

# Development of the Addiction Profile Index Internet Addiction Form (APIINT): Validity and Reliability

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## ABSTRACT

Development of the Addiction Profile Index Internet Addiction Form (APIINT): validity and reliability

**Objective:** To adapt the Addiction Profile Index (API) for internet use and addiction in order to develop an internet addiction questionnaire better suited to the definition of addiction to be used for clinical purposes.

**Method:** The questions of the API were adapted to measure the use of the internet. After pilot application and feedback, a new scale of 18 items was developed. Included in the study were 103 randomly selected first-year students of a private high school and the entire first year cohort of a medical faculty (n=51). The Internet Addiction Scale developed by Nichols and adapted to Turkish by Canan was used for the validation of the questionnaire. The questionnaire was reapplied to the subjects fifteen days later.

**Results:** Cronbach's  $\alpha$  coefficient for the total APIINT was 0.88, and retest correlation was 0.85. Three factors were obtained using explanatory factor analysis that represented 57.03% of the total variance. A correlation coefficient of 0.81 was found between APIINT and Internet Addiction Scale. The area under the ROC curve was 0.97. With a total APIINT cut-off score of 2, both the scale's sensitivity and specificity were 0.90, respectively. A screening form consisting of 2 questions with a cut-off score 3.5 had a sensitivity of 0.72 and its specificity was 0.83.

**Conclusion:** The results show that the APIINT is a valid and reliable questionnaire that can be used for high school and university students.

**Keywords:** Addiction, internet, scale

## ÖZET

Bağımlılık Profil İndeksi İnternet Bağımlılığı Formu'nun (BAPİNT) geliştirilmesi: Geçerlik ve güvenilirliği

**Amaç:** Bağımlılık Profil İndeksi (BAPİ) ölçeğini internet kullanımı ve bağımlılığına uyumlu hale getirmek, böylece bağımlılık tanımına daha iyi uyan ve klinik amaçlarla kullanılacak bir internet bağımlılığı ölçeği geliştirmek amacıyla bu araştırma düzenlenmiştir.

**Yöntem:** Bağımlılık Profil İndeksi (BAPİ) ölçeğinin soruları internet kullanımını ölçmeye uygun hale getirildi. Pilot uygulama ve geri bildirimlerden sonra, 18 soruluk yeni ölçek oluşturuldu. Bir özel lisenin 1. sınıf öğrencilerinden rastgele yöntemle seçilen 103 öğrenci ve bir üniversitenin tıp fakültesi birinci sınıf öğrencilerinin tümü (n=51) araştırmaya alındı. Ölçek bağlantılı geçerliği araştırmak için Nichols tarafından geliştirilen ve Canan tarafından Türkçe'ye uyarlanan İnternet Bağımlılığı Ölçeği kullanıldı. İlk uygulamadan 15 gün sonra ölçek örnekleme tekrar uygulandı.

**Bulgular:** BAPİNT'in Cronbach alfa katsayısı 0.88 ve tekrar test korelasyonu 0.85 bulunmuştur. Faktör analizinde toplam varyansın %57.03'ünü açıklayan 3 faktör saptanmıştır. BAPİNT ile internet bağımlılık ölçeği arasında korelasyon katsayısı 0.81 bulunmuştur. ROC eğrisi altında kalan alan 0.97 olarak saptanmıştır. BAPİNT 2 puan için kesme noktasında duyarlılık 0.90, özgüllük ise 0.90 olmaktadır. İki sorudan oluşan tarama formunda 3.5 puan için kesme noktasında duyarlılık 0.72, özgüllük ise 0.83 olmaktadır.

**Sonuç:** BAPİNT'in ilise ve üniversite öğrencilerinde kullanılabilecek geçerli ve güvenilir bir ölçek olduğu söylenebilir.

