

ORIGINAL ARTICLE

Turkish validity and reliability of the Lawton instrumental activities of daily living scale

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Abstract

Objective: The aim of this study was to assess the validity and reliability of the Turkish version of the Lawton and Brody Instrumental Activities of Daily Living Scale.

Methods: The research is a methodological study and the study sample consisted of 399 elderly individuals. The data were collected between May 15 and July 16, 2019. The study utilized the sociodemographic information form, the Lawton and Brody Instrumental Activities of Daily Living Scale, and the Functional Autonomy Measurement System as data collection tools. The SPSS 22 program was used for data analysis.

Results: The following results were obtained: reproducibility=0.927, minimum marginal reproducibility=0.678 and scalability=0.775. There was a high and positive correlation between the Lawton and Brody Instrumental Activities of Daily Living Scale and the Functional Autonomy Measurement System total score ($p<0.001$; $r:0.88$).

Conclusions: The Turkish version of Lawton and Brody Instrumental Activities of Daily Living Scale was deemed valid and reliable.

Keywords: Aged, Lawton and Brody Instrumental Activities of Daily Living Scale, psychometrics, Türkiye

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INTRODUCTION

Determining the dependency levels of the elderly is related to maintaining their level of independence (preventing further deterioration); improving their quality of life and reducing the social costs related to dependency. For individuals over 65 years of age, determining the levels of mild, moderate, severe and full dependency is important for utilizing available resources according to the level of dependency; ensuring that the needs identified to provide social care are proactive and planning the content of social support (determining the interventions to be made to promote the autonomy of the elderly). According to the dependency status and care needs of the elderly, the number of elderly-friendly facilities in the community (e.g. community cultural activity centers, universities for the elderly, cafes or tea rooms) is increased, and the elderly are more likely to benefit from basic preventive care services in the community. In societies where the dependency levels of the elderly are not known and the necessary social support is not provided, health inequalities increase and the sustainability of healthy ageing decreases. Healthy aging is a public health problem that directly concerns the individual, society and local governments.^{1,2}

There are many scales in Türkiye and worldwide that measure the daily life activities of elderly individuals based on their physical and cognitive abilities and determine their degree of dependency in carrying out these activities. The Katz Activities of Daily Living Scale, the Barthel Activities of Daily Living Index, the Lawton Instrumental Activities of Daily Living (Lawton IADL) are among the scales that are frequently used both around

the world and in Türkiye.³

The Lawton IADL was developed by Lawton and Brody in 1969⁴ and is frequently used in international studies. Reviewing articles published between 2012 and 2019, only 12 studies were found to have been conducted in Türkiye that included the Lawton IADL scale.⁵⁻¹⁶ Some of these studies⁶⁻¹⁴ used different scoring systems, while some^{6,7,9,11,14,15} cited different studies that included the Lawton IADL scale. All the cited references in the related articles^{6,7,9,11,14,15} were accessed and it was observed that the steps to adapt scales normally used in Turkish adaptation studies were not followed for this scale. No findings related to the validity and reliability of the scale were found in the descriptive, cross-sectional or review studies which cited the Lawton IADL scale. Despite this, it was stated that validity and reliability studies had been conducted for the scale and that these studies had been cited. Nevertheless, the Lawton IADL scale was used in 14 studies conducted across different disciplines in Türkiye which were published between 2010 and 2019 in the Web of Science index.^{5,11,12,17-27} The use of the scale has increased in Türkiye in recent years. The original form of the Lawton IADL scale is a Guttman-type scale that consists of eight items. Each item has more than one statement and scores either 0 or 1 points in order to define whether individuals are dependent or independent.⁴ Guttman scales differ from Likert-type scales; therefore, different types of analysis are recommended in order to examine their reliability.

The aim of this study was thus to investigate the evidence regarding the validity and reliability of the Turkish version of the Lawton IADL scale for individuals aged 65 and over

using the analytical methods recommended for Guttman scales.

METHODS

Research type

The research had a methodological, epidemiological design.

