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Adaptation of Affinity for Technology Interaction Scale to Turkish Culture and Evaluation of Measurement Invariance: ATI-T

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ABSTRACT

An important dimension of human-technology interaction is whether people approach actively interacting with technological systems or avoid intense interaction with them. This dimension is also important for an individual's ability to cope with technological changes, necessitating the need to observe and comprehend individual differences. In this study, we aimed to adapt the Affinity for Technology Interaction (ATI) scale to Turkish and evaluate its psychometric properties, including measurement invariance, in the target culture. A team of English and Turkish language linguists, psychometrists, and technology education experts carried out the process. Four applications were conducted in four different respondent groups to examine intelligibility, linguistic equivalence, reliability, validity, and measurement invariance. The one-dimensional and nine-item original scale structure was confirmed by confirmatory factor analysis. The internal consistency and test-retest reliability coefficients were calculated as 0.90 and 0.94, respectively. We also concluded that a strict level of measurement invariance was provided in the analysis of invariance between age and gender groups. These findings demonstrated that ATI-T is a measurement tool capable of measuring affinity for technology interaction in Turkish-speaking societies.

KEYWORDS

Technology interaction; scale adaptation; measurement invariance; validity; reliability

1. Introduction

Today, digital technologies support human beings in every aspect of life. Technology essentially creates new tools that enable human beings to solve current or potential problems and achieve goals more effectively. However, emerging new systems can be a problem for individuals with a low ability to cope with new technologies. In other words, every new technological system requires adaptation and new learning processes from its users. For this reason, an individual must be able to cope with technology in order to adapt to new technological tools and use technology effectively. Therefore, the importance of using technology effectively and coping with technology is increasing for all individuals in society. Two important factors come to the fore in the individuals' coping with technology. The first of these is systemic features, while the other is individual resources and characteristics.

Technology designers and manufacturers are trying to create user-friendly designs to support individuals to cope with technology. As part of the design processes, developers try to improve their designs by collecting information about the acceptance, preferences, satisfaction, and experiences of the user with the help of usability tests. Measuring users' personal resources is also important when examining how system designs relate to user behaviour and user experience.

Individual resources and characteristics are seen as essential parameters in coping with technology. At this point, the fact that the individual has high knowledge and skills about systems supports him to manage new technologies more easily. In addition, personal characteristics and communication skills are also effective at this point. It is emphasized in many studies that individual differences are effective on the interaction styles of individuals and that the individual exhibits different problem-solving approaches in coping with new technologies (Robertson, 1985; Zhang et al., 2012). Another dimension in the individual's coping with technology is the individual's affinity for technology interaction.

The definition of affinity for technology interaction was "whether individuals tend to actively interact with the technical systems or tend to avoid interaction with the new systems" (Franke et al., 2019). In the other words, affinity for technology interaction refers to the level of comfort and willingness that individuals have toward engaging with technology. It is becoming increasingly important in today's society, as technology plays a significant role in many aspects of our lives, including work, education, and communication. Individuals with a high affinity for technology interaction tend to be more comfortable using digital devices and software, and are more likely to seek out new technologies and explore their capabilities. They are also more likely to be comfortable with a wide range of digital tools and platforms. Individuals with a low affinity for technology interaction, on the other hand, may struggle with using digital devices and software and may be less likely to explore

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new technologies. They may also be less skilled in the use of digital tools and platforms.

The behaviour of interacting with or avoiding the problem faced by the individual is a personal characteristic. This characteristic may appear as a tendency to approach and explore actively in technology interaction, or to avoid interaction with new systems in order to avoid problems with technical systems. Concepts such as an individual's approach to problem-solving, self-regulation skills, intellectual styles, approach temperament, and internal motivation affect affinity for technology interaction (Claxton & McIntyre, 1994; Fleischhauer et al., 2010; Nair & Ramnarayan, 2000). The affinity for technology interaction (ATI) is as important as communication skills, personal characteristics, and knowledge about technology. Moreover, it is an important individual resource to measure.

"Affinity for Technology Interaction" is a newly emerged concept in the field of technology or human-computer interaction. Therefore, it can be said that there is not enough research in the literature. However, there is research on related concepts that can provide insight into this topic.

One relevant concept is "technology acceptance," which refers to the degree to which individuals are willing to use and adopt new technologies. The Technology Acceptance Model (TAM) is a well-known theory that explains how individuals form their intentions to use a particular technology. It suggests that two key factors influence technology acceptance: perceived usefulness and perceived ease of use. Studies have found that individuals who perceive a technology to be more useful and easier to use are more likely to adopt and use it (Al-Emran et al., 2018; Choi & Chung, 2013; Davis, 1989; King & He, 2006; Rafique et al., 2020; Sagnier et al., 2000; Venkatesh & Davis, 2000; Yucel & Gulbahar, 2013).

Another related concept is "technology self-efficacy," which refers to an individual's belief in their ability to use technology effectively. High technology self-efficacy is associated with increased confidence in using technology, better problem-solving skills, and more positive attitudes toward technology (Abbitt, 2011; Holden & Rada, 2011; Huffman et al., 2013; Laver et al., 2012; Paraskeva et al., 2008; Venkatesh et al., 2003).

