
Fagerstrom test for nicotine dependence: Reliability in a Turkish sample and factor analysis#

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ÖZET

Fagerstrom nikotin bağımlılık testinin Türkçe versiyonunun güvenilirliği ve faktör analizi

Fagerstrom nikotin bağımlılık testi (FNBT), sıklıkla nikotinin fiziksel bağımlılığını ölçmek için kullanılmaktadır. Bu çalışmada, FNBT ve sigara içme ağırlığı indeksi (SIAl)'nin Türk sigara içicilerinde faydasını belirlemeyi ve FNBT'nin Türkçe versiyonunda itemler arası ilişkisini faktör analizi ile göstermeyi amaçladık. Yüzdört (%61.5)'ü erkek, 65 (%38.5)'i kadın toplam 169 sigara içicisine FNBT'nin Türkçe versiyonu uygulandı. Yüzaltmışdokuz kişiden rastgele seçilen 52 sigara içicisine test-retest güvenilirlik analizi için uygulandı. FNBT'nin Türkçe versiyonu orta derecede güvenilir bulundu (Cronbach alfa: 0.56). FNBT'nin üçüncü sorusu (vazgeçemeyeceğiniz sigara) sorular arasında güvenilirliği en zayıf olan idi ($p < 0.05$). Faktör 1, soru 1 (uyandıktan sonraki ilk sigara), soru 4 (günde içilen sigara sayısı), soru 5 (sabah saatlerinde içilen sigara miktarı), soru 6 (hasta olduğunda sigara içme durumu), soru 2 (sigara içmenin yasak olduğu yerlerde sigarasız olma durumu), faktör 2 soru 3'le farklı bir şekilde ayrıldı. Soru 3, total skor ile anlamlı korelasyon göstermiyordu ve bu soruya verilen yanıt test-retest arasında anlamlı idi ($p < 0.05$). FNBT'nin Türkçe versiyonu, sigara bırakma polikliniklerinde nikotin bağımlılığını değerlendirmede ölçüm metodu olarak kullanılabilir. Ancak üçüncü soru vurgulanmalı ve sigara içicilerinin bu soruyu anlamasına yardımcı olunmalıdır.

Anahtar Kelimeler: Nikotin bağımlılığı, Fagerstrom, güvenilirlik, faktör analizi.

SUMMARY

Fagerstrom test for nicotine dependence: Reliability in a Turkish sample and factor analysis#

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Fagerstrom Test for Nicotine Dependence (FTND) has often been used as a measure of physical dependence on nicotine. In this study, we aimed to verify the usefulness of FTND and Heaviness of Smoking Index (HSI) in a sample of Turkish smokers and present relationship among interrelated items in our Turkish version of FTND by factor analysis. One hundred sixty

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nine smokers, 104 (61.5%) males, 65 (38.5%) females smoker were administered the Turkish translation of FTND. Fifty-two current smokers selected randomly from 169 were administered the questionnaire for test-retest reliability analysis. The Turkish version of FTND had moderate reliability (Cronbach alpha: 0.56). One FTND item (question 3: hate- most to give up) performed poorly on construct reliability tests. Factor 1 was loaded by questions 1 (first cigarette after awakening), 4 (number of cigarettes per day), 5 (smoking status during the first hours), 6 (smoking if ill), 2 (refrain from smoking in forbidden places) and factor 2 was separately loaded by question 3. Question 3 did not have significant correlation with the total score and the response to this question was significant between test and retest. The Turkish version of FTND may become a measuring tool in the assessment of smoking cessation programs. However, question 3 must be used attentively and preferably an explanation should be made to enable a clear understanding of the question to the Turkish smokers as they take the test.

Key Words: Nicotine, dependence, Fagerstrom, reliability, factor, analysis.

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Tobacco "a psychoactive substance causing mental and behavioral disorders" as defined by the World Health Organization (WHO) brings about many physical disease risks as well as high health-care costs (1). Tobacco usage is identified as "the single most important preventable risk to human health in developed countries and an important cause of premature death worldwide" in the report entitled "Smoking and Health: Physician Responsibility" released in 1995 by American College of Chest Physicians (ACCP) in collaboration with five other international organizations (2). Therefore, tobacco epidemic should be adequately addressed and countered. Tobacco and Health Study Group, a branch of Turkish Thoracic Society, is also involved in the prevention of tobacco dependence as well as the reduction of tobacco consumption in Turkey since 1992.

