The Effect of Educational Intervention Based on Health Belief Model to Decrease and Prevent Mobile Phone Addiction among Female High School Students in Iran

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Abstract

Background
Mobile phone has played an increasingly important role in people's lives; however, there is a global concern that it may cause adverse effects on health. This study aimed to assess the effect of educational intervention based on Health Belief Model (HBM) to decrease and prevent mobile phone addiction among female high school students.

Materials and Methods
This quasi-experimental study was done on high school students in Esfahan city in 2018-2019. During a period of 6 months, 112 female high school students were selected and randomly assigned to control and intervention groups. The educational intervention was implemented only in the intervention group (6 sessions of ninety minutes). Health Belief Model constructs were measured by self-report questionnaires and mobile phone addiction was measured by Persian version of mobile phone addiction scale before and two months after the intervention.

Results: 112 students (56 in control group and 56 in intervention group) participated in the study. There was no statistically significant difference between the baseline characteristics of students in both groups as well as HBM constructs and mobile phone addiction. Two months after the intervention, the mean score of mobile phone addiction among the students of intervention group students was decreased and in control group students, the score of mobile phone addiction was increased (P ≤ 0.05). Constructs of the HBM except perceived barriers for reducing mobile phone use and perceived benefits of mobile phone use significantly increased in the intervention group compared to the control group (P <0.05).

Conclusion
According to the results, Educational intervention based on the HBM can prevent and decrease the mobile phone addiction in female students.

Key Words: Health Belief Model, Intervention, Mobile Phone Addiction, Students.

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1- INTRODUCTION

Recently, the Emergence and Development of the Information and Communication Technologies (ICT) has resulted in various positive elements, such as new means of working, communication, learning and entertainment, new interaction styles through time and space (1). Personal desktops increasingly advanced into tablet PCs, personal mobile phones. New versions of the Mobile phone as a smartphone is not just a communication tool, but an update information source and a potent portable computer (2). While the smartphones bring facilities and tranquility to people's daily lives, they are linked to negative consequences. Overuse of mobile phone is extensively growing among high school students in developing countries such as Iran and they are susceptible and vulnerable to the consequences of cell phone overuse (3, 4).

Numerous researches have confirmed that adolescents and young people are expected more than any other demographic group to use mobile phones (5-7). Young adults use smartphones to engage in social media, send text messages, and conduct internet searches (8). Nowadays, studies of adolescents' excessive or inappropriate use are becoming more concerning. Mobile phone addiction, well known as mobile phone dependence, refers to the individual's behavior so that the person's psychological, physical and social performance is impaired significantly (9). There is a growing concern that the consequences associated with high frequency smartphone use may suggest that smartphones have the potential to become a behavioral addiction similar to internet or gaming addictions (10). Previous studies have distinguished that adolescents who are addicted to the mobile phone suffer from various problems such as loneliness and social isolation, depression, aggression, anxiety (5, 11-14),

headache (15), sleep disorders (16), and other somatic symptoms (17). Furthermore, lack of concentration, memory loss, heating behind, around, or on the ear, headaches, tiredness as well as stress have been reported (4, 18-20). In other words, previous studies have acknowledged that mobile phone addiction would bring about undesirable effects on mental and physical health as well as academic problems, social adaption, interpersonal problems (21- 24). The prevalence of internet addiction and smartphones usage in Iran has increased (5, 25). Previous studies showed that in Iran, 22% of total users and 58% of adolescent users connect to the internet through their tablets or smartphones (16).

In another study in 2014, Iranian authors examined the prevalence of internet addiction in Iranian high school students (26). Rate of internet addiction reported by them was about 20 percent (27). Consequently, due to the increased prevalence of internet and smartphones addiction, design and implementation of preventive programs for vulnerable groups such as adolescents are necessary. Researchers noted that the best approach to prevention of addictive behaviors is promotion of knowledge, attitude, and belief (28). In this regard, using proper theories and models of behavior change, increases the effectiveness of educational programs and helps researchers to identify the individual characteristics and environment which may effect on behavior (20). Although there is some evidence that extensive mobile phone use can have adverse effects on well-being and life quality especially in youth, in our search, few studies in Iran have been done on prevention of mobile phone use (29). Success in educational interventions such as prevention of addictive behaviors depends on correct use of proper models and theories. One of the health education models that is used in the prevention of