More recently, the concept of "digital literacy" has emerged as an important area of research (Tinmaz et al., 2022). Digital literacy refers to an individual's ability to find, evaluate, and use digital information effectively (Reddy et al., 2020). It encompasses a range of skills, including basic computer literacy, information literacy, and critical thinking skills. Studies have found that higher levels of digital literacy are associated with more positive attitudes toward technology, increased use of digital technologies, and improved outcomes in areas such as education and employment (Van Deursen & van Dijk, 2015).

1.1. The present study

The aim of this study is to adapt the Affinity for Technology Interaction (ATI) scale developed by Franke et al. (2019) for Turkish culture. This scale has been defined by its authors as a tool to measure different types of active participation in technology interaction. To the best of our knowledge, there are not many scale development or adaptation studies in the literature to measure an individual's affinity for technology interaction. The 19-item scale developed by Karrer et al. (2009) examines affinity for technology under four dimensions. This scale generally focuses on the individual's attitudes toward technology. Schmettow and Drees (2014) developed another scale, the 15-item scale (GEX), which specifically measures enthusiasm for computers. In our study, the motivation underlying the selection of the ATI scale developed by Franke et al. (2019) can be stated as (i) the scale being aimed at large audiences, (ii) being economical in a one-dimensional structure (9 items) and (iii) based on internal motivation.

For a scale to be used in another language, it must be culturally adapted, as well as evidence of validity and reliability collected through studies with target culture samples. Furthermore, scale adaptation is a complex task that requires the collaboration of field experts, psychometrists, and linguists.

There are some widely accepted sources in the literature describe the scale adaptation processes (Hambleton & Patsula, 1999; Hambleton et al., 2005). Taking these into account, we followed the scale adaptation steps given below in our study.

- Deciding whether it would be more useful to develop a new scale or adapt an existing scale.
- Requesting permission to adapt the scale.
- Choosing highly qualified translators.
- Translation and adaptation of the scale to the target language.
- Feedback application of the adapted version of the scale on a small group.
- Examining linguistic equivalence.
- Applying the scale to a larger group that can represent the target group and obtaining evidence of the scale's validity and reliability.
- Examining measurement invariance.

2. Methodology

Both theoretical studies and field studies were conducted with 12 experts and 588 respondents to adapt the Affinity for Technology Interaction (ATI) scale to Turkish culture (ATI-T). The steps followed in the adaptation process (Figure 1) were reported respectively.

2.1. Description of ATI scale original form

The Affinity for Technology Interaction (ATI) scale assesses affinity for technology with a focus on user-system interaction. The ATI scale consists of nine items and uses a 6-point Likert scale from completely disagree to completely agree. Five studies were conducted to examine scale dimensionality, reliability, distribution of values, and validity of

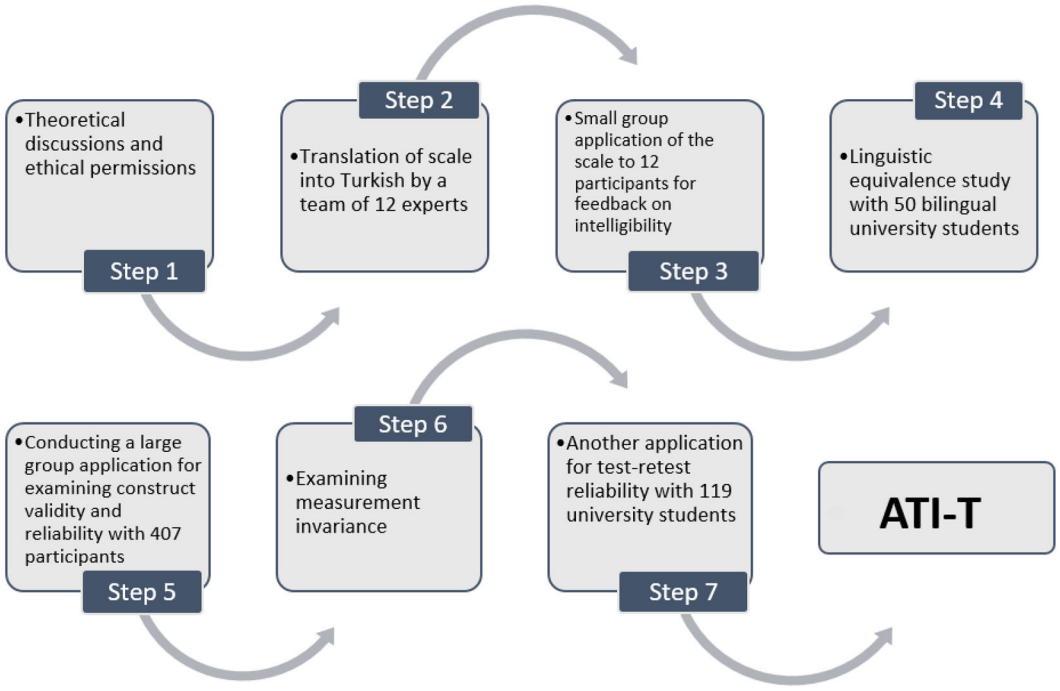

Figure 1. ATI-T adaptation process.