**Ahtar kelimeler:** Bağımlılık, internet, ölçek



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Date of receipt / Geliş tarihi:  
January 19, 2015 / 19 Ocak 2015

Date of acceptance / Kabul tarihi:  
26 March, 2015 / 26 Mart 2015

## INTRODUCTION

Internet addiction is not yet a fully recognized diagnostic category. In studies and development of scales, a variety of terms is being used, such as computer addiction, virtual addiction, and technology or game addiction. It has been shown that internet addiction is a common problem that can negatively affect people's academic, social, economic, and family lives (1,2). It has been pointed out that factors like the ready availability and low cost of the internet and the opportunity for individuals to create an identity outside their own while on the internet may contribute to the fast increase of the problem's dimension (3).

While problems related to internet use are found to resemble impulse control disorders or gambling addiction, it has been proposed that they are psychopathologically distinct from these categories (4,5) and show more similarity with alcohol and substance addition (6,7). In the latest published classification, it has been assessed as "internet game playing addiction" (8). Generally speaking, scales concerned with internet addiction are to a large extent coinciding with scales used to diagnose addiction (9,10).

Several scales have been developed to deal with internet addiction (11). In Turkey, too, some scales to assess internet addiction have been developed and others have been translated into Turkish and tested for their validity and reliability (12-14).

The Addiction Profile Index (API) is a scale developed to assess the severity of addiction and its various dimensions (15). This scale has been used in a number of clinical studies in Turkey. Aim of our study was to adapt API to the assessment of internet use and to develop an internet form for the instrument.

## METHOD

**Internet Addiction Scale:** Developed by Nichols (16,17) and adapted to Turkish by Canan (18), is a scale consisting of 27 items. Its internal consistency is fairly high (Cronbach's  $\alpha=0.94$ ) and the one-week test-retest reliability is also quite good (Spearman-Brown correlation coefficient: 0.98;  $p<0.001$ ). Validity and reliability of the

scale have been tested for high schools as well as for university students (18). Cut-off point is a score of 0.81.

**Addiction Profile Index (API):** A self-reporting scale consisting of 37 questions and 5 subscales measuring characteristics of substance use, dependency diagnosis, the effects of substance use on the user, craving, and motivation to quit using substances (15). In the reliability analysis, Cronbach's  $\alpha$  for the entire scale was 0.89 and for the subscales, it ranged between 0.63 and 0.86. The item-total score correlation coefficient was between 0.42 and 0.89. For the whole scale, the Spearman-Brown coefficient for the split half-test correlation was 0.83. In the explanatory factor analysis, 4 factors representing 52.39% of the variance were obtained. The API Craving subscale was correlated with the Penn Alcohol Craving Scale (PACS) and motivation subscale with the Stages of Change Readiness and Treatment Eagerness Scale (SOCRATES). The API total score was correlated with the mean score in the Michigan Alcohol Screening Test (MAST) and the composite score in the Addiction Severity Index (ASI).

## Sample

One hundred and three randomly selected first-year students at a private high school and the entire first year cohort of a university medical school ( $n=53$ ) were included in the study. All students enrolled in the study ( $n=154$ ) completed the scale. There were no forms that had to be excluded for having been filled in incompletely or wrongly. As this was a standardization study, no distinction was made between the participants. For the study, approval was received from the ethics committee of Acibadem University. The forms were completed by the students anonymously and mixed during collection. Average age of the high school students was  $17.7\pm 0.6$  years, mean age of the university students was  $20.0\pm 0.6$  years.

## Application

After completing the forms, 108 students filled in the forms once again 15 days later.

## Development of the Scale

Since internet addiction was a category for which no scales existed, it has been suggested to use addiction scales as a foundation (10). Thus, in order to develop an internet addiction scale, the Addiction Profile Index (API) was used, for which validity and reliability studies in Turkey existed. Questions for the scale were prepared in accordance with the dimensions of API. However, in order to assess internet issues, the questions were asked in a different structure. Questions not suitable for an investigation of internet addiction (e.g., "Are there other substances you are using?") were removed from the forms. Answer choices were presented, like in the API, on a 5-point Likert-type scale. Total scale score is the average of the points like in API. The question form thus developed was administered by teachers to 10 persons who were known as intensive internet game players. Each question was reviewed individually, and the testers' views and feedback were collected.

