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Development and Validation of the Physical Distancing Behavior Scale: A Study Based on the Integrated Behavior Model

Bütünleşik Davranış Model Perspektifinde Fiziksel Mesafelenme Davranışı Ölçeği: Geçerlik ve Güvenirlik Çalışması

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ABSTRACT

This paper aims to develop a comprehensive scale within the framework of the Integrated Behavior Model (IBM), which is recommended for the protection of public health during the Covid-19 pandemic period and is the leading physical distancing behavior among health behaviors. Within the scope of the study, an item pool consisting of a total of 109 items was created and the first item analysis was performed in the pilot sample (N= 100). At the end of the pilot study, Physical Distancing Behavior Scale (PDBS) was developed, comprising a total of 39 items. This scale consisted of instrumental attitude, experiential attitude, subjective norms, perceived control, self-efficacy, environmental constraints, knowledge habit, intention, and behavior structures. Afterwards, Exploratory Factor Analysis (EFA) was applied to 322 participants (age: 36.48) resulting in 21 items and five structures including instrumental attitude, experiential attitude, perceived control, self-efficacy, and knowledge. After factor structures according to EFA had been formed, a Confirmatory Factor Analysis (CFA) was conducted on 472 participants (age: 36,99). The CFA results confirmed 4 constructs consisting of 19 items which are instrumental attitude, experiential attitude, perceived control, and self-efficacy (RMSEA=0.057, GFI=0.93, CFI=0.94, NFI=0.90, X2/df=2.51), Cronbach's alpha scores of all sub-scales varied between 0.68-0.85. The results revealed that physical distancing behavior has been evaluated through the instrumental attitude, experiential attitude, perceived control, and self-efficacy constructs of IBM. In future studies, the scale may also need to be tested with different model studies. As regards the modeling studies that used this scale, examining different samples could guide community-based intervention programs.
Keywords: COVID-19 pandemic, physical distancing behavior, integrated behavioral model

ÖZ

Bu çalışmada, Covid-19 pandemisi döneminde toplum sağlığının korunması adına önerilen ve sağlık davranışları arasında en önde gelen fiziksel mesafelenme davranışına yönelik Bütünleşik Davranış Model çerçevesinde kapsamlı bir ölçek geliştirilmesi amaçlanmıştır. Çalışma kapsamında 109 maddeden oluşan bir madde havuzu oluşturulmuş ve pilot çalışmada (n=100) ilk madde analizi gerçekleştirilmiştir. Pilot çalışmanın sonunda toplam 39 maddeden oluşan, Fiziksel Mesafelenme Davranışı Ölçeği (FMDÖ) araçsal tutum, deneysel tutum, öznel normlar, algılanan kontrol, özetkinlik, çevresel engeller, davranışa yönelik bilgi ve beceriler, alışkanlık, niyet ve davranış alt ölçeklerinden oluşmuştur. Sonrasında 322 katılımcıyla (Ortyaş= 36.48) yürütülen Açımlayıcı Faktör Analizi (AFA) FMDÖ'nün araçsal tutum, deneysel tutum, algılanan kontrol, özetkinlik ve davranışa yönelik bilgi ve becerileri içeren beş alt ölçek ve 21 madde ile sonuçlanmıştır. AFA'ya göre faktör yapıları oluşturulan ölçeğin daha sonra 472 kişi (Ortyaş= 36,99) üzerinden Doğrulayıcı Faktör Analizi (DFA) yapılmıştır. DFA sonuçları ise araçsal tutum, deneysel tutum, algılanan kontrol ve özetkinlik olmak üzere 19 maddeden oluşan dört boyutlu yapıyı doğrulamıştır (RMSEA=0.057, GFI=0.93, CFI=0.94, NFI=0.90, X2/df=2.51). Alt ölçeklerin Cronbach alfa değerleri 0.68-0.85 arasında değişmektedir. Sonuçlar, fiziksel mesafe davranışının Bütünleşik Davranış Modeli'nin araçsal tutum, deneysel tutum, algılanan kontrol ve özetkinlik yapıları aracılığıyla değerlendirildiğini ortaya koymuştur. Gelecek çalışmalarda ölçeğin farklı model çalışmalarıyla da test edilmesi gerekebilir. Bu ölçeğin kullanıldığı model çalışmalarında farklı örneklemlerin incelenmesinin ise toplum temelli müdahale programlarına yol gösterebileceği düşünülmüştür.
Anahtar sözcükler: COVID-19 pandemisi, fiziksel mesafelenme davranışı, bütünleşik davranış modeli

