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Soo-Young Chae PhD OTR/ATP [a] & Song-Jae Jo PhD CRC/CVRT [b]
[a] Department of Occupational Therapy , University of Kyungwoon , Gumi , Gyeongbuk , South Korea
[b] Department of Vocational Rehabilitation , University of Daegu , Gyeongsan , Gyeongbuk , South Korea
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Development and Validation of Korean Version of Psychosocial Impact of Assistive Devices Scale

SOO-YOUNG CHAE, PhD, OTR/ATP[1] and SONG-JAE JO, PhD, CRC/CVRT[2]*

[1]*Department of Occupational Therapy, University of Kyungwoon, Gumi, Gyeongbuk, South Korea*
[2]*Department of Vocational Rehabilitation, University of Daegu, Gyeongsan, Gyeongbuk, South Korea*

This study aimed to develop and assess the reliability of the Korean version of the Psychosocial Impact of Assistive Devices Scale (K-PIADS). Experts and researchers in the field of assistive technology carried out the original PIADS with a rigorous translation process. To this end, comprehensive measures were taken, including preliminary translation, reverse translation, verification, and expert panel review. Forty-eight people who are currently using an assistive technology (AT) device participated in the validation phase of this study. Findings suggested that reliability for a K-PIADS was very high ($\alpha = 0.94$). The findings of this study indicated that the result could be applied to psychosocial evaluation related to the quality of life of AT device users with disabilities. Replication studies are warranted to further validate K-PIADS.

Keywords: assistive technology, psychosocial well-being, quality of life, reliability

Introduction

It has been widely regarded that assistive technology (AT) devices are crucial to improving the independent living capability of people with disabilities (Gitlin, 1998). For people with disabilities, AT paves the way to greater productivity and economic self-sufficiency by replacing or expanding the capacities needed to cope with various types of social, educational, vocational, and daily living demands. Further, uses of AT devices can significantly improve mobility, communication, as well as home management capability of people with disabilities. Namely, uses of AT devices have a significant impact on both the quantity and quality of participation in various aspects of social, recreational, and community activities among persons with disabilities (Davolt, 1996; Henschke, 2012).

For this reason, the importance of technology in the lives of people with disabilities has been emphasized by several provisions of important rehabilitation-related legislation, at both the federal and state levels in Canada. For example, Section 504 of the Rehabilitation Act of 1973 laid the groundwork for a greater participation by persons with disabilities in any program that receives federal funding (Cook & Polgar, 2008; Rubin & Roessler, 2007). Included in the 1998 amendments to the Rehabilitation Act of 1973, Section 508 opened an "electronic era" for people with disabilities in terms of access to electronic equipments and databases purchased or maintained by the federal government (Rubin & Roessler, 2007). In 1990, provisions in the Americans with Disabilities Act, such as those in Title I, mandated employers to provide reasonable accommodations in the workplace. Further, the Assistive Technology Act of 1998 called for improved coordination of and access to technology assistance, established on a state-by-state basis as assistive technology projects (ATPs; Cook & Polgar, 2008). Features of these projects include device loan, demonstration, reutilization, and financing activities. ATPs also have the obligation to work at the systems level to influence policies and laws that result in greater use of AT by people with disabilities (Rubin & Roessler, 2007).

Because of the aforementioned significance of AT in the lives of people with disabilities, outcomes of AT utilization are regarded as important indicators of a quality service delivery process (Fuhrer, 2001). As a result, recent developments in the outcomes of assessment research confirm the importance of an appropriate and early assessment of consumer needs for AT (Lenker & Paquet, 2004). Thus, it is crucial to maximize functional gains and improve the quality of life (QOL) for people with disabilities when designing AT devices. The problem, however, is that an AT device may cause an ineffectiveness if it fails to reflect a wide range of consumers who have different needs, abilities, and preferences regarding AT devices. Moreover, an inappropriate use of AT devices resulting from ignoring consumers' needs and abilities in prescribing and selecting AT devices may not only restrict functional capacities, but decrease the level of satisfaction with AT devices of that particular user (Marco, Russell, & Masters, 2003). This may lead to an abandonment or halt of the AT devices use, which in

*Address correspondence to: Song-Jae Jo, Department of Vocational Rehabilitation, University of Daegu, Jillyang, Gyeongsan, Gyeongbuk, 712-714, South Korea. Email: josongjae@naver.com

turn, may result in a loss of opportunities to improve the QOL for individuals with disabilities (Scherer, 1996).

