Research article

The predictor role of Internet addiction in high- risk behaviors and general health status among Alborz students: A structural equation model

Azam Toozandehjani [a], Zohreh Mahmoodi [b], Mitra Rahimzadeh [c], Alireza Jashni Motlagh [d], Mahnaz Akbari Kamrani [b], Sara Esmaelzadeh Saeieh [b,*]

[a] Student Research Committee, Alborz University of Medical Sciences, Karaj, Iran
[b] Social Determinants of Health Research Center, Alborz University of Medical Sciences, Karaj, Iran
[c] Social Determinants of Health Research Center, School of Public Health, Alborz University of Medical Sciences, Karaj, Iran
[d] Neonatal-Perinatal Medicine Department of Pediatrics, School of Medicine, Alborz University of Medical Sciences, Karaj, Iran

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ABSTRACT

Background: Internet addiction has become more prevalent in Adolescents. Some adolescents who tend to use Internet excessively have a poorer health status, and engage in more risky behaviors than others. Therefore, the aim of this study was to investigate the predictor role of Internet addiction in high- risk behaviors and the general health status among adolescences.

Methods: This was a descriptive-analytical study of structural equation modeling, conducted on 300 students of Alborz University of Medical Sciences. The multi-stage sampling method was used to identify the number of students aged 19–21 years studying in each faculty in the first stage and convenience sampling was used in the second stage. Data were collected using Iranian Adolescents Risk-taking Scale (IARS), the General Health Questionnaire (GHQ-28) and the Young's Internet Addiction Test (YIAT). The data were analyzed using LISREL version 8.8.

Results: The results of the measurement model using LISREL software showed a goodness of fit for the conceptual model. Internet addiction had a significant direct positive effect on the adolescents' high-risk behaviors ($\beta = 0.17$). Also, Internet addiction had a significant positive effect on the adolescents' general health status ($\beta = 0.33$) and general health problems increased by 0.33 per unit of Internet use. The result of structural model revealed no significant effects of general health on high-risk behaviors. Based on the value of the variance determined, Internet addiction could predict 11% of general health. Also, general health and Internet addiction together could predict 2.7% of high- risk behaviors.

Conclusion: Given the effect of Internet addiction on the general health and high-risk behavior, it is recommended that adolescents will be screened about internet addiction and the necessary training is given to the adolescents on the appropriate use of Internet. All necessary information should be given to the parents regarding Internet risks and dangers.

1. Introduction

Internet usage has significantly increased in recent years and the Internet and social media can be considered the new 21st -century addiction. Internet Addiction (IA) can be defined as spending too much time on the Internet, accompanied by Psychological dependence on overuse of the Internet [1] IA mentions loss of control of using Internet leading to neglecting work and relationships, and also shows symptoms of craving when a person is offline [2].

IA is more prevalent among adolescents. The prevalence rates of IA varied worldwide. The results from a study demonstrated that in the USA, prevalence rates of IA ranged from 7.9 to 25.2% among adolescents while the East Asia and Africa had rates from 17.3 to 23.6%. A study in Asia showed that prevalence rates of IA varied among the adolescents, ranging from 8.1% to 50.9% [3]. Results of Another study were recruited from six Asian countries: China, Hong Kong, Japan, South Korea, Malaysia, and the Philippines showed Hong Kong has the highest number of adolescents reporting daily or above Internet use (68%). Internet addiction is highest in

the Philippines (21%) [4]. A study indicated that the prevalence rate of IA among 1,491 Iranian adolescents 2.4% [5]. The results of studies have shown that IA could have a negative effect on the mental health status of adolescents and causes psychosocial stress, anxiety, depressive symptoms, sleep problems, alcohol abuse, attention deficit and hyperactivity and decreased self-esteem among them [6, 7, 8, 9]. The use of the Internet before going to bed can affect the function of the circadian system and can reduce the melatonin secretion in the body, accompanied by fatigue, loss of appetite, and sleep disturbances, leading to chronic insomnia, mood disorders, and depression [10]. Adolescents who use the Internet excessively are more likely to have a poorer health status, and engage in more risky behaviors such as smoking, alcohol use and drug use and risky sexual behaviors than others [11]. Risky sexual behaviors among adolescence include engaging in early sexual debut, multiple sexual partners and unprotected sexual intercourse [12]. Adolescence engaging in the risky sexual behaviors is more likely to experience unwanted pregnancies, sexually transmitted diseases, and AIDS [13]. Adolescents who use the Internet excessively and engage in risky sexual behaviors may also receive or send sexual messages, which can lead to mental health problems, affect communicating with others and fall victim to sexual relations and engage in high-risk sexual behaviors [14]. Therefore, this study was conducted to investigate the predictor role of Internet addiction on high- risk behaviors and the general health status of adolescences with conceptual model in (Figure 1).