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Introduction

COVID-19 is one of the fatal pandemics humanity has faced in recent times (Feehan and Apostolopoulos 2021). More than 153 million people were infected by the virus, 3.2 million of whom died (WHO 2021). The risk of exposure to the virus still threatens the world because of its high rate of transmission. Although scientists have found effective vaccinations against COVID-19, due to insufficient global vaccination supplies and anti-vaccination movement, it still remains unclear whether the pandemic will repeat again (Skegg et al. 2021). We should note that the lack of an effective treatment against the disease contributes to the severity of the situation; this emphasizes the significance of nonpharmacological interventions (Xie et al. 2020). Some exemplary nonpharmacological suggestions from authorities include wearing masks, physical distancing, washing hands and not staying indoors for a long time which are proven to be effective against the spread of COVID-19 (Xie et al. 2020, WHO 2021). Improvements in compliance with these suggestions are expected to affect the number of overall cases as well as its rate of transmission. Although the World Health Organization has officially declared end to COVID-19 as a global health emergency since May 2023 (WHO 2023), the factors affecting the compliance of people towards these nonpharmacological prevention behaviors during epidemics and pandemics are still needed to be understood for the future interventions in order to maintain public health (Burton el al. 2023). Physical distancing behavior has often been conventionally used to block the transmission of viruses (Shahzad et al. 2021). Despite being an ancient approach, people find physical distancing behavior challenging to implement in the course of their daily lives (Durand et al. 2020, Shahzad et al. 2021). Therefore, assessing physical distancing is a substantial measure for understanding the behavior as a phenomenon.

Physical distancing behavior is considered to be an essential preventative method against viruses transmitted through actions, such as coughing, sneezing, or speaking (Koo et al. 2020, Soucy et al. 2020, WHO 2021). Although this behavior is crucial for maintaining physical health against such diseases, recent studies have revealed that the behavior brings about negative social and psychological consequences, such as increased levels of anxiety, depression, substance use, emotional loneliness, domestic violence and child abuse (Galea et al. 2020). Besides, specific issues have been identified as significant factors preventing people from adhering to social distancing behaviors. Some of these factors include not supporting family or friends in need and not socialising when feeling alone (Charles et al. 2022, Coroiu et al. 2020, Farrell et al. 2021). Moreover, physical distance adherence rates may differ from one study to another. Reported adherence rates may differ by interventions about physical distancing behavior; this can also be observed in different countries' variations in case numbers (Soucy et al. 2020). Therefore, to increase the adherence rate of physical distancing behavior, the need exists to motivate people to adapt to such new habits rather than enforce these behaviors by legislating new rules. (Briscese et al. 2023).

Although different types of vaccines have been developed against COVID-19, there is still a long way to go in terms of spreading the vaccine. There are still many unvaccinated people in the world. Some of them are anti-vaccine, and some live in low-income countries that do not have access to the vaccine. There are also vulnerable groups that cannot be vaccinated yet, and the children among them must go to school. Thus, protective health behaviors remain essential for humans all over the world (Farrell et al. 2021).

Motivating people to maintain this particular behavior can be challenging due to the aforementioned psychosocial reasons (Pedersen and Favero 2020, Farrell et al. 2021, Briscese et al. 2023). Using theory-based health behavior models that have been repeatedly proven to be effective is necessary for these types of challenging situations for developing effective intervention programs. However, the factors preventing individuals from following physical distancing behavior (Oosterhoff et al. 2020) have to be deeply investigated before developing intervention programs designed for increasing motivation among the population. Developing a theory-based scale is critical for investigating the behavior's psychological, social and individual processors (Glanz et al. 2008, Michie et al. 2018, Prachthauser et al. 2020). In summary, health models that provide a framework for evaluating health behaviors can also help researchers develop a measurement tool; this would be the first step in evaluating this behavior. Also, the literature regarding physical distancing behavior will obtain a new model-based measurement tool.

Derived from the theory of planned behavior (TPB) (Montaño et al. 2008, Ajzen 2015), the integrated behavioral model (IBM) is one of the social cognitive models (Bandura 1991) used for explaining preventive behavior. IBM consists of three main parts: attitudes, perceived norms, and personal agency, predicting behavioral intention. Intention, habits, environmental constraints, behavioral salience and the knowledge and skills for performing a behavior predict a behavior (Ajzen 1991, Montaño et al. 2008). The IBM framework has been used to explain various health behaviors, such as condom usage, scanning for Alzheimer's behavior, binge drinking and oral self-

care (Braun et al. 2014, Gutema et al. 2018, Ho et al. 2019, Park et al. 2020). Consequently, IBM has been proven to be a suitable model for developing questionnaires, investigating the components of behavior and creating intervention programs.

Although some scales have been developed to be used in different studies researching the predictors of the behavior (e.g., Coroiu et al. 2020, The Khoa et al. 2021) only a few of them are based on theoretical backgrounds such as Health Belief Model or Theory of Planned Behavior (Beeckman et al. 2020, Adiyoso and Wilopo 2021, Gibson et al. 2021, Yu et al. 2021, Hita et al. 2023). The authors have identified a severe defiency regarding the assessment of the physical distancing behavior by using a comprehensive model such as IBM. This study views IBM as the appropriate model in that it contains social, cognitive and environmental factors for evaluating physical distancing behavior. In addition, some cross-cultural studies show that predictors of physical distancing behavior may vary in different societies (Zirenko et al. 2021, Fischer and Karl 2022) however according to the knowledge of the authors, currently available literature does not present any scale with Turkish sample. Thus, this study aims to develop a comprehensive scale evaluating the predictors of physical distancing behavior based on the integrated behavioral model with the Turkish sample. Consequently, this study intends to develop a new social-cognitive scale for physical distancing behavior during the COVID-19 pandemic based on IBM and validate this new tool using exploratory and confirmatory analyses.