Language Translation

In this study, the scale was translated into Turkish by an expert from a Department of Turkish-to-English Translation and Interpreting. The opinions of a psychiatrist, a public health specialist and a geriatrist were obtained. The scale's language was revised in line with the opinions of the experts. In the original form of the scale, the fourth item, "Housekeeping", includes five statements that range increasingly from conditions of independence to dependence. The fourth statement and the fifth statement were caused confusion both in the expert evaluations and recommendations and during pre-application. To prevent any problems in scoring the scale, the two statements were combined into one statement while maintaining the integrity of their content.

Study Group

The data collection phase of the research consisted of two parts. The study group consisted of individuals aged 65 and over living in the provincial center of Burdur and in the Serik district of Antalya Province. A sample size of approximately 400 is recommended when the sample size is not calculated based on the number of items.²⁸ The sample size was determined to be 450 on the basis of issues that might arise such as unanswered items or incomplete answers. The quota sampling method, one of the improbable sampling

methods, was used for the sample selection.

The individuals who participated in this study were informed that the study had a second phase during which the scale would be re-administered. For this reason, they were asked to provide their name, surname, telephone number and address. All those who voluntarily supplied this information were included in the study.

In the test-retest phase of the data collection (the second part), the data were re-collected from 142 individuals who had participated in the first part of the study and had agreed to take part again.

The inclusion criteria were: living in the provincial center of Burdur or the Serik district of Antalya province, being 65 or over, being able to understand questions, agreeing to participate in the study, and agreeing to participate in the second phase of the study.

Data Collection Tools

The data were collected using a personal information form consisting of 15 questions regarding sociodemographic information, the Lawton IADL scale, and the Functional Autonomy Measurement System (FAMS).

Lawton Instrumental Activities of Daily Living Scale

This scale was developed by Lawton and Brody (1969). The Lawton IADL scale consists of eight items and evaluates the ability of individuals to perform tasks related to the activities of daily living. It consists of eight functional areas, including "Ability to use telephone", "Housekeeping", "Mode of transportation", "Laundry", "Responsibility for own medication", and "Ability to handle finances". Responses to each statement in

the scale are scored as 0 (unable or less able) or 1 (able) and the total score is obtained by adding up all item scores. The score obtained from the scale ranges from 0 (low function, dependent) to 8 (high function, independent). A low score indicates a high dependence level.⁴ The Lawton IADL was developed for individuals aged 65 and over living in the general community. There is no complete information about the method of selection of the items of the scale and why these items were selected. It is known that parallel test analyses were performed during the development of the original scale and the scale correlated with some other scales [For construct validity, the Lawton IADL demonstrates a moderate positive correlation with the Physical self-maintenance scale and between the Lawton IADL and the Mental Status Questionnaire ($p < 0.01$, Physical self-maintenance scale Pearson's $r = 0.61$, Mental Status Questionnaire Pearson's $r = 0.48$)].²⁹

The scale is a Guttman type scale. The Guttman Scale is concerned with the consistent answers given by the participants to the questions in the scale. If the scale prepared in accordance with the Guttman scaling technique gives consistent results, that scale is considered unidimensional, that is, valid. Guttman scales are unidimensional and reproducible. When the total score obtained from the scale is known, it can be predicted which items the person said yes to (cumulative feature). Scalogram analysis and reproducibility coefficient are among the analyses performed. Guttman-type scales are difficult to prepare and apply and require expertise.³⁰

Functional Autonomy Measurement System

The FAMS evaluates the functional independence and disability levels of

individuals aged 65 and over. The scale evaluates 29 functions related to the activities of daily living: mobility, communication, mental functions and instrumental activities of daily living. The scale was adapted to Turkish by Tuna and Çelik in 2012. In the adaptation of the scale, a structure consisting of three subdimensions including activities of daily living, communication and mental functions was created.³¹

Data Collection

The data collection phase was completed with 450 individuals (399 individuals included in the evaluation) who agreed to participate in the research between May 15 and July 16, 2019. Since the study was conducted with individuals aged 65 and over in Burdur province and Serik district of Antalya, no specific setting or criteria were used for the selection of participants. Cafes, coffee houses, parks, playgrounds, streets and markets were visited for data collection. The individuals included in the study were identified by researchers residing in Burdur and Antalya. Individuals who volunteered to participate in the study and who agreed to participate in the study for the second time if they were included in the test-retest group were included in the sample group. The data collection form was filled in by the researchers in line with the answers given by the participants. It took approximately 35-40 minutes for the researchers to read the questions in the data collection form and mark the answers.