2. Methods

This was a descriptive-analytical study of structural equation modeling, conducted on 300 students of Alborz University of Medical Sciences, Karaj, Iran. The study inclusion criteria were as follows: (1) adolescences aged 19–21 years who were at the end of adolescence, (2) Internet access and (3) the use of social media. The study exclusion criteria were specified as follows: being divorced and having a history of physical and mental illnesses. The multi-stage sampling method was used to identify the number of students aged 19–21 years studying in each faculty in the first stage and convenience sampling was used in the second stage and convenience sampling was used in the second stage. The sample size was determined based on Monroe's study [15]. Since the sum items of questions in the study's questionnaire was 86 questions (Iranian Adolescents Risk-taking Scale (IARS) (38 item), General Health Questionnaire (GHQ-28) (28 item) and Young's Internet Addiction Test (YIAT) (20 item)) 3 people were considered for each question The sample size was 300 people expecting that 10% of all participants would be lost. Six samples with incomplete responses and missing data were deleted and finally 294 students were included in the study. The data were collected using the self-report questionnaire.

Following research hypotheses were proposed:

H1. Internet addiction will be associated with high risk behavior.

H2. Internet addiction will be associated with general health.

H3. general health will be associated with high risk behavior.

2.1. Instruments

2.1.1. Iranian Adolescents Risk-taking Scale (IARS)
The IARS was designed and standardized by Zadeh Mohammadi et al [16]. This scale consists of 38 item, which assesses 7 subscales of

high-risk behaviors, including substance abuse ($\alpha = 0.90$), alcohol consumption ($\alpha = 0.90$), cigarette smoking ($\alpha = 0.93$), violence ($\alpha = 0.78$), sexual behavior ($\alpha = 0.87$), relationship with opposite sex (w $\alpha = 0.83$), and dangerous driving ($\alpha = 0.74$). Items are scored using a five-point Likert scale, where (0) = strongly disagree, (1) = disagree, (2) = neither agree nor disagree, (3) = agree, and (4) = strongly agree.

2.1.2. General Health Questionnaire (GHQ-28)
The GHQ was developed by Goldberg (1972). The standard GHQ-28 consists of 4 subscales, each containing 7 questions. Items are scored using the Likert method (0-1-2-3), sub-scale scores are summed to provide a total GHQ score with a possible range of 0–84, and hence a higher total score indicates worse general health. Nazifi et al analyzed the psychometric properties of the GHQ-28in hospitals Cronbach's alpha coefficient of 0.85 were obtained [17].

2.1.3. Young's Internet Addiction Test (YIAT)
The (YIAT is the first valid and reliable tool for measuring Internet addiction. It contains 20 self-report items measuring the presence of addiction to the Internet in people. It classifies Internet addiction into mild, moderate, and severe degrees. The items are scored using a five-point Likert-type scale (1 = Rarely. 2 = Occasionally. 3 = Frequently. 4 = Often. 5 = Always). Scores between 20 and 49 denote normal Internet use, 50–79 represent moderate Internet use (moderate addiction), and 80–100 mean severe Internet use (severe addiction). This is a standardized questionnaire and its validity and reliability have been reported in previous studies with Cronbach's alpha of 0.90. The reliability of the Persian version of this scale was confirmed with a Cronbach's alpha coefficient of 0.88 [18].

2.2. Statistical analysis

Skewness and kurtosis index were applied to identify the normality of the data. The data were first entered in SPSS and then the variables of IA, general health and high-risk behavior were assessed by measurement and structural models from the structural equation modeling (SEM), which are regression-based methods using LISREL version 8.8.

2.3. Ethical considerations

The study protocol was approved by the Ethics Committee of Alborz University of Medical. Sciences with code (IR.ABZUMS.REC.1398.248). The researcher explained the purposes of the study to all participants and written informed consent was obtained from them. The researcher assures participants that Information collected from them is kept strictly confidential.

