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Turkish validity and reliability study of the Attitudes Toward Face Mask Use Scale

Özcan Erdoğan[1] and Ahmet Doğan Kuday[1,2]

Abstract

This study validates the Turkish version of the Attitudes Toward Face Mask Use Scale (ATFMUS). This scale is crucial for understanding public attitudes toward mask usage in preventing the transmission of infectious diseases. The research was conducted between September 2023 and February 2024 with 530 students from a foundation university's health sciences faculty. The study assessed the scale's language equivalence, content validity, and factor structure through exploratory and confirmatory factor analyses. Reliability was examined via item-total correlations, Cronbach's alpha coefficient, and test-retest reliability, indicating satisfactory internal consistency and stability over time. The results confirm the Turkish ATFMUS's validity and reliability in measuring attitudes toward mask usage. This offers essential insights for formulating preventive initiatives within Turkish communities.

Keywords

adaptation, attitudes, face mask, reliability, validity

Introduction

Infectious diseases hold a significant position among the leading causes of death globally and result in substantial economic losses. Factors such as the rapidly growing population, inadequate healthcare systems, and environmental issues contribute to the spread of these diseases (Çalışkan and Özcebe, 2013). However, these diseases can be prevented through the use of personal protective equipment and vaccination, which are recognized as the most common and effective methods. Particularly, face masks that meet specific standards are used frequently to prevent the spread of infectious diseases transmitted via respiratory droplets (Leung et al., 2020). Face masks act as a barrier against the transmission of infectious diseases within the community, by preventing the inhalation of droplets expelled by an infected person (Sterr et al., 2022). They serve to protect uninfected individuals by filtering respiratory droplets, particles, and aerosols in the inhaled air (Howard et al., 2021). They contribute to the preservation of public health by reducing the transmission of diseases from both symptomatic and asymptomatic

[1]Bezmialem Vakıf University, Türkiye
[2]University of Health Sciences, Türkiye

Corresponding author:
Ahmet Doğan Kuday, Department of First and Emergency Aid, Vocational School of Health Services, Bezmialem Vakıf University, Muhsin Yazicioglu Street, 2115 Street, No: 6, 34265 Sultangazi, Istanbul, Türkiye.
Email: dogankuday@gmail.com

individuals (Chughtai et al., 2020). The use of face masks minimizes environmental contact, thus reducing the burden on healthcare systems and protecting healthcare workers.

In recent years, face masks have gained significant importance worldwide. Especially during the COVID-19 pandemic, they have become a crucial tool in preventing the spread of infectious diseases. Following the COVID-19 pandemic, many countries have made the use of face masks mandatory in public places in line with comprehensive prevention and control measures established by organizations such as the World Health Organization (WHO) and the Centers for Disease Control and Prevention (CDC; Barati et al., 2021). As of 2024, while many countries have relaxed their mask mandates, some still enforce them in specific settings. For instance, in Spain, face masks are still mandatory in health facilities due to recent spikes in COVID-19 and flu cases (Jones, 2024). The Tour de France has reintroduced protective measures in some areas to limit health risks after several riders were forced to abandon the race after testing positive for COVID-19 (Pretot, 2024). However, despite compelling evidence showing that wearing face masks in public spaces reduces the transmission of COVID-19, it has been reported that many people resisted wearing masks and completely stopped using them after vaccination (Bartsch et al., 2022; Brooks and Butler, 2021). In addition, it has been reported that even healthcare workers experienced vaccine hesitancy due to fear and lack of confidence in the fight against COVID-19 (Yilmaz et al., 2022). These situations illustrate how significant individuals' attitudes and beliefs are in the transmission of contagious diseases like COVID-19.

