Educational intervention for the prevention of internet addiction disorder among 15-19-year-old adolescents in Colombo district, Sri Lanka

Gayan Ariyadasa[1], **Chithramalee De Silva**[1], **Nimal Shantha Gamagedara**[1]

(Index words: internet addiction, adolescent, school-based, intervention, Colombo)

Abstract

Introduction: Internet addiction disorder is growing as a potentially problematic condition, especially among adolescents. Nonetheless, the condition is widespread and problematic, limited scientific evidence is available on the prevention, and efficacy of the treatment globally as well as locally.

Objectives: The objective of this study was to determine the effectiveness of the developed educational package for the prevention of Internet addiction disorder among 15-19-year-old adolescents in Colombo district.

Methods: The study was a quasi-experimental study to determine the effectiveness of an educational intervention for the prevention of Internet addiction disorder. The educational package was developed on Social Cognitive Theory. The contents were designed following a literature review, expertise from a multidisciplinary panel, and using the preliminary results of the descriptive cross-sectional study. Adolescents from two educational zones in Colombo district were purposefully selected for the Intervention group (n=280) and control group (n=290). A self-administered questionnaire including a validated Internet Addiction Test (IAT). Sinhala version was used for the data collection. Following the implementation of the educational package, primary and secondary outcomes were compared between study groups by chi-square test and paired t-test using the SPSS-21 version.

Results: Following the intervention, the proportion of adolescents with Internet addiction disorder in the intervention group was less in comparison with the control group and the difference was statistically significant (χ^2=9.026, df=1, p=0.003). There was a statistically significant difference between the mean differences of pretest and post-test IAT scores (t=-0.412, df=279, p=0.001) with the reduction of mean IAT scores among the intervention group. The proportion of study participants engaged in social media (χ^2=10.6,df=1, p=0.001) and excessive engagement in internet gaming (χ^2=5.514, df=1, p=0.019) among the intervention and the control groups revealed a statistically significant difference in favor of the intervention group.

Conclusions: The developed educational package was found effective for the prevention of Internet addiction disorder and recommended to use in future prevention programs and to aid the policymakers and administrators in the prevention, diagnosis, and management of Internet addiction disorder among this age group.

Introduction

The Internet is an amazing invention. Across the globe, it is an integral part of modern life for many people. It has become a significant component of contemporary life for all age groups. Even though Internet addiction disorder has emerged as a universal issue, its international prevalence estimates vary vastly. A meta analysis reported a global prevalence of 6.0% (95% CI 5.1-6.9) in 2014 [6]. There were limited estimates on Internet addiction disorder in Sri Lanka. A local study reported a prevalence of 27.6% of Internet addiction disorder among University students [12]. A cross sectional study revealed a prevalence of 16.1% among information and communication technology users in Gampaha district, Sri Lanka [9].

There is a growing importance of prevention of Internet Addiction disorder among adolescents due to the presence and severity of addictive use of the Internet and its impact on personal, academic, and social life. A lack of preventive strategies can be also enhanced the negative outcomes of addiction among the youth. Studies

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[1]*Ministry of Health, Sri Lanka.*

Correspondence: KGL, *e-mail: <ariyadasagayan@gmail.com>.* *Received 20 October 2022 and revised version 14 December 2022 accepted 23 December 2022*

revealed that young people seem greatly susceptible to Internet addiction disorder compared to adults and preventive strategies are very much needed since it is preventable [3].

Out of the scientific studies on Internet addiction disorder at the global level, only a few have been available in the literature on the preventive aspects. The majority of the researchers agreed that preventive interventions for Internet addiction disorder should be focused mainly on adolescents in their school environments since they have the highest prevalence [7]. Investigators have found that cognitive-behavioral therapy-based treatment approaches are effective on addicted adolescents in terms of secondary prevention [13]. Some antidepressant drugs have been also tried for the treatment of Internet addiction disorder and revealed that both psychological and pharmacological interventions as combined therapy proved beneficial in severe addicts [11]. An interventional study revealed, Internet addiction disorder is a significant mental health issue among adolescents and the prevention of Internet addiction disorder needs to be supported by effective preventive strategies with a knowledge-based educational approach [8].

Methods

This study includes the development of an educational package to prevent Internet addiction disorder and a quasi-experimental study to determine the effectiveness of the developed educational package. Social Cognitive Theory (SCT) emphasizes the influence of individual experiences, the actions of others, and environmental factors on individual health behaviors [04]. The application of this theory supposed that addictive behavior can be interpreted by identifying the individual's organizational mechanisms which are influenced by behavior-based outcomes and the individual's self-efficacy. The theory further describes the impact of self-efficacy on ambition, performance, and learning levels, being an important basis to define an individual's motivation level, psychological health, and personal performance. Therefore, this theory has been applied as a basis for interventional strategies to prevent Internet addiction disorder [2].