addictive behaviors is Health Belief Model (HBM) (30-32). In this model individuals' behaviors are beliefs including: A- Perceived susceptibility (refers to the person's perception of the chances or risk of the disease or certain condition), B- perceived severity (refers to one's perception of the seriousness of the consequences of the disease or certain condition), C- perceived benefit (refers to the person's belief in the efficacy of the recommended actions to decrease probability or seriousness of disease or certain condition), D- perceived barrier (refers to the person's opinion of noticeable physical or psychological costs of the recommended actions), E- cues to action (proper actions to notify the person and prepare him/her for behavior change, and F- self-efficacy (one's confidence in his/her ability to do recommended actions (20, 33). While this model is a commonly used model and has been applied to explain different health-related behaviors and to design educational interventions among adolescents, few studies have used this model to prevent mobile phone addiction. Earlier study reported that constructs of the HBM are potentially useful to control and prevent Internet addiction and should be tested for efficacy (34). This study aimed to apply and measure HBM constructs to decrease and prevent mobile phone addiction among female high school students.

2- MATERIALS AND METHODS

2-1. Study design and population

This study is a semi-experimental research that was conducted from 2018 to 2019 in Isfahan high school girl students in Iran, during a period of 6 months. The participants consisted of female high school students in Esfahan city, Iran. A convenience method was used to recruit participants from Isfahan girls' high schools; two high schools were selected and randomly allocated into experimental and control groups and in each group, seventy students were selected randomly.
To obtain the sample size, we used the following formula:

$$n = \frac{\left(Z_{1-\frac{\alpha}{2}} + Z_{1-\beta}\right)^2 \left(\sigma_1^2 + \sigma_2^2\right)}{d^2} = 55$$

In the above formula, $1-\alpha$ and $1-\beta$ were the confidence level and test power, which were 0.95 and 0.9 respectively. Thus, $z_{1-\frac{\alpha}{2}}$ and $z_{1-\beta}$ of the normal distribution table were 1.96 and 1.2, respectively.

$(\sigma_1^2 + \sigma_2^2)$ and (d) was respectively the variances and mean differences of the intervention and control groups, which, using previous studies, are equal to $[\sigma_1^2 = 3. \sigma_2^2 = 2.1 \; and \; d = 2.5]$(20).

Thus, the sample size was 55 students. After a 10% drop, 60 students were selected in each group.

The selected students were asked to participate the study and were evaluated for inclusion criteria. Inclusion criteria included (1) have a smart phone (2) be interested in participation, and (3) have written parental consent for their participation in the study. The students were excluded if they had filled out the questionnaire incompletely and had absence in more than two educational sessions. All selected students, except n = 4 in control group and n=5 in intervention group, were eligible to participate in the study. In control group 7 students were excluded from the study due to incomplete questionnaires and 3 students were absent in data collection day. In intervention group 3 students were excluded from the study due to incomplete questionnaires and 4 students were absent in more than two educational sessions and 2 students were absent in data collection day. Finally, 112 students (56 in control group and 56 in

intervention group) participated in the study.

2-2. Procedures

Ethical approval was obtained from Isfahan University of Medical Sciences Ethical Review Board (No.397137). All participants were given information about the study goals. They were also informed of their right to drop out of the study at any time, written informed consent was obtained from them and confidentiality were guaranteed. Likewise, before the study, full consent from the principals of selected high schools was acquired. While students were completing the questionnaires all teachers were asked to leave the classrooms. Answering the questionnaires took about thirty minutes. To compensate for the time spent on the survey a small gift was given. The educational intervention was held only for Intervention group students. After two months, students in both groups completed the questionnaires again. Since high schools were selected separately, we ensured that the intervention group students did not transfer their information to the control group students.

2-3. Measures

Data was collected by 3 questionnaires as follows:

1. Baseline characteristics like age, family economic situation, parents' and information about the use of mobile phone accessories and features.

2. Persian version of mobile phone addiction scale (MPAI): Mobile Phone Addiction Index (MPAI), this questionnaire which has 17 items was developed by Leung (2008) (35). Amidi Mazaheri et al. (2012) translated this scale into Persian, they measured and confirmed the cultural adaptation and psychometric properties of this scale in a normative sample of university students (5). In this questionnaire the maximum score is 75 and the minimum score is 15.