Due to the previously mentioned reasons, efforts to measure work-related capabilities and QOL for people with disabilities are on the rise in the field of rehabilitation research, including rehabilitation engineering and occupational therapy (Law, Baum, & Dunn, 2001; Okoro, Strine, Balluz, Crews, & Mokdad, 2010). Outcome studies regarding uses of the AT devices can be applied to improve quality of rehabilitation services (Fuhrer, 2001). In addition, outcome research regarding QOL is instrumental to understand psychological and social characteristics of AT device users and their unique needs (Scherer, 2005). However, most of the related research has focused on the level of satisfaction with and the cost of the AT devices. As a result, research on the psychosocial state of individuals (e.g., QOL) using AT devices has received relatively little attention despite its significance in the lives of people with disabilities (Chae, Jo, Kwon, Kong, & Chang, 2008; Kwon, 2006).

In spite of the importance of an accurate and customized assessment of AT needs, relevant and standardized instruments that enable researchers and AT specialists to evaluate AT needs and capabilities of an individual who uses a specific AT device do not exist in Korea (Chae et al., 2008; Kwon, 2006). As a result, most AT specialists, if not all, take an existing instrument and use it to evaluate AT needs without going through the proper translation and validation process, which may cause an inaccurate decision in choosing an AT device. This malpractice hinders potential benefits from AT usages by people with disabilities (Chae et al., 2008; Kwon, 2006). Thus, it would be desirable to develop an indigenous instrument that accurately represents and reflects AT needs among Koreans with disabilities without having to be concerned about a language problem. Unfortunately, however, developing and standardizing an indigenous instrument requires too much time and resources for an individual researcher to conduct. Due to this reason, it is much more feasible and practical to translate an existing instrument that has been validated and widely used, such as Psychosocial Impact of Assistive Devices Scale (PIADS; Sohn, 2003).

PIADS, developed by Day and Jutai (1996), is a standardized and objective evaluation tool to measure the impact of AT devices on QOL among people with disabilities. PIADS has been widely regarded as a reliable indicator to predict various aspects related to AT, including stoppage or abandonment of a specific AT device and the impact of AT on QOL among its users (Jutai, Coulson, Fuhrer, Dermers, & DeRuyter, 2008; Jutai & Day, 2002; Jutai, Fuhrer, Dermers, Scherer, & DeRuyter, 2006). Thanks to its reputation as a valid and a reliable indicator in predicting many AT-related issues, PIADS was translated into several languages, including French, Chinese, and Japanese. Considering the fact that many researchers in different countries apply PIADS to understand the impact of AT on the psychosocial state of people with disabilities, it would not only be relevant, but beneficial, to translate PIADS into Korean and validate it in order to provide ground to develop an indigenous and practical instrument. Therefore, the purpose of this article is to develop a Korean version of the PIADS and conduct a preliminary investigation for its validation.

What is PIADS?

PIADS is a self-reported instrument with 26 items designed to measure the impact of AT devices on functional independence, psychological well-being, and QOL of people with disabilities. PIADS is composed of three subscales (i.e., competence, adaptability, and self-esteem).

The competence subscale has 12 items (e.g., productivity, usefulness, and performance). It measures one's abilities to realize his or her needs and feelings of self-efficiency. The adaptability subscale has 6 items (e.g., ability to participate and willingness to take chance). It measures an attitude and a willingness to take a risk or to accept new challenges. The self-esteem subscale is composed of 8 items (e.g., security and sense of power). It measures what perceived effects the use of a specific AT device may have on the level of confidence and the emotional well-being of its user.

In PIADS, a 7-point Likert scale ranging from -3 to 3 is used for scoring. A positive score indicates that the use of a specific AT device has a positive influence or that users of AT devices feel some notable changes in his or her psychological well-being. Conversely, a negative score indicates that the use of an AT device has a negative impact on the respondent's QOL or that the respondent does not experience any notable change in his or her psychological well-being. A score at or close to zero indicates that the use of an AT device does not have any significant impact on the respondent's QOL. The final score is calculated based on the mean score of each subscale (Day & Jutai, 2003).