Charles Tatum (2019) described a system for the development and evaluation of educational programs. The model was used as a guide in the development of the educational intervention to prevent Internet addiction disorder among 15-19-year-old adolescents in the current study. As per the guideline, five steps have been followed in the development of the educational package according to the model. The steps were planning design, development, implementation, and evaluation [5].

A quasi-experimental study was conducted considering the practicability and feasibility of a school-based study. The study population for the interventional study was 15-19-year-old adolescents in Sinhala medium schools in Colombo district. Adolescents aged 15-19 years who were intellectually impaired were excluded from the study.

Out of four educational zones in Colombo district, two educational zones were selected randomly for the Intervention group (Piliyandala educational zone) and control group (Homagama educational zone). Three schools were randomly selected out of all the eligible schools in Piliyandala educational zone following a baseline survey for the intervention group. Four classes were randomly selected in each school for the intervention. All the eligible students of the selected classes were recruited. Meanwhile, three schools were randomly selected out of all the eligible schools in Homagama educational zone for the control group and four classes were randomly selected in each school for the control arm. Piliyandala and Homagama educational zones were expected to be relatively homogeneous in terms of sociodemographic, environmental, and educational characteristics. Both areas have a similar education system and almost similar information sources. However, schools in both zones were situated distantly with less risk of contamination. The pre-intervention assessment was carried out in selected schools in both intervention and control groups simultaneously. Adolescents who consented to the study were enrolled. The validated IAT-Sinhala version with the outcome assessment questionnaire was administered to both intervention and control groups.

Three sessions of the intervention modules were completed for the intervention group at fixed time intervals for 1 week apart. The post-test analysis was completed after 12 weeks after the pre-test. Each session was completed within two hours. Module one consisted of the Introduction of Internet addiction disorder and why adolescents are at higher risk. The module included one hour lecture and video presentation with a question-and-answer session. The second module was completed after one week. Students were required to memorize the information provided during module one at the beginning. Module two was mainly on the different types of Internet addiction disorder and the clinical characteristics of these types. The session included a Powerpoint presentation and brainstorming session with the involvement of the participants. During module three, preventive strategies for Internet addiction disorder were discussed in-depth and ways of establishing a culture for responsible use of the internet were reinforced. Teaching materials were provided for the students. Powerpoint presentations, video presentations, and interactive discussions were included in all the modules. Modules were fully completed as planned one week apart by the principal investigator. Post-intervention data collection was conducted following 12 weeks of the pre-test. The validated IAT-Sinhala version was re-administered, and primary and secondary outcomes were assessed. At the same time, the post-assessment of the control group was similarly completed. The study was

conducted from February 2021 to May 2021. Pretest and post-test data were collected 12 weeks apart. Primary and secondary outcome measures were defined. Measuring a change in outcomes provides information as to whether the intervention has made a difference. The post-intervention proportion of adolescents with Internet addiction disorder was the primary outcome and the proportion of adolescents who used the internet more than 3 hours per day for non-academic use at the post-intervention stage, the proportion of adolescents engaged excessively in social media at the post-intervention stage, the proportion of adolescents engaged excessively in internet gaming at the post-intervention stage, the mean difference of IAT scores between the pre-intervention and the post-intervention stages of the intervention group were the secondary outcomes. The sample size for the interventional study was calculated for a dichotomous response. This is a common formula that can be used to compare two proportions [10]. Therefore the total calculated sample size was 480. There was no randomization of the study groups and blinding was not applied considering the feasibility and the study setting. An equal number of study participants for the intervention and control groups were selected. All the gathered data were manually cleaned and checked before entering the statistical package of social sciences (SPSS-version 21).

Pre-interventional basic socio-demographic characteristics of the intervention and the control groups were compared. The primary outcome was assessed by comparing the proportion of adolescents with Internet addiction disorder at the pre-intervention and post-intervention stages of the study groups by using the chi-square test. The chi-square test was used to assess the secondary outcomes between the two groups except for the mean difference in total IAT score of the intervention group between the pre-intervention and the post-intervention stages, which was assessed by using paired t-test.

Results

Basic characteristics such as sex, age groups, and school grades of the study participants of both intervention and control groups were compared and the differences among the two groups were not statistically significant (p>0.05).