the ATI scale in different samples (S1–S5). To put it briefly, S1 ($N = 300$) was a university and social media sample, consisting of a composite sample of easily reachable groups (social media users and students in different study programs), S2 ($N = 200$) consisted of activity tracker users, S3 ($N = 65$) consisted of school students, S4 was a US American online sample ($N = 240$), and S5 ($N = 529$) was a German quota sample. To examine the dimensionality of the ATI scale, exploratory factor analyses were computed using parallel analysis, and the results indicated a clear one-factor solution (i.e., unidimensionality) in all five samples. The reliability of the ATI scale was assessed in all samples. Cronbach's alpha coefficients ranged from .83 to .92 in the samples and can therefore be interpreted as good to excellent (Franke et al., 2019). Previous to the current study, the ATI scale was available in nine different language versions: English, German, Italian, Spanish, Romanian, Dutch, Persian, French, and Finnish (Franke et al., 2019; Ghasemi et al., 2022; Heilala et al., 2023;). For conditions with time constraints, there was also a short version (ATI-S) derived from the original ATI scale (Wessel et al., 2019). In this study, the original English version (Appendix B) was used to adapt the scale to Turkish and the Turkish version we adapted is named ATI-T (ATI-Turkish) shown in the Appendix A.

2.2. Deciding on the adaptability of the scale

Some scales may not be suitable for adaptation to a different culture due to the fact that the expressions in the scale items are not fully understood or perceived differently by the respondents belonging to the target culture. In order to avoid encountering the problem of cognitive construct differentiation due to intercultural differences in the following steps, we conducted a process that included theoretical discussions on the adaptability of the scale to Turkish with a team of two psychometrists, one English language and one Turkish language linguist, and one technology education experts before starting the scale adaptation study. At the end of this process, we decided that the expressions in the scale items were not foreign to Turkish culture, and we made a foresight that the measured construct could also be confirmed in a sample selected from Turkey.

2.3. Requesting permission for adaptation

To adapt the scale without violating any ethical rules, we contacted each of the three researchers who developed it and acquired their permission. The study was approved by the Ethical Board of Ege University (Protocol No: 1062-10/08).

2.4. Translation of scale items

We set up a team of twelve (Table 1), consisting of six English language linguists and two Turkish language linguists, two technology education experts, and two psychometrists, to translate the scale.

In forward and back translation phase, six English language linguists were divided into three groups of two each. In each group, one expert translated the original English form of the scale into Turkish (forward translation), and the other expert translated the Turkish form back into English (back translation). Each group compared the back-translated form with the original form and discussed the differences, and finalized the translation. Thus, we obtained three different forms translated into Turkish from three different groups. Later, in the evaluation phase, 12 experts got together and examined whether there was a difference

Table 1. Characteristics of experts.

Expertise	Frequency	Education level	Year of experience	Profession
English Linguistic	6	PhD	>10 years	2 Teachers, 3 Academicians, 1 Translator
Turkish Linguistic	2	PhD	>15 years	Academicians
Technology Education	2	PhD	>8 years	Academicians
Psychometry	2	PhD	>9 years	Academicians