Research findings suggest that PIADS is a very sound instrument in terms of psychometric properties. Internal consistency (Cronbach's alpha) for each subscale of PIADS is very high; 0.92 for competence subscale, 0.88 for adaptability subscale, and 0.87 for self-esteem subscale. Test-retest reliability ranges from 0.77 to 0.90, which indicates that PIADS is very trustworthy instrument. Finally, concurrent validity is also high, ranging from 0.75 to 0.83.

Methods

Developing K-PIADS

In order to translate PIADS into Korean, authors applied and modified a translation protocol developed by Neuman, Greenerg, Labovitz, and Suzuki (2004). This protocol was also used by Lim, Park, and Yoon (2007) in their research to translate and standardize Sensory Profile into Korean (Figure 1).

First, two AT specialists translated the English language version of PIADS into Korean language. Next, two rehabilitation engineering researchers, proficient in both English and Korean, proofread a draft to verify translated version. A professional Korean-English interpreter did a reverse translation and two people whose mother tongue is English, native of the United States, proofread a back-translated draft. Following these steps, authors conducted a pilot test with university students, asking whether the translated draft made sense to them. There were 19 participants in the pilot test. Of the 19 participants, 11 were female and 9 were male. No participant exhibited any cognitive impairment. A 5-point Likert scale (1 = *do not understand at all* to 5

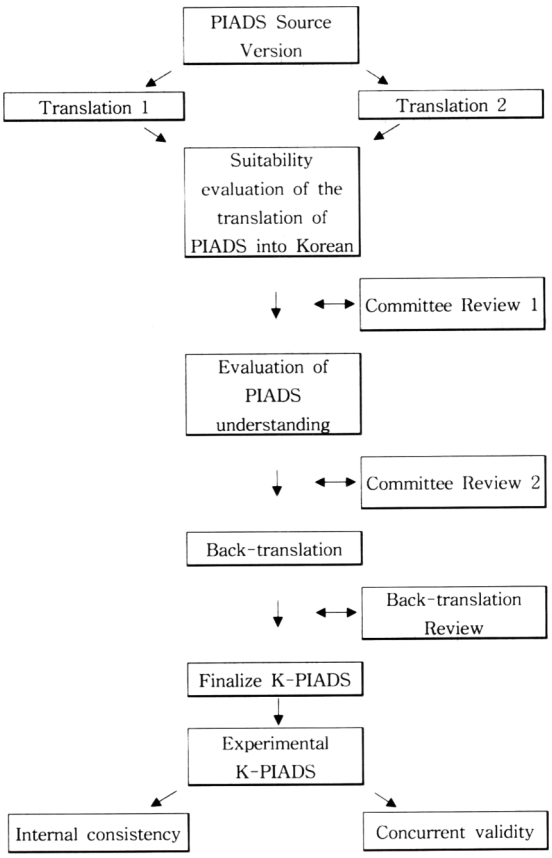

Fig. 1. Translation procedure and psychometric property of the K-PIADS.

= *easily understand*) was used to find out how much participants understand a translated draft. Four items with less than 80% of understanding by respondents were retranslated. A panel of three, who are bilingual and knowledgeable at AT, conducted a final review based on the results above mentioned steps, including a pilot test. A corresponding author contributed to translate glossary and scoring instruction.

Evaluating Psychometric Properties

Participants

Participants who are using AT devices and received related services via rehabilitation centers in three provinces in Korea were used to measure psychometric properties of K-PIADS were. Although 48 participants did not seem to cause any statistically significant problem, the size of sample in this study was of a concern. A replication study to further validate with more participants is desirable. All participants were using some kind of AT device at the time of the survey and none of them had a cognitive impairment that may hinder completing the survey.

Participants were informed of the purpose and procedure of the study. We noted that participants could withdraw anytime during the survey. Measures to keep their responses confidential were fully explained. We also explained necessary steps in case privacy or confidentiality was breached. Necessary accommodations were provided in order to make sure that a disability would not prevent anyone from completing the survey. It took approximately 30 minutes to complete K-PIADS.

Data analysis

Descriptive statistics (e.g., frequency and means) were used to analyze demographic characteristics of the participants. Reliability was calculated based on mean scores. Reliability provides information about internal consistency of the instrument (Yoon, 2006).