Many studies have been conducted in various countries examining people's attitudes toward wearing face masks during the COVID-19 pandemic. These studies have shown that the majority of citizens believe that masks protect them from infection, but some still have difficulty wearing masks and do not always use them correctly (Manh et al., 2021; Muhamad et al., 2023; Shashina et al., 2022). The effective use of face masks depends on the attitudes of users toward these measures, and these attitudes can be influenced by various factors. Therefore, measuring attitudes toward the use of face masks is an important step in developing effective public health strategies. Although the scales developed to measure these attitudes in the literature have served their purposes well in their respective studies, the majority provide limited information on how they were developed. Furthermore, the dimensions of these scales vary, with some presenting a single dimension while others exhibit multiple dimensions. Therefore, the psychometric properties of many of these scales have not been adequately established (Mahalik et al., 2021; Rieger, 2020; Tadesse et al., 2020; Taylor and Asmundson, 2021).

Acknowledging this gap in the literature, Ireri et al. (2022) developed the Attitudes Toward Face Mask Use Scale (ATFMUS) in English by utilizing samples consisting of university and high school students from Kenya and Ghana. ATFMUS specifically targets attitudes toward face mask use and focuses directly on masking. This scale provides more targeted data than scales that offer information about general health awareness and behaviors. Identifying negative attitudes toward mask use and misinformation helps develop targeted education and information strategies, thus promoting well-informed behaviors in the community. In emergencies such as pandemics, specific data on mask use enables quick and effective decision-making. Scales focused on general health behaviors may not provide sufficiently specific data in such emergencies. Therefore, ATFMUS is a critical tool for public health professionals, policymakers, and researchers.

This study conducted a Turkish validity and reliability analysis of the ATFMUS to assess attitudes toward face mask usage in the Turkish population. The research aims to address the following questions: (1) Is the ATFMUS a highly valid measurement tool in the Turkish

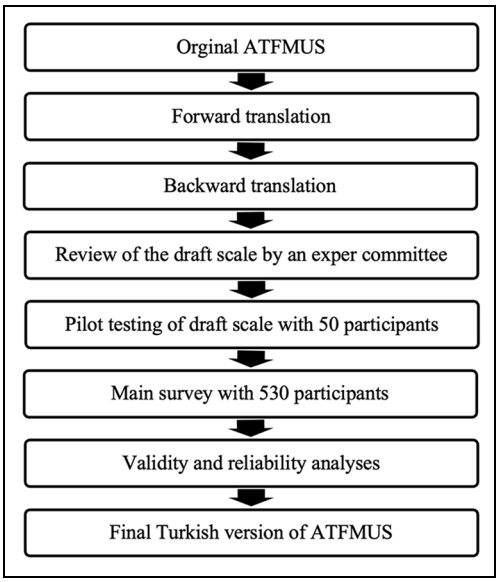

Figure 1. Summary of the scale adaptation process.

population? and (2) Is the ATFMUS a highly reliable measurement tool in the Turkish population? Based on these research questions, the study hypothesizes that ATFMUS is a highly valid measurement tool in the Turkish population (H1) and ATFMUS is a highly reliable measurement tool in the Turkish population (H2). We believe that the scale can assist public health experts, researchers, and policymakers in developing effective policies and interventions.

Methods

This methodological study was conducted between September 2023 and February 2024 with students enrolled in the faculty of health sciences of a foundation university. The study design includes the steps required to adapt the scales. The steps followed for adapting the scale are shown in Figure 1.

Language equivalence

The language equivalence of the scale was conducted using the forward-backward translation technique. The scale was translated into Turkish by two independent expert translators preserving the original content. Subsequently, the Turkish-translated scale was back-translated into English by two different independent experts proficient in the culture of the country where the original scale was developed. The original scale and the translated version were evaluated for linguistic equivalence, and the draft scale was finalized before being presented to experts for their opinion.

Expert reviews

Researchers prepared an Expert Evaluation Form to assess the items in the Turkish version of the scale in terms of both linguistic and cultural equivalence. This form was sent via email to 10 experts with experience in public health and methodological research. The Davis technique was used to calculate the content validity index (CVI) of the scale (Davis, 1992). In the Davis technique, expert opinions are rated on a scale from A to D, ranging from "highly relevant" to "not relevant." According to this technique, the CVI value can be calculated for each item on a scale (I-CVI) as well as for the overall scale (S-CVI). The I-CVR for an item is obtained by dividing the number of experts who selected ratings (A) and (B) by the total number of experts, while the S-CVI is obtained by dividing the sum of I-CVIs for each item by the total number of experts. The acceptability criterion for I-CVI is 0.78, while for S-CVI it is set at 0.80 (Polit et al., 2007).