Methods

Participants

The current study was conducted using a cross-sectional design between April 2020 and May 2020. Convenience sampling method was preferred, and a total of 900 participants living in various cities in Turkey were reached (focus groups = 6, pilot study = 100, AFA = 322, DFA = 472). The sample group was approached through online communication tools such as WhatsApp, LinkedIn, and Instagram, and they participated in the survey prepared using Google forms. The sample age range was determined as 20-65 years during the data collection period, as individuals under the age of 20 and over the age of 65 were subjected to curfew measures (Ministry of Interior 2020) and did not have the opportunity to practice physical distancing behaviors. In addition, being literate was another inclusion criterion.

When determining exclusion criteria, care was taken not to overshadow the strongest determinant of behavior, which is intention (Montaño et al. 2008), with factors like bans or obligations. Therefore, active healthcare workers who, due to the nature of their profession, do not have the possibility of physical distancing and individuals with a positive history of COVID-19 who were isolated to prevent the spread of the disease constituted the exclusion criteria for the study.

Procedure

The ethical approval of the study was obtained through the decision numbered 2018-144 (08.04.2020) by the Istanbul University Social and Humanities Ethics Committee. Participants who agreed to participate in the research were assessed after accepting the written informed consent form. Scales were uploaded to online data collection system (Google-Forms). The completion of scales took approximately 20 minutes. Participation to the study was completely voluntary. Written informed consent was obtained before the scales were administered.

Measures

Two scales at all stages of the research were applied to the participants. These were Sociodemographic Form and the Physical Distancing Behavior Scale (PDBS) for which development work was actualized.

Sociodemographic Form

The form was designed by researchers. The general demographic information of the participants, such as gender, age, marital status, income level, and education status, were asked in this form.

Developing the Physical Distancing Behavior Scale (PDBS)

IBM consists of experiential attitudes, instrumental attitudes, injunctive norms, descriptive norms, perceived control, self-efficacy, knowledge and the skills to perform the behavior, environmental constraints, habits, intentions, and behaviors. The model recommends developing a sub-scale for each construct (Fishbein and Yzer

2003). Since the development of scale items occurred during the period of the COVID-19 pandemic in Turkey, there was no existing literature available to guide the creation of scale items related to physical distancing. Therefore, information from the reports and press releases of the World Health Organization, media sources, social media, and interpersonal interactions was used as a source of information. In the absence of any existing scale specifically assessing the relevant construct, scale items related to that component were written by a team of 3 researchers specializing in health behavior models, along with 1 advanced-level researcher in the same field, based on the definition and measurement recommendations provided by Montaño and Kasprzyk (2015). For instance, based on IBM, experiential attitude involves evaluating emotional reactions developed toward the behavior. Therefore, an item like "Physical distancing makes me feel frustrated" was added to the item pool. The items were then scaled on a 7-point Likert-type scale, following the agree-disagree format proposed by Francis et al. (2004).

In the first phase of the scale development, the scale contained 51 items covering 11 relevant IBM constructs (eleven items for instrumental attitudes, six items for experiential attitudes, three items for injunctive norm, four items for descriptive norm, five items for perceived control, five items for self-efficacy, five items for environmental constraints, nine items for knowledge and skill, and one item each for habits, intentions and behaviors). Except for knowledge and skills (true/false/undecided), all other constructs were evaluated using a 7-point Likert-type scale.

Content Validity and Pre-Testing for the Physical Distancing Behavior Scale (PDBS)

The first draft of the PDBS consisted of 51 items to be tested for content validity. The same team evaluated the scale for face validity and content validity. Three Turkish language specialists assessed the items' suitability to the Turkish language with the criteria of simplicity, explicitness, fluency, correct use of language, spelling of expressions, and intelligibility. In preparation for the pilot study, a focus group with six individuals evaluated the clarity and the applicability of the scale. After making corrections by considering the comments received from the focus group, a pilot study was conducted with 100 participants. An item analysis was conducted in the pilot study for all items in each section to assess the items' operability. As a result of the item analysis, 12 items whose item-total correlations were under .20 were removed, leaving a scale with 39 items ready for the main study. The process of forming the items is summarised in Figure 1. Accordingly, the scale had the following eleven sub-scale: instrumental attitudes (8 items), experiential attitudes (6 items), injunctive norms (3 items), descriptive norms (3 items), perceived control (5 items), self-efficacy (5 items), environmental constraints (4 items), knowledge and skills to perform the behavior (2 items), habits (1 item), intentions (1 item) and behaviors (1 item).

