A Cross-cultural Validation of Multidimensional Digital Stress Scale in Türkiye

Çok Boyutlu Dijital Stres Ölçeğinin Türkiye'de Kültürlerarası Geçerliği

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Abstract

Purpose: The Multidimensional Digital Stress Scale, originally developed in English by Hall, Steele, Christofferson, and Mihailova (2021), was aimed to be adapted to Turkish culture in this study. To achieve this goal, the suitability of the Turkish translation, Turkish grammar control, and translation from Turkish to English back were examined by an expert whose mother tongue is English and who is proficient in Turkish.

Design/Methodology/Approach: The study was conducted with a participant group of 409 young individuals enrolled in the Gazi Faculty of Education during the 2021-2022 Spring Semester, ranging in age from 18 to 30. Within the scope of the adaptation study, exploratory factor analysis (EFA) was first performed to provide evidence for validity. Then, the obtained structure was tested with confirmatory factor analysis (CFA).

Findings: The scale, adapted based on the findings from EFA and CFA, consisted of 5 dimensions and 24 items, consistent with the original scale. Cronbach's alpha, stratified alpha, and McDonald's ω coefficient were sequentially computed to assess the reliability of both the sub-dimensions and the entire scale. The stratified alpha coefficient calculated for the complete scale was .95. Additionally, measurements for each dimension yielded reliable results.

Highlights: According to all findings, the scale maintained the same structure in Turkish culture.

Öz

Çalışmanın amacı: Çalışmanın amacı Hall, Steele, Christofferson ve Mihailova (2021) tarafından İngilizce olarak geliştirilen Çok Boyutlu Dijital Stres Ölçeğini Türk kültürüne uyarlamaktır. Bu amaç doğrultusunda, Türkçe çevirinin uygunluğu, Türkçe dilbilgisi kontrolü ve ana dili İngilizce olan ve Türkçe bilen bir uzman tarafından Türkçe'den İngilizce'ye geri çeviri incelenmiştir.

Materyal ve Yöntem: Çalışma grubu, Gazi Eğitim Fakültesi'nde öğrenim gören ve yaşları 18 ile 30 arasında değişen 409 öğrenciden oluşmaktadır. Uyarlama çalışması kapsamında geçerliğe kanıt sağlamak amacıyla ilk olarak açımlayıcı faktör analizi yapılmıştır. Sonrasında elde edilen yapı doğrulayıcı faktör analizi ile test edilmiştir.

Bulgular: Çalışmada AFA ve DFA bulgularına göre uyarlanan ölçek, orijinal ölçek formunda olduğu gibi 5 boyut ve 24 maddeden oluşmuştur. Çalışmada ölçeğin alt boyutlarının ve ölçeğin tamamının güvenirliği için sırasıyla Cronbach-alfa, tabakalı-alfa ve McDonald's ω katsayısı hesaplanmıştır. Ölçeğin tamamı için hesaplanan tabakalı alfa katsayısı 0,95'tir. Ayrıca, her bir boyut için yapılan ölçümler güvenilir sonuçlar vermiştir.

Önemli Vurgular: Tüm bulgulara göre ölçek Türk kültüründe aynı yapıyı ölçmektedir.

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INTRODUCTION

Approximately 68% of the world's population has internet access (Internet world stats, 2022). In Türkiye, the proportion of households with internet access is 92% and the proportion of individuals using the internet is 85% (TÜİK, 2022). Compared to the world average, it can be stated that a much higher proportion of individuals in Türkiye use the internet. This percentage signifies the extent of digitalization's prevalence and offers insights into the nature of interpersonal communication (Nesi & Prinstein, 2015) because digital communication applications serve as platforms for social interaction and maintaining friendships (Anderson & Jiang, 2018). The availability of applications like Facebook and Instagram on smartphones, enabling messaging, has redefined the concept of staying connected (Hall, Steele, Christoferson & Mihailova, 2021). Especially during the Covid-19 pandemic, people who had to stay at home instead of being involved in social environments were able to stay connected with the resources provided by technology (Brown & Greenfield, 2021).

It has been confirmed through research that both adolescents and adults in developed countries spend a significant amount of time on social media (Nesi & Prinstein, 2015; Reinecke, 2017). Particularly, the Covid-19 pandemic has resulted in increased internet and social media usage (Çelik, Karadağ & Bayazıt, 2022; King et al., 2020). An international study reported that 45% of individuals spent more time messaging and 44% on social media during the Covid-19 pandemic (Gökler & Turan, 2020). There is a differentiation between the studies on the psychological effects of this increase. For example, Feng and Tong (2022) examined whether there is a relationship between online-chatting and psychological well-being and found that there is a positive relationship between online-chatting and happiness and self-esteem. They also found that there is a negative relationship with loneliness. In addition, Orben, Tomova, and Blakemore (2020) stated that digital connection tools can be useful for people who have difficulty or do not have the opportunity to communicate face-to-face with their peers. On the other hand, there are some findings opposite to these studies. A study of young adults aged 19-32 found that high social media users were much more likely to feel socially isolated than their counterparts who do not use social media as often (Primack vd., 2017). Also, some clinical studies have revealed that this excessive information exposure can lead to digital stress in individuals, resulting in consequences such as anxiety, major disorders, and burnout (Fischer, Reuter & Riedl, 2021; Smith, Fowler, Graham, Jaworski, Firebaugh, et al., 2021). To better evaluate these contradictory results, it is thought that it is important to clearly reveal the effect of technology use on psychology with data to be obtained from different groups. At this point, it can be stated that the use of valid and reliable measurement tools is also very important for an appropriate evaluation. In this study, a valid and reliable measurement tool for determining the level of stress caused by using technology on individuals was adapted to Turkish.