3. Health Belief Model constructs: This questionnaire was developed by Maheri et al. (2017) to assess knowledge (seven questions, the maximum score is 21 and the minimum score is 7), perceived severity (six questions, the maximum score is 30 and the minimum score is 6), perceived susceptibility (five questions, the maximum score is 25 and the minimum score is 5), perceived barriers (five questions, the maximum score is 25 and the minimum score is 5), perceived benefits (five questions, the maximum score is 25 and the minimum score is 5), self-efficacy (six questions, the maximum score is 30 and the minimum score is 6), and cause of action (five questions, the maximum score is 10 and the minimum score is 5).

Knowledge questions were answered with true and false choices and other constructs were scored on a five-point Likert-type scale (completely agree=5 to completely disagree=1). The reliability and validity of this questionnaire had been determined and approved previous study (20).

2-4. Intervention

Intervention group students (n=56) received the educational intervention consisted of six (60–90 min) sessions which were designed based on the Health Belief Model constrictions. Control group students received the usual school curriculum. To facilitate student's involvement in educational sessions, they were divided into small groups (8-15), also several actions were considered; for example, school principals attended in some sessions and thanked the students for their contributions. The educational sessions were delivered by skilled and trained educator in the field of mobile phone addiction and active learning methods such as focus group discussion, film, role-playing, question and answer, and lectures were used.

The content and educational strategies of sessions were as follows:

Session 1: This session was developed based on the constructs of perceived susceptibility and increasing knowledge of students about mobile phone addiction. In this session, an interesting film about the effect of mobile rays on the brain which was made by the training channel of Islamic Republic of Iran Broadcasting (10 min) was showed and students were encouraged to discuss the addictive nature of the internet and mobile phone usage. In the end of this session the students were asked to explore and recognize symptoms of mobile phone addictions in themselves and others.

Session 2: The second session, based on the constructs of perceived severity, short and long-term negative consequences of mobile phone addiction were discussed. In the end of this session the educator asked students to provide a list of activities which they could not do because of excessive use of mobile.

Session 3: The third session was developed based on the constructs of perceived benefits and barriers of proper mobile phone usage. The benefits of proper mobile phone use were explored via brain storming; the educator asked them to provide a list of the things they would like to do rather than excessive mobile phone use. Also, the barriers of proper mobile phone usage were explored via a focus group discussion. In the end of this session the educator asked students to assess their mobile phone usage hours and record them in the weekly tables (self-assessment).

Session 4: This session was developed based on the self-efficacy construct. To promote self-efficacy; "goal setting" and "role modeling" were used as main educational strategies. Using the results of the self-assessment of mobile phone use, the educator guided students to regulate their goals. Small groups were formed based on student-chosen goals and their goals were compared and how to cope with the probable barriers was discussed. Besides, two successful students served as a role model for others. They demonstrated to their classmates how to limit and manage the use of mobile phone. In the end of this session the educator asked students to assess their mobile phone usage hours and record them in the weekly tables, they were also asked to record alternative activities which they like to do instead of using the mobile phone (like face to face interpersonal communication, physical activity, doing artwork, playing, following personal interests, etc.).

Session 5: This session was developed based on cue to action construct. In the beginning of this session, students reported their efforts to attain their goals, compared with each other's and discussed their experiences in small groups. Then the educator taught the students how to identify and pay attention to cues that could remind them of the proper use of mobile phone. For this purpose a mobile application was introduced to them. During this session students made an attractive wall collage about the proper use of mobile phones for their classroom. In the end of this session the educator asked students to make attractive postcards about the correct use of the phone for their friends.

Session 6: During this session the subjects of the previous sessions were reviewed and summarized. The students gave postcards to each other and the educator asked them to place the postcards in their rooms.

2-5. Ethical approval

This study was submitted to the School of Health at Isfahan University of Medical Sciences and was approved as a Master's thesis in Health Education (code: 397137). Also, the study was approved by Iran National Committee for Ethics in

Biomedical Research. Code of Ethics: IR.MUI.RESEARCH.REC.1397.099).