Smoking is best regarded as a chronic disease that requires a long-term management strategy which is vital during the cessation activity (3). The potential health benefits of smoking cessation are the reduction of quantity of tobacco-related diseases, a major decrease in the progression of established tobacco-related diseases and an increase in life expectancy, even in case of smokers who stopped smoking after the age of 65 or even after the development of a tobacco related disease (4). Nicotine, the basic component of tobacco, plays the major role in tobacco dependence that requires treatment both in biological and behavioral terms. Nicotine dependence

should be assessed prior to a quit attempt in order to acquire proper treatment strategies (5).

The most widely used tests in determination of nicotine dependence levels are the six-item Fagerstrom Test for Nicotine Dependence (FTND) and two-item Heaviness of Smoking Index (HSI), yet a shorter version of the same test. FTND, with the six items that it comprises, has a good level of reliability in determination of nicotine dependence level (6,7).

As indicated in the smoking cessation guideline released for health professionals in 1997 by the European Medical Association on Smoking or Health (EMASH), the answer to one of the questions of this test which is "How soon after waking up do you smoke your first cigarette?" was stated to be sufficient to show the level of nicotine dependence (8).

This study has been conducted with the objectives of verifying the usefulness of FTND in a sample of Turkish smokers and representing relationship among interrelated items in our Turkish version of FTND by factor analysis.

MATERIALS and METHODS

One hundred and sixty nine smokers, 104 (61.5%) males and 65 (38.5%) females, were administered the Turkish translation of FTND (Table 1). Among 169, 107 smokers had participated in the treatment to quit smoking in Smoking Cessation Clinic Yedikule Hospital of Chest Diseases and Thoracic Surgery. FTND was administered twice, 10 to 14 days apart, to 52 cur-

Table 1. Turkish version of Fagerstrom Test for Nicotine Dependence.

- Q1. İlk sigaranızı sabah uandıktan ne kadar sonra içersiniz? (How soon after you wake up do you smoke your first cigarette?)*
- Uyandıktan sonraki ilk beş dakika içinde (within 5 minutes)
 - 6-30 dakika içinde (within 6 to 30 minutes)
 - 31-60 dakika (31 to 60 minutes)
 - Bir saatten fazla (after 60 minutes)
- Q2. Sigara içmenin yasak olduğu örneğin; otobüs, hastane, sinema gibi yerlerde bu yasağa uymakta zorlanıyor musunuz? (Do you find it difficult to refrain from smoking in places where it is forbidden e.g. in church, at the library, in cinema, etc.?)
- Evet (yes)
 - Hayır (no)
- Q3. İçmeden duramayacağınız, diğer bir deyişle vazgeçemeyeceğiniz sigara hangisidir? (Which cigarette would you hate most to give up?)
- Sabah içtiğim ilk sigara (the first one in the morning)
 - Diğer herhangi biri (all others)
- Q4. Günde kaç adet sigara içiyorsunuz? (How many cigarettes a day do you smoke?)*
- 10 adet veya daha az (10 or less)
 - 11-20
 - 21-30
 - 31 veya daha fazlası (31 or more)
- Q5. Sabah uyanmayı izleyen ilk saatlerde, günün diğer saatlerine göre daha sık sigara içer misiniz? (Do you smoke more frequently during the first hours after waking than during the rest of the day?)
- Evet (yes)
 - Hayır (no)
- Q6. Günün büyük bölümünü yatakta geçirmenize neden olacak kadar hasta olsanız bile sigara içer misiniz? (Do you smoke if you are so ill that you are in bed most of the day?)
- Evet (yes)
 - Hayır (no)

* HSI items.

rent smokers selected randomly from 169 smokers who had referred to the smoking cessation clinic.

The items of the FTND were translated into Turkish by a pulmonologist and psychiatrist and translated back to original form by three individuals, two being native English speakers. We compared the original version with the back-translated version and compiled a Turkish version with the help of an English language expert. The final version was approved by Dr. Fagerstrom.