3. Results

Of the participants, 52.7% were females and 47.3% were males. 7.1% of participants lived in dormitory, 58.2% lived with their parents, 31.6% lived alone and 3.1% lived with their spouses. 5.1% of the participants were married. 61.6% of adolescents had a good economic well-being. Homosexuality was found in 3.1% of the participants. The total scores of general health, internet addiction and high-risk behaviors and their subscales based on gender are presented in Table 1.
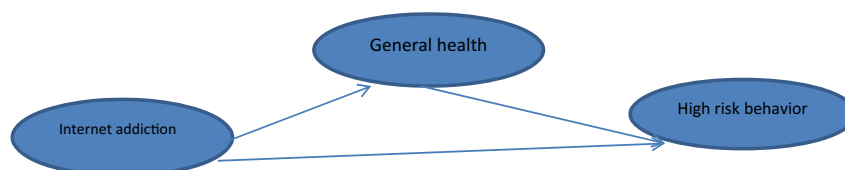

Figure 1. Conceptual model of study.

After performing confirmatory factor analysis, the conceptual model fit was determined. Modified model fit indices are presented in Table 2. The modified measurement model showed an acceptable fit.

Hypothesis 1 tested with structural equation modeling: the results of structural model showed that IA had a significant direct positive effect on the adolescents' high-risk behaviors ($\beta = 0.17$).

Hypothesis 2 tested with structural equation modeling: the IA also had a significant negative effect on general health ($\beta = -0.33$).

Hypothesis 3 tested with structural equation modeling: the result of structural model revealed no significant effects of general health on high-risk behaviors. Path coefficients of the modified model are presented in Table 3 and Figure 2.

After modifications, the model was implemented with and without existence of general health mediator. The direct, indirect and total effects of IA on high-risk behaviors are presented in Table 4.

The analysis of general health mediator showed that the model was significant without the existence of general health mediator, the direct effect of the model was also significant with the existence of general health mediator, but the general health had no significant effect on high-risk behaviors. This analysis based on Baron& Kenny's method [19] showed that in this model, general health was not a mediator.

Based on the value of the variance determined, IA could predict 11% of general health. Also, general health and Internet addiction together could predict 2.7% of high- risk behaviors (Table 5).

4. Discussion

Results of study showed the effect of Internet addiction on the general health and high-risk behaviors. The mean (standard deviation) of Internet use duration per day per hour was 5.1 (2.9). 57.5% of females and 47.5% of males were are at risk for addiction to the Internet and only one participant developed IA. The prevalence rate of IA among the adolescents is reported at 10% in China [20]. According to a systematic review conducted in 2020, this rate is reported at 7.04 % [21]. Previous studies have shown that prevalence rates for IA vary between 0.8% to 26.7%9 [22]. The term Internet addiction is widely used; synonyms such as Internet abuse, compulsive Internet use, and pathological Internet use are also commonly used. These variations have increased the difficulties of defining the disorder, and thus correspondingly increased the

difficulties of formulating appropriate clinical diagnoses [23]. Instagram was the most popular social network used by 81.3% of the participants. 14.3% of the participants used cigarettes, 26.5% used hookah, 0.7% consumed substances and 31.6% drank alcohol. The results of a systematic review performed in 2020 showed that the most risky behavior was substance use, including alcohol and tobacco (45%), followed by depressive/suicidal/self-harm behavior (21.6%), violent or aggressive behavior (14%), high-risk sexual risk behavior (11%), and two or more risk behaviors (8.4%) [24]. The minimum age for sexual intercourse was 15 years old and 41% of participants had their first sexual intercourse at the age of 20. Another study found that 41.3% of adolescents started sex before age 15 and 58.8% consumed alcohol and substance [14]. According to the results of this study, as IA scores increased, scores of general health problems increased. A study has shown that people with IA are more likely to express their problems such as anxiety and depression to others, and the Internet use is a way to regulate their emotions and help forget negative feelings [20]. Silvana and Oreskovic showed that there is a significant association between adolescents' mental health and quality of life and the level of their IA. Out of the total number of adolescents in low level of health, 39% of them are moderately or severely addicted to the Internet. 20% out of the total number of adolescents in medium level health is moderate of severely addicted to the Internet. Finally, out of the total number of adolescents in good health 13% has been moderate of highly addicted to the Internet [25]. The results of this study demonstrated that IA had significant effects on the high-risk behaviors and people with IA had higher risky behaviors. A Korean study showed that the risk of IA was related to cigarette smoking, alcohol drinking, drug abuse, and sexual intercourse experience among adolescents [26].