2-6. Data Analyses

The collected data were analyzed using SPSS software version 16.0 using descriptive statistics such as mean and standard deviation (SD), and independent and paired t-test, Chi-square and Mann–Whitney test. The significance level was set at 0.05. Independent t- test was used to compare the mean scores of knowledge and all the constructs of Health Belief Model and performance between intervention and control groups before and after the training intervention. Moreover, paired t-test was used to evaluate the effectiveness of intervention and compare the abovementioned variables in each group separately before and after the intervention. Chi-square test was used to compare the two groups in terms of the frequency of parents' job status. Finally, Mann-Whitney U test was used to evaluate the differences between the two groups in terms of education level.

3- RESULTS

One hundred and twelve students (56 in control group and 56 in intervention group) participated in the study. The mean age in the control group was equal to (14.66 ± 0.83) years old, and in the intervention group it was equal to (14.61 ± 0.52) years old, and the intervention and control groups did not differ significantly in terms of the mean age of the participants (P> 0.05). In this study the participants have a relatively narrow age range. Since age is strongly associated with school grade in Iran and all of the participants were in 7th grade. **Table.1** shows the students baseline characteristics in the intervention and control group. As **Table.1** illustrates two groups were not significantly different in terms of baseline characteristics (P>0.05). **Table.2** compares the constructs of Health Belief Model in control and intervention groups before and after education. As **Table.2** illustrates all constructs of the Health Belief Model except perceived barriers for reducing mobile phone use and perceived benefits of mobile phone use significantly increased in the intervention group compared to the control group (P <0.05). **Table.3** compares the mean of mobile phone addiction score in intervention and control groups before and after intervention. As **Table.3** illustrates the mean score of mobile phone addiction in students of intervention group was decreased and the mean score of mobile phone addiction in students of control group was increased.

Table-1: Baseline characteristics of the students in the intervention and control groups.

Variables	Intervention group Number (%)	Control group Number (%)	P-value
Age (year)			
(Mean±SD)	14.62±0.52	14.66±0.83	0.91**
Age using a mobile phone			
(Mean± SD)	10.17±1.53	10.51±1.07	0.82**
Father's education			
Illiterate	-	2(3.6%)	0.06*
Under diploma	2(3.6%)	2(3.5%)	
Diploma and Advanced Diploma	11(19.6%)	6(10.7%)	
Bachelor	26(46.4%)	24(42.9%)	
Master	13(23.2%)	18(32.1%)	
Doctoral	4(7.1%)	4(7.1%)	

Mother's education			
Illiterate	-	1(1.8%)	0.1*
Under diploma	4(7.1%)	4(7.1%)	
Diploma and Advanced Diploma	20(35.7%)	22(39.2%)	
Bachelor	23(41.1%)	23(41.1%)	
Master	9(16.1%)	5(8.9%)	
Doctoral	-	1(1.8%)	
Mobile use skills			
Lack of skill	5(8.9%)	3(5.4%)	0.08*
Primary skill	32(57.2%)	41(73.2%)	
Advanced skill	19(33.9%)	12(21.4%)	
The use of mobile			
Less than 3-4 hours	41(73.2%)	40(71.4%)	0.065*
About 4-5 hours	9(16.1%)	13(23.2%)	
About 5-6 hours	3(5.4%)	1(1.8%)	
More than 6 hours	3(5.4%)	2(3.6%)	
Type of SIM card			
Continual	14(25%)	11(19.6%)	0.2*
Credit	42(75%)	45(80.4%)	
The family economic situation			
Rich	6(10.7%)	10(17.9%)	0.07*
Relatively rich	27(48.2%)	29(51.58%)	
Middle	23(41.1%)	17(30.4%)	

SD: Standard Error. ** Chi-square test. * Independent t test.

Table-2: Comparison of Mean and Standard deviation scores of Health Belief Model constructs, before and after intervention.