Digital stress is experienced due to the complexity arising from continuous information and communication technology use and the challenges in using, managing, and deriving outcomes from it (Wrede, Anjos, Kettschau & Claaben, 2021; Steele, Hall & Christoferson, 2020). Digital tools offer flexibility in terms of time and space in daily life and work, and technological advancements have accelerated the pace of daily life. This current situation leads to increased online engagement, forming the foundation of digital stress (Özyılmaz, 2021). Studies have been conducted on the effects of digital stress on human psychology. One of these was carried out by Nick et al. (2022) with 680 students. The study revealed that many participants, regardless of gender and ethnicity, felt distress and pressure while using social media. In addition, it was determined that people with high digital stress have more mental and psychosocial difficulties.

Steele, Hall, and Christofferson (2020) pointed out the absence of a framework for structures related to digital stress and its complications in the literature. They introduced a multidimensional conceptual model that included four dimensions: accessibility stress, approval anxiety, fear of missing out (FoMO), and excessive connection. Accessibility stress represents the anxiety an individual feels when others expect them to respond or be accessible via digital tools. Approval anxiety entails uncertainty or concern about others' responses or reactions to their online presence. Fear of missing out (FoMO) reflects the distress arising from the inability to partake in appealing social experiences involving others. Another dimension, excessive connection, describes the distress induced by excessive digital notifications. Hall, Steele, Christoferson, and Mihailova (2021) conducted a scale development study on digital stress, originally conceived as four-dimensional. The factor analysis revealed that the structure was not four-dimensional but five-dimensional. In the process of scale development, four items from the FoMO subscale formed a distinct factor, termed "unanticipated," which was referred to as online vigilance. The online vigilance factor includes compelling items related to compulsively checking social media accounts and accessing one's phone.

Because scale development studies are demanding, expensive, and time-consuming, they can be employed in scale adaptation studies by researchers. In scale adaptation studies, it is demonstrated that it is suitable to adapt a scale originally designed for another language and culture to a new cultural and linguistic context. In these adaptation studies, which facilitate the bypassing of extended phases such as the creation of an item pool and the solicitation of expert opinions, there is substantiating evidence that the scale yields valid and reliable results within the language and culture aimed for adaptation. Although it represents a pioneering effort for the "Multidimensional Digital Stress" scale, which encompasses 24 items and five dimensions, this is a scale that has been meticulously examined during its developmental phase, rendering it capable of producing valid and reliable

measurements. Given today's lifestyle and the amount of time individuals devote to the internet, adapting this scale to Turkish culture will make a substantial contribution to researchers and our body of literature.

METHOD/MATERIALS

In this section, firstly, the research design is introduced. Then, descriptive statistics are presented over the study group in which the data were collected. Subsequently, brief information about the Digital Stress Scale as a data collection tool and detailed information about the scale adaptation process are presented.

Study Design

Psychometric properties of a measurement tool developed for a specific culture are examined through scale adaptation studies, wherein adaptation to other cultures is carried out (Deniz, 2007).

Study Group

The research's study group comprised 409 undergraduate students enrolled at Gazi University, Gazi Faculty of Education, in Ankara during the 2021-2022 academic year. The scale was administered to volunteer participants online via "Google Docs." Ethical approval necessary for the study was granted by the Gazi University ethics committee (Date and reference number: 19.04.2022/E-344780).

When selecting the study group, the criteria outlined in the original form of the scale were taken into account. These criteria included: (i) participants being 30 years of age or younger, and (ii) possessing active social media accounts. Descriptive statistics are presented in Table 1.

Table 1. Descriptive statistics for the study group

Variable		N	%
Gender	Female	320	78.2
	Male	87	21.3
	Other	2	0.5
Grade	1st Grade	172	42.1
	2nd Grade	168	41.1
	3rd Grade	52	12.7
	4th Grade	17	4.2
Time allocated to digital technology applications	Less than 1 hour	23	5.6
	1 to 3 hours	116	28.4
	3 to 5 hours	157	38.4
	More than 5 hours	113	27.6

Examinations of the study group in terms of gender revealed that 78.2% of the group were women (n=320), 21.3% (n=87) were men, and 0.5% (n=2) belonged to the other group. In terms of grade level, 42.1% (n=172) of the group were in the 1st grade, 41.1% (n=168) were in the 2nd grade, 12.7% (n=52) were in the 3rd grade, and 4.2% (n=17) were in the 4th grade. Lastly, regarding the time spent on digital technology, it was reported by the participants that 5.6% (n=23) spent less than one hour, 28.4% (n=116) spent 1 to 3 hours, 38.4% (n=157) spent 3 to 5 hours, and 27.6% (n=113) spent more than five hours on digital technology.