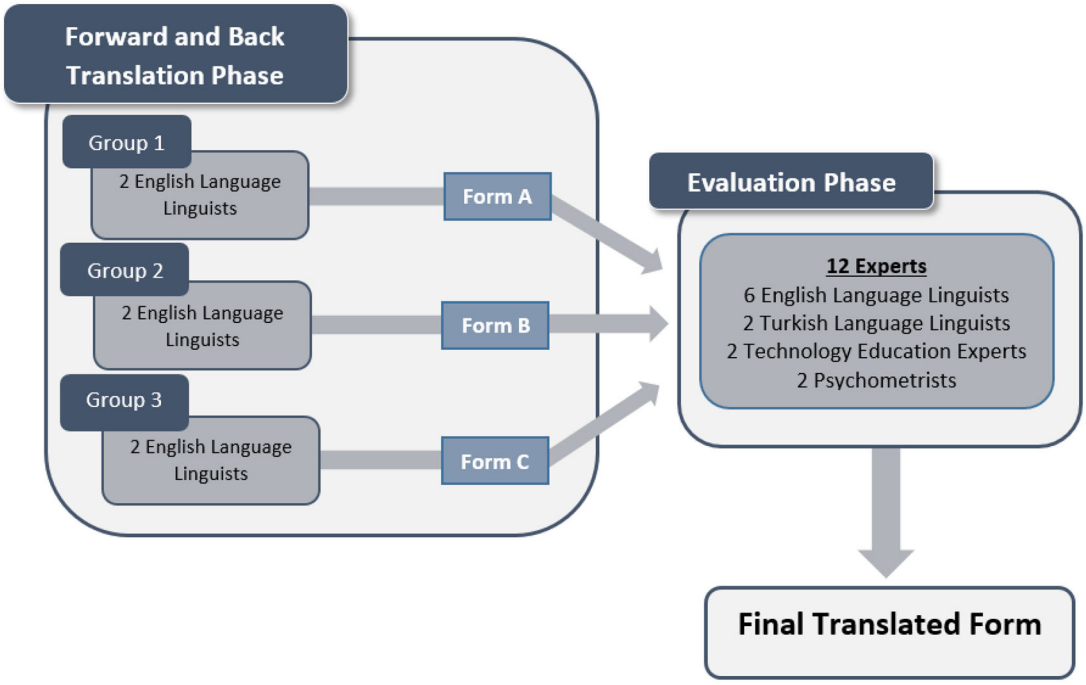

Figure 2. Translation process.

Table 2. Participants in the small group application's characteristics.

	Category	Frequency	Cumulative frequency	Percentage	Cumulative percentage
Gender	Female	5	5	41.7	41.7
	Male	7	12	58.3	100
Age	19–29	3	3	25	25
	30–39	4	7	33.3	58.3
	40–49	2	9	16.7	75
	50–59	1	10	8.3	83.3
	60+	2	12	16.7	100

between these three forms. There were some differences between the forms, and we sought ways of reconciliation to resolve these differences. We completed the translation after reaching an agreement among all experts on a final form of translation. Figure 2 summarizes and visualizes the process of translation.

It should also be noted that as part of the cross-cultural adaptation study, this translation process involved more than just word for word translation. Although some concepts or expressions are shared by both cultures, they are perceived differently. In Turkish culture, for example, the expression "technical systems" in the original scale is not perceived as defined by developers. Therefore, we adapted this expression as "technological systems" after discussions with both our team and the developers of the scale. Within the scope of this study, the psychometric analyses of the adapted scale and the confirmation of the original scale structure were also investigated.

2.5. Small group application

We applied the ATI-T scale to 12 participants ranging in age from 19 to 64. We asked the participants if they clearly understood the expressions used in the scale. All participants agreed that the expressions used were clear and that no correction was required. Detailed demographic information for the small group application participants is shown in Table 2.

2.6. Linguistic equivalence

The linguistic equivalence study included 50 university students who were fluent in both languages. These are the students who passed the English Proficiency exam at Ege University and are continuing their education in English. They are also all native Turkish speakers. Participants in the linguistic equivalence application's characteristics shown in Table 3.

Table 3. Participants in the linguistic equivalence application's characteristics.

	Category	Frequency	Cumulative frequency	Percentage	Cumulative percentage
Gender	Female	28	28	56	56
	Male	22	50	44	100
Age	<20	8	8	16	16
	20–23	32	40	64	80
	24+	10	50	20	100

Table 4. *T*-test results for linguistic equivalence.

Form	*M*	*SD*	*t*	*df*	*P*
Turkish	32.70	7.40			
English	32.20	7.86	−1.25	49	.22

We administered the paper-pencil application in English and Turkish at two-week intervals to avoid the effect of participants remembering their own answers. To control the pre-application effect, we divided the group into two equal parts and applied the Turkish and then the English versions to one group, and the English and then the Turkish versions to the other. Pearson's product-moment correlation coefficient between the scores of the students in the English and Turkish forms was .93. Furthermore, using the paired samples *t*-test, we determined that there was no statistically significant difference between the mean scores. Table 4 shows the results of the tests.

2.7. Large group application

The large group application included 407 participants in order to obtain statistical evidence that the adapted scale could be used to make valid and reliable measurements in the target culture. Data was collected online from participants ranging in age from 11 to 70 years old. The numbers and percentages for all participant subgroups were shown in Table 5. Because the scale consists of nine items and can be completed in a very short period of time, potential problems were not encountered while collecting online data.

We attempted to diversify the participant group as much as possible because the adapted scale does not have a specific target audience. It was not possible to choose subgroups among the participants in proportion to the population. We attempted, however, to ensure that participants originated from all subgroups because the participant pool should be diverse enough to adequately represent the target audience. For example, participants in the application came from all seven regions of Turkey, and we tried to ensure that more people from the more densely populated areas participated. Turkey's Marmara region has the highest population density, but the Aegean, Central Anatolia, and Mediterranean regions are also densely populated. The histogram graph of the participants' total test scores was given in Figure 3.

The distribution's skewness was −0.53, and its kurtosis was 0.61. The lowest total score was 10, the highest was 54, and the range was 44.

2.8. Analyzing data from large group application

Confirmatory factor analysis (CFA) was performed to examine whether the construct measured by the scale was confirmed in the target culture. Furthermore, using factor loadings obtained from CFA, average variance extracted (AVE) values for examining convergent validity and McDonald's Omega coefficients for composite reliability (CR) were calculated. Cronbach's Alpha coefficient was also calculated to determine internal consistency. A multi-group confirmatory factor analysis was also performed to examine the measurement invariance in terms of gender and age variables.