Structures of model	Control group (Mean±SD)	Intervention group (Mean±SD)	P-value
Knowledge			
Before intervention	11.57±1.51	11.37±2.9	0.66*
After intervention	11.10±1.9	14.82±2.1	0.001*
P-value	0.10**	0.001**	
Susceptibility			
Before intervention	11.89±2.81	12.08±4.6	0.78*
After intervention	11.44±3.17	14.96±3.2	0.001*
P-value	0.46**	0.001**	
Severity			
Before intervention	14.17±3.5	14.14±6.5	0.97*
After intervention	13.82±3.1	16.9±5.1	0.001*
P-value	0.61**	0.001**	
Benefits			

Before intervention	9.92±2.6	9.83±5.06	0.908*
After intervention	9.5±2.7	10.3±3.7	.20*
P-value	0.49**	0.24**	
Barriers			
Before intervention	19.10±3.56	19.2±6.7	0.89*
After intervention	18.96±4.4	20.64±4.9	0.062*
P-value	0.83**	0.01**	
Help for action			
Before intervention	6.07±0.8	6.08±10.4	0.92*
After intervention	6.17±0.81	7.51±0.63	0.001*
P-value	0.50**	0.001**	
Self-efficacy			
Before intervention	21.73±3.27	20.80±6.7	0.35*
After intervention	22.14±3.5	24.92±3.7	0.001*
P-value	0.49**	0.001**	

SD: Standard Error. * Independent T Test. ** Paired T Test.

Table-3: Comparison of the mean of mobile phone addiction score in intervention and control groups before and after intervention

Mobile phone addiction score	Control group	Intervention group	P-value
Before intervention	29.19±5.51	30.25±14.7	0.61*
After intervention	31.96±5.41	26.76±9.3	0.001*
P-value	0.016**	0.001**	

* Independent T Test. ** Paired T Test.

4- DISCUSSION

The aim of this study was to examine the effect of educational intervention based on HBM to prevent mobile phone addiction among female high school students. The response rate was desirable in both groups in the pretest and posttest stages. As we expected, in the intervention group school principals and students welcomed the educational sessions. The baseline characteristics of the participants of both groups were similar. Also, before the intervention, students in both groups were similar in their mobile phone addiction score. Pre-test scores for mobile phone addiction in both groups were not desirable, and were consistent with the previous findings from similar survey among female students at Isfahan University of Medical Sciences (29). Although in pretest stage the both groups had similar knowledge scores, the knowledge scores in intervention group increased significantly after the intervention. This finding is consistent with results of previous studies (20, 36). Earlier study reported that knowledge is essential for accepting healthy behavior such as preventive behaviors of addiction. Also, another study indicated that

knowledge about side effects of addictive behaviors can protect students against (28).

The results showed that there was a significant increase in perceived susceptibility and perceived severity scores of intervention group after the intervention. This increase could be attributed to the effects of the intervention on the students' perceived susceptibility and perceived severity. After educational intervention most of the students believed that they are at risk for mobile phone addiction and this behavior could be harmful, though before the educational intervention, many of them were unaware of the risk of mobile phone addiction and its consequences. This finding is consistent with results of previous studies (20, 36).

Based on the HBM, high perceived sensitivity and susceptibility are necessary to increase the motivation of individuals to adopt healthy behaviors (33). Previous study reported, increasing perceived susceptibility and severity are predictive factors which lead to avoidance of addictive behaviors (28). It seems that the way of conducting education through group discussion, question and answer, films and lectures used in this study could affect the perceived susceptibility and sensitivity of the students. In the present study, there was no significant change in the perceived benefits of mobile phone use before and after the intervention.

This finding was inconsistent with the previous study (20, 36). With regards to the possible reasons for this contradiction, it can be said that in previous studies, the participants were older than our participants. Perceived benefits of mobile phone use in view of adolescents are different from that of adults. Furthermore, some of the perceived benefits of proper use of mobile phone such as academic achievement and physical health can be measured in the long term and are not tangible in the short term. Likewise, another perceived benefit of proper use of

mobile phone is better relationship with family members; which depends on their collaboration with the student; in the present study, educational intervention was carried out only for students, if the parents participated and were trained, significant changes in this construct could be observed. The present study also showed that contrary to former studies (20, 36), there were no significant changes in the perceived barriers for reduction of mobile phone use. Most of these barriers are not controlled only by students, and the change in these barriers is not possible in the short term and exclusively by student education. Changes in social and cultural structures are needed in this regard, which must be considered in future studies.

