Original Article

Development and Psychometric Properties of the COVID-19 New Coronavirus Awareness Scale for University Students

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Abstract

Background: Many university students gained knowledge about COVID-19 pandemic through social media and distance education. Their knowledge, attitude, and behavior related pandemic can be evaluated to take effective measures.
Objectives: This study developed the COVID-19 New Coronavirus Awareness Scale (CV19S-CAS) and determined the psychometric properties in university students.
Methodology: The sample comprised 577 Turkish university students via an online survey. The items of the CV19S-CAS constructed based on the review of the literature, and expert evaluations. The psychometric tests conducted for the reliability and validity properties.
Results: After the expert review and pilot study, the reliability and validity analysis conducted. According to the exploratory factor analysis, the CV19S-CAS consisted of four sub-scales (knowledge, protection, attitude, behavior), and the sub-scales explained 46.1% of the total variance. Six items excluded from the scale because the factor loads were below 0.30. Cronbach's alpha coefficient of the CV19S-CAS-26 items was 0.87; four sub-scales were 0.62, 0.57, 0.71, and 0.82, respectively.
Conclusion: The Five-point Likert-CV19S-CAS, a 26-item scale, with four factors and sub-scales, is a valid and reliable scale for university students. It can also use for the level of COVID-19 awareness among the general population.

Keywords: COVID-19, awareness, reliability, university students.

Introduction

In December 2019, in Wuhan, China's Hubei province, the pneumonia epidemic caused by a new coronavirus could not be brought under control and spread to the rest of the world, primarily in Europe and then the North American continent, leading to other provinces of China in a short time. Causative virus; it was first named as the new coronavirus-2019 (2019-nCoV), then by the World Health Organization as "Serious Acute Respiratory Syndrome-Coronavirus-2(SARS-CoV-2)" and the disease it caused was called COVID-19 (Coronavirus Disease 2019) (Rebuplic of Turkey Ministry of Health, 2020; WHO Coronavirus Disease (COVID-19) Dashboard, 2021).

Although all measures and efforts taken to minimize the risk of transmission of infection are correct and necessary, individuals may not take necessary measures due to a lack of information. Many warnings made regarding the rules to follow in collective places, measures at home, personal hygiene. Awareness of society increased through posters, brochures, and guides. However, no scale determines the awareness of individuals about coronavirus and evaluates their knowledge and attitudes. There have been reports on the psychological impact of the COVID-19 pandemic on the different groups (Cao et al., 2020; Chen et al., 2020; Wang et al., 2020; Yang et al., 2020). During the COVID-19 process, many university students

gained knowledge about this process through social media and distance education (Huddart et al., 2020). Many students have experienced anxiety, depression, and fear in this process (Chang et al., 2020; Liu et al., 2020). During the pandemic in China, it was revealed that adolescents had higher rates of depression incidence than adults (Wang et al., 2020). In a large population study with adolescents; the prevalence of depressive symptoms, the prevalence of anxiety symptoms, and the prevalence of the symptoms of both were found to be 43.7%, 37.4%, and 31.3%, respectively, during COVID-19 outbreak (Zhou et al., 2020). In a study, it was found that 24.9% of the students experienced anxiety due to the COVID-19 outbreak (Cao et al., 2020). In a study conducted with 11835 adolescents in China, it was found that students were more likely to experience decreased sleep quality, and sleep disorders during the pandemic (Zhou et al., 2020). In studies investigating the applications of students in health sciences against knowledge, attitude, and coronavirus; found that students' knowledge levels and protective practices are good (Gallè et al., 2020). In research in Iran; Iranian medical students were found to have a high level of knowledge and high performance in preventive behavior, but with moderate risk perception (Taghrir et al., 2020). In a study, the rate of adolescents to comply with all preventive measures was found to be 17%, and it is stated that it is difficult to comply with all rules (Saurabh and Ranjan, 2020).

In this research, it planned to develop a measurement tool related to COVID-19 awareness that can evaluate the knowledge, attitude, and behavior of university students. With the development of this scale, it aimed to create a measurement tool in which the awareness of young people and its effect on other problems they face.

Methodology

Design: A cross-sectional, methodological, and descriptive study conducted to develop and assess the psychometric properties of the COVID-19 New Coronavirus Awareness Scale for university students.