2.9. Additional application for reliability

To obtain evidence for the stability of the scale scores, we applied the scale to 119 university students with an interval of two weeks. In Table 6, participants in the test-retest application's characteristics has been presented. We calculated the Pearson's product-moment correlation coefficient between the scores from the test-retest and examined the paired samples t-test results to determine whether there was a significant difference between the mean scores of these two applications.

3. Results

3.1. Construct validity

In order to test the construct validity, a single factor structure consisting of nine items was requested to be verified with CFA. The first finding obtained from the CFA, which was carried out without any modifications, was that the model-data fit of the scale was not sufficient. The fit indices of this model were calculated as RMSE = .14, CFI = .86, SRMR = .06. Even if the SRMR value is within acceptable limits, RMSEA values larger than .10 suggest "bad" fit (Browne & Cudeck, 1992). Therefore, it was seen that modifications between the 6th item and the 7th and 8th items of the scale were necessary for CFA. Since the assumption of common error among these items is theoretically verifiable, CFA was carried out with the proposed modifications. Standardized item factor loadings of modified model were .80, .88, .57, .81, .85, .57, .64, .55, .60, respectively and all t-values were significant at the .01 level. The fit index values were found as CFI = .96, RMSEA = .08, SRMR = .04, $\chi^2/df = 4.24$. The most commonly used cutoffs for model fit statistics yield CFI values above .95 are commonly considered suggesting "good" fit (Hu & Bentler, 1998), χ^2/df values less than 5, and RMSEA and SRMR values between .05 and

Table 5. Participants in the large group application's characteristics.

	Category	Frequency	Cumulative frequency	Percentage	Cumulative percentage
Gender	Female	220	220	54.1	54.1
	Male	187	407	45.9	100
Age	10–19	12	12	2.9	2.9
	20–29	57	69	14	16.9
	30–39	180	249	44.3	61.2
	40–49	73	322	17.9	79.1
	50–59	46	368	11.3	90.4
	60+	39	407	9.6	100
Region	Aegean	127	127	31.2	31.2
	Marmara	68	195	16.7	47.9
	Mediterranean	65	260	16	63.9
	Central Anatolia	74	334	18.2	82.1
	Black Sea	27	361	6.6	88.7
	Eastern Anatolia	19	380	4.7	93.4
	South. Anatolia	27	407	6.6	100
Education Level	Less than University	72	72	17.7	17.7
	Undergraduate	211	283	51.8	69.5
	Postgraduate	124	407	30.5	100
Status	Employee	284	284	69.8	69.8
	Unemployed	26	310	6.4	76.2
	Retired	46	356	11.3	87.5
	Student	51	407	12.5	100

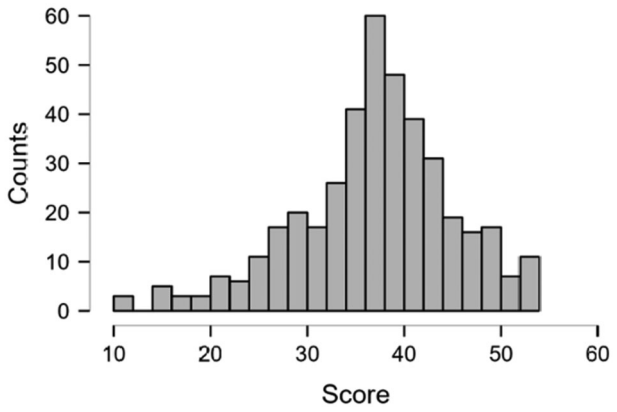

Figure 3. Distribution of scale total scores from the large group application.

.10 are considered to suggest "acceptable" fit (Browne & Cudeck, 1992). The path diagram obtained for the measurement model of the Turkish version of ATI scale was given in Figure 4.

3.2. Convergent validity

Convergent validity is the degree of agreement between multiple indicators of the same construct. To establish convergent validity, the factor loading of the indicator, CR, and AVE have to be considered (Hair et al., 2017). The AVE and CR values for the ATI-T scale were calculated as .50 and .90, respectively. These values show that the convergent validity level of the scale was sufficient (Bagozzi & Yi, 1988; Fornell & Larcker, 1981; Hair et al., 2017; Henseler et al., 2015).

3.3. Internal consistency

Cronbach's alpha coefficient was used to determine the reliability of internal consistency and it was calculated as .90. The item-total correlation of each item of ATI was summarized in Table 7.

3.4. Test-retest reliability

The correlation coefficient for the test-retest was calculated as 0.94, which was a high positive correlation providing good evidence for test-retest reliability. The paired samples *t*-test results were given in Table 8. The table shows that there was no significant difference between test and retest mean scores of the group ($p = 0.10$). This finding supports test-retest reliability along with the correlation coefficient.

3.5. Measurement invariance

The measurement invariance of the ATI-T scale was examined in terms of gender and age variables, and results were given in Table 9. Measurement invariance analysis was performed on a group of 407 participants. There were 187 men and 220 women in the group, as previously stated. When examining the measurement invariance in terms of age variable, the group was divided into two groups as participants over 35 years old and participants under 35 years old. While there were 197 participants under the age of 35, there were 210 participants over the age of 35.

