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The digital obesity scale: A scale development study

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ABSTRACT

With digital transformation introduced technologies to every aspect of human life. Consequently, misuse and excessive use of the internet have also been on the increase. Thus, everyone is a digital obesity candidate today. Therefore, certain strategies should be developed for the use of digital devices. The current study aimed to develop a valid and reliable measurement instrument to determine the digital obesity level. In the study, initially, a literature review was conducted on digital obesity and a 63-item draft scale was developed. The language, semantic and content validity of the scale items were determined based on expert opinion. The study data were collected from 320 volunteering participants, who were older than 18 and lived in different geographical regions in Turkey during the 2022 spring term. Statistical procedures such as exploratory factor analysis, item analysis, total item correlation, t-test, and Cronbach Alpha coefficient were conducted. The study findings demonstrated that there were statistically significant differences between all scale items. Exploratory factor analysis revealed that the scale included 5 factors across 33 items. Furthermore, it was determined that the construct of the scale was reliable and the scale could measure the attitudes of individuals towards digital obesity based on the Cronbach Alpha reliability coefficient (α) = 0.93.

Keywords: Digital obesity, scale development, validity, reliability.

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INTRODUCTION

We witness the rapid rise of digital technologies. In particular, digital media and online devices have become increasingly popular. Millions of people employ mobile devices to access the internet. Thus, it could be suggested that digital tools and the internet play a key role in our daily lives. Digital tools provide temporal and spatial facilities for individuals to conduct daily tasks. Furthermore, they significantly contribute to entertainment, immediate access to data, and interpersonal communications. However, the misuse and excessive use of digital devices and the internet could also lead to digital addiction.

In general, addiction could be described as the inability to prevent or stop the use of a substance or behavior (Egger and Rauterberg, 1996). The addicted individual could not avoid the use of a substance or behavior despite the knowledge that the substance/behavior is harmful in the long run. For example, individuals could be addicted to drugs, smoking, substances, gambling, or sex (Orford, 2001). The popularity of the Internet and digital devices led to a new type of addiction called the "digital addiction". Individuals who center their lives on digital devices and could not abstain from the use of these devices even for a short period could be considered digital addicts. This addiction is quite similar to other addictions. Several studies conducted in many countries, especially in the United States, demonstrated that behavioral and substance addictions were quite similar. In other words, it was determined that there are similarities between drug addiction and digital addiction (Olsen 2011; Kuss and Griffiths 2012). When addicted individuals stay away from the computer, internet, social media and various digital tools, they become unhappy, and could exhibit aggression and nervousness, the reactions observed in drug addicts (Ziyalar, 1999). Similar to the discomfort experienced by the individual

after excessive consumption of food, long-term and unnecessary use of digital devices could also lead to certain problems. The most significant problem induced by digital addiction is digital obesity.

Digital obesity refers to the excessive use of digital devices. Individuals with digital obesity experience certain physiological and psychological problems. Unfortunately, the number of individuals who are dependent on digital tools and who are likely to encounter these problems increase every day. It was determined that the number of social media users was 3.66 billion in 2019, while the same figure reached over 4.5 billion in 2021 (We are social, 2021). Another study conducted in the US reported that Americans check their smartphones 50 to 80 times a day (Allcott et al., 2021). The Digital Games Report (2019) reported that about one out of every six individuals is addicted to digital games worldwide. Thus, it could be suggested that digital technologies are consumed by large masses, which in turn increases the number of individuals with digital obesity.

Several global studies demonstrated that the number of individuals with digital obesity has reached alarming figures, and digital obesity negatively affects physical, emotional, and cognitive development (Scherer, 1997; Harris et al., 2015; Bel-Serrat et al., 2013; Hysing et al., 2015). Thus, certain strategies should be adopted for digital device use. These strategies should address digital addiction and include the acknowledgment of the fact that certain applications marketed by technology companies alleviate the addiction of the individuals, planning the periods of access to social media accounts, prevention of the digital takeover of workspaces, and discovering the power of silence (Peper and Harvey, 2018). Undoubtedly, it is possible to add further strategies. However, the individual's acceptance of digital obesity is more important. Only the acceptance of the individual would lead to the adoption of coping strategies. Thus, individual digital obesity levels should be determined. Therefore, the authors considered the development of a digital obesity scale important. It is a matter of curiosity to define today's century as the digital age and how individuals spend their time in digital environments and, accordingly, to determine the levels of digital obesity. However, this study is important because there is no measurement tool to test the digital obesity status of individuals in the literature. Therefore, this study is aimed at developing a digital obesity scale. In the following sections, the development stages of the scale are discussed.