Given the exploratory nature of this study, a level of significance of $p = 0.05$ was used as the minimum rejection level of all statistical analyses in this study. The Statistical Package for the Social Sciences (SPSS) software version 12.0 was employed in all of the data analyses.

Results

Development of K-PIADS

In order to produce a final version of K-PIADS, a review panel modified the names of three items (i.e., sense of control, willingness to take chances, and ability to participate) in the draft, based on findings of a pilot test, to convey their meanings with more clarity and to prevent any potential misunderstanding of certain terms. The review panel also compared an original version and back-translated draft to find out whether any notable difference in meaning exists of any item between the two. In this process, the review panel modified one item (i.e., well-being) to convey its meaning more clearly.

Demographic Characteristics

As shown in Table 1, of 48 individuals who participated in this study, 26 (54.2%) were male and 22 (45.8%) were female. The mean age of participants was 35.7 years (*SD* = 15.8).

Table 1. Demographic summary of participants ($N = 48$).

Characteristic		Parameters	%
Gender	Male	26	54.2
	Female	22	45.8
Age (years)	*Mean*	35.7	—
	SD	±15.8	—
Disability type	Orthopedic	18	37.5
	Spinal cord injury	7	14.6
	Hearing	6	12.5
	Vision	3	6.3
	Cognitive	14	29.1
Type of AT device currently used	ADL	5	10.4
	Computer access	3	6.3
	Mobility	27	56.3
	Seating and positioning	2	4.1
	Sensory aids	9	18.8
	Driving and transporting	2	4.1
Length of AT device use	Less than 1 year	13	27.1
	1 ∼ 3 year	10	20.9
	More than 3 years	25	52.0

Note. ADL = AT = assistive technology.

Eighteen participants (37.5%) reported having a physical disability, while 14 (29.1%) reported having a cognitive disability. Out of 48 participants, 27 (56.3%) responded that they are using a mobility related AT device, including different types of wheelchairs. Twenty-five respondents (52%) reported that they have used an AT device for more than 3 years.

Table 2. Comparison of Korean version of the Psychosocial Impact of Assistive Devices Scale (K-PIADS) with original Psychosocial Impact of Assistive Devices Scale (PIADS).

PIADS items	K-PIADS items	PIADS test value[a]	K-PIADS *mean* (*SD*)	*df*	*T*-test and *P*-value
Competence subscale		1.44	1.16 (0.76)	47	−2.55; 0.014*
1 Competence	자기욕구 실현능력 (Jakiyorku silhyunungnyuk)	1.71	1.46 (1.07)	47	−1.63; 0.110
3 Independence	독립심 / 자립심 (Doklipsim/Jalipsim)	1.33	1.56 (1.07)	47	1.51; 0.139
4 Adequacy	일상생활 및 돌발 상황에 대한 적절한 대처 (Ilsangsaenghwal mit dolbal sanghwange daehan jukjulhan daechue)	1.27	0.98 (1.23)	47	−1.64; 0.108
5 Confusion	혼란 (Holan)	1.09	0.19 (0.92)	47	−6.84; 0.000*
6 Efficiency	효율성 (Hyoulsung)	1.83	1.56 (1.01)	47	−1.84; 0.072
8 Productivity	생산성 (Sangsansung)	1.70	1.15 (1.09)	47	−3.52; 0.001*
11 Usefulness	유용성 (Uyongsung)	1.59	1.48 (1.19)	47	−6.48; 0.520
13 Expertise	전문성 (Junmoonsung)	1.10	0.71 (1.22)	47	−2.23; 0.031*
14 Skillfulness	능숙함 (Neungsukharm)	1.35	1.21 (1.13)	47	−0.87; 0.389
16 Capability	유능감 (Uneungam)	1.69	1.23 (1.10)	47	−2.91; 0.005*
17 Quality of life	삶의질 (Salme jil)	1.32	1.38 (1.18)	47	0.32; 0.748
18 Performance	수행능력 (Suhangneungnyuk)	1.79	1.42 (1.11)	47	−2.34; 0.024*
Adaptability subscale		0.89	1.00 (0.69)	47	4.79; 0.000*
15 Well-being	웰빙 (Well-being)	1.05	1.21 (1.17)	47	0.94; 0.352
22 Willingness to take chances	진취적 태도 (Jinchuijuk taedo)	0.50	1.29 (1.15)	47	4.78; 0.000*
23 Ability to participate	공동체 활동에 대한 참여 능력 (Gongdongche hwaldonge daehan charmyeo)	1.06	1.40 (1.20)	47	1.94; 0.058
24 Eagerness to try new things	새로운 것에 도전하고자 하는 열망 (Saelowoon goese dojunhagoja hanun yeolmang)	0.63	1.60 (1.09)	47	6.21; 0.000*
25 Ability to adapt to the activities of daily living	일상생활활동에 대한 적응능력 (Ilsangsaenghwaldonge daehan juguengnuengnyuk)	1.26	1.73 (1.13)	47	2.89; 0.006*
26 Ability to take advantage of opportunities	기회활용 능력 (Kihwoihwalyong neungnyuk)	1.02	1.77 (0.99)	47	5.23; 0.000*
Self-esteem subscale		0.77	0.94 (0.78)	47	1.50; 0.140
2 Happiness	행복감 (Haengbogam)	0.81	1.33 (1.24)	47	2.92; 0.005*
7 Self-esteem	자존감 (Jajongam)	0.61	1.27 (1.16)	47	3.94; 0.000*
9 Security	안전감 (Anjuengam)	1.25	0.98 (1.42)	47	−1.32; 0.193
10 Frustration	좌절감 (Joajuelgam)	0.85	−0.08 (0.92)	47	−7.04; 0.000*
12 Self-confidence	자신감 (Jasingam)	0.90	1.54 (1.17)	47	3.81; 0.000*
19 Sense of power	자신에 대한 영향력 (Jasine daehan younghyangnyuk)	0.62	1.25 (1.16)	47	3.77; 0.000*
20 Sense of control	환경에 대한 통제감 (Hwangyunge daehan tongjegam)	0.99	1.00 (1.20)	47	0.06; 0.954
21 Embarrassment	창피함 (Changpiharm)	0.38	−0.04 (1.22)	47	−2.39; 0.021*
Overall score		1.03	1.21 (0.74)	47	1.65; 0.107