EFA was first performed to determine the validity and reliability of this draft of the PDBS. Sample items from the PDBS are presented in addendum.

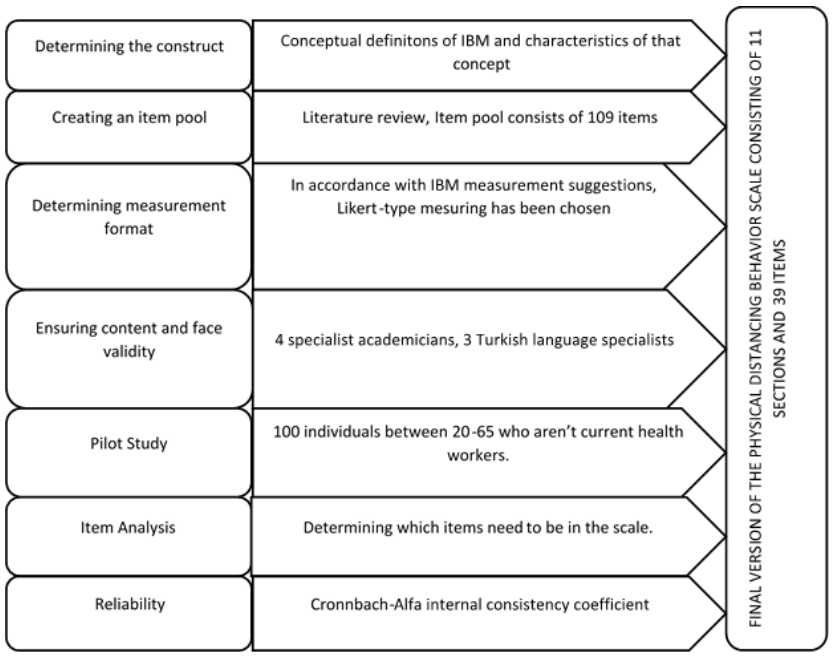

Figure 1. Phases in developing PDBS' items.

Statistical Analysis

Explatory Factor Analysis and Confirmatory Factor Analysis were performed using Statistical Package for Social Sciences (SPSS) version 21.0. Participants' demographic information and scale scores were calculated using descriptive statistical methods. Demographics and categorical variables were compared by analyzing the frequencies and percentage distributions of the groups.

In the EFA study, three items (one item from instrumental attitudes, two items from environmental constraints) were removed from the sub-scales because their item-total correlations scores were under .20 and decreased the scale's reliability. Thus, Cronbach's alphas for the constructs of injunctive norms, descriptive norms, and environmental constraints were under .60, these were removed for the EFA. Although the final form of the scale had 28 items, only one item (habit, intention, behavior) was eliminated before the factor analysis. Thus, the factor analysis was conducted over 25 items.

The principal component analysis with Varimax rotation was performed on the 25 remaining items to extract the significant contributing factors. The factors with an eigenvalue greater than one were further inspected. Those with factor loadings greater than 0.40 were kept for further analysis (Cliff 1988, Peterson 2000, Sass 2010, Şimşek 2017). Four items from the construct of instrumental attitude whose commonality values were less than 0.30 were removed from the scale's analysis, and then the analysis was conducted again. After the item and factor analyses, the Cronbach's alphas for the remaining 21 items were estimated. The Cronbach's alpha values for each subscale was between .68-.85. The level of acceptable internal consistency for each subscale was specified as a Cronbach's alpha of 0.60 (Ponterotto and Ruckdeschel 2007). The model's validity was determined in the CFA. The chi-squared fit test, root mean square approximation error (RMSEA), CFI, GFI, AGFI, SRMR and NFI values were analysed to assess the model's validity (Şimşek 2017). Attention was paid to the 90% confidence interval of RMSEA not being greater than .10 units for interpreting the model's fit statistics. The $\chi 2$ difference test was used to determine the fit indices following the modifications (Hu and Bentler 1999, Fan and Sivo 2007, Van de Schoot et al. 2012, Şimşek 2017)..

Results

Demographic Characteristics of the Participants from the EFA and CFA

For the EFA, the 322 participants had a mean age of 36.48 years (SD = 10.29), and most are females (72%) have a bachelor's degree or higher education level (70.2%), and are married (69.9%). For the CFA, the 472 participants had a mean age of 36.99 years (SD = 10.51), and the majority were also females (74.4%) have a bachelor's degree or higher education level (75.5%), and are married (68%). The descriptive properties of both samples are shown in Table 1.

EFA Results of the PDBS

EFA was performed for all 21 items from the PDBS to test its validity. The Kaiser-Meyer-Olkin (KMO) value was calculated as .80, which is considered good/perfect; Bartlett's test of sphericity is significant with $p < 0.001$, which also supports the model's validity from our EFA model. An EFA was conducted over the items to explore the domain; eight domains explained 65.20% of the total variance. The scree plot is shown in Figure 2.