Data Collection Tool

The Multidimensional Digital Stress Scale, developed by Hall, Steele, Christofferson, and Mihailova (2021), comprises 24 items that measure 5 sub-dimensions. Additionally, scale items are in a 5-point Likert type, with answers ranging from "never" to "always". In the stage of determining the scale's factor structure, firstly, parallel analysis was conducted, and the analysis findings supported the 4-factor structure theoretically proposed by Steele et al. (2020). However, EFA (exploratory factor analysis) revealed that the dimension of fear of missing out was not uniformly distributed and was divided into two factors. The items related to online vigilance constituted a new factor, resulting in the scale becoming five-dimensional. In addition to EFA, CFA was carried out to verify the structure of the scale. As a result, it was determined by CFA that the five-dimensional structure was perfectly compatible with the data (RMSEA = .044 (90% CI of .039-.048), CFI = .973, TLI = .969, SRMR = .040, $\chi2/df$ = 2.41). The approval anxiety and excessive connection dimensions of the scale consist of 6 items, while the accessibility stress, fear of missing out, and online vigilance dimensions contain 4 items each. The internal consistency coefficients of reliability, calculated using Cronbach's alpha based on dimension, varied between 0.86-0.93; however, it was 0.85 for the whole scale.

Adaptation Procedures

Translation Phase

In the adaptation procedure, permission was initially obtained from the researchers who owned the original English form of the scale to adapt it to Turkish. Subsequently, a series of studies were conducted to demonstrate the cross-cultural equivalence of the original form of the scale and the translation form. First, the scale items were translated into Turkish by the researchers, and Turkish grammar experts examined the translated items. Then, Turkish translations were presented to English experts, and their opinions on suitability were sought. The Turkish translations were translated back into English by the researchers. Opinions about the suitability of the items translated into English and the original items of the scale were also obtained from foreign language experts whose mother tongue was Turkish. In the last stage, the final Turkish form of the scale was created and an expert, who is a native speaker of English and has a good command of Turkish, gave an opinion on the suitability of the final version of the scale items for translation.

Application Phase

In the application phase, the necessary permissions were obtained from the Gazi University Ethics Committee. Subsequently, data were collected through Google Documents from volunteer participants studying at Gazi University in the spring semester of the 2021-2022 Academic Year. The scale application took approximately 15 to 20 minutes.

Phase for Validity-Reliability Analysis

In the data analysis phase, the data set was randomly divided into two parts and exploratory factor analysis and confirmatory factor analysis were applied respectively to obtain evidence of the construct validity of the scale. The number of factors was determined through EFA, and the factor structure established through CFA was confirmed. Additionally, the fit indices obtained according to the created model were reported and interpreted based on predetermined criteria. Item discrimination coefficients were also calculated within the scope of item analyses to provide evidence of validity. Each item in the scale needed to have a significant relationship with the total score, which was examined by calculating the correlation between the item score and the total score for each item (DeVellis, 2003, p.93). As the scale was multidimensional, Cronbach's alpha and Mc Donald's ω coefficients were calculated for each dimension for internal consistency. For the entire scale, the stratified alpha coefficient was also calculated.

Data Analysis

Within the data analysis, Mahalonobis values were first examined to determine whether the data met the assumption of multivariate normality. Consequently, the data of 20 individuals identified as extreme values were excluded from the analysis. After the extreme values were removed from the data, the data were randomly divided into approximately 50% and EFA was performed on 214 data and CFA was performed on 195 data.

The SPSS 25.0 package program was utilized for EFA to establish evidence of the scale's construct validity. Subsequently, Kaiser-Meyer-Olkin (KMO) and Barlett Test values were examined to assess the sample's suitability for factor analysis for EFA. For factorization of the dataset, the recommended KMO value should be at least 0.50. The significance of the Barlett statistic indicates a sufficient relationship between the variables (Field, 2013, p.659).

EFA also assessed the degree of dimensionality in responses to items. Various methods were employed to evaluate the number of significant factors underlying participants' responses to latent variables. When determining the number of factors, this study considered the explained variance ratio and eigenvalues greater than 1 (Kaiser, 1960). Additionally, the "principal axis analysis" method was used as the factor extraction method, and the "promax" method was employed as the rotation method in the original scale.

In the CFA analysis, Mplus 8.3 package program was utilized for analysis and model fit indices and factor loadings were examined to assess the data's conformity with the structure. In model parameter estimation, Maximum Likelihood (ML) estimation was used. Model fit indices, including χ^2/sd, RMSEA, CFI, TLI, and SRMR values, were sequentially analyzed.

FINDINGS

Exploratory Factor Analysis

KMO and Barlett test results were examined before conducting EFA. The analysis revealed that the KMO value was 0.892, and the Barlett test yielded statistically significant results (χ^2= 3419.997; p<0.05). Based on these statistics, it was concluded that factor analysis was appropriate for the data obtained from the scale.

In Table 2, eigenvalues, explained variance ratios, and cumulative explained variance ratios obtained from the EFA conducted with the dataset from the entire study group are presented.