In the present study, high-risk behaviors, including violence, dangerous driving and relationship with opposite sex in female adolescents at risk of IA was lower than those in male adolescents and there was no difference between male and female adolescents with respect to substance abuse, alcohol consumption and cigarette smoking. The results of a study in Korea also showed no significant difference was found in female adolescents with male in terms of high-risk behaviors except relationship with opposite sex, which could be due to watching more pornographic films by male adolescents and their personality traits [26].

The results of the present study revealed no significant effects of general health on high-risk behaviors and general health as a mediating variable did not contribute to this model and the direct effect of IA on

Table 1. Internet addiction and general health and high-risk behavior scores by gender among adolescents.

		Female adolescents Mean (SD)	Male adolescents Mean (SD)	t	p-value
General health	Somatic symptoms	8.6 (4)	6.9 (4.4)	3.498	0.001
	Anxiety/insomnia	11.3 (5.4)	8.4 (5.5)	4.488	<0.001
	Social dysfunction	10.4 (4.3)	10.4 (4.3)	0.132	0.895
	Severe depression	6.5 (5.5)	4.9 (5.2)	2.616	0.009
	Total score	36.8 (11.6)	30.5 (12.6)	4.436	<0.001
high-risk behaviors	Substance abuse	3.2 (5.1)	4.2 (4.9)	−1.606	0.109
	Alcohol consumption	6.8 (5.9)	7.3 (5.6)	−0.820	0.413
	Cigarette smoking	3.8 (4.8)	4.2 (5.1)	−0.827	0.409
	Violence	3.4 (3.2)	4.5 (4.1)	−2.557	0.011
	Sexual behavior	6.3 (4.6)	7.6 (4.4)	−2.566	0.011
	Relationship with opposite sex	8.6 (5)	9.3 (4.6)	−1.299	0.195
	dangerous driving	7.6 (4.9)	9.1 (6.1)	−2.229	0.022
	Total score	39.7 (27.8)	46.9 (26.6)	−2.265	0.024
Internet addiction	Total score	51.9 (8)	48.1 (12.4)	3.090	0.002
		Frequency (%)	Frequency (%)		
	Normal Internet use	44 (28%)	56 (38.8%)		
	moderate Internet use (moderate addiction)	111 (72%)	87 (60.4%)		
	severe Internet use (severe addiction)	0	1 (0.6%)		

Table 2. Modified model fit indices.

Fit indices	Allowable amount	The obtained value
chi-square/degrees of freedom (df)	lower than 3	2.45
RMSEA	Lower than0.8	0.07
GFI	Greater than 0.8	0.85
AGFI	Greater than 0.8	0.81
NFI	Greater than 0.9	0.92
NNFI	Greater than 0.9	0.94
CFI	Greater than 0.9	0.95
IFI	Greater than 0.9	0.95

high-risk behaviors was greater than that of general health. This might be due to the fact that the mean total score of high-risk behavior among the study participants was low. The samples were selected from university students and they had knowledge about health issues and high-risk behaviors.

The results of a study conducted on adolescents showed that consensual sexting was significantly more likely in those who reported depressive symptoms, alcohol use, drug abuse and tobacco use [27]. The results of this study show that the Internet can have a positive effect on the adolescents lives, but excessive use of the Internet was associated with general health problems and high-risk behaviors such as cigarette smoking, alcohol consumption, violence, sexual behavior and relation-

Table 3. Coefficients of the model in standard and non-standard modes.