The eight domains and their item loadings were examined. One of the items was found to be double loaded in injunctive norms and descriptive norms. Both of these sub-scales had two items. Therefore, all items from injunctive norms and descriptive norms were removed from the analysis. Each had only one item remaining after removing the double-loaded items; after this, the analysis was reperformed. The six remaining domains were determined to account for 63.51% of the total variance. In addition, experiential attitudes and instrumental attitudes were divided into two sub-domains, different from IBM's theoretical construct. The model was forced into five factors to obey the theory. These five factors then appeared to have eigenvalues above 1, which is indicative of acceptable significance together explain 59.03% of the variance. The five factors were self-efficacy, experiential attitude, perceived control, instrumental attitude, and knowledge and skills to perform the behavior. The variance values for each of the five factors in order were 26.27% for self-efficacy, 9.56% for experiential attitudes, 8.15% for perceived control, 7.81% for instrumental attitudes, and 7.23% for knowledge and skills (Table 2).

Table 1. Demographic characteristics of participants from the EFA and CFA				
	AFA		**DFA**	
Variables	Mean (SD)	n (%)	Mean (SD)	n (%)
Age	36.48 (10.29)		36.99 (10.51)	
Gender				
Woman		232 (72%)		351 (74.4%)
Male		90 (28%)		121 (25.6%)
Education Level				
Literate		4 (1.2%)		1 (.2%)
Primary School		3 (0.9%)		-
Middle School		6 (1.9%)		4 (.8%)
High School		34 (10.6%)		66 (14.0%)
Vocational high school		20 (6.2%)		45 (9.5%)
Bachelor's degree		191 (50.3%)		259 (54.9%)
Master's degree		58 (18.0%)		77 (16.3%)
PhD		6 (1.9%)		20 (4.3%)
Marital Status				
Single		80 (24.8%)		118 (25.0%)
Married		225 (69.9%)		321 (68.0%)
Cohabitation		3 (.9%)		8 (1.70%)
Divorced		14 (4.3%)		25 (5.3%)
Impact of the pandemic on revenue				
None.		39 (13.4%)		84 (19.7%)
Few		104 (35.6%)		126 (29.5%)
Partially		81 (27.7%)		120 (28.1%)
Mostly		68 (23.3%)		97 (22.7%)
No response		30		45

Table 2 summarises the descriptive statistics, EFA, and internal consistency (Cronbach's alphas). The five extracted factors accounted for 59.03% of the total variance in the 21 items. The reported Cronbach's alpha values ranged from 0.68-0.85 for each subscale, which showed good reliability for each scale's domain.

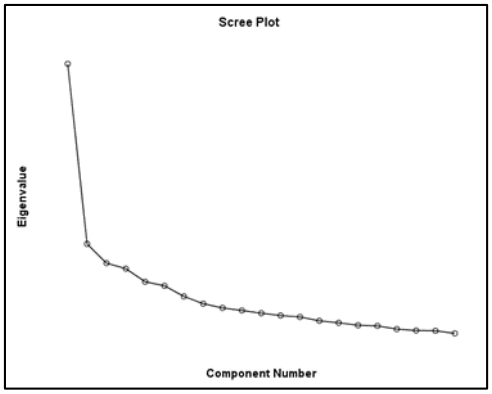

Figure 2. Scree plot

CFA Results for the PDBS

Before conducting the CFA analysis, the kurtosis and skewness values of the variables were checked for their conformity to the normal distribution. According to this examination, it was observed that all variables' kurtosis and skewness values fell within the acceptable range of +-2 (George and Mallery 2010). CFA was conducted using the program LISREL to test the measurement model comprising instrumental attitude, experiential attitude, perceived control, self-efficacy, and knowledge variables.

The fitness of the model was addressed considering the goodness-of-fit criteria. Firstly, p-values were checked, and the p-value was considered significant based on the sample size from the factor analysis. Thus, the alternative goodness-of-fit indices were assessed. These goodness-of-fit indices can be seen in Model 1 from Table 3. Accordingly, the chi-square fit value was seen to be quite close to the acceptable level at 3.02; the other fit indices had acceptable levels of fit.

Table 2. Results from the descriptive statistics, exploratory factor analysis, and reliability analysis for the EFA sample (n = 322)							
# of items in Abbreviated Factors	**M**	**SD**	**Factor Loading**				
			1	2	3	4	5
SE1	6.39	.89	.70				
SE2	5.99	1.20	.80				
SE3	5.87	1.31	.71				
SE4	5.95	1.24	.79				
SE5	6.21	1.05	.75				
EA1	5.59	1.51		.66			
EA2	5.88	1.50		.55			
EA3	5.22	1.88		.66			
EA4	5.95	1.56		.64			
EA5	6.28	1.22		.68			
EA6	5.91	1.45		.77			
PBC1	3.83	1.94			.56		
PBC2	4.05	2.08			.60		
PBC3	4.30	2.16			.46		
PBC4	3.47	2.08			.75		
PBC5	3.36	2.04			.73		
IA1	6.68	.85				.70	
IA2	6.20	1.16				.81	
IA3	6.47	.93				.76	
KNOWL4	1.99	.06					.91
KNOWL5	1.99	.08					.92
Eigenvalue			5.52	2.01	1.71	1.64	1.52
Explained Variance (%)			26.27	9.56	8.15	7.81	7.3
Cumulative variance (%)			26.27	35.83	43.98	51.80	59.03
Cronbach's alpha			0.85	0.78	0.68	0.75	0.80