Statistical Analysis

Test-retest reliability with Pearson correlation method, Wilcoxon matched-pairs signed-ranks test and McNemar tests, Cronbach's alpha (reli-

ability factor) and corrected item-total correlation were used in the analysis of internal consistency. Variables were standardized for factor analysis (mean= 0, standardized deviation= 1). Two factors were evaluated for the analysis.

RESULTS

Table 1 shows Turkish Version of FTND. One hundred and sixty nine smokers, 104 (61.5%) males and 65 (38.5%) females, were administered FTND. Our sample included adults over 16 years old, participating to our smoking cessation clinic. Their mean age was 38 and average number of cigarettes smoked per day was 22 (SD= 8.2) (Table 2). Cronbach alpha coefficient for the FTND test was 0.56 (Table 3). Table 4

Table 2. Demographic characteristics of smokers.

N: 169	
Male	104 (61.5%)
Female	65 (38.5%)
Age, year	38 ± 12 (16-74)
Education	
Primary	79 (46.7%)
Secondary	90 (53.3%)
Smoking pack year	22 ± 8.2 (mean ± standard deviation)
FTND score	5 ± 2.5 (mean ± standard deviation)
FTND score < 696	(56.8%)
FTND score ≥ 673	(43.2%)

shows the Pearson correlations of the total scores on the test. The correlations of each item in relation to the total score on the test were moderate to high. Question 3 did not have significant correlation with the total score and the response to this question was significant between test and retest (Table 4). Table 5 shows that one FTND item (question 3: Hate-most to give up) performed poorly on construct reliability tests. Factor 1 was loaded by questions 1 (first cigarette after awakening), 4 (number of cigarettes per day), 5 (smoking status during the first hours), 6 (smoking if ill), 2 (refrain from smoking in forbidden places) and Factor 2 was separately loaded by question 3. Response percentages of smokers with FTND score ≥ 6 was shown on Table 6.

Table 3. Cronbach alpha for internal consistency.

Item-total statistics	
Scale	Corrected alpha if item deleted
Q1	0.4110
Q2	0.5153
Q3	0.6539
Q4	0.3936
Q5	0.4789
Q6	0.5185
Cronbach alpha: 0.56	

Table 4. Correlations for each item with total score and test-retest correlations for FTND, in the subsample of 52 who took questionnaires.

Questions	Item with total score (r) correlations for test-retest (r) and compared significance		
	n= 169	n= 52	
Q1	0.80*	0.90*	NS #
Q2	0.50*	0.68*	NS ##
Q3	0.01 NS	0.68*	p< 0.05 ##
Q4	0.74*	0.84*	NS #
Q5	0.60*	0.55*	NS #
Q6	0.50*	0.58*	NS ##

* p< 0.01

NS: Not significant.

Wilcoxon Matched-Pairs Signed-Ranks for test-retest.

McNemar for test-retest.

Table 5. Factor analysis.

Factor	Loadings	
	1	2
Question 1	0.726	0.269
Question 4	0.700	0.349
Question 5	0.698	0.007
Question 6	0.620	- 0.259
Question 2	0.574	- 0.117
Question 3	-0.309	0.854

Factor 1 variance: 38.56%, Factor 2 variance: 16%.

Cumulative variance is 55.39% for two components.

Kaiser-Meyer Olkin Measure of Sampling Adequacy: 0.73.

Barlett's Chi-square: 141.99 (p< 0.001).

* Extraction method: Principal component analysis.

Rotation method: None.

DISCUSSION

Smokers appear with various dependence levels of smoking. The related treatment is defined by the intensity of the dependence level that varies by social class, cultural diversity, geographical region as well as country borders (9,10). EMASH had requested smokers to be evaluated through assessment of nicotine dependence and clinical factors. As stated by EMASH, tobacco dependence can practically be determined by questioning the timing of the first cigarette of the morning. However, a valid and reliable question-

Table 6. Response percentages of smokers with FTND score ≥ 6 (n= 73).

Item score	0 n (%)	1 n (%)	2 n (%)	3 n (%)
Q1	2 (2.7)	6 (8.2)	22 (31.1)	43 (58.9)
Q2	24 (32.9)	49 (67.1)		
Q3	43 (58.9)	30 (41.1)		
Q4	0	10 (13.7)	25 (34.2)	38 (52.1)
Q5	21 (28.8)	52 (71.2)		
Q6	17 (23.3)	56 (76.7)		

naire that measures nicotine addiction is potentially useful in clinical practices and researches on smoking cessation.