According to the feedback received, the structure of the questions was modified and questions not understood by the testers were removed from the form. The completed questions were sent to 5 experts working in the field of addiction and their views were received. The questionnaires were finalized in accordance with the feedback. Thus, face validity was obtained. Cronbach's  $\alpha$  coefficient for the scale

consisting of 21 questions and 5 dimensions was found to be 0.86. It was agreed to remove 3 items with a reliability coefficient below 0.4 from the scale ("You wanted to use the internet, but when you could not use it, did any problems emerge?", "Has internet use affected your bodily health negatively?", and "Were you upset when you could not get on the internet when you had planned to?") The resulting scale consisting of 18 questions and 5 dimensions was named Addiction Profile Index Internet Form (APIINT).

## Statistical Analysis

For the reliability analysis, Cronbach's  $\alpha$  coefficient was calculated, and the factor structure of the scale was evaluated using explanatory factor analysis and varimax rotation. The scale's criterion-related validity analysis was performed using Pearson correlation analysis. All statistical calculations in this study were made using the SPSS 17.0 package.

## RESULTS

### Reliability

Cronbach's  $\alpha$  coefficient for the entire scale was 0.88 and for the subdimensions it ranged between 0.64 and 0.77. Item-total score correlation coefficients were between 0.44 and 0.68 (Table 1).

**Table 1: APIINT scale reliability coefficients**

	Scale average with item removal	Scale variance with item removal	Item-total correlation	Scale Cronbach's $\alpha$ coefficient with item removal
Spending too much time on the internet	17.2153	112.855	0.473	0.883
Increase of the time spent on the internet	18.7639	113.482	0.446	0.884
Difficulty to stop	18.5278	105.482	0.646	0.877
Thinking that spending too much time on the internet	18.3056	107.808	0.639	0.877
Internet use due to feeling sadness	18.6667	112.126	0.450	0.884
Giving up attending events	19.1806	109.995	0.579	0.880
Internet use first thing in the morning	18.7708	110.038	0.440	0.885
Breakdown of family relations	19.3264	111.228	0.583	0.880
Impact on educational life	18.8194	109.478	0.580	0.879
Using internet because life is boring without it	18.5972	112.340	0.404	0.886
Impact on relations with friends	19.7222	117.349	0.421	0.885
Reduced self-care	19.2292	110.667	0.509	0.882
Preferring to spend time on the internet rather than with others	19.5139	114.531	0.478	0.883
Family getting worried	19.0694	107.576	0.640	0.877
Thinking of the pleasurable effect of the internet	18.6528	105.067	0.543	0.882
Feeling urge or craving	19.0069	108.217	0.681	0.876
Thinking of internet use as a problem	19.3472	113.375	0.452	0.884
Wish to reduce	18.8125	110.699	0.468	0.883

The retest correlation for the entire scale was 0.85 ( $p < 0.01$ ). Retest correlations for the subdimensions were all statistically significant ( $p < 0.01$ ) and ranged from 0.64 to 0.82.

### Validity

Explanatory factor analysis was performed using the principal component method and varimax rotation.

In the factor analysis, like in the original scale, internet use characteristics were not included in the analysis. In the explanatory factor analysis, 4 factors with an eigenvalue above 1 were obtained, accounting for 57.4% of the variance (Table 2).