SE = self-efficacy, EA = experiential attitudes, PBC = perceived behavioral control, IA = instrumental attitudes, KNOWL = knowledge and skills to perform the behavior

When examining the model's t values, the error variances of two items in the knowledge component were seen to be insignificant. These two items were removed from the model, and the analysis was repeated. When examining the correction indices LISREL produced regarding the model, two error covariances were determined to exist. As a result of the modification, the ratio of X2/df (362.25/144) was 2.51 ($p < .01$). After the modification, the model was observed to show a statistically significant improvement and adequate compliance with the data (Values are shown in the column of fit values for the revised measurement model). As shown in Table 3, all fit index values were at acceptable levels after the modification.

Table 3. Summary of the PDBS model's fit ındices (n = 472)					
	Fit Values for the Measurement Model	**Fit Values for the Revised Measurement Model**	**Fit Values After Removing 2 Knowledge Items and Revising**	**Acceptable Fit Values**	**Perfect Fit Values**
X^2/df	(542.08 / 179) 3.02	(380.39 / 177) 2.14	(380.39 / 177) 2.51	2-3	0-2
RMSEA (90% CI)	0.066 (0.059;0.072)	0.049 (0.043;0.056)	0.057 (0.049;0.064)	.05-.08	.00-.05
AGFI	0.87	0.91	0.90	.85-.90	.90-1.00
GFI	0.90	0.93	0.93	.90-.95	.95-1.00
CFI	0.95	0.97	0.94	.90-.95	.95-1.00
SRMR	0.060	0.055	0.056	.05-.08	.00-.05
NFI	0.92	0.94	0.90	.90-.95	.95-1.00

The standardised factor loading values vary between .35 and .88 (Table 4). Factor loadings less than 0.30 are not desired (Harrington 2009). The current study is seen to have met this criterion. The model was found to be a good fit for examining the goodness-of-fit indices, the outcomes (t-test, error variance and factor loading) and revision.

Pearson correlation analysis was conducted to examine the relationships between each subscale in the PDBS scale under the context of discriminant validity The results are shown in Table 5. Accordingly, the correlations between the subscales were seen to have low and medium values in the range of 0.11-0.39.

Table 4. Parameter values for the measurement model				
Constructs/Items	**Standardized loads/ Standardized coefficients**	**Error variances/ Standard error**	**t values**	R^2
Self-Efficacy				
SE1	0.56	0.65	12.80	0.31
SE2	0.66	0.26	22.80	0.43
SE3	0.70	0.50	17.01	0.49
SE4	0.67	0.24	23.13	0.45
SE5	0.66	0.26	22.64	0.43
Experiential Attitudes				
EA1	0.68	0.17	15.06	0.46
EA2	0.50	0.17	10.42	0.25
EA3	0.37	0.40	7.55	0.14
EA4	0.35	0.40	7.16	0.12
EA5	0.72	0.48	16.28	0.52
EA6	0.50	0.36	18.54	0.25
Perceived Behavioral Control				
PBC1	0.55	0.70	11.52	0.30
PBC2	0.49	0.76	10.20	0.24
PBC3	0.47	0.76	9.64	0.22
PBC4	0.62	0.34	18.33	0.38
PBC5	0.68	0.54	14.70	0.46
Instrumental Attitudes				
IA1	0.64	0.59	14.52	0.41
IA2	0.88	0.22	21.62	0.77
IA3	0.83	0.21	19.92	0.69

Reliability Analysis

Only the knowledge component was removed from the scale; the other structures remained the same in reliability analysis. The final reliability values of the scale are shown in Table 2.

Table 5. Correlation analysis conducted for discriminant validity with DFA sample (n= 472)				
	IA	**EA**	**SE**	**PBC**
IA	1	.33**	.27**	.11*
EA		1	.39**	.35**
SE			1	.33**
PBC				1

IA = instrumental attitudes, EA = experiential attitudes, SE = self-efficacy, PBC = perceived behavioral control; **p < 0.01, *p < 0.05..