In this study, the first objective was to develop the best translated Turkish-language version of the FTND. Two different specialists, a pulmonologist and a psychiatrist made translations of the FTND (Table 1). To give the best result of the Turkish version, minor changes were made: Question 1: We added "morning" at the end of the sentence to emphasize "waking up". Question 2: The verb "refrain" is a difficult word for Turkish language, so we gave the meaning of "difficulty not being able to smoke". The word "bus" was preferred to be used instead of "church" (smoking is legally forbidden in buses since 1994 and this condition is very important for Turkish people) and "hospital" instead of library for different frequency of visiting and more prominent public area for prohibition of smoking. Question 3: This was the most difficult question for Turkish people because the phrase "hate most to give up" was not understood by the majority. In order to communicate the meaning of "you can not endure without", the phrase "in other words one that you can never do without" had to be added. There were no problems in other questions. The smoking female and male survey attendee ratios were unequal which was comparable for the reported smoking rates were 60-65% for males and 20-24% for females in Turkey (11).

Most of the participants attended to the smoking cessation clinic. The mean value for FTND score was 5 ± 2.5 , indicating that the participants

were relatively light smokers, although the patients who attend smoking cessation are usually expected to be heavy smokers (Table 2). The uneven distribution of smokers may have resulted because of the reluctance of heavy smokers for smoking cessation. This reluctance for quitting smoking in heavy smokers should be investigated in terms of the psychology of addiction.

The Turkish version of FTND had moderate reliability (Cronbach alpha: 0.56), indicating that the FTND scale may help the health professionals decide on the appropriateness of stop-smoking programs for their patients on an individual basis (Table 3). A lower level of reliability as compared to prior studies might be explained by the cultural variances that affect nicotine dependence among countries (10). The internal consistency of the Turkish version of FTND would increase to 0.65 if Q3 was omitted.

Earlier studies showed lower coefficients for FTND (alpha= 0.56, alpha= 0.61) (6,12). However, both the French-language translation (alpha= 0.70) and a Dutch-language translation (alpha= 0.71) of the FTND produced higher alpha coefficients whereas the Spanish version had given a low coefficient (alpha= 0.57) like the Turkish version (10,13).

Test-retest correlations were satisfactory for the FTND and HSI scales. Test-retest correlations in this study were comparable or somewhat lower than previously published data ($r= 0.88$ for the total FTND score, and from 0.71 to 0.91 for individual items) (6). The attained results showed good correlation.

One FTND item (hate-most to give up) performed poorly on construct reliability tests. Etter and coworkers had reached similar results in their study. They found that questions 2 and 3 had the lowest factor loadings (0.47 and 0.39, respectively) for the FTND (14).

We have observed that even some (about 40%) of the smokers with high scores had reported that their most desired cigarette was not the first one in the morning (Table 6). Either the syntax is incomprehensible to the average Turkish smoker or the power of the question in determining the level of nicotine dependence is low. We are in favor of the latter explanation such that in factor analysis Q3 showed low loading in factor 1 and high loading in factor 2.

Factor 1 assessed the degree of urgency to initiate smoking after overnight abstinence and question 3 in factor 2 reflected the persistence with which smoking was maintained throughout the waking hours. The factor analysis after stratification by gender was not tested due to the limited number of smokers.

With these attained results, it can be stated that the FTND had been useful in a study on Turkish smokers for the identification of the individuals with the greatest dependence on tobacco products. The clinicians may rely on the results of FTND and HSI or another measurement tool along with FTND though not solely in their assessment of addiction to cigarettes. In the administration of FTND questionnaire, question 1 and 4 are the most reliable ones however question 3 must be used attentively and preferably an explanation should be made to enable a clear understanding of the question to the Turkish smokers as they take the test.

In conclusion, the results of this study call into question the current practice of using the Fagerstrom test to measure nicotine addiction that has persisted despite accumulating evidence of the instrument's limitations. The FTND may become the essential measuring tool in the assessment of smoking cessation programs, in nicotine replacement and drugs as well as behavioral treatments. Whereupon it may be suggested that

the very combination of the FTND with another dependence measurement tool like the most widely known and used DSM IV is most essential for the definition and support of the diagnosis of "nicotine dependence".

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