Note. Source: Day and Jutai (1996). *$P < 0.05$.

Table 3. Comparison of internal consistency of original the Psychosocial Impact of Assistive Devices Scale (PIADS) and the Korean version of the Psychosocial Impact of Assistive Devices Scale (K-PIADS).

Scale	Original PIADS internal consistency Cronbach's α	K-PIADS internal consistency Cronbach's α
Competence	0.92	0.89
Adaptability	0.88	0.91
Self-esteem	0.87	0.95
Overall	0.95	0.94

Psychometric Properties

As shown in Table 2, mean scores for the three subscales of K-PIADS range from 0.77 to 1.44, suggesting that the use of AT devices brought positive changes in QOL of the respondents and their psychological well-being.

The findings suggest that K-PIADS has very high internal consistency score (see Table 3). Cronbach's alpha for K-PIADS is 0.94. Cronbach's alpha for the three subscales is 0.89 (competence), 0.91 (adaptability), and 0.95 (self-esteem). These findings suggested that K-PIADS is as a reliable instrument as the original version.

Discussion

The purpose of this study was to develop and validate K-PIADS. To develop K-PIADS, comprehensive measures were taken, including preliminary translation, reverse translation, verification, and expert panel review. It was found that mean scores of the three subscales in K-PIADS were in the positive range, indicating that the use of AT devices contributed to positive changes in the lives of respondents and their psychological well-being. The findings also suggest that K-PIADS has a very high internal consistency, implying that it is indeed a reliable instrument to predict the impact of the use of AT devices on the psychological well-being and the QOL of Koreans with disabilities.

The main contribution of this study is that AT specialists working with people with different types of disabilities in Korea can now employ a sound and reliable instrument to evaluate a wide range of emotional and psychological state of clients that they serve. With that, this study has some limitations. First, due to a relatively small sample size, readers may want to be cautious when applying this study's findings. Second, linguistic differences between English and Korean may have hindered a proper translation of the original version semantically. For example, the Korean language does not have an appropriate vocabulary for "well-being." Replication research with a larger sample is warranted in order to correct translation error, if any, and validate K-PIADS. Though power analysis is to be conducted to identify a proper sample size, we estimate that any future replication study would require at least 150 or more participants to obtain sound psychometric properties. Finally, those who are interested in obtaining a copy of K-PIADS must get a permission from the first author, Soo-Young Chai.

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