The same data collection tool was re-administered to 146 individuals (142 individuals included in the evaluation) after two weeks to complete the test-retest phase.

Data Analysis

When the incomplete forms were excluded, the data of 399 individuals who participated in the first phase of the research and 142 individuals who participated in the second phase (test-retest) were assessed. The SPSS 22 program was used for data analysis. $p < 0.05$ was accepted as statistically significant.

Item Analysis and Creation of Scalogram

The Lawton IADL scale for item analysis, the independence rate of each item was calculated by dividing the number of individuals who gave the "independent" answer (those who answered "1" to a statement were considered independent for that statement) by the total number of respondents, which was 399.^{30,32}

The statements remaining on the scale after analysis were arranged from the one that showed the most independence to the one that showed the least independence and a scalogram model was created. The data obtained from a scalogram model were used to determine the number of errors in the reliability analysis and the total number of correct estimations.^{32,33}

Reliability and Validity Analyses

The reproducibility and scalability coefficients, which form part of the reliability analysis of Guttman scales, were calculated.

To calculate the producibility coefficient, the number of errors was determined for the Lawton IADL scale for which the scalogram model was created. After the number of incorrect answers was determined, the formula of Number of Items x Number of Respondents was used to determine the total number of estimations. Accordingly, the Producibility Coefficient (R), a measure of

the reliability of the scale that is calculated with the formula $1 - (\text{Number of Errors} / \text{Total Number of Estimations})$, was calculated.³³

The number of correct estimations was found for the Lawton IADL scale in order to calculate the scalability coefficient and the total number of estimations was used again. To calculate the number of correct estimations, the number of answers repeated the most was found in the scalogram model. The method used to determine the total number of estimations was described in the producibility coefficient calculation section (in the above paragraph). To calculate the scalability coefficient, first, the Minimum Marginal Reproducibility (MMR) Coefficient was calculated with the formula of Number of Correct Estimations / Total Number of Estimations. After the calculation of the MMR, the Scalability Coefficient, which is among the criteria for scale reliability and is calculated with the formula $(\text{Reproducibility Coefficient} - \text{Minimum Marginal Reproducibility}) / (1 - \text{Minimum Marginal Reproducibility})$, was calculated.³³

For the test-retest reliability, the correlation between three subgroups and two separate total sums (102 individuals for the test-retest phase, 142 individuals with the data from 40 individuals collected by different researchers) were evaluated.^{34,35}

In the data analysis, the parallel tests method for reliability (also known as concurrent validity in the validity analyses) was implemented.³⁶ In this study, the FAMS was used to test the parallel tests method. Furthermore, as explained in the language translation and pre-application sections, expert opinions were obtained for face validity and a pre-application was performed.

RESULTS

Of the participants, 58.1% were female; 71.7% were aged between 65 and 74; 68.9% were married; 49.4% were primary school graduates; 58.9% were living with their spouses (Table 1).

The ages of the participants were 72.05 ± 6.96 (minimum=65; maximum=101).

Table 1. Distribution of Individuals Aged 65 and Over who Participated in the Study According to Various Sociodemographic Characteristics

Characteristics of Participants (n=399)	n	%
Sex	Female	232 58.1
	Male	167 41.9
Age	65-74 years	286 71.7
	75-84 years	85 21.3
	85 years and over	28 7.0
Marital Status	Married	275 68.9
	Widowed	117 29.3
	Other*	7 1.8
Educational Status	Illiterate	112 28.1
	Literate	62 15.5
	Primary school	197 49.4
	Secondary school	11 2.8
	High school	11 2.8
Economic Status	University	6 1.5
	Poor	127 31.8
	Undecided	49 12.3
	Good	223 55.9
Employment Status	Retired	54 13.5
	Never been employed, still not employed	167 41.9
	Have been employed, still employed	178 44.6
Living Arrangement	Alone	80 20.1
	With spouse	235 58.9
	With Child/Children	72 18.0
	Other**	12 3.0

Table 1. Distribution of Individuals Aged 65 and Over who Participated in the Study According to Various Sociodemographic Characteristics