Table 1. Comparison of the proportion of Internet addiction disorder among the intervention and the control groups at the preintervention stage

	Internet addiction disorder at preintervention stage					
	Intervention group		*Control group*		*Total*	*Significance*
	No	*%*	*No*	*%*	*No(%)*	
Yes	59	48.8	62	51.2	121 (100)	**χ^2=0.008 df=1 p=0.928**
No	221	49.2	228	50.8	449 (100)	
Total	**280**		**290**		**570**	

At the preintervention stage, there was no statistically significant difference between the two group proportions (χ^2=0.008, df=1,p=0.928).

Table 2. Comparison of the proportion of study participants with Internet addiction disorder among the intervention and the control groups at the postintervention stage

	Internet addiction disorder at post-intervention stage					
	Intervention group		*Control group*		*Total*	*Significance*
	No	*%*	*No*	*%*	*No (%)*	
Yes	39	36.1	69	63.9	108 (100)	**χ^2=9.026, df=1 p=0.003**
No	241	52.2	221	47.8	462 (100)	
Total	**280**		**290**		**570**	

At the post-intervention stage, there was a statistically significant difference between the proportions of the two groups (χ^2=9.026, df=1,p=0.003).

Table 3. Comparison of the proportion of study participants excessively engaged in social media (self-perceived) among the intervention and the control groups at the preintervention stage

	Excessive engagement in social media (self-perceived)					
	Intervention group		*Control group*		*Total*	*Significance*
	No	*%*	*No*	*%*	*No (%)*	
Yes	226	47.8	247	52.2	473 (100)	**χ^2=2.005 df=1**
No	54	55.7	43	44.3	97 (100)	**p=0.157**
Total	**280**		**290**		**570**	

There was no statistically significant difference between the intervention and control groups in terms of excessive social media use among study participants at the pre-intervention stage (χ^2=2.005, df=1, p=0.157).

Table 4. Comparison of the proportion of study participants engaged in social media (self-perceived) among the intervention and the control groups at the post-intervention stage

	Excessive engagement in social media (self-perceived)					
	Intervention group		*Control group*		*Total*	*Significance*
	No	*%*	*No*	*%*	*No (%)*	
Yes	215	45.9	253	54.1	468 (100)	**χ^2=10.6 df=1**
No	65	63.7	37	36.3	102 (100)	**p=0.001**
Total	**280**		**290**		**570**	

Post-intervention comparison of the proportion of study participants engaged in social media among the intervention and the control groups revealed that there was a statistically significant difference between the two groups following the intervention (χ^2=10.6, df=1, p=0.001).

Table 5. Comparison of the proportion of participants excessively engaged in Internet gaming (self-perceived) among the intervention and the control groups at preintervention

	Excessive engagement in Internet gaming (self-perceived)					
	Intervention group		*Control group*		*Total*	*Significance*
	No	*%*	*No*	*%*	*No (%)*	
Yes	219	48.1	237	51.9	456 (100)	**χ^2=0.702 df=1**
No	61	53.6	53	46.4	114 (100)	**p=0.402**
Total	**280**		**290**		**570**	

There was no statistically significant difference between the intervention and control groups in terms of excessive engagement in Internet gaming among the intervention and the control groups at the preintervention stage (χ^2=0.702, df=1, p=0.402).

Table 6. Comparison of the proportion of participants engaged in Internet gaming among the intervention and the control groups at post-intervention

Excessive engagement in Internet gaming (self-perceived)						
	Intervention group		*Control group*		*Total*	*Significance*
	No	*%*	*No*	*%*	*No (%)*	
Yes	207	46.5	238	53.5	445 (100)	**χ^2=5.514 df=1 p=0.019**
No	73	58.4	52	41.4	125 (100)	
Total	**280**		**290**		**570**	

Postintervention comparison of the proportion of study participants engaged in Internet gaming among the intervention and the control groups at the post-intervention stage reported that there was a statistically significant difference between the two groups following the intervention (χ^2=5.514, df=1, p=0.019).

Table 7. Comparison of the mean difference of IAT scores at the preintervention and the post-intervention of the intervention group

Mean difference of the IAT score (Pretest-posttest)	*95% Confidence interval*		*Significance*
	Lower	Upper	**t=4.412 df=279 p=0.001**
1.86	1.02	2.69	

The mean difference of the IAT score was 1.86 (95% CI=1.02-2.69). There was a statistically significant difference between mean differences of pretest and posttest IAT scores (t=-0.412, df=279, p=0.001).

Discussion

Quasi-experimental studies have been extensively used to assess the effectiveness of educational interventions at school settings globally as well as locally. Many public health interventions found in the literature have been quasi-experimental and researchers argued that quasi-experimental studies were more practicable than true experiments since they provide beneficial and generalizable information [1].