METHOD

The main objective of the current study is to determine digital obesity behavior and to develop a scale to measure these behaviors. The data on the study group, scale development process, data collection and, data analysis are presented in this section.

Study group

The scale data were collected online with the voluntary participation of 320 18 years old or older individuals living in different regions in Turkey during the 2022 spring semester. It was reported that the sample size should be at least five and at most, ten times the number of variables (items) for dependable scale reliability and validity analyses (Ho, 2006, cited by Can, 2014; Tavşancıl, 2018). In the current study, it could be suggested that the study group size was adequate for the factor analysis of the scale data.

Scale development

The scale was developed based on the following three stages:

Description of the scale scope

Initially, the scope of the scale and the theoretical framework were determined. Thus, a literature review was conducted by the authors. The studies available in the literature were reviewed (Scherer, 1997; Kuss and Griffiths, 2012; Pelgrom, 2016; Bayrak and Cihan, 2021; Rahman, et al., 2019; Kasap, 2020; Akkuş, 2022).

The development of the item pool and its submission for expert review

Based on the collection from the literature review, an item pool that included 5 to 6 times more items than the target scale size was developed. The draft scale included 75 positive and negative items that measured attitudes. The items included cognitive, affective, and behavioral attitudes based on the theoretical framework. The draft items were reviewed by experts (measurement and evaluation field specialists, Turkish language specialists, and lecturers in various universities) to determine item suitability and content and face validity.

Scale development

The draft scale items were reviewed based on expert recommendations. Incomprehensible and repetitive items were excluded from the scale. After the revision, the scale was finalized, and the scale candidate included 63 items. The scale included 5-point Likert-type items that reflected the agreement of the participant with the statement (Tavşancıl, 2018). The scale was scored as

follows: strongly agree (5 points), partially agree (4 points), undecided (3 points), partially disagree (2 points), and strongly disagree (1 point). Negative scale items were reverse scored. Furthermore, the first section of the scale included information about the aim of the study, and it was stated that the responses will be used solely for scientific purposes.

Data collection

To collect the study data, the scale (information form and scale items) was transferred to Google Forms. It was preferred to collect the data on an electronic medium. The hyperlink for the scale was sent to the study group by the authors. Data were collected in two weeks.

Data analysis

In the study, the study data were initially transferred to the SPSS 22.0 software. A set that included the data collected from 320 individuals on 63 scale items was developed. Then, the data were reverse coded for the responses to the negative items. Then, a total score was calculated for each participant.

To determine the accuracy of the instrument in measuring a phenomenon, construct validity was calculated with factor analysis (Tavşancıl, 2018). In the current study, the dimensions of the scale were determined with exploratory factor analysis based on the correlations between the variables (Can, 2014). Before the exploratory factor analysis, Kaiser-Meyer Olkin (KMO) test was conducted to determine whether the scale data were suitable for factor analysis and the Bartlett Test of Sphericity was conducted to determine the normal distribution of the data. KMO and Bartlett's test statistics are presented in Table 1 for the digital obesity scale.

It was reported in the literature that KMO should be above 0.50 to conduct factor analysis on the data and a high Bartlett's test result improves significance (Tavşancıl, 2018). The review of the KMO and Bartlett's test statistics revealed that KMO was .884 at the .000 significance level and Bartlett's test chi-square was 10648.425. These figures demonstrated that the study data were suitable for factor analysis. In the factor analysis, the vertical rotation (varimax) method was adopted to achieve a small number of dimensions with the scale items. Items with a load of .33 and above were accepted (Karasar, 2012). Those with a load of less than .33 and with a load in two factors were gradually removed from the scale (attention was paid to ensure that the difference was at least 0.10). Then, exploratory factor analysis was re-conducted on the remaining scale items (Büyüköztürk, 2007). In the study, the Cronbach Alpha coefficient was calculated to determine the reliability of the scale. Furthermore, the item scores were ranked. Thus, the independent t-test was employed to compare upper and lower percentiles of 27 to determine whether the students exhibited the attitudes that the item aimed to measure (Can, 2014). Based on the validity and reliability analyzes, the scale items were revised. The final digital obesity scale included 33 positive (9) and negative (24) items.