Pilot test

A pilot test was conducted with 50 individuals to assess the comprehensibility of the scale's questions. Individuals participating in the pilot application were not included in the main sample of the study. After expert reviews and pilot tests, the final version of the scale was decided, and then it was applied to the main sample.

Sample and settings

The population of the study consists of all individuals residing in Türkiye. However, the study's sampling frame includes a total of 792 undergraduate students studying at the Faculty of Health Sciences of a foundation university. These students consist of those studying in the departments of nursing, nutrition and dietetics, physiotherapy and rehabilitation, health management, occupational therapy, and audiology. The sample size of the study was calculated based on the number of items in the scale. In scale development and adaptation studies, it is recommended to have at least 5 the number of participants as the number of scale items or to reach a minimum sample size of 100 (Gorsuch, 2014). However, increasing the sample size makes the factor analysis of the scale more appropriate and increases its reliability (Kyriazos, 2018). Therefore, the study was conducted with 530 undergraduate students who volunteered to participate. The literature suggests that different data sets should be used for exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) (Schermelleh-Engel et al., 2003). Accordingly, our data were randomly divided into two groups, one (n = 265) for EFA and the other (n = 265) for CFA. It was ensured that the two randomly assigned subsamples did not differ significantly in terms of key demographic variables such as age, gender, and year of study, to maintain the validity of the comparisons and analyses.

Data collection and research instruments

The data were collected through an online survey administered to the students after explaining the purpose of the study. During the data collection process, the Personal Information Form and the ATFMUS were used. The personal information form consists of nine questions aimed at determining individuals' gender, age, department, education level, presence of chronic illness, previously contracted infectious disease, places where masks are used the most, duration of mask usage, and frequency of mask replacement. ATFMUS was developed by Ireri et al. (2022) to measure attitudes toward mask usage. The scale consists of five items and a single dimension. The items in the scale are scored on a 5-point Likert scale ranging from "1" Strongly Disagree to "5" Strongly Agree. The total score of the scale ranges from 1 to 25 points, where an increase in score indicates a negative attitude toward mask usage. The Cronbach's alpha value of the original scale is 0.71.

Statistical analysis

The data were analyzed using the Statistical Package for the Social Sciences (SPSS) 27.0 and Analysis of a Moment Structures (AMOS) 22.0 package programs. The normality of the data has been checked through the histogram graph and the z-scores of skewness and kurtosis values (Kim, 2013). Descriptive findings were presented with numbers, percentages, mean, and standard deviation values. To determine the adequacy of sample size and the suitability of items for factor analysis, the Kaiser-Meyer-Olkin (KMO) and Bartlett's test of sphericity were used. The criterion that the KMO value should be greater than 0.50 was considered for conducting factor analysis (Ponnam et al., 2014). EFA was conducted to determine item-factor relationships, while CFA was performed to assess whether the items explain the underlying structure of the scale. Principal Component Analysis (PCA) was used as the factor extraction method in EFA. Cronbach's Alpha coefficient, item-total score correlation, and test-retest reliability were calculated to determine the reliability of the scale. To assess the test-retest reliability, the scale was administered again to 100 participants who completed the ATFMUS after 15 days. It was ensured that the 100 participants selected for the test-retest reliability analysis did not differ significantly in terms of key demographic variables such as age, gender, and department. The criterion for

internal consistency reliability was set at 0.70, and items with a factor loading $\geqslant 0.30$ were considered acceptable (Hair et al., 2010). A significance level of $p < 0.05$ was considered in all statistical analyses.

Ethical considerations

Author permission was obtained via email from the original developers of the scale to conduct the validity and reliability study of the scale in Turkish. Subsequently, Ethics approval was obtained from the Bezmialem Vakıf University Ethics Committee (dated 22.03.2023, with reference number 101259), and permission to conduct the study was granted by the Dean's Office of the Faculty of Health Sciences at the university where the research would be conducted. The participants were informed about the study and their written and verbal consent was obtained.