The response rate of the intervention group was 97.2% and in the control group, it was 96.3%. The response rates reflect the minimum loss of follow-up rates indicating high validity of the results of the study. There was no statistically significant difference between the intervention and control groups in terms of age (χ^2=1.72, df=1, p=0.678), sex (χ^2=1.43, df=1, p=0.231) and school grade (χ^2=0.172, df=1, p=0.678). Therefore no significant difference in baseline characteristics was observed between the two groups.

Comparison of the proportion of study participants with Internet addiction disorder among the intervention and the control groups at the postintervention stage revealed that there was a statistically significant difference between the proportions of the two groups(χ^2=9.026, df=1, p=0.003) with the reduced proportions of adolescents with internet addiction disorder in the intervention group. Out of a large number of scientific studies on Internet addiction disorder, only a few have been available in the literature on the preventive aspects.

A school-based intervention on the prevention of Internet addiction disorder among adolescents in 2016 in Italy showed a significant reduction of the levels of Internet addiction disorder between pre-test and post-test values for both males and females (p=0.038) [14]. An interventional study compared post-test scores between intervention and control groups following a peer training programme on secure internet use among adolescents and reported a significant difference in favor of the intervention group (U=40350.5, p<0.05). Since the study groups were small, nonparametric tests have been used for the analysis [15].

Preintervention comparison revealed there was no statistically significant difference observed between intervention and control groups in terms of the proportion of time used on the internet for non-academic activities (χ^2=0.029, df=1, p=0.865), social media use (χ^2=2.005, df=1, p=0.157), and engagement in internet gaming (χ^2=0.702, df=1, p=0.402). Therefore no statistically significant difference was observed between the intervention and control groups at the baseline. This result

was expected since the two educational zones of the study groups were relatively homogeneous in terms of socio-demographic, environmental, and educational characteristics. Both the areas have similar education systems and almost similar information sources. Relevant post-intervention outcomes were also determined accordingly between two groups and assessed the effectiveness of the intervention. Post-intervention comparison of the proportion of adolescents who used more than 3 hours per day for non-academic use among the intervention and the control groups revealed that there was no statistically significant difference between the two groups even after the intervention (χ^2=0.560, df=1, p=0.454). This was an unexpected result since the intervention modules were largely focused on the reduction of screen time among the intervention group. The proportion of study participants engaged in social media (χ^2=10.6, df=1, p=0.001) and the extent of engagement in Internet gaming (χ^2=5.514, df=1, p=0.019) among the intervention and the control groups at the postintervention stage reported that there was a statistically significant difference in favor of the intervention group.

Comparison of the mean difference of total IAT scores at the pre and post-intervention of the intervention group using paired t-test revealed a statistically significant difference between mean differences of pretest and post-test IAT scores (t=-0.412, df=279, p=0.001). A similar result was observed in a school-based study conducted in 2016 in Italy that reported a significant difference following the intervention among the study participants. However, the outcome assessment was carried out for males and females separately and reported mean difference between pre-and post-test IAT scores among males were 7.29 (SD=16.36, 95% CI:2.38-12.2, p<0.001) and for females 5.33 (SD:16.76, 95% CI:0.29-10.37, p=0.038) (Ruggieri 2016).

There are limited studies available in the literature on the preventive aspects of Internet addiction disorder. Different outcome assessment methods, different instruments used, and different methodologies were the major challenges to compare and contrast the different interventional studies. Considering the results of primary and secondary outcome assessment of the quasi-experimental study it can be concluded that the educational package for the prevention of Internet addiction disorder is being effective.

Conclusion

The developed educational package was effective in favour of the intervention group at the post-intervention stage revealing statistically significant differences in the proportion of study participants having Internet addiction disorder (χ^2=9.026, df=1, p=0.003), mean differences of pretest and post-test IAT scores(t=-0.412, df=279, p=0.001), the proportion of study participants engaged in social media(χ^2=10.6,df=1, p=0.001) and the extent of internet gaming (χ^2=5.514, df=1, p=0.019).

The quasi-experimental study showed that developed educational package for the prevention of Internet addiction disorder is effective. Similar interventions should be implemented at different settings to prevent and control Internet Addiction Disorder and the developed educational package are recommended to use in future prevention programs and to advocate policymakers and administrators to implement programs for prevention, diagnosis, and management of Internet addiction disorder.

Ethics approval

Ethical clearance for the study was by the Ethics Review Committee of the Faculty of Medicine, Colombo.

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The investigators bore all expenses.

Conflict of interests

All authors declare to have no conflict of interests.

Author contributions

While all authors were involved in all stages of the research, specific contributions were made as followed. GA handled research proposal, data collection, analysis and manuscript. CDS conceptualized the research. NG edited the research proposal, contributed to the analysis and editing of the manuscript.

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