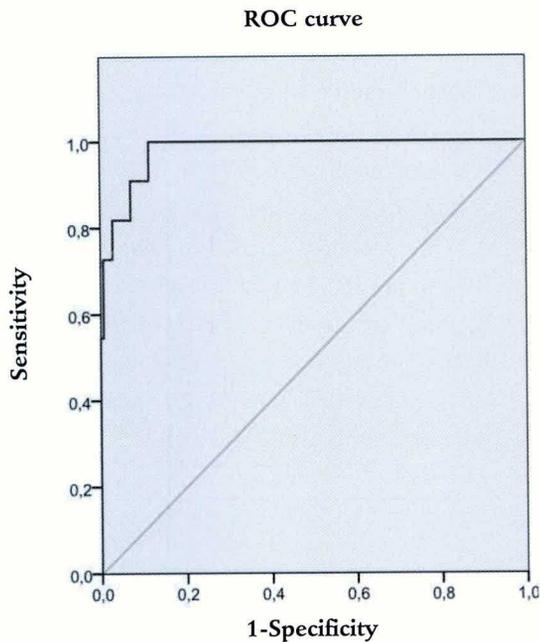
The first factor can be named "impact of internet use on life", the second factor "diagnostic criteria for addiction", the third factor "motivation", and the fourth factor "stopping to attend events". Considering the

**Table 2: APIINT scale explanatory factor structure (first version)**

	Factor			
	1	2	3	4
Breakdown of family relations	0.793			
Family getting worried	0.670			
Impact on educational life	0.542			
Internet use first thing in the morning	0.492			
Using internet because life is boring without it		0.640		
Difficulty to stop		0.558		
Thinking of the pleasurable effect of the internet		0.530		
Felling urge or craving		0.505		
Internet use due to feeling sadness		0.480		
Increase of the time spent on the internet		0.477		
Thinking that spending too much time on the internet		0.469		
Wish to reduce			0.824	
Thinking of internet use as a problem			0.795	
Spending too much time on the internet		0.443		
Preferring to spend time on the internet rather than with others				0.800
Reduced self-care				0.722
Giving up attending events				0.643
Impact on relations with friends				0.417

**Table 3: APIINT scale explanatory factor structure (When similar questions to "giving up attending events" are assessed together)**

	Factor		
	1	2	3
Breakdown of family relations	0.829		
Family getting worried	0.689		
Impact on educational life	0.663		
Giving up attending events	0.536		
Internet use first thing in the morning	0.504		
Using internet because life is boring without it		0.658	
Increase of the time spent on the internet		0.657	
Feeling urge or craving		0.624	
Thinking of the pleasurable effect of the internet		0.594	
Difficulty to stop		0.589	
Internet use due to feeling sadness		0.511	
Thinking that spending too much time on the internet		0.505	
Wish to reduce			0.844
Thinking of internet use as a problem			0.784
Spending too much time on the internet		0.493	



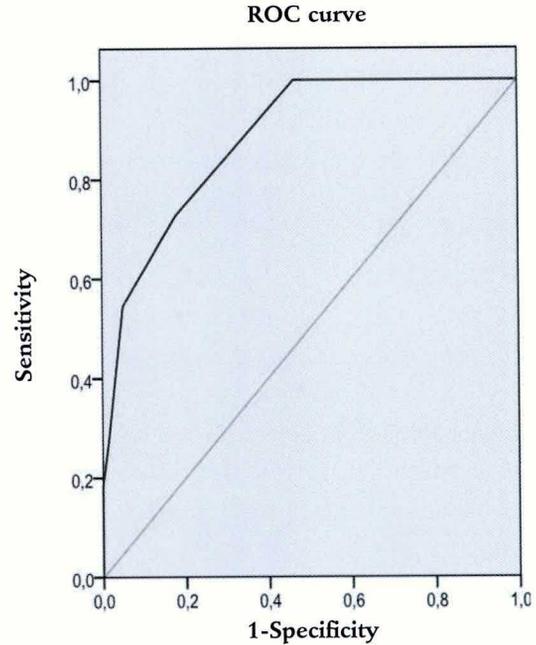
**Figure 1:** ROC curve for APIINT scores of participants who do and do not receive a diagnosis of addiction through the Internet Addiction Scale

fourth factor to contain one of the diagnostic criteria, the average of the 3 questions contained in this factor was used to create the second factor. Thus, 3 factors explaining 57.03% of the total variance were found. Questions relating to “stopping to attend events”, which in the previous analysis was seen as a separate factor, were now included in the factor “impact of internet use on life” (Table 3).

