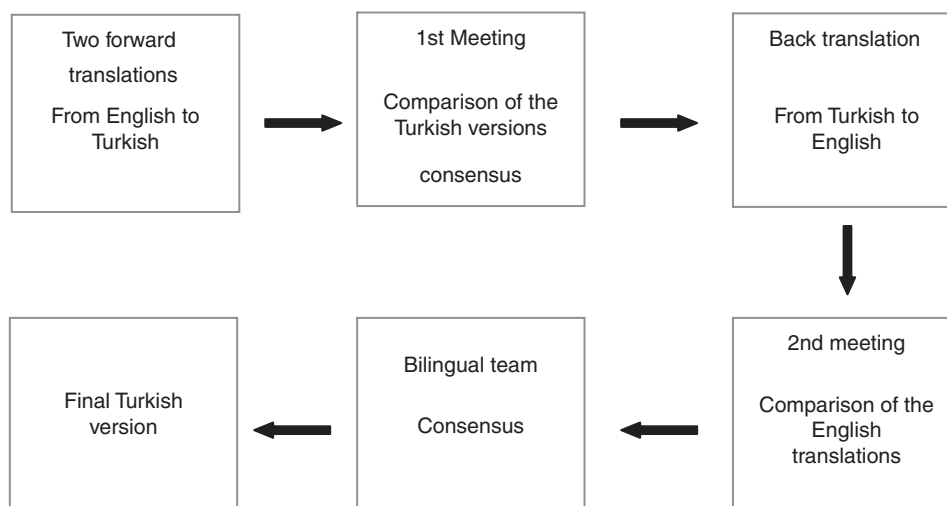


Figure 1. Translation procedure.

Table I. Inter-subscale and subscale-total correlation matrix.

<i>n</i> = 55	Autonomy r(p)	Caregiver Relief r(p)	Contentment r(p)	Doing Activities r(p)	Effort r(p)	Fam/Soc Intrr(p)	Safety r(p)	Supervision r(p)	Total FIATS-tr r(p)
Autonomy	–								0.755 (0.000)**
Caregiver relief	0.223 (0.102)	–							0.636 (0.000)**
Contentment	0.561 (0.000)**	0.367 (0.006)**	–						0.739 (0.000)**
Doing activities	0.514 (0.000)**	0.279 (0.039)*	0.416 (0.002)**	–					0.653 (0.000)**
Effort	0.503 (0.000)**	0.662 (0.000)**	0.505 (0.000)**	0.332 (0.013)*	–				0.834 (0.000)**
Fam/soc. int	0.167 (0.223)	.227 (0.096)	0.311 (0.021)*	0.264 (0.052)	0.253 (0.063)	–			0.393 (0.003)**
Safety	0.629 (0.000)**	0.354 (0.008)**	0.540 (0.000)**	0.497 (0.000)**	0.699 (0.000)**	0.116 (0.400)	–		0.821 (0.000)**
Supervision	0.647 (0.000)**	0.456(0.000)**	0.682 (0.000)**	0.366 (0.006)**	0.714 (0.000)**	0.175 (0.202)	0.690 (0.000)**	–	0.836 (0.000)**

Notes: *Correlation is significant at the 0.05 level (two-tailed). **Correlation is significant at the 0.01 level (two-tailed).

Table II. Descriptive statistics for FIATS-tr and WeeFIM.

<i>n</i> = 55	Test X ± SD	Retest X ± SD
Autonomy	4.24 ± 1.26	3.98 ± 1.25
Caregiver relief	3.75 ± 1.31	3.80 ± 1.23
Content	3.39 ± 0.77	3.50 ± 0.83
Doing	5.35 ± 1.28	5.29 ± 1.09
Effort	3.34 ± 1.22	3.46 ± 1.33
Family & social interaction	5.73 ± 0.88	5.63 ± 0.87
Safety	3.47 ± 1.44	3.45 ± 1.32
Supervision	3.29 ± 1.23	3.49 ± 1.31
FIATS-tr total	32.6 ± 6.79	32.64 ± 7.27
Technology acceptance	5.72 ± 1.02	5.86 ± 0.89
WeeFIM	62.53 ± 32.48	63.04 ± 32.39

child who used at least one assistive device for everyday activities and attended a special rehabilitation clinic (at least three times a week). The study was approved by Commission on Ethics of the University of Abant Izzet Baysal (decision number 2008-100-92).

Protocol

FIATS-tr was administered to the parents/caregivers twice, with a one-week interval. WeeFIM was scored by the treating physiotherapist of the child at the second session.