Results

The process leading to the final version of the ATFMUS is given below in three steps, and the final version of the ATFMUS is provided in Appendix.

Characteristics of the participants

80% of the participants in the study are female, and 20% are male. The average age of the students is 20.05 ± 1.36 years, with 27.6% being 19 years old. In terms of their fields of study, 41.1% are in nursing, 19.4% in physiotherapy and rehabilitation, 18.7% in nutrition and dietetics, 10.8% in audiology, 8.0% in health management, and 2.0% in occupational therapy. Regarding their education levels, 27.1% of the students are in their first year, 24.9% in their second year, 26.8% in their third year, and 21.2% in their fourth year.

10.6% of the students have a chronic illness, while 89.4% do not. 49.1% of the students have previously had an infectious disease, whereas 50.9% have not. Regarding where mask use is most prevalent, 38.1% reported using masks in healthcare facilities, 32.9% on public transportation, and 24.7% in shopping centers. Additionally, 4.3% stated that they do not pay attention to wearing masks. In terms of the duration of mask use, 34.7% of the students reported wearing masks for 0–2 hours, 35.1% for 2–4 hours, 26.4% for 4–8 hours, and 3.8% for 8–12 hours. Regarding the frequency of changing masks, 38.5% of the students stated they change their masks once a day, 57.4% change them 2–3 times a day, 2.6% change them 2–3 times a week, and 1.5% change them 2–3 times a month (Table 1).

Validity analysis of the ATFMUS

Expert reviews were consulted to ensure the content validity of the ATFMUS. The Davis technique was used to evaluate expert opinions, and the CVI was calculated. According to the evaluation of 10 experts, both I-CVI and S-CVI were found to be 1.0. This result demonstrated that experts generally found the scale appropriate and that the Turkish version of ATFMUS has a high level of content validity.

To test the structural validity of the scale, both exploratory and confirmatory factor analyses were conducted. Before conducting factor analysis, the adequacy of the sample size and the suitability of the data set for factor analysis were assessed using the KMO and Bartlett's test of sphericity. The KMO value was 0.738, and Bartlett's test of sphericity was significant ($\chi^2 = 328.059$; $p < 0.001$). The anti-image correlation matrix was used to assess the relationship between items. It was found that the intersections of items with the same number in the rows and columns of this matrix are greater than 0.5. The diagonal values in the anti-image matrix exceeding 0.50 indicate that these items are relevant and significantly contribute to the scale (Can, 2013).

For EFA, the principal component method was used as the extraction method. Items with

Table 1. Demographic information of participants

Variables	*n*	%
Gender		
Male	106	20.0
Female	424	80.0
Age		
18	64	12.1
19	146	27.6
20	128	24.2
21	110	20.8
22	54	10.1
23	28	5.2
Department		
Nursing	218	41.1
Physiotherapy and rehabilitation	103	19.4
Nutrition and dietetics	99	18.7
Audiology	57	10.8
Health management	42	8.0
Occupational therapy	11	2.0
Education level		
First year	144	27.1
Second year	132	24.9
Third year	142	26.8
Fourth year	112	21.2
Presence of chronic disease		
Yes	56	10.6
No	474	89.4
Previously contracted infectious disease		
Yes	260	49.1
No	270	50.9
Places where mask are used the most		
Healthcare facilities	226	38.1
Public transportation	140	32.9
Shopping mall	108	24.7
I don't pay attention to wearing mask	92	4.3
Duration of mask usage		
0–2 hours	184	34.7
2–4 hours	186	35.1
4–8 hours	140	26.4
8–12 hours	20	3.8
Frequency of mask replacement		
Once a day	204	38.5
2–3 times a day	304	57.4
2–3 times a week	14	2.6
2–3 times a month	8	1.5

factor loads $\geqslant 0.30$ within the factor structures were evaluated. As a result of the EFA analysis, a factor structure consisting of five items with factor loadings ranging from 0.536 to 0.831 was obtained. The EFA revealed that the single-factor structure explained 49.92% of the total variance. After the EFA, a CFA was performed (Figure 2). In the confirmatory factor analysis,