Discussion

Many scales were formed for evaluating physical distancing (eg., Hita et al. 2023), but we have not seen it in Turkish based on a model comprehensively. Hence, the study aimed to develop a Turkish scale for measuring physical distancing behavior during the COVID-19 pandemic. The scale development process was started with a pool of 109 items. The final version of the scale consisted of 19 questions, as several were dropped and eliminated during the analysis. The main reason for excluding the items is to develop a simple and pure scale with good psychometric properties (Hu and Bentler 1999, Fan and Sivo 2007, Ponterotto and Ruckdeschel 2007, Van de Schoot et al. 2012, Şimşek 2017).The validity and reliability analysis were examined in this study for scale development. As a result of the EFA, five interrelated structures have emerged: instrumental attitude, experiential attitude, perceived behavioral control, self-efficacy and knowledge. All sub-scales except for knowledge were confirmed in the CFA analysis. Thus, 19 items with four constructs were formed after all validity analysis ended, and the Cronbach Alpha score was acceptable. Therefore, The PFMB can be a measurement tool with high validity and reliability and is usable in different studies when considering the obtained results.

The items which was developed at the beginning of the pandemic were first integrated into all the structures of IBM. However, numerous items and sub-scales could not obtain an effective statistical score in explaining the physical distancing behavior. Hence, it was determined that the remaining four structures, instrumental attitudes, experiential attitude, perceived behavioral control, and self-efficacy, explained physical distance behavior in the COVID-19 pandemic situation. In the discriminant validity analysis, in which the relationship of

these constructs was examined, it was found that although all sub-dimensions showed a significant relationship, instrumental attitudes had a low correlation power level with perceptional behavioral control and self-efficacy. It had similar findings to Braun et al. (2014), study investigated un-binge eating and alcohol consumption behaviors. Although a protective behavior towards the covid pandemic has been studied, these findings revealed the similar as a former study (Braun et al. 2014) that the relationship between the cognitive aspect of attitudes with behavioral control and belief in ability was not as strong as experiential attitude. Besides, perceived behavioral control and self-efficacy were found, a low-level relationship with a cognitive assessment of the behavior. However, other studies will be needed to disclose how this relationship between the structures will be formed in the model.

The analyses showed that IBM's constructs of injunctive norms, descriptive norms and environmental constraints were low reliability. Low Cronbach Alpha score is seen in measurements with a few items (Kagee and Van der Merwe 2006). Besides, among the constructs of IBM, subjective norms are required the most experiential attention and the most advanced study (Armitage and Conner 2001). The low-reliability coefficient of the environmental constraints suggests that the scale items are not adequately related to the structure. Some of the knowledge and skills to perform the behavior sub-scales were eliminated during the pilot study, and the remaining items were removed as the information about physical distancing behavior is sufficiently explicit for the nature of the behavior. In the present study, more than 95% of the sample answered the information questions correctly, making this structure ineffective by restricting the diversity of variance in the group.

On the other hand, physical distancing behavior was mainly assessed as an outcome variable (Gollwitzer et al. 2020, Tabernero et al. 2020, Alivernini et al. 2021, Bicalho et al. 2021) and for a measure of behavioral adaptation (Bicalho et al. 2021, Kuper-Smith et al. 2021). When evaluating health behavior, IBM recommends defining the behavior specifically and developing a scale for the behavior (Beeckman et al. 2020). The measurement developed in this study addresses structures IBM recommendations, instrumental attitudes, experiential attitude, perceived control, self-efficacy as adapted to physical distancing behavior. The scale was made to fill a critical deficiency in Turkish measurements for providing a model-oriented behavioral evaluation. Thus, the current study may provide researchers with a significant framework when establishing intervention programs for physical distancing behavior.

The Covid process has been an experience that occurred suddenly and caused an unpredictable environment in terms of health and social aspect of life. Thus, the developed scale contains sufficient methodological and content evaluations that provide a substantial tool for preventing ambiguity. However, the scale implementation was at the beginning of the pandemic, which may cause a problem whether the answers given are still current. Therefore, the new model study should be tested with the scale. Besides, there are predictions that new pandemics may occur in future, and preventive health interventions may be needed for many problems, such as new variants of viruses, climate change or air/water pollution (CDC 2022). It should obtain information about the nature of preventive health behaviors in Turkish culture with all these possible risky situations.

Health behaviors and their predictors may differ concerning culture and geographical characteristics. The current study sample consisted of participants from seven geographical regions of Turkey, who may show both individualistic and collectivistic cultural characteristics (Imamoğlu and Karakitapoğlu-Aygün 2004). Therefore, the developed scale may shed light on the interventions for different cultural orientations worldwide. Findings from this study may guide health interventions, media campaigns and pandemic control strategies. Moreover, it is assumed that these findings will provide valuable insights into interventions for different health behaviors (e.g., anti-vaccination movement).

The scale was developed and tested at the beginning of the pandemic, so it has various limitations. The most important is the scale selected for the external validity test. Besides, one of the limitations arising from the period in which the data had been collected was that the participants' evaluations of physical distancing behavior may still have been premature, as well as the anxiety experienced by many people at the beginning of the pandemic process, perhaps creating a bias. As IBM suggests, adapting the determining health behavior to the measurement time is essential. Thus, considering the conditions of the measurement period will be important when applying this scale in future studies. The current research can be beneficial for defining behavior and assessment levels regarding the IBM construct. However, further studies should be focused on the predictors of health behavior and intervene to improve the behavior.