Table 1. KMO and Bartlett's test statistics for the digital obesity scale.

Kaiser-Meyer-Olkin test	.884	
	Approximate chi-square	10648.425
Bartlett Test of Sphericity	7552.035	1953
	Degree of freedom (sd)	.00

FINDINGS

Exploratory factor analysis

The digital obesity attitudes scale was analyzed with exploratory factor analysis. Thus, the scale factors were determined based on the statistical data on the construct validity of the scale. The factor eigenvalues determined in the analysis are presented in Table 2.

As seen in Table 2, the first-factor analysis results revealed 17 factors with an eigenvalue of over 1, and explained variance varied between 1.592 and 25.823%. Also, the factor loads of the scale items were examined. The varimax technique, a vertical rotation method, was employed to reflect a large number of scale items with a small number of factors. 29 items (1, 2, 3, 4, 5, 6, 7, 9, 10, 11, 13, 15, 17, 19, 20, 21) 29, 32, 36, 38, 39, 40, 50, 53, 54, 59, 61, 62, 63) were gradually removed from the scale. Then, exploratory factor analysis was re-conducted on the remaining items (33 items) and the final factor eigenvalues are presented in Table 3.

As seen in Table 3, the data obtained with the second-factor analysis revealed 5 factors with an eigenvalue of over 1, and explained variance varied between 5.098 and 17.840. The scale was finalized after the second-factor analysis. The final scale included 33 items. Scale item statistics and loads are presented in Table 4.

As seen in Table 4, loads of the 14 items in the first

Table 2. First-factor analysis findings.

Factor	Factor eigenvalue	Explained variance %	Cumulative variance %
1	16.269	25.823	25.823
2	4.428	7.029	32.852
3	2.689	4.269	37.121
4	2.195	3.484	40.604
5	1.880	2.984	43.588
6	1.694	2.689	46.278
7	1.530	2.428	48.706
8	1.512	2.400	51.106
9	1.417	2.248	53.355
10	1.358	2.156	55.511
11	1.263	2.004	57.515
12	1.214	1.926	59.441
13	1.168	1.853	61.294
14	1.120	1.778	63.073
15	1.056	1.675	64.748
16	1.015	1.611	66.359
17	1.003	1.592	67.951

Table 3. Second factor analysis findings.

Factor	Factor eigenvalue	Explained variance %	Cumulative variance %
1	5.887	17.840	17.840
2	4.850	14.698	32.538
3	3.393	10.282	42.820
4	2.442	7.401	50.221
5	1.682	5.098	55.319

factor called "Ego Surfing" varied between .71 and .48, and the Cronbach Alpha coefficient was .91. In the second factor called "Dependency", loads of 9 items varied between .75 and .47, and the Cronbach Alpha coefficient was .81. In the third factor called “Accessibility”, loads of the 5 items varied between .73 and .44, and the Cronbach Alpha coefficient was .75. In the fourth factor called "Loading content ", loads of the 4 items varied between .62 and .40, and the Cronbach Alpha coefficient was .60. In the fifth factor called "Reference", loads of the 2 items varied between .78 and .66, and the Cronbach Alpha coefficient was 61. Items with a total item correlation between 0.20 and 0.30 could be included in the measurement tool when necessary, items with a total item correlation of 0.30 or above are good (Büyüköztürk, 2007). As seen in Table 4, it could be suggested that the total item correlations were generally good.

Item analysis and reliability

Independent samples t-test was conducted to compare the 27% upper and lower groups to determine the students who exhibited the attitudes that the scale items aimed to measure, and the results are presented in Table 5.

As seen in Table 5, the p-value of .000 between the mean item scores demonstrated that there was a significant difference between the upper and lower groups. Thus, the measurement instrument could distinguish between the participants who exhibited and could not exhibit the attitudes that the items intended to measure (Can, 2014). The Cronbach Alpha coefficient was calculated to determine the reliability of the scale and determined as 0.93. Based on the Cronbach alpha coefficient analysis criteria (0.60 and above), it could be suggested that the scale was highly reliable (Özdamar, 1999, cited by Tavşancıl, 2018).