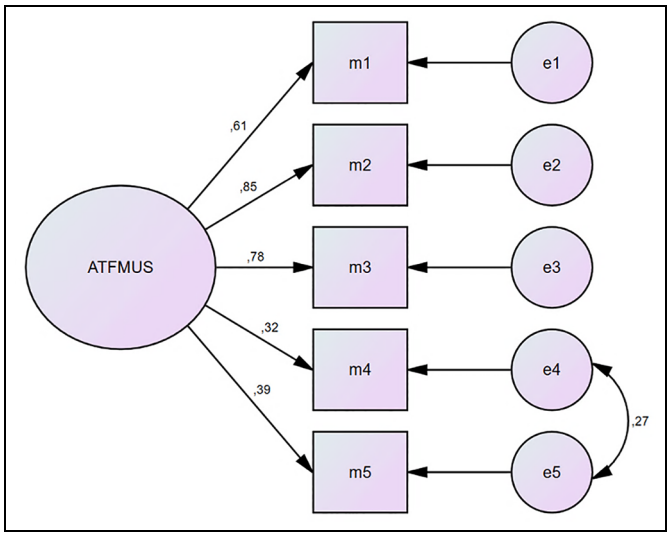

Figure 2. Path diagram of ATFMUS.

Table 2. Fit measures of confirmatory factor analysis.

Goodness-of-fit measure	Good fit value	Acceptable value	Value
χ^2/df	$0 \leqslant \chi^2/df \leqslant 2$	$2 \leqslant \chi^2/df \leqslant 3$	1.343
AGFI	$0.90 \leqslant$ AGFI $\leqslant 1.00$	$0.85 \leqslant$ AGFI $\leqslant 0.90$	0.970
GFI	$0.95 \leqslant$ GFI $\leqslant 1.00$	$0.90 \leqslant$ GFI $\leqslant 0.95$	0.992
NFI	$0.95 \leqslant$ NFI $\leqslant 1.00$	$0.90 \leqslant$ NFI $\leqslant 0.95$	0.984
CFI	$0.97 \leqslant$ CFI $\leqslant 1.00$	$0.95 \leqslant$ CFI $\leqslant 0.97$	0.996
IFI	$0.95 \leqslant$ IFI $\leqslant 1.00$	$0.90 \leqslant$ IFI $\leqslant 0.95$	0.996
RMSEA	$0.00 \leqslant$ RMSEA $\leqslant 0.05$	$0.05 \leqslant$ RMSEA $\leqslant 0.08$	0.036

a high covariance was observed between the fourth and fifth items. This high covariance indicated that these two items shared a significant amount of variance, suggesting that they may be measuring a very similar aspect of the construct. To address this issue, we assigned covariance between these items in the CFA model. This means that we allowed the errors of the fourth and fifth items to correlate, which is a common practice when high covariance is observed (Byrne, 2010). By doing so, it was aimed to account for the shared variance between these items, improving the overall fit of the model. After assigning covariance, all fit indices have reached a considerably high level (Hu and Bentler, 1999). According to the CFA results, the fit indices were: $\chi^2/df = 1.343$; AGFI = 0.970; GFI = 0.992; NFI = 0.984; CFI = 0.996; IFI = 0.996; RMSEA = 0.036 (Table 2).

Reliability analysis of the ATFMUS

The reliability of the scale was assessed through item-total correlation, Cronbach's alpha, and test-retest methods. The item-total correlations for all items of the scale were above 0.30, ranging between 0.362 and 0.648 (Table 3). For the Turkish version of ATFMUS, Cronbach's alpha was 0.743. In the test-retest method, a break of 15–21 days should be given after the first application (Wyse, 2020). In this study, a re-test was

Table 3. Statistical values of the ATFMUS.