Development of the COVID-19 New Coronavirus Awareness Scale (CV19S-CAS): *Item pool:* The literature on coronavirus awareness reviewed to create an item pool for the CV19S-CAS. The World Health Organization (WHO), Centers for Disease Control and Prevention, and the Republic of Turkey Ministry of Health's The health protection and promotion guidelines about new coronavirus were reviewed (CDC, 2020; Rebuplic of Turkey Ministry of Health, 2020; WHO Coronavirus Disease (COVID-19) Dashboard, 2021). The relevant and possible items pooled by the researchers.

Evaluation of items: The scale pool was composed of 40 items about knowledge, attitude, behaviors related to the new coronavirus. After the evaluation of the 12 experts (Ph.D. nurses in pediatrics, public health, woman health, psychiatry, oncology; psychiatrist, general physician, virologist, psychologist, and linguistics). The content validity index (CVI) used for the assessment of experts' opinions, the item-based content validity index (I-CVI) was found to range from 0.83 to 1.00 and the scale-based content validity index (S-CVI) was 0.90. Eight items removed based on the suggestion from the expert panel.

Pilot study: Pilot testing performed with CV19S-CAS-32 items. The CV19S-CAS-32 items were a 5-point Likert type; (1) I disagree at all, (2) Disagree, (3) I am indecisive, (4) I agree, (5) I totally agree. As the scale score increases, the level of awareness increases. Some items reversed. Five-point Likert-CV19S-CAS-32 items administered to 20 university students for a pilot study to test whether the university students understand the items. No negative feedback about the scale took. The response time of the scale took 10 min. All respondents fully understood the items. No further changes made in the pilot study.

Population and Study Sample: A total of 577 university students volunteered for the study via an online survey posted in Turkey (Facebook, Twitter, Instagram). The data collection occurred from 9 Jun to 9 July 2020. Inclusion criteria for volunteers were 18 to 25 years old, Turkish-speaking citizens, and university students. All the participants completed the online survey and gave their informed online consent, and it took around 10 min to complete. All procedures conducted approved by the Republic of Turkey Ministry of Health Scientific Research Platform and ethics committee of the university. An ethical committee of the university approved the study with the decision number 2020/12-10 and the protocol number 5486-GOA. The Republic of Turkey Ministry of Health Scientific Research Platform also approved the study (23 May 2020).

Procedure: All participants completed the sociodemographic form (the socio-demographics of the participants such as age, gender, faculty, chronic disease, positive/suspected coronavirus test, etc.) and the five-point Likert-CV19S-CAS-32 items.

Data Analysis: Descriptive statistics used for participants' characteristics. Content validity index (CVI), exploratory factor analysis (EFA), and confirmatory factor analysis (CFA), item-total score analysis, Cronbach's alpha coefficient, split-half analysis, the Spearmen Brown coefficient, Guttman-split-half coefficient, and the correlation coefficient between the two parts were performed. All the

descriptive, validity, and reliability analyses conducted using IBM SPSS 23.0 (Armonk, NY).

Results

Participants: In this study, 75.4% (n = 435) of the participants were women, the average age was 21.77 + 2.58 (18-25). Of the students 92.5% were attending the university online, 53% of the students (n = 306) were in the faculty of nursing or medicine, and 23.2% (n = 134) were educated in different departments in the Faculty of Economics and Administrative Sciences. The proportion of students whose friend / relative is a health worker was 78.3% (n = 452), and 6.9% (n = 40) had a chronic disease. The most common chronic disease was asthma with 2.8% (n = 16). Only 2.3% (n = 13) of the students' coronavirus test was positive. The quarantined student ratio was 2.3% (n = 13), 17.5% (n = 101) of the students had positive / suspected COVID-19 relatives. Of the students, 94.5% (n = 545) followed the publication about COVID-19, 51.8% (n = 299) of those followed the publications from the health organizations and 33.1% (n = 191) from social media.

Construct Validity Results; Exploratory Factor Analysis and Confirmatory Factor Analysis As a result of the EFA, the Kaiser-Meyer Olkin (KMO) coefficient was 0.890, the Bartlett test X^2 value was 4544.323 and $p<0.01$. According to EFA results, the scale consisted of four sub-scales, and the sub-scales explained 46.1% of the total variance. The factor loadings of sub-dimensions were determined to vary from 0.49 to 0.82, 0.52 to 0.59, 0.43 to 0.69 and from 0.38 to 0.77, respectively (Table 1).

As a result of the CFA, fit indices determined as follows: X^2 =861.77, df = 290, X^2 / df = 2.971, RMSEA = 0.059 (Table 2). The factor loads of the sub-scales ranged from 0.24 to 0.68, 0.33 to 0.63, 0.33 to 0.73 and 0.43 to 0.69 (Figure 1, Table 2).