Chi-square difference tests and analyses of the CFI change between models were employed to test the measurement invariance. The fact that the chi-square change value was $p > 0.05$ and CFI $\leq$ 0.01 indicates that the measurement invariance was provided at that model level (Cheung & Rensvold, 2002; Hu & Bentler, 1998). As seen in Table 9, all the significance values for the chi-square difference test were calculated as $p > 0.05$, which indicates that measurement invariance was achieved. In the change of CFI values between models, ΔCFI values are less than 0.01 in all models for both age and gender variables. These results show that the ATI-T scale provides measurement invariance in terms of both gender and age groups at the strict invariance level.

Table 6. Participants in the test-retest application's characteristics.

	Category	Frequency	Cumulative Frequency	Percentage	Cumulative Percentage
Gender	Female	62	62	52.1	52.1
	Male	57	119	47.9	100
Age	<20	17	17	14.3	14.3
	20–23	79	96	66.4	80.7
	24+	23	119	19.3	100

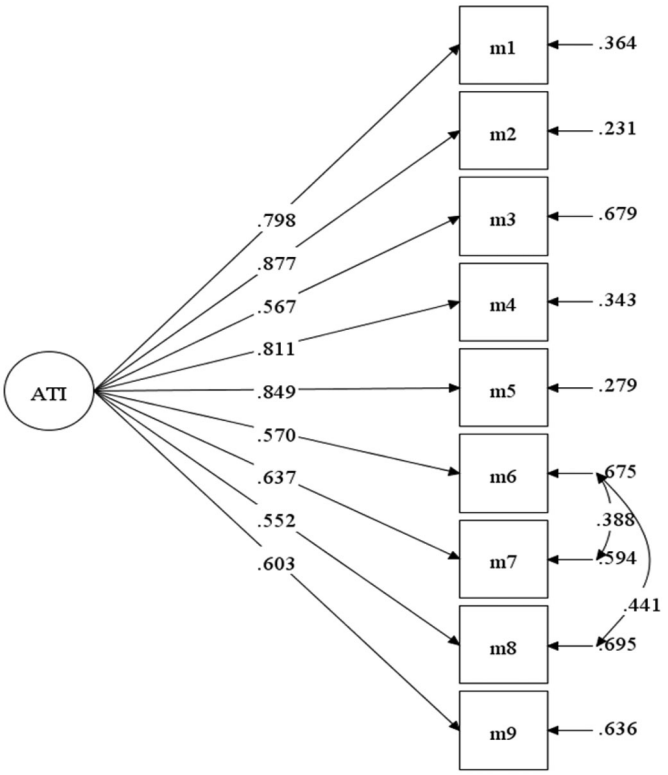

Figure 4. Measurement model path diagram of the ATI-T scale and the modification error variances between m6 and m7, m8.

4. Discussion

The aim of the present study was to adapt the ATI scale developed by Franke et al. (2019) to Turkish culture. First of all, we started the process with theoretical discussions on whether the structure measured with the ATI scale and the expressions used in the scale also exist in Turkish culture, that is, whether it is suitable to adapt the scale to the target culture. After the discussions, the translation process started and the English language linguists were divided into three groups and completed the translation and back-translation of the scale. Turkish language linguists, psychometrists, and technology education experts were also involved in the process, and then we applied the scale to a small sample, examined the intelligibility of the items, and finalized the ATI-T scale. To examine linguistic equivalence, we applied Turkish and English forms to 50 university students who can speak English and Turkish fluently. We performed the *t*-test, and as a result, there was no significant difference between the mean scores of the two forms of the scale.

The large group application was carried out with 407 people and the psychometric properties of the scale were examined. As with the original ATI scale, ATI-T has no floor and ceiling effects. CFA was performed for construct validity and the one-dimensional structure consisting of nine items in ATI was preserved in the same way in ATI-T. Due to the high RMSEA value (0.14), some modifications in the model were proposed. It is very important that the modifications made in scale adaptation and development studies are justified. Among the proposed modifications, covariances were defined between the error variances of item 6 and items 7–8, which are theoretically possible to share common error variance as well as semantically close to each other. We came to the conclusion that these items contain a similar or opposing statement that measures the same feature. For example, item 6 [It is enough for me that a technical system works; I don't care how or why] and item 8 [It is enough for me to know the basic functions of a technical system] are reverse-coded items on the scale and have similar content. While both stated that it is sufficient to know the basic functions of a technical system, item 6 also emphasized that it is not concerned with why and how the system works. On the contrary, item 7 [I try to understand how a technical system exactly works] refers to making an effort to know exactly how a technical system works. The modified model fit indices values were CFI = .96, RMSEA = .08, SRMR = .04, $\chi^2/df = 4.24$, which can be considered a good fit (Hu & Bentler, 1998). Since all items in the original scale were preserved in the ATI-T scale, there was no threat to the content validity. For convergent validity, the AVE and CR values were calculated as .50 and .90, respectively, which indicates that the convergent validity level of the ATI-T scale is sufficient (Bagozzi & Yi, 1988; Fornell & Larcker, 1981; Hair et al., 2017; Henseler et al., 2015).