Item	$X \pm SD$	Factor loading	ITCS	Variance (%)	Cronbach's alpha
1. Yüz maskesi kullanma fikri bana cazip gelmiyor.	3.13 ± 1.18	0.735	0.533	49.92	0.743
2. Mümkün olduğu takdirde yüz maskesi kullanmaktan kaçınırım.	3.20 ± 1.24	0.831	0.648		
3. Yüz maskesi kullanma fikrinden hoşlanmıyorum.	3.46 ± 1.26	0.793	0.583		
4. Sadece takmadığım için ceza alabileceğimi bildiğim zamanlarda yüz maskesi kullanırım.	2.01 ± 1.22	0.536	0.362		
5. Yüz maskeleri hijyenik değildir.	2.61 ± 1.08	0.592	0.417		

ITCS: Item Total Score Correlation.

administered to 100 individuals 15 days after the initial data collection process. The correlation coefficient (r) should be at least 0.70 or higher. As this value approaches +1, the reliability of the test increases (Ratner, 2009). Upon retesting the questionnaires after 15 days, the test-retest reliability for the scale was found to be above 0.70. It was found that there is a very strong ($r = 0.941$), positive, and statistically significant correlation between the two measurements ($p < 0.001$). Thus, it was determined that the scale had time invariance.

Discussion

In this study, the validity and reliability of the Turkish version of the ATFMUS were tested. In psychological assessment research, the use of student samples and the evaluation of measurement invariance are encouraged (Boateng et al., 2018). Therefore, this study was conducted with a total of 530 undergraduate students. The results indicate that H1 (ATFMUS is a highly valid measurement tool in the Turkish population) and H2 (ATFMUS is a highly reliable measurement tool in the Turkish population) are supported.

The results indicate that the factor structure of the Turkish version of the ATFMUS is the same as the factor structure of the original version. The study has revealed a single dimension consisting of five items, with factor loadings of the scale items ranging from 0.536 to 0.831. The factor loading values above 0.50 indicate that the scale items contribute sufficiently to the scale (Gürbüz and Şahin, 2014). In the confirmatory factor analysis, the chi-square/degrees of freedom ratio (χ^2/df) value is 1.343 and the Root Mean Square Error of Approximation (RMSEA) is 0.036. When considering the acceptable value for these measures, our results indicate that the Turkish version of ATFMUS has excellent goodness-of-fit (Kriston et al., 2008).

The item-total correlation values for the items in the scale are positive and range between 0.362 and 0.648. Having item-total correlations above 0.30 and being positive indicates that the items in the measuring instrument exhibit similar behaviors and that the scale has acceptable internal consistency (Cristobal et al., 2007; Field, 2017). Therefore, all items measure the same underlying direction of attitude toward face mask usage and are associated with the total score. The Cronbach's alpha coefficient of 0.743 in our study exceeds the commonly accepted threshold of 0.70, indicating satisfactory internal consistency and reliability (DeVellis and Thorpe, 2021; Taber, 2018). When the test-retest reliability of 0.941 is added to the item-total correlation and Cronbach's alpha value, it can be said that the internal consistency reliability of the scale is at an acceptable level. In conclusion, all findings indicate that the Turkish version of the ATFMUS, which assesses attitudes toward wearing face masks, has good validity, reliability, and consistency.

Comparing these findings with previous studies, the Turkish ATFMUS demonstrates similar reliability and validity metrics as other attitude scales used during the COVID-19 pandemic (e.g. Mahalik et al., 2021; Taylor and Asmundson, 2021). This consistency across different contexts supports the robustness of the scale and its applicability in diverse cultural settings. Additionally, the alignment of the findings with those of Ireri et al. (2022), who developed the original ATFMUS, indicates the consistency of the scale's factor structure across different populations and suggests that attitudes toward face mask use are likely influenced by similar factors regardless of cultural differences. From a theoretical perspective, the Health Belief Model (HBM) posits that individuals are more likely to engage in health-promoting behaviors if they perceive a high level of threat and believe in the efficacy of the behavior (Silva et al., 2023). The positive correlations found between the items in the Turkish ATFMUS and the overall scale score suggest that higher negative attitudes toward mask usage are associated with lower perceived benefits, which is consistent with the HBM.