It is important to explore the underlying mechanism behind the perceived barriers for reduction of mobile phone use among female students. The results of present study indicated that before the intervention both groups had similar self-efficacy scores, the self-efficacy scores in intervention group increased significantly after the intervention. This finding is consistent with results of previous studies (20, 36). Self-efficacy which is the strength or level of one's belief in his/her own ability to complete tasks, success and achievement of objectives, is one of the important factors that effectively influence on individuals behaviors and numerous studies confirmed that increased self-efficacy leads to increased adoption of healthy behavior (28, 34, 37).

There are several strategies to increase self-efficacy, among these strategies goal setting has been used in several studies and its usefulness was confirmed in various behaviors (38). In present study we used goal setting strategy and peer role model to increase student's self-efficacy to cope with addictive behavior. Peers as strong socializing agents, can actively change other students' behaviors. Peers with high level of self-efficacy may serve as positive

role models, therefore students may directly learn positive beliefs about proper use of mobile phone. Moreover, observing peers who have successful control over their mobile phone use may promote one's perceived self-efficacy on controlling mobile phone use through vicarious learning (38). Also, the results of present study disclosed that before the intervention both groups had similar cue to action scores, the cue to action scores in intervention group increased significantly after the intervention. This finding is consistent with results of some previous studies (20, 36). This structure refers to cases that remind the person to do proper behavior and to avoid unsafe behaviors.

In this study, as a reminder, students were asked to make interesting collages and postcards about proper use of the mobile phone for themselves and their friends. Contrary to our study earlier study which used reminders from parents and teachers/social workers to reduce Internet use among adolescents, cue to action was positively associated with risk of Internet addiction (38). Therefore, it is better to use methods that are favorable and acceptable for students as cue to action. A final important finding from this study was that, two months after intervention, the mean score of mobile phone addiction among the students of both groups was changed statistically compared to before the intervention.

As expected, score of mobile phone addiction in intervention group students was decreased and in control group students, the score of mobile phone addiction was increased. The decrease of mobile phone addiction among the students of intervention group could be due to the effects of education and HBM constructs, especially self-efficacy. This finding is consistent with results of previous study (36). Increasing addiction to mobile phone among students in the control group indicates that in the absence

of appropriate training, mobile phone addiction increases in students as time passes. This finding suggests that there is an urgent need to design and implement appropriate interventions to reduce and prevent addiction. Students use mobile phone as a key means of developing and maintaining friendships and obtaining instrumental and emotional support. The mobile phone become an important resource for learning, entertainment, formation of new social networks among students. Hence it is necessary to design and apply educational interventions to reduce and prevent mobile phone addiction. The results of present study support the effectiveness of educational intervention based on the HBM, to prevent and decrease the mobile phone addiction. Students should be educated on how to diagnose their mobile phone addiction symptoms, and exercise correct control on their mobile phone use, and how to use mobile phone properly by school nurses.

4-1. Study Limitations

This study, like other studies, had limitations. First of all, despite the fact that teachers left the classrooms when students completed the questionnaire, most of them responded conservatively. In future studies instead of the school, other places should be considered for data collection. In current study, self-report questionnaire was used to measure the mobile phones use and addiction to it; it is better that in future studies other methods should be used to measure this behavior, such as parent's questions. Also, in this study only female students were included, in future studies it would be better to examine the role of gender. Finally, in the present study, educational intervention was implemented only for students. It is suggested that in future studies parents of students should also be involved in intervention. Parents should be educated on what means to use to diagnose their adolescent's mobile phone addiction

symptoms, communicate with their adolescent on proper mobile phone use, and exercise correct control on her/his mobile phone use.

5- CONCLUSION

The scores of mobile phone addiction in students were not desirable, there is an urgent need to design and implement appropriate interventions to reduce and prevent addiction. The results of present study support the effectiveness of educational intervention based on the HBM, to prevent and decrease the mobile phone addiction.

6- AUTHOR CONTRIBUTIONS

Amidi and Khoshgoftar designed the study. Khoshgoftar collected the data. Tarahi analyzed the data. Amidi and Khoshgoftar designed the intervention and prepared the manuscript. Critical revision and supervision were provided by Amidi.

7- CONFLICT OF INTEREST: None.

8- ACKNOWLEDGEMENT

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