The data have been collected online in the present study. Therefore, this study has reached literate people, who have a high level of education, have access to computers, and individuals who can fill out an online questionnaire. Therefore, this study has the limitations like most studies in which online data was collected. However, the increase in persons online habits during the pandemic suggests that this limitation has been experienced at a

minimum level. Further studies can be conducted to test the scale on samples that include individuals from different socioeconomic-level. In addition, translating the scale into other languages and applying the translated versions are also crucial in testing its validity. Therefore, the new studies will be beneficial for test validation.

Conclusion

This study tests the validity and reliability of the IBM-based scale consisting of 19 items and four constructs related to physical distancing behavior during the COVID-19 pandemic. Research and intervention programs in the clinical health psychology are needed to meet the need in order to be prepared for the next pandemics. These research and intervention studies can pave the way for people who have never performed this behavior to adopt it. Even though, this is a scale development study, it will lead to further modeling and intervention studies on physical distancing behavior.

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Addendum 1. Physical Distancing Behavior Scale

Physical Distancing Behavior Scale

Instruction: Below are various statements about physical distancing. Please indicate the extent to which you agree with each of these statements with a score between 1 and 7. (1. Strongly disagree 2. Mostly disagree 3. Somewhat disagree 4. Undecided 5. Somewhat agree 6. Mostly agree 7. Strongly agree).

1.	Fiziksel mesafe virüsün bulaşma riskini azaltır. (Physical distance reduces the contagion risk of the virus.)	
2.	Fiziksel mesafe beni hastalıktan korur. (Physical distance protects me from getting ill.)	
3.	Benim fiziksel mesafelenmem diğer insanları hastalıktan korur. (Me keeping my physical distance protects other people from getting ill.)	
4.	Fiziksel mesafelenme endişemi azaltır. (Physical distancing reduces my worries.)	
5.	Fiziksel mesafelenme suçlu hissetmemi önler. (Physical distancing keeps me from feeling guilt.)	
6.	Fiziksel mesafelenme beni engellenmiş hissettirir. (Physical distancing makes me feel frustrated)	
7.	Fiziksel mesafelenme beni öfkeli hissettirir. (Physical distancing makes me feel angry)	
8.	Fiziksel mesafelenme beni daha güvende hissettirir. (Physical distancing makes me feel safe.)	
9.	Fiziksel mesafelenme beni iyi hissettirir. (Physical distancing makes me feel good.)	
10.	Fiziksel mesafeyi sağlamak zorlayıcıdır. (Keeping the physical distance is challenging.)	
11.	Marketlerde ve eczanelerde önlemler (bariyerler, şeritler vb.) alınsa bile fiziksel mesafeyi sağlamam kolay değildir. (It is not easy for me to keep the physical distance even though relevant measures (placing barriers, tapes etc.) are taken in grocery stores and pharmacies.)	
12.	Çevremdeki insanların fiziksel mesafeyi tehdit eden davranışları (tokalaşmak için elini uzatması, eve ziyarete gelmesi gibi) olduğunda onları durdurmak zorlayıcıdır. (It is challenging for me to stop people when they act in a manner threatening the physical distance (such as attempting to shake hands, making a home visit etc.))	
13.	Pandeminin ne kadar süre devam edeceğini bilememek fiziksel mesafeyi sürdürmeyi zorlaştırır. (Not knowing how long the pandemic will last makes it harder to keep the physical distance.)	
14.	Havanın güzel oluşu fiziksel mesafeyi sürdürmeyi zorlaştırır. (Nice weather makes it harder to keep the physical distance.)	
15.	Fiziksel mesafeyi sağlayabilirim. (I can keep the physical distance.)	
16.	Pandemi ne kadar süre devam ederse etsin fiziksel mesafelenmeyi sonuna kadar sürdürebilirim. (I can carry out the physical distancing to the end, no matter how long the pandemic lasts.)	
17.	Yakınlarım fiziksel mesafeyi tehdit eden davranışlarda bulunsa da kendimi geri çekerek bu mesafeyi koruyabilirim. (I can pull myself away to keep the physical distance even when my significant others act in a manner threating the physical distance.)	
18.	Fiziksel mesafe ne kadar zor, rahatsız edici, kısıtlayıcı olursa olsun buna dayanabilirim. (No matter how challenging, disturbing, restricting it becomes, I can bear with the physical distancing.)	
19.	Hava çok güzel olsa dahi fiziksel mesafelenmeyi sağlayabilirim. (I can sustain my physical distancing even when the weather is really nice.)	

Scoring

Items in bold font will be calculated in reverse order
Instrumental Attitude: 1, 2, 3; Experiential Attitude: 4, 5, **6, 7**, 8, 9; Perceived Control: **10, 11, 12, 13, 14**
Self-efficacy: 15, 16, 17, 18,19

Rating

After the reverse transformation process, the sum of the 19 items gives the "Physical Distancing Behavior" score, and the sum of the subscales gives the physical distancing score for each subscale. The higher the score, the higher the level of physical distancing behavior.