The explanatory factor analysis carried out with the total score from the subdimensions resulted in only one factor with an eigenvalue above 1, accounting for 57.3% of the total variance. Factor loads were 0.88 for diagnostic criteria, 0.84 for impact on life, 0.80 for craving, 0.62 for internet use characteristics, and 0.61 for motivation, respectively.

### Scale-Related Validity

The correlation coefficient between APIINT and Internet Addiction Scale was 0.81 ( $p < 0.01$ ). Based on the Internet Addiction Scale, the area under the ROC curve (Figure 1) was 0.97 ( $p < 0.001$ ). With a cut-off



**Figure 2:** ROC curve of APIINT screening form scores for participants who do and do not receive a diagnosis of addiction through the Internet Addiction Scale

point of 2, APIINT sensitivity was 0.90, and specificity, too, was 0.90 (positive predictive value [PPV]: 99.1 and negative predictive value [NPV]: 61.5). In the study, 83% of the participants were under cut-off point of 2.

Two questions were selected to be used for a screening form: “duration of internet use” and “internet use can cause problems in a person’s life”. These questions show a high correlation with the total overall APIINT score (0.82,  $p < 0.01$ ). Using the Internet Addiction Scale as a basis, the area under the ROC curve (Figure 2) is 0.88 ( $p < 0.001$ ). With a cut-off point at a score of 3.5, sensitivity is 0.72, specificity 0.83 (PPV: 97.5, NPV: 75.7).

### High School and University Students

In a separate analysis for the high school students, Cronbach’s  $\alpha$  coefficient was 0.88. In the explanatory factor analysis, four factors with an eigenvalue above 1 were found, accounting for 59.2% of the total variance. Distribution of questions to factors was similar to that in the general group. Cut-off point was 2.

In a separate analysis for the university students, Cronbach's  $\alpha$  coefficient was 0.90. In the explanatory factor analysis, four factors with an eigenvalue above 1 were found, accounting for 71.7% of the total variance. Distribution of questions to factors was similar to that in the general group. Cut-off point was 2.

## DISCUSSION

After factor analysis of the questions, it can be said that distribution to factors was consistent with dimensions identified in earlier studies with other API forms. As a result of factor analysis, questions related to "stopping to attend events" were transferred from the "diagnostic criteria" dimension to "impact on life". It has been noted that in the original API paper, "stopping to attend events" also remained in between two dimensions (15). While various studies found similar results (20), we believe that in research on groups with high-intensity addiction, attending events may drop.

In the factor analysis, craving fell into the diagnostic criteria dimension. However, we believe that in order to facilitate patient assessment in clinical use, it is beneficial to leave craving as a separate dimension. Thus, we can say that APIINT consists of the dimensions listed below:

- Frequency of internet use
- Diagnostic criteria of addiction (addiction symptoms)

- Impact of internet use on life
- Craving for internet use
- Motivation to reduce internet use

The subdimensions of APIINT resemble those put forward by a number of other clinical studies (21,22). All studies specified that symptoms like impact of internet use on life, frequency of internet use in daily life, development of tolerance, or deprivation could be used to identify the problem. The diagnostic criteria proposed for internet addiction are also similar (9).

In separate evaluations for high school and university students, reliability coefficients reached a good level, and the factor structure in both populations was similar. Thus, we can say that the scale can be used in either group. We do believe, though, that for using the scale with adults, respective standardization studies need to be conducted.

In our view, data obtained from applying APIINT in larger and more socioeconomically diverse populations will contribute to the scale's validity and reliability. It will be especially useful, after developing diagnostic criteria for internet addiction, to compare scores for groups that are and those that are not addicted. In the current state, we must not forget that scale reflects a diagnostic category whose diagnostic criteria are not entirely clear, and we have to evaluate it accordingly.

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