Scales

FIATS/FIATS-tr. The FIATS, a parent-report questionnaire, includes questions that address how ADs might influence child and family functioning. It is intended to detect the effects of ADs on eight dimensions of child and family life (2,4). These dimensions include child-related factors (autonomy, contentment, doing activities, safety, family/social interaction) and caregiver-related constructs (caregiver relief, effort,

Table III. Correlations for technology acceptance subscale with total FIATS scale and its subscales at test.

	Technology acceptance r(p)
Autonomy	–0.041(0.768)
Caregiver relief	–0.035(0.799)
Contentment	–0.105(0.445)
Doing activities	0.151(0.270)
Effort	–0.005(0.970)
Family & social interaction	0180(0.898)
Safety	–0.115(0.401)
Supervision	–0.134(0.329)
FIATS-tr total	–0.045(0.743)

supervision). The FIATS also includes statements that contribute to scoring for a separate measurement scale called the Technology Acceptance Scale (TAS) (9). The TAS is an emerging, standalone measure that provides an indication of the extent to which parents believe that ADs can be beneficial for their child.

Parents or caregivers complete the questionnaire by indicating the extent to which they agreed or disagreed with each of 64 statements using a seven-point Likert scale. The total impact score is calculated by summing the means of the eight subscales. Lower results are indicative of lower child and family functioning, and the total score range is between 8 and 56 (2).

The Functional Independence Measure for Children (WeeFIM). The WeeFIM is an 18-item measurement scale used to evaluate the level of functional independence of a child in six domains related to the activities of daily living (10). The subsets include self-care (6 items), sphincter control (2 items), transfers (3 items), locomotion (3 items), communication (2 items), and social cognition (3 items). Scoring for each item ranges between 1 (total dependence) and 7 (total independence). The minimum score that can be obtained is 18 and the maximum score is 126. A physiotherapist who was treating the child for at least three months and was experienced in pediatric rehabilitation used direct observation and interviews conducted with caregivers or parents of the children to score individual items on the WeeFIM (11).

Measurement analyses

Correlational statistics (Pearson's r) allowed us to explore the strength of the associations among the FIATS-tr subscale and total scale scores using data from the first administration.

We calculated Cronbach's alpha using parent ratings from the first administration to evaluate the internal consistencies of the overall FIATS-tr and its subscales. We estimated the test-retest reliabilities of the FIATS-tr scale and subscales using the intraclass correlation coefficient (ICCs) and a two-way fixed effect model for absolute agreement, and data from the two administrations of the FIATS-tr. Homogeneous scales should have alphas from 0.70 to 0.90 and test-retest reliability ICCs should exceed 0.70 for research purposes (12).

To assess the convergent construct validity of FIATS-tr, we hypothesized that the WeeFIM measured constructs that related to the AD-related aspects of child and family functioning. We theorized that higher levels of functional independence in children would correspond with higher levels of child and family functioning measured by the overall FIATS-tr score. We explored this empirically by calculating

Table IV. Test-retest reliability ICCs for FIATS-tr subscales.

	ICC	95% confidence interval
Autonomy	0.831	0.708–0.902
Caregiver relief	0.883	0.799–0.932
Contentment	0.803	0.664–0.835
Doing activities	0.839	0.723–0.906
Effort	0.935	0.888–0.962
Family & social interaction	0.632	0.369–0.785
Safety	0.909	0.844–0.947
Supervision	0.899	0.825–0.941
FIATS-tr total	0.931	0.881–0.960
Technology AcceptanceScale (TAS)	0.846	0.737–0.910

Pearson's r to estimate the strength and valence of the associations between the total FIATS-tr and WeeFIM. We expected that the overall FIATS-tr scores would have fair-to-moderate, positive correlations with WeeFIM. Measurement authorities suggest that these correlations should fall within 0.40–0.80 if the scales are measuring related constructs (12).

Results

We assumed our rating scale to be an interval scale to be consistent with the analytic plan used by authors of the source version of the FIATS (9). To confirm this assumption, we reviewed the distributions of our FIATS-tr scale and subscale scores and found no evidence of severe skewness or kurtosis (12). Significant inter-subscale correlations for the FIATS-tr ranged from $r = 0.279$ ($p = 0.039$) (doing activities and caregiver relief) to $r = 0.714$ ($p < 0.001$) (caregiver supervision and effort). Significant subscale-to-total correlations ranged from $r = 0.393$ ($p = 0.003$) (family and social interaction) to $r = 0.836$ ($p < 0.001$) (caregiver supervision) (Table I). As an added check for our

Table V. Internal consistency for FIATS-tr and subscales.

	Number of items	Cronbach's alpha
Autonomy	5	0.636
Caregiver relief	9	0.822
Contentment	9	0.492
Doing activities	5	0.707
Effort	8	0.779
Family & social interaction	4	0.199
Safety	8	0.838
Supervision	7	0.742
Technology Acceptance Scale (TAS)	9	0.834

Table VI. Correlations between FIATS total and WeeFIM for test and retest.