Table 2. Eigenvalues & explained variance ratios

Item	Eigenvalue	Explained Variance Ratio	Cumulative Explained Variance Ratio
1	9.021	37.586	36.101
2	2.330	9.710	44.520
3	2.246	9.360	52.560
4	1.629	6.787	58.055
5	1.387	5.781	62.206
6	.870	3.625	
7	.847	3.531	
8	.666	2.774	
9	.584	2.432	
10	.526	2.192	
11	.447	1.862	
12	.428	1.784	
13	.401	1.672	
14	.376	1.568	
15	.362	1.508	
16	.322	1.344	
17	.286	1.193	
18	.279	1.162	
19	.251	1.046	
20	.235	.977	
21	.168	.701	
22	.146	.607	
23	.122	.509	
24	.070	.290	

According to the analysis findings, the variance ratio explained by the first factor was 37.59%, the variance ratio explained by the second factor was 9.71%, and by the third factor, it was 9.36%. The variance ratios explained for the fourth and fifth factors were 6.79% and 5.78%, respectively. Additionally, the variance explained by the five factors amounted to 62.21% in total. Furthermore, the number of factors with eigenvalues above 1 was determined to be five.

Secondly, the scree plot graph was examined to determine the number of dimensions. According to the graph shown in Figure 1, a flattening was observed after the fifth dimension. Therefore, it was concluded that the number of dimensions of the scale should be 5, consistent with its original form.
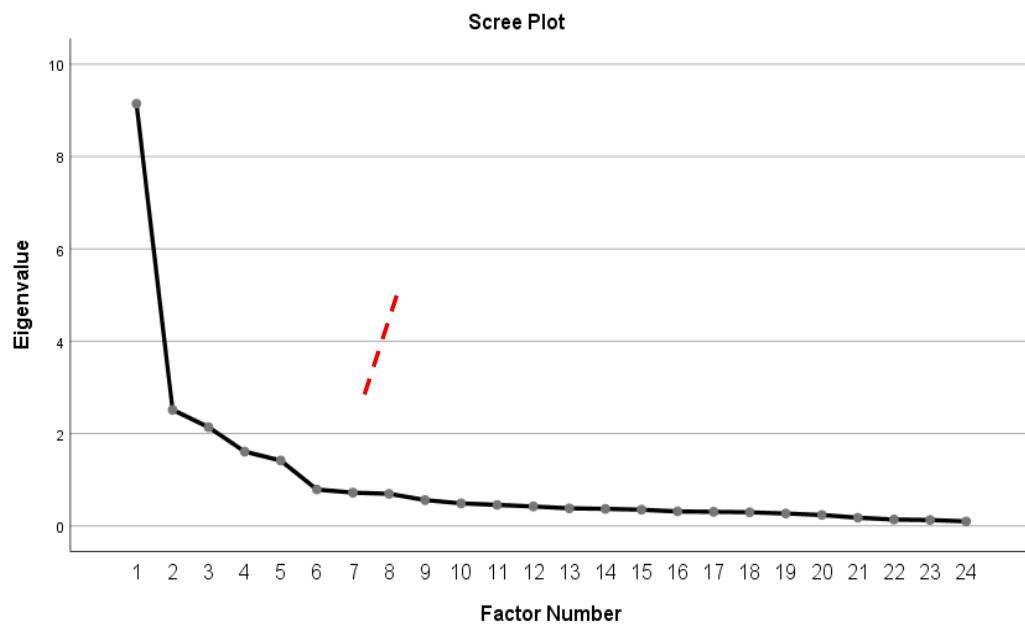
Figure 1. Multidimensional Stress Scale Scree-plot

The factor loadings obtained through EFA for the scale items are presented in Table 3.

Table 3. Distribution of factor loadings

Item	Factor1	Factor2	Factor3	Factor4	Factor5
7	.964				
6	.962				
8	.918				
5	.868				
10	.523				
9	.476				
18		.809			
19		.722			
17		.682			
16		.675			
20		.649			
15		.621			
22			.875		
24			.839		
23			.817		
21			.768		
2				.923	
1				.868	
3				.787	
4				.480	
11					.952
12					.923
13					.376
14					.332

In the first dimension, the factor loadings for the items, as displayed in Table 3, ranged from .476 to .964. Similarly, loadings for the items of the second dimension ranged from .621 to .809. Subsequently, loadings for the items of the third dimension ranged from .768 to .875. Additionally, loadings of the items of the fourth dimension ranged from .480 to .923. The loadings for the items of the fifth dimension ranged from .332 to .952. Consequently, all factor loadings exceeded .32.

The correlation coefficients between the scores obtained from the sub-dimensions of the scale and the scores obtained from all of them are presented in Table 4.

Table 4. Correlation between sub-dimensions and total score

Dimensions	1	2	3	4	5
1. Accessibility Stress	1				
2. Approval Anxiety	.507**	1			
3. Fear of Missing Out	.477**	.574**	1		
4. Excessive Connection	.393**	.541**	.318**	1	
5. Online Vigilance	.516**	.479**	.333**	.359**	1

**<.01

Confirmatory Factor Analysis

To validate the factor structure established by EFA, one and two-level CFAs were conducted in the study. Below, the findings from both analyses are presented.

One Level CFA

The fit indices obtained from the one-level CFA results, performed to assess the support for the five-dimensional structure, are presented in Table 5.