Chronic Disease	Yes	279 69.9
	No	120 30.1
Perceived Health Status	Very bad	33 8.3
	Bad	160 40.1
	Undecided	33 8.3
	Good	164 41.1
Status of Using a Device	Very good	9 2.3
	I don't use any devices	191 47.9
	I use a device	208 52.1
	Glasses	87 41.8
	Cane	85 40.8
	Prosthesis	13 6.3
	Other***	23 11.1

*Two individuals were single; five individuals were separated. **Three individuals were living with a careworker; four individuals were living with their spouses and children; one individual was living with their adopted child; two individuals were living with their spouses and grandchildren; two individuals were living with their grandchildren. ***nine individuals were using wheelchairs; eight individuals were using hearing aids; six individuals were using crutches.

There was a statistically significant correlation between the dependence/independence of the individuals aged 65 and over in all items of the Lawton IADL scale and their sex. The men's level of independence was higher in the statements related to the ability to use telephone ($p < 0.01$), shopping ($p < 0.001$), transportation ($p < 0.001$), responsibility for own medication ($p < 0.01$) and finances ($p < 0.001$). The women's independence was higher in the statements related to food preparation ($p < 0.001$), housekeeping ($p = 0.011$), and laundry ($p < 0.001$) (Table 2).

Table 2. Distribution of Dependence/Independence According to the Lawton IADL Scale of Women and Men Aged 65 and Over who Participated in the Study

Items		Female		Male		x ² ; p value ¹
		n	%	n	%	
1 (Ability to Use Telephone)	Dependent	34	14.7	10	6.0	7.434;
	Independent	198	85.3	157	94.0	0.01
2 (Shopping)	Dependent	159	68.5	46	27.5	65.308;
	Independent	73	31.5	121	72.5	0.001
3 (Food Preparation)	Dependent	143	61.5	140	83.8	23.196;
	Independent	89	38.4	27	16.2	0.001
4 (Housekeeping)	Dependent	48	20.7	69	41.3	6.507;
	Independent	184	79.3	98	58.7	0.011
5 (Laundry)	Dependent	59	25.4	118	70.7	80.475;
	Independent	173	74.6	49	29.3	0.001
6 (Transportation)	Dependent	90	38.8	27	16.2	23.985;
	Independent	142	61.2	140	83.8	0.001
7 (Responsibility for own Medication)	Dependent	62	26.7	21	12.6	11.800;
	Independent	170	73.3	146	87.4	0.01
8 (Finances)	Dependent	127	54.7	22	13.2	71.707;
	Independent	105	45.3	145	86.8	0.001
Total		232	100.0	167	100.0	

¹Chi-squared test

The total independence and dependence rates of the individuals aged 65 and over who participated in the study were calculated in Table 3. The independence rate for Item 1 was found to be $355 / 399 = 0.89$ and the dependence rate for Article 1 was found to be

$1 - 0.89 = 0.11$. The same calculations were made for the other items. The activities of daily living in which the individuals aged 65 and over who participated in the research were most independent were the ability to use the telephone (89.0%) (Table 3).

Table 3. Descriptive Statistics and Independence and Dependence Rates for the Lawton IADL Scale Items

Items	Definition of Item	Number of Statements in the Item	Independent*		Dependent*	
			n	%	n	%
Item 1	Ability to use telephone	4	355	89.0	44	11.0
Item 2	Shopping	4	194	49.0	205	51.0
Item 3	Food preparation	4	116	29.0	283	71.0
Item 4	Housekeeping	4	253	63.0	146	37.0
Table 3. (Continued) Descriptive Statistics and Independence and Dependence Rates for the Lawton IADL Scale Items						
Item 5	Laundry	3	222	56.0	177	44.0
Item 6	Transportation	5	282	71.0	117	29.0
Item 7	Responsibility for own Medication	3	316	79.0	83	21.0
Item 8	Finances	3	250	63.0	149	37.0

*The number of statements in each item varies between three and five. Each of these statements is scored "0" or "1". Participants who choose "0" for the statement are interpreted as being dependent and participants who choose "1" are interpreted as being independent for that statement.