CONCLUSION

In the age of advanced technology and information, the digital obesity levels of individuals should be determined. Thus, it is important to develop a digital obesity scale to

Table 4. Item analysis.

Factor-Cronbach alpha	Item	Factor load	X (Mean)	SD (standard deviations)	Item total correlation	Item reliability coefficient
1st factor: Ego surf Cronbach Alpha: .91	1. I feel better when my post receives a positive comment or like in social media.	.71	3.32	1.26	.390	.936
	2. I like my own posts in social media.	.68	4.55	.74	.319	.937
	3. When my posts are liked in social media, this increases my self-esteem.	.67	1.66	1.08	.296	.936
	4. I like to monitor the likes received the photographs I post on social media.	.64	4.64	.87	-.225	.940
	5. I search my name in search engines.	.53	4.08	1.20	.449	.935
	6. I like to spend time on digital media (soical media, e-commerce, web sites, etc.) when I stop working on a task.	.56	2.04	1.25	.525	.934
	7. I cannot help myself but look at the photos I post on social media.	.54	3.69	1.11	.414	.935
	8. I feel good when I am on digital media (social media, e-commerce sites, websites, etc.).	.54	3.27	1.39	.624	.933
	9. I spend several hours on social media although this affects daily life negatively.	.54	3.01	1.42	.614	.933
	10. I check social media as soon as I wake up.	.53	3.37	1.39	.693	.933
	11. I wonder what other people do on social media.	.51	2.72	1.43	.604	.934
	12. Whenever I am bored, I check digital media (social media, e-commerce sites, websites, etc.).	.49	2.84	1.24	.699	.933
	13. I spend more than 2 hours a day on digital media (social media, e-commerce sites, websites, etc.).	.49	2.02	1.30	.620	.933
	14. The idea that my social media account could be hacked makes me nervous.	.48	2.21	1.30	.703	.933
2nd factor: Dependency Cronbach Alpha: .81	15. I postpone using digital media (social media, e-commerce sites, websites, etc.) to conduct daily activities.	.75	3.69	1.11	.546	.934
	16. The time spent on digital media (social media, e-commerce sites, websites, etc.) should be less than the previous time.	.67	2.87	1.45	.689	.933
	17. I can sleep less to spend time on digital media (social media, e-commerce sites, websites, etc.).	.65	2.66	1.19	.324	.936
	18. I would feel lonely without digital media (social media, e-commerce sites, websites, etc.)	.64	2.88	1.39	.623	.933
	19. Digital media (social media, e-commerce sites, websites, etc.) should be used without distracting one from daily life.	.60	3.44	1.32	.629	.933

Table 4. Item analysis.

	20. I feel happy when I do not spend time on digital media (social media, e-commerce sites, websites, etc.).	.55	2.35	1.49	.630	.933
	21. I spend a long time reading other people's posts on social media.	.53	2.51	1.61	.374	.936
	22. I constantly refresh digital media pages (social media, e-commerce sites, websites, etc.).	.53	4.08	1.20	.449	.935
	23. Although I want to stop using digital media (social media, e-commerce sites, websites, etc.), I cannot.	.47	2.13	1.32	.637	.933
	24. I do not feel restless if I cannot Access the Internet (slow connection, interruption, etc.).	.76	3.12	1.37	.330	.936
	25. I do not worry when digital devices (phone, computer, tablet, etc.) run out of charge.	.73	4.21	.89	.188	.937
3rd factor: Accesibility	26. I am afraid of losing my smartphone.	.69	2.83	1.31	.631	.933
Cronbach Alpha: .75	27. Digital media (social media, e-commerce sites, websites, etc.) provide easier and faster access to information.	.46	3.32	1.45	.635	.933
	28. I do not like to spend my free time on digital media (social media, e-commerce sites, websites, etc.).	.44	1.95	1.36	.633	.933
	29. I download a lot of content on digital media (social media, e-commerce sites, websites, etc.) without caring for time.	.62	1.83	1.29	.553	.934
4th factor: Loading content	30. Most of my daily activities involve digital media (social media, e-commerce sites, websites, etc.).	.62	2.38	1.45	.627	.933
Cronbach Alpha: .60	31. I consume less and less content on digital media (social media, e-commerce sites, websites, etc.).	.40	2.69	1.51	.695	.933
	32. I research the information I hear on the internet and verify its accuracy.	.78	2.73	1.49	.691	.933
5th factor: Reference	33. When I think I am sick, I research the disease on the internet and apply the information I learn on the internet.	.66	2.31	1.40	.756	.932
Cronbach Alpha: .61						
Cronbach Alpha coefficient 0.93						

Table 5. Independent samples t-test results on the upper and lower 27 percentiles.