Table 5. Fit indices obtained as a result of the study

	χ^2/sd	RMSEA	SRMR	CFI	TLI
Perfect fit	$0 \leq \chi^2/sd \leq 2$	$0 \leq RMSEA \leq .05$	$0 \leq SRMR \leq .05$	$.95 \leq CFI \leq 1.00$	$.95 \leq TLI(NNFI) \leq 1.00$
Acceptable Fit	$2 \leq \chi^2/sd \leq 5$	$.05 \leq RMSEA \leq .10$	$.05 \leq SRMR \leq .10$	$.90 \leq CFI \leq .95$	$.90 \leq TLI(NNFI) \leq .95$

| Results | 2.17 | 0.078 | 0.09 | 0.91 | 0.90 |
| Comment | Acceptable Fit | Acceptable Fit | Acceptable Fit | Acceptable Fit | Acceptable Fit |

The fit indices obtained as a result of CFA were interpreted according to the criteria determined by Schermelleh, Engel, and Moosbrugger (2003). An acceptable fit between the data and the model was observed based on RMSEA, SRMR CFI and TLI values. Additionally, the χ2/sd value was found to be lower than the specified range. While there is no conclusive acceptable criterion for its relative χ2 statistic in the literature, it is generally deemed acceptable up to 5.0 (Wheaton, Muthen, Alwin, & Summers, 1977). Taking into account all the fit indices obtained, it was concluded that the data demonstrated a good fit to the structure (χ2/sd = 2.17; RMSEA = 0.078; SRMR = 0.088; CFI = 0.91; TLI = 0.90). The structural model obtained as a result of CFA is presented in Figure 2.
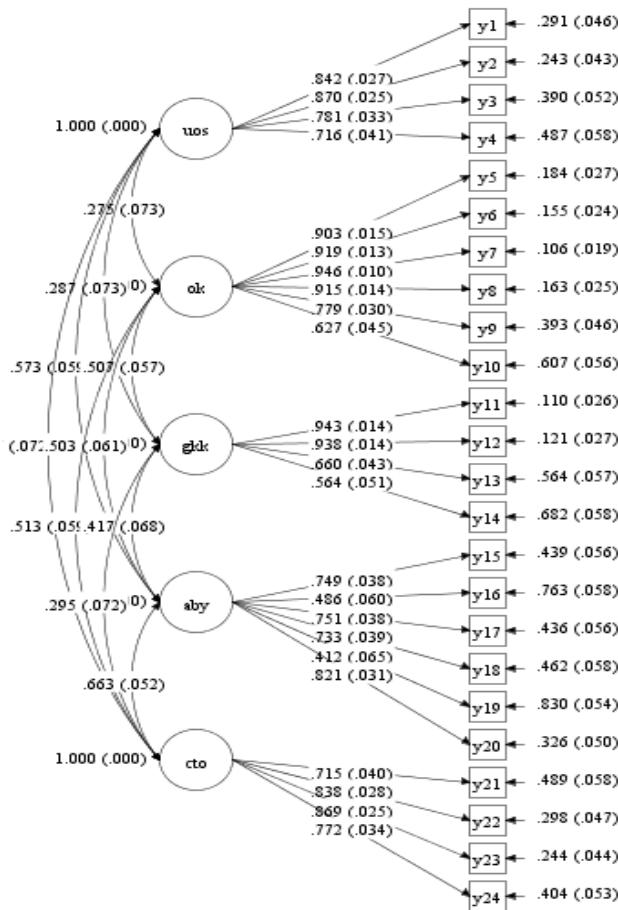
Figure 2. 5-Factor CFA Model

According to the factor loadings for the standardized prediction in the structural model as visualized in Figure 2, the loadings for the Accessibility Stress sub-dimension ranged from 0.66 to 0.82. Similarly, the loadings for the Approval Anxiety sub-dimension ranged from 0.61 to 0.95. Additionally, the loadings for the Fear of Missing Out sub-dimension varied between 0.53 and 0.93, while the loadings for the Excessive Connection sub-dimension ranged from 0.49 to 0.81. Lastly, the loading values for the Online Vigilance sub-dimension were found to vary between 0.74 and 0.84.

Two-level CFA

Following the single-level CFA stage, a two-level CFA was conducted using the data obtained from the study group. The fit indices obtained based on the results of the two-level CFA are displayed in Table 6.

Table 6. Fit indices obtained as a result of the study

	χ^2/sd	RMSEA	SRMR	CFI	TLI
Perfect fit	0 ≤ X²/sd ≤ 2	0 ≤ RMSEA ≤ .05	0 ≤ SRMR ≤ .05	.95 ≤ CFI ≤ 1.00	.95 ≤ TLI(NNFI) ≤ 1.00
Acceptable Fit	2 ≤ X2/sd ≤ 5	.05 ≤ RMSEA ≤ .10	05 ≤ SRMR ≤ .10	.90 ≤ CFI ≤ .95	.90 ≤ TLI(NNFI) ≤ .95

Results	2.25	0.080	0.098	0.91	0.90
Comment	Acceptable Fit	Acceptable Fit	Acceptable Fit	Acceptable Fit	Acceptable Fit