The total number of errors in the Lawton scale scalogram model was found to be 230. According to the scalogram model, the highest score (independence score) obtainable from the scale is "8". This score is possible if one performs the activities of daily living completely independently or at a certain level of independence. The lowest score (dependence score) that can be obtained from the scale is "0". According to the scalogram model, almost everyone was independent in Item 1 and almost everyone was dependent in Item 3 (Table 4). The total number of

estimations of the scale was found to be $8 \times 399 = 3192$. The Reproducibility, Minimum Marginal Reproducibility, and Scalability coefficients of the model were calculated as follows (detailed information about the calculations was given in the data analysis section):

$$\text{Reproducibility} = 1 - (230 / 3192) = \underline{0.927}$$

$$\text{Minimum Marginal Reproducibility} = 2166 / 3192 = \underline{0.678}$$

$$\text{Scalability} = (0.927 - 0.678) / (1 - 0.678) = \underline{0.775}$$

Table 4. Number of Correct Estimations in the Items

Item Number (Item Definition)	Answer Repeated the Most	Number of Correct Estimations
1 (Ability to use Telephone)	Independent	355
7 (Responsibility for Own Medication)	Independent	316
3 (Food Preparation)	Dependent	283
6 (Transportation)	Independent	282
4 (Housekeeping)	Independent	253
8 (Finances)	Independent	250
5 (Laundry)	Independent	222
2 (Shopping)	Dependent	205
Total		2166

The correlation coefficients for the Lawton IADL scale were found to be highly statistically

significant and positive for the test-retest phase in all three groups ($p < 0.001$) (Table 5).

Table 5. The Lawton IADL Scale Test-Retest Results

Sample	Test-Retest Results			
	First Measurement	Second Measurement	Statistical Values	
	Mean \pm SD	Mean \pm SD	r	p
1st Group* (n=52)	5.07 \pm 2.41	4.88 \pm 2.45	0.888	<0.001
2nd Group** (n=50)	4.60 \pm 2.84	4.48 \pm 2.76	0.978	<0.001
3rd Group*** (n=40)	4.82 \pm 2.64	4.72 \pm 2.49	0.964	<0.001
Total for 1st and 2nd Groups (n=102)	4.84 \pm 2.63	4.68 \pm 2.60	0.938	<0.001
Total for All Groups (n=142)	4.83 \pm 2.62	4.69 \pm 2.56	0.945	<0.001

*Those who were living in Antalya province and participated in two rounds (the same researcher collected the first-round and second-round data).

**Those who were living in Burdur province and participated in two rounds (the same researcher collected the first-round and second-round data).

***Those who were living in Antalya province and participated in two rounds (different researchers collected the first-round and second-round data).

When the data of the individuals who participated in the first part of the study were examined, there was a significant, high and positive correlation between the Lawton IADL scale and the FAMS total score ($p < 0.001$;

$r:0.88$). For the data collected in the first round of the research, the correlation of the Lawton IADL scale with the subdimensions and the total score of the FAMS was acceptable (Table 6).

Table 6. Correlation Coefficients between the Lawton IADL Scale and the Functional Autonomy Measurement System and its Subdimensions

Sample* Activities of Daily Living	Functional Autonomy Measurement System				
		Communication	Mental Functions	Total	
Lawton IADL Scale	Correlation	0.88	0.54	0.66	0.88
	p-value	<0.001	<0.001	<0.001	<0.001

*Measurements of 399 individuals who participated in the first round.

DISCUSSION

In the original study, the Lawton IADL scale was designed as a measurement tool that investigate the dependence and independence of individuals aged 65 and over. The observer examines the behaviors of the individual and ranks these behaviors.⁴ In the literature, there are international studies in which the participants answer the questions on the scale themselves (or through a researcher/interviewer)^{37,38} or in which the participants are observed and the questions are scored by the observers/evaluators.³⁹⁻⁴¹ In studies conducted in Türkiye, participants fill out the form by themselves with the aid of a

researcher.^{5,11,12,17-20,26} Although the original form of the Lawton IADL scale was designed to be scored by those observing the behaviors of participants, it is commonly implemented using the self-response method. The answers of the participants were filled in by the researchers in this study. This approach, although different from its original design, was chosen for the current study since it was believed that the scale will continue to be used in this way, and that there is thus a need for validity and reliability evidence for both modes of implementation.