Beyond the scope of COVID-19, the ATFMUS is a valuable tool for assessing public attitudes toward mask use during future pandemics and infectious disease outbreaks, aiding public health officials in designing effective communication strategies (Rieger, 2020). Additionally, ATFMUS can gauge attitudes toward mask use in regions with high air pollution, assisting policymakers in promoting protective mask use. In sectors like construction, manufacturing, and healthcare, ATFMUS can evaluate employee attitudes, enhancing workplace safety by informing necessary training. It can also assess attitudes across different societal segments, enhancing the effectiveness of public health campaigns and encouraging informed mask use. Understanding cultural and social dynamics influencing mask use through ATFMUS provides insights for public health interventions globally, facilitating culturally appropriate education programs.

However, the study has some limitations. Firstly, despite efforts to ensure linguistic and cultural equivalence of the scale, there is a possibility of measurement error due to potential variations in interpretation among respondents' comments. Additionally, since the study was conducted among students enrolled in the Faculty of Health Sciences at a foundation university, the generalizability of the findings to other populations, such as individuals with diverse age ranges or educational backgrounds, might be limited. For future research, it is important to first confirm the validity and reliability of the scale on different demographic groups with a broader sample. Additionally, post-implementation studies and intervention research could be conducted to assess the practical impact of scale usage. Such studies could help us understand changes in attitudes and behaviors related to mask usage and aid in the development of effective prevention strategies.

Conclusions

The Turkish version of ATFMUS is a valid and reliable tool for measuring attitudes toward wearing face masks. All items in ATFMUS are focused on the negative aspects of face mask use, and therefore, the scale may function well in capturing negative attitudes toward face mask use. Analysis results demonstrate good internal consistency and test-retest reliability of the scale. The scale is easy to use and can be applied in most instances. Assessing attitudes toward face mask usage can provide valuable insights for developing preventive programs and guiding the course of transmission to Turkish society.

Author contributions

Conceptualization: Özcan Erdoğan; Resources: Ahmet Doğan Kuday; Methodology: Özcan Erdoğan; Formal analysis and investigation: Ahmet Doğan Kuday; Writing—original draft preparation:

Ahmet Doğan Kuday, Özcan Erdoğan; Writing—review and editing: Ahmet Doğan Kuday, Özcan Erdoğan.

Data sharing statement

The data generated during and/or analysed during the current study are not publicly available as it was stated that the data collected while obtaining institutional permission will not be shared with any other person/platform.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

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Ethics approval

Ethics approval was received from the Bezmialem Vakif University Ethics Committee dated 22 March 2023 and reference number 101259.

Informed consent

All participants gave their informed consent before participating in this study.

ORCID iD

Ahmet Doğan Kuday https://orcid.org/0000-0001-8361-5526

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Appendix

Attitude Scale Towards the Use of Face Masks (ATFMUS)

The Attitude Scale Towards the Use of Face Masks was developed by Ireri et al. (2021), and the validity and reliability studies of the Turkish sections were conducted by Erdogan and Kuday (2024). The scale consists of 5 items and single dimensions. Each item is rated with a 5-point Likert performance (1 = strongly disagree, 2 = disagree, 3 = Undecided, 4 = Agree, 5 = strongly disagree). The total score that can be obtained from the scale is between 5 and 25, and the expanding scores decrease in the direction of face mask use. While the Cronbach's alpha value of the original version of the scale was determined as 0.710, the Cronbach's alpha value of the Turkish sections is 0.743.

No.		1—Strongly disagree 2—Disagree 3—Undecided 4—Agree 5—Strongly disagree
1	The idea of using a face mask does not appeal to me.	① ② ③ ④ ⑤
2	If possible, avoid using a face mask.	① ② ③ ④ ⑤
3	I don't like the idea of wearing a face mask.	① ② ③ ④ ⑤
4	I only wear a face mask when I might be penalized for wearing it.	① ② ③ ④ ⑤
5	Face masks are not hygienic.	① ② ③ ④ ⑤