After analyzing the table values, it was evident that a strong compatibility with the structure was exhibited by the data, as indicated by all fit indices (χ2/sd = 2.25; RMSEA = 0.080; SRMR = 0.098; CFI = 0.91; TLI = 0.90). Figure 3 illustrates the structural model that was obtained through the two-level CFA.
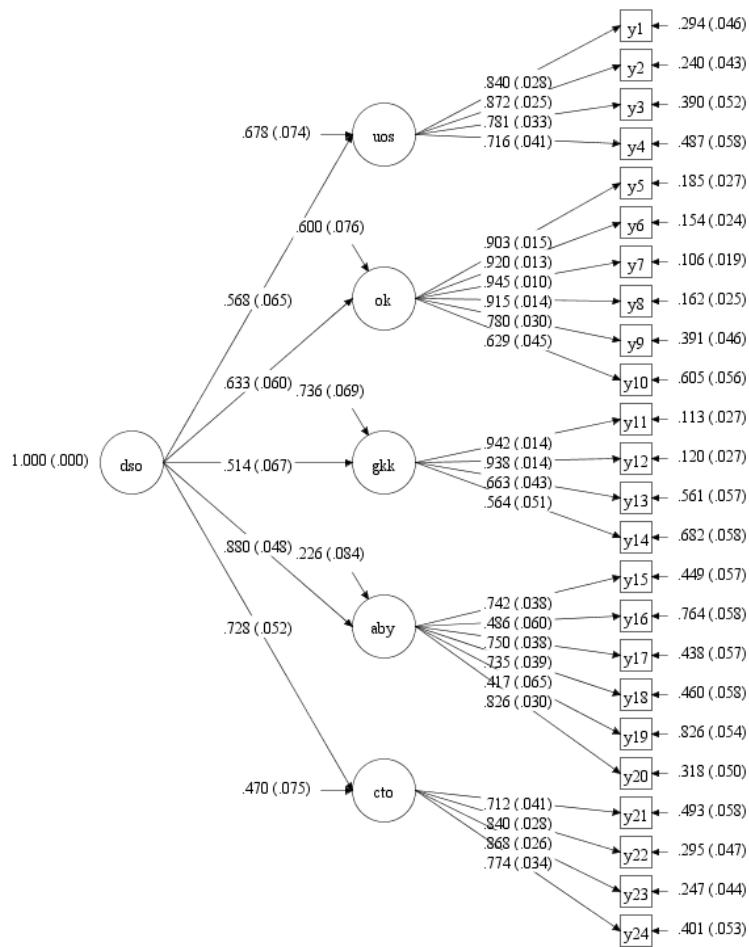
Figure 3. 5-Factor Two-Level Structural Model

In addition to providing evidence of the study's validity, corrected item-total correlations and alpha values based on each dimension were calculated for the scale items. Field (2013) emphasized that the corrected item-total correlation should exceed 0.3 (p. 713). Table 7 display the corrected item-total correlations and corrected Cronbach alpha coefficients for the items in each sub-dimension.

Table 7. Corrected item-total correlation for the items in the scale (for each dimension)

Dimension	Item	Corrected Item-Total Correlation	Cronbach's Alpha If Item Deleted
Accessibility Stress	1	.75	.80
	2	.78	.79
	3	.71	.82
	4	.60	.87
Approval Anxiety	5	.85	.91
	6	.88	.91
	7	.88	.91
	8	.85	.91
	9	.70	.93
	10	.63	.94
Fear of Missing Out	11	.74	.77

	12	.72	.78
	13	.66	.81
	14	.59	.83
Excessive Connection	15	.64	.80
	16	.54	.82
	17	.62	.81
	18	.70	.79
	19	.48	.84
	20	.70	.80
Online Vigilance	21	.68	.85
	22	.76	.83
	23	.75	.83
	24	.73	.84

The corrected item-total correlations for the items in the accessibility stress dimension were found to range from .60 to .75; for the items in the approval anxiety dimension were found to range from .63 to .85; for the items in the fear of missing out dimension were found to be ranged from .59 to .74; for the items in the excessive connection dimension were found to range from .48 to .70. Lastly, the corrected item-total correlations for the items in the online vigilance dimension were found to range from .68 to .76. These high correlations indicate strong item discrimination.

Finally, Table 8 provides the values obtained in the original development study of the scale, along with the factor loadings and R^2 values obtained in the adaptation study.

Table 8. Factor analysis results obtained in the original form and adaptation study