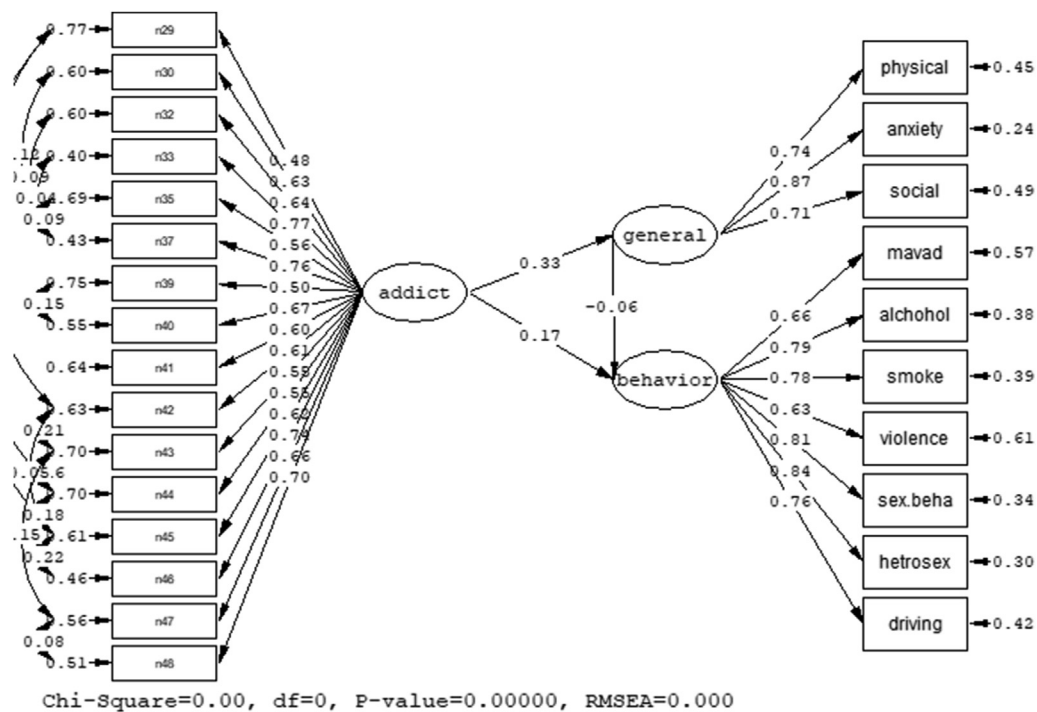|			Path coefficient	t-value
Internet addiction	—>	High risk behavior	0.17	2.48
Internet addiction	—>	General health	0.33	4.78
General health	—>	High risk behavior	−0.06-	−0.081

Figure 2. Standardized path coefficients of the structural model.

Table 4. The direct, indirect and total effects of IA on high-risk behaviors.

			C (without mediator)	Direct effect	a	b	A*B Indirect effect	Total
Internet addiction	—>	High risk behavior	0.16	0.17	0.33	−0.06	0.0198	0.18

Table 5. Explained variance of the conceptual model of the study variables.

Variables	R2
General health	0.11
High risk behavior	0.027

ship with opposite sex. The result of structural model revealed that general health and IA together could predict 2.7% of high- risk behaviors. Therefore, many variables can contribute to predicting high-risk behaviors and Internet use, including individuals' personality traits, sleep [28] quality of life [29], family conflicts, and relationship with parents, and other variables affecting Internet use and high-risk behaviors, which were not examined in this study. Therefore, it is recommended that future research be examine the effects of such variables using larger

models. However, this study had some limitations. Firstly, the participants who were at the end of adolescence were included in the study. Given the barriers to studying high-risk behaviors, as the taboo research topic, in schools of Iran, samples were selected from university students. It is therefore recommended that large studies be conducted with a larger sample size in early and middle adolescence. Secondly, adolescents completed IARS as self-report, which many people are reluctant to tell the truth about high-risk behaviors. Thirdly, this study was conducted during the COVID-19 pandemic, which affected the use of the Internet due to the restrictions and online training.

5. Conclusion

Findings would likely given the effect of Internet addiction on the general health and high-risk behavior. Technology innovations will continue to affect the psychosocial and behavioral development of adolescents. Thus, it is important to examine correlation between internet use, mental health, and risk behaviors. it is therefore recommended that adolescents at different ages be screened and the necessary training be given to the adolescents on the appropriate use of Internet. All necessary information should be given to the parents regarding Internet risks and dangers. The result of structural model revealed that general health and IA together could predict 2.7% of high- risk behaviors, we suggested that more studies are assessed the effect of more variables in internet addiction and high risk behaviors in adolescents. And also further research is certainly suggested to better clarify formal diagnosis and treatment.

Declarations

Author contribution statement

Sara Esmaelzadeh Saeieh: Conceived and designed the experiments; Performed the experiments; Analyzed and interpreted the data; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Azam Toozandehjani: Conceived and designed the experiments; Contributed reagents, materials, analysis tools or data; Wrote the paper.

Mahnaz Akbari Kamrani, Zohreh Mahmoodi: Performed the experiments; Wrote the paper.

Alireza Jashni Motlagh: Contributed reagents, materials, analysis tools or data; Wrote the paper.

Mitra Rahimzadeh: Analyzed and interpreted the data; Wrote the paper.

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Data availability statement

Data associated with this study has been deposited at Data In Brief.

Declaration of interests statement

The authors declare no conflict of interest.

Additional information

No additional information is available for this paper.

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