We used internal consistency and test-retest reliability techniques to determine the reliability of the measurements obtained with the ATI-T scale. For internal consistency, Cronbach's alpha value was calculated as 0.90. The researchers who developed the ATI scale conducted their studies on five samples, and Cronbach's alpha coefficients ranged from 0.83 to 0.92 in the samples (Franke et al., 2019). Since the value obtained for ATI-T is 0.90, which indicates that it is excellently reliable (Cortina, 1993; Cripps, 2017). Test-retest reliability was not examined during the development of the ATI scale, and the researchers recommended that it be examined in future studies (Franke et al., 2019). Test-retest reliability study was conducted with 118 people for ATI-T and the coefficient was calculated as 0.94. Furthermore, there was no significant difference between the mean scores of the groups between the two applications, suggesting that the ATI-T is a tool that can obtain reliable measurements.

Measurement invariance studies were conducted for ATI-T for age and gender groups and it was observed that ATI-T provided strict measurement invariance across both age and gender groups. Heilala et al. (2023), in their study,

Table 7. Item-total correlations of the ATI items.

	Mean	Standard deviation	Scale mean if item deleted	Corrected item-total correlation	Cronbach's alpha if item deleted
Item1	4.55	1.02	32.86	0.69	0.88
Item2	4.57	1.06	32.84	0.78	0.87
Item3	3.98	1.49	33.44	0.53	0.89
Item4	4.17	1.17	33.24	0.73	0.87
Item5	4.26	1.23	33.15	0.79	0.87
Item6	3.75	1.46	33.67	0.65	0.88
Item7	4.19	1.29	33.22	0.66	0.88
Item8	3.17	1.27	34.25	0.61	0.89
Item9	4.76	0.98	32.65	0.56	0.89

Table 8. *T*-test results for test-retest reliability.

Variable	*M*	*SD*	*t*	*df*	*P*
Test	34.40	7.18	−1.67	118	0.10
Retest	34.86	7.44			

Table 9. Measurement invariance fit statistics for age and gender variables.

	Equivalence	χ^2	*df*	$\Delta\ \chi^2$	*p*	CFI	ΔCFI
Gender	Configural	141.54	50			0.941	
	Metric	150.03	58	8.79	0.39	0.940	0.001
	Scalar	163.28	66	11.93	0.10	0.937	0.003
	Strict	167.88	77	4.60	0.94	0.935	0.002
Age	Configural	161.689	50			0.945	
	Metric	172.931	58	11.242	0.19	0.944	0.001
	Scalar	184.359	66	11.428	0.18	0.937	0.008
	Strict	199.401	77	15.042	0.18	0.928	0.006

which is an adaptation of ATI to Finnish, stated that the scale showed differential validity by identifying a gender difference with respect to the measured construct. It is very difficult to reach the strict level of psychological measurements. Because the strict invariance criterion is often too strict to achieve, so many studies indicate that scalar invariance is sufficient (Brown, 2015; Van De Schoot et al., 2015). Vandenberg and Lance (2000) conducted a comprehensive review of 67 studies of measurement invariance in their research and found that less than half of these studies considered strict invariance. Therefore, ATI-T's strict level of measurement invariance shows that it is a valid measurement tool for comparing different age and gender groups.

5. Conclusion

In this study, the cross-cultural adaptation and psychometric properties of the Turkish version of the Affinity for Technology Interaction Scale, which we named ATI-T, were reported. The results showed that the ATI-T was successfully culturally adapted and had high validity and high reliability, as well as measurement invariance across age and gender groups. ATI-T showed a similar construct to the original English version and strong psychometric properties. While it is possible to obtain valid and reliable measurements that can contribute to the understanding of how people adapt to technology and help model this interaction with ATI, this is now possible for Turkish speakers with ATI-T. Therefore, we recommend the use of ATI-T in Turkish-speaking societies to researchers or practitioners interested in the subject.

As a result, the ATI scale can help researchers better understand how people interact with technology and adapt to a changing world, as well as how they deal with difficult situations caused by technology. Adaptation studies of the ATI scale to different cultures become important in terms of possible global modeling studies of human-technology interaction. ATI-T will also help to examine human-technology interactions in Turkish-speaking societies, as well as global modeling studies.

6. Limitations and further research

Some limitations and the need for further research should be considered when interpreting the results of the present study, although the psychometric properties of ATI-T were satisfactory. First, the inability to reach a larger sample can be seen as a limitation of the study. More than 1500 individuals and 8 separate subgroups were used in the development of the original ATI scale (Franke et al., 2019). The use of subgroups with different characteristics strengthens further research. Second, although construct, content, and convergent validity studies were conducted for the ATI-T scale, the lack of criterion validity study is another limitation of this study. It may be recommended to conduct criterion validity studies with scales measuring similar constructs such as technology acceptance, technology self-efficacy, and digital literacy, which were mentioned in the introduction of this study. Furthermore, the relationships between these constructs and the affinity for technology interaction can be modeled. In both ATI and ATI-T studies, samples containing adult individuals were studied. In order to investigate the construct validity of child and adolescent populations, it would be useful to examine samples from these age groups.