Reliability Analysis Results: Cronbach's alpha coefficient of the overall scale was determined as 0.87. Cronbach alpha coefficients of four sub-scales were 0.62, 0.57, 0.71, and 0.82, respectively. On the other hand, the split-half analysis yielded a Cronbach's alpha 0.73 for the first part and 0.82 for the second part. The Spearmen Brown coefficient was 0.81, the Guttman-split-half coefficient was 0.80, and the correlation coefficient between the two parts was 0.67. No floor and ceiling effect was determined for the scale. Hotelling T square test employed to test the existence of response bias, it found to be 2004.276, F = 76.831 and $p < .01$, which indicated the scale had no response bias (Table 3).

Table 1. Results of the Exploratory Factor Analysis (n=577)

Items		Factor Loads			
		Knowledge Subscale	**Protection Subscale**	**Attitude Subscale**	**Behavior Subscale**
1	I have enough coronavirus information.	0.82			
2	I know how the coronavirus is transmitted.	0.78			
3	The most common symptoms of coronavirus are fever, cough, and shortness of breath.	0.50			
4	By strengthening my immunity, I can be protected from coronavirus.	0.49			
5	I wear a surgical mask in public areas to protect against coronavirus.		0.58		
6	I wear gloves in public areas to protect against coronavirus.		0.54		
7	I have a cologne, hand sanitizer next to me to prevent coronavirus.		0.59		
8	To avoid coronavirus, I adhere to a social distance in public places.		0.52		

9	I touch my mouth, nose, and eyes with my hands outside.				0.43
10	I wash my hands with soap and water for at least 20 seconds.				0.42
11	I stay away from crowded environments.				0.38
12	I keep the mask for reuse.				0.50
13	I ventilate indoor environments frequently.				0.53
14	I provide hygiene frequently used places such as doorknobs and electric switches at home.				0.77
15	I wipe the outside of packaged products from the outside with a soapy cloth.				0.61
16	I clean the shared toilet and bathroom at least once a day.				0.72
17	I provide hygiene of technological products such as mobile phones, computers, and controllers if necessary.				0.65
18	I wash my hands for at least 20 seconds before and after wearing gloves.				0.62
19	When I cough and sneeze, I close my mouth with a handkerchief to protect myself and those around me, if I don't have a handkerchief, I use the inside of my elbow.			0.62	
20	I use hand sanitizer in public places where I cannot reach water and soap.			0.43	
21	I wear a surgical mask to protect others when I have symptoms such as cough and fever.			0.66	
22	I avoid people with positive coronavirus tests.			0.63	
23	I know the risky groups (elderly people, chronic diseases, etc.) that can be most affected by a coronavirus.			0.69	
24	The elderly are at risk for coronavirus due to chronic disease.			0.63	
25	Children can be/transmit coronavirus carriers.			0.56	
26	The routine vaccines should be continued during the outbreak.			0.36	
	Eigenvalue	**2.000**	**2.159**	**3.885**	**3.963**
	Explained Variance (%)	**7.7**	**8.3**	**14.9**	**15.2**

**Item 9, 12, 17 reverse coded.*

Table 2. Model fit indices of the Scale (n=577)

	X^2	DF[a]	X^2/DF	RMSEA[b]	GFI[c]	CFI[d]	IFI[e]	RFI[f]	NFI[g]	TLI[h]
Two-Factor Model	861.77	290	2.971	0.059	0.90	0.95	0.95	0.92	0.93	0.95

a: Degree of Free; b: (Root Mean Square Error of Approximation; c: Goodness of Fit Index; d: Comparative Fit Index; e:Incremental Fit Index; f: Relative Fit Index; g: Normed Fit Index; TLI (NNFI): Trucker-lewis Index.

Table 3. Results of the reliability analyses of the scale and sub-dimensions

Scale and Sub-scale	Cronbach α	Split-Half Analysis					Mean ± SD (Min-Max) (n=849)
		First half of Cronbach α	Second half of Cronbach α	Spearman-Brown	Guttman split-half	Correlation Between Two halves	
Scale total	0.87	0.73	0.82	0.81	0.80	0.67	117.75±10.61 (79-130)
Knowledge Subscale	0.62						16.52±1.98 (4-20)
Protection Subscale	0.57						16.65±2.35 (6-20)
Attitude Subscale	0.71						36.29±3.24 (20-40)
Behavior Subscale	0.82						42.28±5.52 (20-50)

Discussion

We obtained opinions from 12 experts to determine the coherence with their language and content of the items on the scale. The item and scale content validity index used to examine the expert evaluations. Both of these values should be over 0.80, which indicates that the experts agreed (Shi et al., 2012). In this study, both of these values found out to be over 0.80. The results of these values demonstrated; the scale adequately assessed the subject and assured the consistency of the content.