	Values Obtained in the Original Form of the Scale		Values Obtained as a Result of Adaptation		
	Factor Loading (EFA Result)	R2 value	Factor Loading (EFA Result)	Factor Loading (CFA Result-one level)	R2 value
Item 1	0.92	0.76	0.87	0.84	0.71
Item 2	0.88	0.71	0.92	0.87	0.76
Item 3	0.70	0.48	0.79	0.78	0.61
Item 4	0.62	0.68	0.48	0.72	0.51
Item 5	0.94	0.83	0.87	0.90	0.82
Item 6	0.90	0.82	0.96	0.92	0.85
Item 7	0.86	0.83	0.96	0.95	0.89
Item 8	0.85	0.78	0.92	0.92	0.84
Item 9	0.75	0.49	0.48	0.78	0.61
Item 10	0.71	0.38	0.52	0.63	0.40
Item 11	0.96	0.55	0.95	0.94	0.89
Item 12	0.87	0.52	0.92	0.94	0.88
Item 13	0.58	0.67	0.38	0.66	0.44
Item 14	0.47	0.40	0.33	0.56	0.32
Item 15	0.86	0.72	0.62	0.75	0.55
Item 16	0.86	0.54	0.68	0.49	0.24
Item 17	0.78	0.64	0.68	0.75	0.56
Item 18	0.76	0.54	0.81	0.73	0.54
Item 19	0.76	0.64	0.72	0.41	0.17
Item 20	0.71	0.53	0.65	0.82	0.68
Item 21	0.86	0.55	0.77	0.72	0.51
Item 22	0.82	0.67	0.88	0.84	0.71
Item 23	0.65	0.57	0.82	0.87	0.75
Item 24	0.65	0.52	0.84	0.77	0.60

As shown in Table 12, the lowest factor loading was observed in Item 14 (0.47), and the highest factor loading was found in Item 11 (0.96) based on the EFA conducted with data obtained from the original version of the scale. Likewise, in the EFA conducted with data collected for the adaptation study, the lowest factor loading was found in Item 14 (0.33), while one of the highest factor loadings was observed in Item 11 (0.95).

Evidence of reliability

Cronbach's Alpha (α) and McDonald's Omega (ω) coefficients were computed for each dimension, and the stratified-alpha (α) reliability coefficient (Cronbach, Schönemann & McKie, 1965) was determined for the entire scale to establish the reliability of the scales obtained from the instrument. Table 9 displays the resulting statistics.

Table 9. Cronbach alpha, mc donald's omega, and stratified alpha reliability coefficients

Dimension	Cronbach's α	Stratified-α	Omega
Accessibility Stress	.861		.863
Approval Anxiety	.931		.932
Fear of Missing Out	.839	.95	.823
Excessive Connection	.837		.839
Online Vigilance	.872		.875

Based on the analysis of the computed reliability coefficients, it was found that the Cronbach Alpha values for each dimension were above 0.83, and the Omega coefficients exceeded 0.82. The reliability coefficient for the entire scale was determined to be 0.95. Hence, the calculations for both the five dimensions and the entire scale were considered reliable.

Table 10 presents a summary of the reliability coefficients obtained from the original form of the scale and those obtained in the adaptation study, along with the factor loadings.

Table 10. Reliability coefficients obtained in the original form and adaptation study

	Values Obtained in the Original Form of the Scale	Values Obtained as a Result of Adaptation
1. Accessibility Stress	.93	.86
2. Approval Anxiety	.88	.93
3. Fear of Missing Out	.91	.84
4. Excessive Connection	.87	.84
5. Online Vigilance	.86	.87
Total digital stress	.85	.95

Based on the examination of the coefficients presented in the table, it is evident that the reliability values obtained from both the original scale and the adaptation study were high.

DISCUSSION, CONCLUSION AND RECOMMENDATIONS

This study aimed to establish evidence of validity and reliability by adapting the Digital Stress Scale to Turkish culture. Initially, the study conducted an Exploratory Factor Analysis (EFA) using data from the study group. The findings from the EFA, including the examination of eigenvalues and scree plots, indicated the presence of 5 dimensions in the latent structure, mirroring the original scale. These 5 dimensions accounted for approximately 70% of the total variance. Furthermore, the factor loadings ranged from 0.41 to 0.98. The results show that the scale structure is applicable to Turkish culture.

Additionally, Confirmatory Factor Analysis (CFA) was performed to verify the established model. The CFA results demonstrated a good fit between the data and the model for both the one-level and two-level structures. Upon examining the factor loadings, it was evident that the items exhibited appropriate factor loadings across all sub-dimensions. This reaffirmed the presence of the five-dimensional structure.

Regarding reliability, Cronbach's Alpha and McDonald's Omega (ω) reliability coefficients were calculated for each subscale, all of which exceeded 0.82. Moreover, the stratified reliability coefficient for the entire scale was high at 0.95. Consequently, the calculations in this regard were considered reliable.

When the scales developed and adapted in Türkiye are examined, it is seen that there is no measurement tool to measure technological stress. When the latent constructs close to digital stress were examined, it was determined that the "Digital Burnout Scale" developed by Erten and Özdemir (2020) and the "Techno-Stress Scale at Workplace" adapted by Türen, Erdem and Kalkın (2015) were used in the Turkish literature. However, the latent construct addressed in the first of these scales, the "Digital Burnout Scale", is burnout. There are three dimensions in this measurement tool and these dimensions are named as "digital attrition", "digital deprivation" and "emotional exhaustion". When the dimensions are considered, it is seen that it has different sub-dimensions with the existing measurement tool. The other measurement tool has the sub-dimensions of "technological workload overload", "technological complexity" and "technological uncertainty" and measures different latent characteristics with the current measurement tool.

In addition, there are some measurement tools in the Turkish literature for the "Fear of Missing Out", which is one of the dimensions in the current measurement tool. Çelik and Özkara (2020) adapted the "Fear of Missing Out (FoMO) Scale" into Turkish and obtained a valid and reliable measurement tool to measure individuals' sense of FoMO. This measurement tool has two

dimensions and is named as "personal FoMO" and "social FoMO". However, in the current measurement tool, FoMO is evaluated as a single sub-dimension and its relationship with other sub-dimensions in the scale can be revealed by using this measurement tool.