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Appendix A. Turkish version of ATI-SCALE (ATI-T).

Teknoloji Etkileşimine Yakınlık Ölçeği (TEYÖ)
Başlamadan önce lütfen açıklamayı dikkatlice okuyunuz.
Bu ölçekte, teknik sistemlerle etkileşiminize ilişkin dokuz madde bulunmaktadır. "Teknolojik sistem" ifadesi mobil uygulamalar ve diğer yazılım uygulamalarının yanı sıra tüm dijital cihazları (cep telefonu, bilgisayar, televizyon, araç navigasyon cihazı vb.) kapsayan bir kavram olarak kullanılmıştır.

Lütfen aşağıdaki ifadelere ne derece katılıp katılmadığınızı Belirtiniz.	Hiç Katılmıyorum 1	2	3	4	5	Tamamen Katılıyorum 6
1. Teknolojik sistemlerle detaylı bir şekilde uğraşmayı severim.	□	□	□	□	□	□
2. Yeni teknolojik sistemlerin işlevlerini denemeyi severim.	□	□	□	□	□	□
3. Teknolojik sistemlerle genellikle zorunlu olduğum için ilgilenirim.	□	□	□	□	□	□
4. Yeni bir teknolojik sistemle karşılaştığımda onu yoğun bir şekilde denerim.	□	□	□	□	□	□
5. Yeni bir teknolojik sistemi tanımak için zaman harcamaktan keyif alırım.	□	□	□	□	□	□
6. Bir teknolojik sistemin çalışıyor olması benim için yeterlidir; neden ve nasıl çalıştığıyla ilgilenmem.	□	□	□	□	□	□
7. Bir teknolojik sistemin tam olarak nasıl çalıştığını anlamaya çalışırım.	□	□	□	□	□	□
8. Bir teknolojik sistemin temel işlevlerini bilmek benim için yeterlidir.	□	□	□	□	□	□
9. Bir teknolojik sistemin sunduğu tüm imkânlardan yararlanmaya çalışırım.	□	□	□	□	□	□

Uygulayıcılar İçin Yönerge:

1. Ölçeğin açıklama kısmının katılımcılar tarafından okunduğundan emin olunuz.
2. Ölçekte dokuz madde bulunmaktadır ve maddeler "1= Hiç katılmıyorum" ifadesinden "6 = Tamamen katılıyorum" ifadesine doğru sıralı yanıt kategorilerinden oluşmaktadır.
3. Ölçekte yer alan 3., 6. ve 8. maddeler ters maddelerdir. Bu maddeler kodlanırken yanıt kategorileri ters çevirilerek yeniden kodlanmalıdır. (6 = 1, 5 = 2, 4 = 3, 3 = 4, 2 = 5, 1 = 6)
4. Ölçekte yer alan dokuz maddeye verilen yanıtlar toplanarak toplam puan elde edilir.

Appendix B. English version of ATI-SCALE.

Affinity for Technology Interaction (ATI) Scale

In the following questionnaire, we will ask you about your interaction with technical systems. The term "technical systems" refers to apps and other software applications, as well as entire digital devices (e.g., mobile phone, computer, TV, car navigation).

Please indicate the degree to which you agree/disagree with the following statements	Completely disagree 1	Largely disagree 2	Slightly disagree 3	Slightly agree 4	Largely agree 5	completely agree 6
1. I like to occupy myself in greater detail with technical systems.	☐	☐	☐	☐	☐	☐
2. I like testing the functions of new technical systems.	☐	☐	☐	☐	☐	☐
3. I predominantly deal with technical systems because I have to.	☐	☐	☐	☐	☐	☐
4. When I have a new technical system in front of me, I try it out intensively.	☐	☐	☐	☐	☐	☐
5. I enjoy spending time becoming acquainted with a new technical system.	☐	☐	☐	☐	☐	☐
6. It is enough for me that a technical system works; I don't care how or why.	☐	☐	☐	☐	☐	☐
7. I try to understand how a technical system exactly works.	☐	☐	☐	☐	☐	☐
8. It is enough for me to know the basic functions of a technical system.	☐	☐	☐	☐	☐	☐
9. I try to make full use of the capabilities of a technical system.	☐	☐	☐	☐	☐	☐

Analysis

1. When entering the participants' responses into a data file for the analysis, the responses should be coded as follows: completely disagree = 1, largely disagree = 2, slightly disagree = 3, slightly agree = 4, largely agree = 5, completely agree = 6.
2. Responses to the three negatively worded items (items 3, 6, 8) need to be reversed (6 = 1, 5 = 2, 4 = 3, 3 = 4, 2 = 5, 1 = 6).
3. Finally, a mean score should be computed over all dokuz items.
4. Report mean (*M*), standard deviation (*SD*) and Cronbach's alpha, usually with two decimal places, e.g., $M = 3.61$, $SD = 1.08$, $\alpha = .87$.

Source. Franke et al. (2019).
More information. https://ati-scale.org/