Until carrying out the exploratory factor analysis, the sufficiency of data for factor analysis calculated using the KMO method, and Bartlett's sphericity method. These methods used to determine the appropriateness and sufficiency of data for factor analysis. The value should be statically significant and at least 0.60 (DeVellis, 2012; Johnson and Christensen, 2014). In this study, The value of Barlett methods was $p < .05$, and the value of KMO was greater than 0.60 (DeVellis, 2012; Johnson and Christensen, 2014).

To evaluate the number of variables, the proper value of 1 and above was agreed (Hooper, 2012; Sencan, 2005). In this analysis, it was found that values of scale and subscale are above 1. The scale described as having four sub-scales. In this analysis, 46.1% of the total variance clarified by the four-factor scale. he explained variance should be above 40% in multidimensional scales (Hooper, 2012; Sencan, 2005).

The results of the analysis presented that, for four sub-scales, the load factor ranged from 0.38 to 0.82. The minimum value should normally be 0.30 and over. Items were excluded from the scale in this study because the factor loads of six items were below 0.30 (DeVellis, 2012; Johnson and Christensen, 2014; Terwee et al., 2007). The loading factor of scales was greater than 0.30, suggesting that the scale had a high factor build in this analysis.

The analysis was used to determine whether the original scale structure clarified by items and subscales. The confirmatory factor analysis evaluates the construction obtained by EFA (Hooper et al., 2008; Noar, 2003). For the four-factor confirmatory factor analysis, factor loadings were greater than 0.30. A strong and significant relationship observed between the scale and its sub-scales. According to literature, the fit indices of the model were should be greater than .91 and the root means square error of approximation should be less than .080 (Hooper et al., 2008; Noar, 2003). The

confirmatory factor analysis results were consistent with the parameters in this study. The results of the analysis showed that the data was in agreement with the model, and verified the four-factor construct.

The alpha coefficient for Cronbach shows that the objects are measuring the same property. This value is wanted to be as close to 1 (Nunnally and Bernstein, 2010; Rattray and Jones, 2007; Şencan, 2005). In the present study, these values of the scale and sub-scale were greater than 0.70 and were highly reliable. Those results showed that the products assessed the subject appropriately and that the scale was strong reliability (Nunnally and Bernstein 2010; Rattray and Jones, 2007; Şencan, 2005). Therefore, the scale has an internal consistency of high.

Cronbach's alpha values, Spearman-Brown, and Guttman's coefficients values obtained from the split-half method should be more than 0.70 (Nunnally and Bernstein, 2010; Rattray and Jones, 2007; Sencan, 2005). These results proved the reliability of the scale.

One of the main factors affecting the reliability of scales is response bias. The T-square test at Hotelling used to evaluate the scale to assess the presence of bias in response. The test showed the participants' answers were different, and there was no response bias in the scale (Nunnally and Bernstein, 2010; Rattray and Jones, 2007; Şencan, 2005).

The analysis illustrates the relation between the scores acquired from each item in the scale and the total score in the scale (DeVellis, 2012; Johnson and Christensen, 2014; Terwee et al., 2007). This value should be greater than 0.20, and close to 1 (Sencan, 2005). The item-total score correlation of six items was removed from the scale in this study, as it was below 0.20. The values were positive and greater than 0.20 because of removing the items with low values. These findings also presented that our research had a high degree of internal consistency.

Limitations: Although this study had several strengths, there were two limitations. The first limitation of this research was; this study used convenience sampling. The second limitation of this research was; participants completed data collection using an online research tool.

Conclusion: This study demonstrated that COVID-19 New Coronavirus Awareness Scale was determined as a valid, reliable, selective, and sensitive scale that can use for university students. Coronavirus pandemic affects young people negatively as in many other segments of society. It is important that university students, who constitute the young population, are more aware of the disease, especially due to the fear of being a carrier and transmitting the disease, the unknown face of the disease, the treatment process. Determining the awareness of university students will contribute to the creation of educational content to this group. Nurses, who are at the forefront of providing health education, should determine their awareness of the subject in the pieces of training that they will apply to this population and establish an appropriate training program.

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