Factor	Item	Upper 27%		Lower 27%		Sd	*t*	P
		$\bar{X}$	SD	$\bar{X}$	SD			
Ego surf	M.1	3.96	1.03	2.60	1.11	171	8.01	.000
	M.2	4.65	.54	4.36	.91	171	2.46	.015
	M.3	2.23	1.34	1.29	.71	171	5.71	.000
	M.4	4.45	1.06	4.83	.58	171	2.94	.004
	M.5	2.93	1.32	1.24	.43	171	11.28	.000
	M.6	4.19	.86	2.98	1.26	171	7.34	.000
	M.7	4.40	.81	1.94	1.12	171	17.10	.000
	M.8	4.20	.81	1.59	.92	171	19.76	.000
	M.9	4.50	.69	1.81	1.09	171	19.19	.000
	M.10	4.68	.67	3.17	1.39	171	9.04	.000
	M.11	4.00	.89	1.66	1.06	171	15.60	.000
	M.12	3.88	.85	1.78	.84	171	16.25	.000
	M.13	3.06	1.54	1.09	.29	171	11.71	.000
	M.14	3.44	1.18	1.16	.42	171	16.88	.000
Dependency	M.16	4.37	.85	2.78	1.24	171	9.79	.000
	M.17	4.25	.85	1.52	.88	171	20.56	.000
	M.18	3.19	1.21	2.09	1.25	171	5.88	.000
	M.19	3.98	.96	1.90	1.18	171	12.64	.000
	M.20	4.51	.69	2.29	1.29	171	13.96	.000
	M.21	2.74	1.55	1.16	.66	171	8.75	.000
	M.22	3.74	1.31	1.27	.74	171	15.25	.000
	M.23	3.18	1.56	1.74	1.30	171	16.88	.000
Accesibility	M.24	3.27	1.33	1.19	.54	171	3.94	.000
	M.25	4.53	.68	4.01	1.02	171	12.54	.000
	M.26	3.91	1.07	1.86	1.08	171	17.30	.000
	M.27	4.54	.68	2.10	1.12	171	13.81	.000
	M.28	3.30	1.43	1.09	.42	171	9.88	.000
Loading content	M.29	2.95	1.54	1.17	.66	171	13.50	.000
	M.30	1.17	.66	.07	.14	171	21.56	.000
	M.31	3.58	1.29	.76	.08	171	16.88	.000
Reference	M.32	4.25	1.07	2.21	1.48	171	22.98	.000
	M.33	3.83	1.07	1.06	.33	171	0.33	.000

identify these levels in the technological society. The current study aimed to develop a valid and reliable measurement instrument that could determine the digital obesity levels of individuals. Initially, a 75 item-scale was developed and presented for expert review. The revisions conducted based on the expert opinion led to the removal of 12 items from the data set and the draft scale included 63 items. The scale was administered to 320 adults. Exploratory factor analysis was conducted on this data set. The first scale factor was called “Ego Surfing”, the second factor was called “Dependency”, the third factor was called “Accessibility”, the fourth factor was called “Content loading,” and the fifth factor was called “Reference”. The item loads varied between .40 and .78.

The result of the Cronbach Alpha coefficient internal consistency analysis conducted to determine the reliability revealed that the reliability coefficient for the overall scale was.93. The internal consistency coefficient of the first sub-dimension was .91, the internal consistency coefficient of the second sub-dimension was .81, the internal consistency coefficient of the third sub-dimension was .75, the internal consistency coefficient of the fourth sub-dimension was .60, and the internal consistency coefficient of the fifth sub-dimension was .61. The high Cronbach Alpha reliability coefficients of the scale sub-dimensions indicated that the items in the sub-

dimensions were consistent. The final scale was a 33-item, 5-point Likert-type scale with 5 factors. The current study included the development of a scale to determine the digital obesity levels of adults. It could be suggested that the development of the scale would fill the gap in the literature. The validity and reliability of the scale should be determined again when the scale will be applied to different study groups.

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