The Lawton IADL scale adapted in this study is a Guttman type scale. Such scales

are considered the first example of one-dimensional and cumulative scales. The total score is significant in terms of interpreting the scale's results.⁴² In addition to the total score, the reproducibility coefficient obtained through the scalogram model created using the study data has a prominent role. The scalogram model is specific to Guttman scales and provides estimations for the answers to some statement using the answers given to specific statements.³³ According to the cumulative scalogram model, if the total score of an individual is known, which statements the individual answered "yes" to can also be estimated. On a Guttman scale that includes eighteen propositions, if the respondent answered "yes" to the tenth proposition, it is accepted that they also answered "yes" to the first nine propositions in the scale.³⁰ This study implemented these analyses designed for Guttman type scales.

The fourth and fifth statements for the fourth item, which was defined as "housekeeping" in the original form of the scale, have very similar meanings in Turkish. For this reason, these two expressions were combined into single expression while preserving the integrity of their content. This revision was not made some studies^{39,41} conducted to adapt the Lawton IADL scale, and both propositions were used. In this study, such revision was needed according to the expert opinion and the pre-application.

During the adaptation of Guttman scales it is necessary to create a scalogram model in order to determine the reliability coefficients and to calculate the reproducibility and scalability coefficients.³⁴ In various studies conducted on the adaptation of the Lawton IADL scale, the internal consistency has been determined

using the Cronbach's alpha^{37-39,41}, exploratory factor analysis^{37-39,41} and confirmatory factor analysis.^{37,38} No calculations regarding the reproducibility and scalability coefficients were found in these studies. In general, it is recommended that the Cronbach's alpha be used to determine internal consistency in graded scales.²⁸ In the Lawton IADL scale, the answers to each statement score 0 or 1. Since Guttman scales are designed as one-dimensional and cumulative scales^{29,30,39}, they are not expected to have different dimensions.

The literature states that the reproducibility coefficient of Guttman-type scales should be more than 0.90 and that the scalability coefficient should be more than 0.60.^{32,33} In this study the reproducibility coefficient was found to be 0.92 and the scalability coefficient was found to be 0.77. These results show that the Lawton IADL scale, which was adapted into Turkish as a self-evaluation scale, demonstrates the criteria for reliability. Further evidence of scale reliability is obtained by the test-retest method.⁴³ In the study the test-retest reliability of the scale was examined in three subgroups, and a correlation was determined between 0.89 and 0.98. In other studies test-retest findings reported similar values, 0.98⁴¹, 0.99.³⁹

This study also investigated the correlation between the Lawton IADL scale and the FAMS. In the original study, the Physical Self-Maintenance Scale was used to test concurrent validity.⁴ In this study the correlation between the Lawton IADL scale and the total score and subdimensions of the FAMS was positive and acceptable.

In the original form of the Lawton IADL scale, the scores obtainable were between 0 and 8 for women and between 0 and 5 for men.⁴

In the original form of the scale, men were evaluated out of a total of 5 points since daily tasks such as food preparation, housekeeping and laundry were performed more frequently by women at the time the scale was developed (1969). It was also thought that care services were provided by women.⁴ In this study and many studies in the literature, the score was out of 8 points and no discrimination was made by sex.^{37,41} Evaluations out of 8 points for both sexes in the international adaptation studies for the Lawton IADL scale may be due to the high female employment rate and high female contribution to the labor market in the regions where adaptations were conducted.

Lawton IADL measures the degree of dependency of the elderly to whom it is applied. The scale is used in interventions to reduce age-related dependency in older adults, to provide a safe living environment for the elderly and to improve their quality of life. The use of the scale is important for planning the relevant intervention according to the level of dependency and evaluating the effectiveness of the interventions. The scale is used in many areas such as determining the need for home care services and social services in the general community, during hospitalization and during hospitalization. Participants consisted of elderly people residing in the general community, hospital outpatients (such as psychiatric patients) and rural elderly communities.⁴⁴

CONCLUSION

When the validity and reliability analyses of the Lawton IADL in Turkish were examined, values that can be accepted as valid and reliable for the selected sample group were obtained.

Research Limitations

The limitation of the research is that the study was carried out only with elderly individuals living in the Antalya and Burdur provinces. The other limitation of the research is the collection of the data for the scale through the commonly used self-evaluation method (in its original form, the observers scored the scale).

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