As a result, the examination of the validity and reliability results, in general, determined that all the items in the original form of the scale were also found to be suitable for Turkish culture, and the measurement model presented in the original form was found to be similar to Turkish culture. In this regard, the Digital Stress Scale can be employed within Turkish culture for individuals aged 18 to 30, enabling the determination of the stress level induced by digital technology in adults. In addition, cross-cultural measurement invariance studies can be conducted by applying the scale in the culture in which it was developed and in Turkish culture.

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Statements of publication ethics

We hereby declare that the study has not unethical issues and that research and publication ethics have been observed carefully.

Researchers' contribution rate

The study was conducted and reported with equal collaboration of the researchers.

Ethics Committee Approval Information

"Multidimensional Adaptation of Digital Stress Scale into Turkish: Reliability and Validity Analysis" Gazi University Ethics Commission, at its meeting dated 19.04.2022 and numbered 08 unanimously approved.

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APPENDIX

DİJİTAL STRES ÖLÇEĞİ Değerli Katılımcı, bu ölçme aracı ile bireylerde Dijital Stres Düzeylerinin belirlenmesi amaçlanmaktadır. Ölçme aracında toplamda 24 madde olup, 1=hiçbir zaman; 2= nadiren; 3= bazen; 4= sık sık ve 5=her zaman olacak şekilde maddelere katılım düzeylerinizi belirtmeniz istenmektedir. Katılımınız için şimdiden çok teşekkür ederiz.	1 (Hiçbir zaman)	2 (Nadiren)	3 (Bazen)	4 (Sık sık)	5 (Her zaman)
1) Arkadaşlarım benden sürekli çevrimiçi olmamı bekliyor.					
2) Arkadaşlarım için sürekli çevrimiçi olmam önemlidir.					
3) Arkadaşlarımın çoğu, sürekli çevrim içi olmamı onaylar.					
4) Sürekli çevrim içi olma yönünde sosyal bir zorunluluk hissediyorum.					

5)	İnsanların gönderilerime ve fotoğraflarıma nasıl tepki vereceği konusunda gergin hissediyorum.					
6)	Sosyal medyada yeni bir fotoğraf paylaştığımda başkalarının nasıl tepki vereceği ile ilgili kaygı duyuyorum.					
7)	Bir gönderi veya fotoğraf paylaştıktan sonra başkalarının nasıl karşılayacağı beni geriyor.					
8)	Sosyal medyada hayatımla ilgili değişiklikleri paylaştığımda başkalarının nasıl karşılayacağı beni geriyor.					
9)	Çevrim içi ortamda diğer insanların onay vereceği bir fotoğraf bulmak veya oluşturmak için çok çaba sarf ederim.					
10)	Paylaştığım gönderileri ve mesajları oluştururken çok çaba sarf ederim.					
11)	Arkadaşlarımın benim yaşadığımdan daha cazip deneyimler yaşamasından korkuyorum.					
12)	Diğer insanların benim yaşadığımdan daha cazip deneyimler yaşamasından korkuyorum.					
13)	Arkadaşlarımın bensiz eğlendiğini öğrendiğimde endişeleniyorum.					
14)	Arkadaşlarımın ne yaptıklarını bilmediğim zaman kaygılanıyorum.					
15)	Çok fazla bildirimi kontrol etmek zorunda kalıyorum.					
16)	Telefonumdaki mesajların/bildirimlerin akışı beni bunaltıyor.					
17)	-Yanıp sönen bir ışık veya vızıltı gibi- ilgilenmem gereken başka bir mesaj olduğunu her zaman hatırlatan bir şey varmış gibi geliyor.					
18)	Önemli olanlara ulaşmak için birçok önemsiz bildirimi gözden geçirmem gerektiği için stresli hissediyorum.					
19)	Yapmam gereken diğer şeylerin yanı sıra, bildirimleri takip etmek bir angaryadır.					
20)	Bildirimlere/mesajlara yanıt vermek için çok fazla zaman harcıyorum.					
21)	Neler olduğunu takip edebilmem için telefonum yanımda olmalı.					
22)	Telefonum olmadan kaybolmuş veya "çıplak" hissediyorum.					
23)	Mesajlar/bildirimler için telefonumu sürekli kontrol ediyorum.					
24)	Telefonum yanımda olmadığında sosyal olarak ulaşılabilir olmadığımı hissediyorum.					

Boyutlar

Ulaşılabilir Olma Stresi: 1., 2., 3. ve 4. maddeler

Onaylanma Kaygısı: 5., 6., 7., 8., 9. ve 10. maddeler

Gelişmeleri kaçırma korkusu: 11., 12., 13. ve 14. maddeler

Aşırı Bağlantı Yükü: 15., 16., 17., 18., 19. ve 20. maddeler

Çevrimiçi Tetikte Olma: 21., 22., 23. ve 24. maddeler

There are no reverse items in the scale. A high score from the scale indicates a high level of digital stress.

Note: You can use the scale in your study by citing it. Also, no permission is required.