	FIATS-tr total test $r(p)$	FIATS-tr total retest $r(p)$
WeeFIM total	0.688 (0.000)*	0.659(0.000)*

Note: *Correlation is significant at the 0.01 level (two-tailed).

parametric assumption, we recalculated our correlations using non-parametric statistics (Spearman’s rho) and found a very similar range of moderate, significant correlation coefficients among the FIATS-tr total scale and subscale scores.

The means and standard deviations for FIATS-tr total and its subscales and WeeFIM total for the two administrations are provided in Table II.

The highest mean subscale score was estimated for family and social interaction (5.73), while the lowest score was obtained for caregiver supervision (3.29) following the first administration (see Table II). The TAS was not significantly correlated to any other subscale or FIATS total ($p > 0.05$) (Table III).

Reliability

Test–retest reliability was found to be ICC = 0.931 (95% CI 0.881–0.960) for FIATS total. Subscale ICC point estimates ranged between ICC = 0.632 (family and social interaction) and ICC = 0.935 (effort) (Table IV).

Cronbach’s alpha for the overall FIATS-tr was 0.858. Individual alpha values for FIATS subscales ranged from 0.199 to 0.838 (Table V). Three of the eight subscales had internal consistencies below the recommended lower limit of 0.70. None of the scales exceeded the upper limit of 0.90.

Validity

The correlation between FIATS-tr total and WeeFIM total was used to assess convergent construct validity. FIATS-tr total was well correlated with WeeFIM total ($r = 0.688, p < 0.001$) (Table VI).

Discussion

Translation into different languages and subsequent validation of questionnaires are of importance for international understanding of the measurement properties of these scales (13). Thus, the aim of this study was to estimate the preliminary validity and reliability of the Turkish version of the FIATS and to present relevant data.

Test–retest reliability analysis indicated high levels of reliability for the overall FIATS-tr, similar to the value obtained by others for the English source

version (i.e. ICC = 0.92) (9). Despite the excellent stability of the total FIATS-tr scale over time, one of the subscales (family/social interaction subscale) had an ICC point estimate marginally below the level suggested by measurement authorities. The wide 95% confidence interval for this dimension (0.369–0.785) suggests that a more precise estimate of reliability would be obtained by employing a larger sample size in future studies.

The internal consistency of a scale relates to its homogeneity. The coefficient of internal consistency is mainly assessed with Cronbach’s alpha (14). It is suggested that while alpha should be above 0.80 for acceptance as high internal consistency, 0.70 may be considered as acceptable internal consistency (11,15). As was found with the source version of the FIATS, we estimated the overall FIATS-tr to have a high internal consistency (9). Interestingly, we found one subscale was marginally below (autonomy) and two subscales were well below (contentment and family and social interaction) the recommended threshold for acceptable internal consistency. This is in contrast to the results of the original FIATS reliability study, which found the alphas for only two of the eight subscales to be marginally below 0.7 (9). It may be that cultural interpretation of items on the three scales by Turkish-speaking parents may have contributed to the lower internal consistency in the current study. We recommend that a small sample of parents of children with AD needs review the meaning of the items on these three subscales to identify and resolve concerns relating to alternative interpretations.

We found the TAS to have high internal consistency and excellent test–retest reliability, but found no statistically significant associations with the FIATS-tr total score and its subscales. Although the TAS had good stability over time, its items appear to be tapping into a construct unrelated to the other FIATS-tr dimensions. These findings were consistent with results reported elsewhere for the source version of the FIATS (9). We concur that the TAS should remain as an independent scale to explore respondents’ attitudes regarding the potential benefit of ADs for their child.

The benchmark for construct validity (WeeFIM) was found to be well correlated to FIATS-tr. This correlation suggests that the level of functional independence of the child that is measured using WeeFIM is moderately and positively associated with the child and family functioning as suggested by the overall FIATS-tr score.

Conclusion

This study showed that overall FIATS-tr appears to have acceptable levels of validity and reliability when used to measure the functional impact of ADs.

Further study of the homogeneity of subscale items on a few subscales may further improve the internal consistency, face validity, and other measurement properties of the FIATS-tr. One should keep in mind that this scale measures child and family functioning and further exploration of its responsiveness to change is also necessary to judge its usefulness as an outcome measure for children who rely on ADs for everyday living. Still, measuring ADs' impact on parameters crucial to the achievement of higher rates of quality of life has numerous benefits for disabled children, their families/caregivers and the health care system.

Declaration of interest: The authors report no conflicts of interest. The authors alone are responsible for the content and writing of the paper.

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