

# Effect of E-learning on Health-Promoting Behaviors Among Adolescents: An Empowerment Model

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## ABSTRACT

**Objective:** Paying attention to the health of adolescents, especially girls, is one of the sustainable development goals, and the improvement of health-promoting behaviors in adolescents is necessary. Therefore, this study aimed to determine the effect of the empowerment-based e-learning program on health-promoting behaviors among adolescents.

**Methods:** The present study was a quasi-experimental study in which 80 middle and high school female students in the city of Rasht, Guilan, Iran, participated. The sampling method was multi-stage cluster random. Data were collected between March 2021 and June 2021 using the questionnaire of demographic characteristics and the Health-Promoting Lifestyle Profile II. Health-Promoting Lifestyle Profile II was assessed before and 8 weeks after the intervention in both intervention and control groups. The empowerment model was performed for the intervention group. Descriptive statistics independent *t*-tests, paired *t*-tests, and analysis of covariance were used for data analysis in the Statistical Package for the Social Sciences software version 16.0. The significance level (*P*-value) was .05.

**Results:** The implementation of the educational program led to increased mean scores in the dimensions of health responsibility, physical activity, nutrition, and interpersonal relationships in the intervention group, but spiritual growth and stress management had no significant change. The control group did not show significant changes in the dimensions of health-promoting behaviors.

**Conclusion:** The result of this study showed that empowerment-based e-learning could be effective in changing the behavior of female adolescents toward healthy behaviors. On this basis, we suggest to use this educational approach as a basis to improve adolescent health-promoting behaviors.


**Keywords:** Empowerment, promotion, health, adolescent

## Introduction

Adolescence is an important and critical period of human life and is one of the best and most valuable years of each individual's life.<sup>1</sup> Adolescents (10-19 years old) constitute more than one-fifth of the world's population.<sup>2</sup> Adolescence is accompanied by many physical, mental, emotional, and developmental changes. Because of these changes, adolescents face many high-risk behaviors that threaten their health in adulthood as well.<sup>3</sup> On the other hand, numerous factors, including precocious puberty, increased age of marriage, the epidemiological transition of diseases, technology development, access to global media, and changes in cultural values, all expose adolescents to conditions affecting their health.<sup>4</sup> One of the health determinants is health-promoting behaviors (HPB), which are the main indicators of health and are considered fundamental factors in disease prevention.<sup>5</sup> Therefore, by improving the status of HPB in adolescence, many problems can be prevented in adolescents.<sup>6</sup>

Empowerment is an internal growth process leading to the full realization of natural talents.<sup>7</sup> Notification, communication, and health education are located at the core of empowerment.<sup>8</sup> Using empowerment strategies, healthcare providers can develop the skills of problem-solving, critical thinking, negotiation, and information search in adolescents and increase their level of health.<sup>9</sup> The results of empowerment include positive self-confidence, the ability to achieve the goal, a feeling of control over life, change activities, and having hope for the future.<sup>10</sup>

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Nowadays, adolescent empowerment, given its fundamental value in adolescent health and its overall positive impact on the family, is viewed as an important and necessary public policy goal.<sup>11</sup> The implementation of an empowerment program aiming to increase awareness, knowledge, motivation, self-esteem, and self-efficacy leads to self-control and preventive behaviors, being essential to promote health and quality of life.<sup>12</sup>

The goal of the kinds of empowerment-based e-learning interventions such as online psychoeducation,<sup>13</sup> peer-to-peer support,<sup>14</sup> and support-based family-centered empowerment model<sup>15</sup> (FCEM) is to empower individuals and communities to decide on selecting the best health option. Namazi et al<sup>15</sup> concluded that the FCEM, as the most common method of identifying the physical and mental concerns of families, along with face-to-face orientation and online methods, can easily meet the family's health needs. Also, the online peer-to-peer support method could be a powerful tool for adolescents' help-seeking for health problems.<sup>14</sup> Mirhosseini et al<sup>13</sup> recommended implementing online psychoeducational support as an effective way to reduce the caring burden on family caregivers. Therefore, it can be said that empowerment plays an important role in the health promotion issue.<sup>16</sup>

Given that adolescents have problems such as immobility, poor nutrition, and not pursuing health problems, they are considered vulnerable groups in the community, and paying attention to health and HPB in this age group is necessary.<sup>1</sup> Therefore, new and accessible educational strategies, including electronic education based on the educational model, seem necessary to improve their health.<sup>3</sup>

Since most of the previous studies focused on traditional educational methods to promote adolescent health,<sup>6</sup> in this study, the e-learning method was used as a well-planned and organized educational method intended to develop health education among adolescents aimed to achieve optimum learning outcomes.

A lack of information about the effect of the e-learning method on health promotion and a scarcity of relevant studies in Iran were the reasons for conducting this study. The results of this study can help the policymakers in the Ministry of Health improve the quality, increase access, and improve the health education outcomes in Iran or any country.

The aim of this study was to determine the effect of implementing the empowerment-based e-learning program on HPB in adolescents. Based on research objectives, we designed a study to test a hypothesis against with control group. Based on the empowerment theory, we assumed that empowerment-based e-learning programs can trigger changes in HPB if tailored e-learning is an effective and accessible intervention for enhancing HPB among learners.

## Methods

### Study Design and Participants

The present study was a randomized controlled trial. In the present study, the sample size was calculated using G\*Power statistical software version 3/1. To determine the sample size, the first type error was considered 0.05, and the second type error (power 0.8) was considered 0.2. According to the earlier information, the sample size was 36 people in each group, which given the possible loss of samples and for increasing the accuracy of the study, 40 people were finally included in each group in the study (Figure 1).

The sampling method was multi-stage cluster random; so districts 1, 2, 3, and 4 of the city of Rasht were considered the main clusters. Then, using the list of public and non-public schools in these 4 districts, 4 schools from each district were selected as the systematic random

method. In each district, 2 public schools (1, first grade and another, second grade) and 2 non-public schools (1, first grade and another, second grade) were selected. Overall, 16 schools were selected from these 4 districts. Initially, we invited 16 schools by telephone. Immediately after the telephone conversation, schools received recruitment material for the school management, teachers, and student council. In the following weeks, the high schools were contacted again to follow up on the invitation. We invited all students who adhered to our exclusion and inclusion criteria. The inclusion criteria were 10- to 19-year-old female students in middle and high schools, who completed a written informed consent form to participate in the study, had a normal state of consciousness, and lacked a history of mental illness. Exclusion criteria were either not attending a training session or unwillingness to continue the study. An independent researcher made random allocation cards using computer-generated random numbers. He kept the original random allocation sequences in an inaccessible third place and work with a copy. Since the executors can get confused with the original coding of A and B later, the allocator recorded exactly what these codes mean to avoid further confusion. The independent researcher printed it on each sheet. The inside of the envelope was not visible from the outside and was printed separately for each one and placed in the envelope after being folded several times. There was a serial number on the outside of the envelopes. Input data, time, participant ID, post-intervention results, etc. had recorded on another sheet inside the envelope.

### Data Collection

Data collection tools involved the questionnaire of demographic characteristics and Health-Promoting Lifestyle Profile II (HPLP II). The HPLP II designed by Walker measures self-initiated health behaviors. This tool has 52 items in 6 subscales, including spiritual growth (9 items), health responsibility (9 items), physical activity (8 items), nutrition (9 items), interpersonal relationships (9 items), and stress management (8 items). The scoring method is based on a 4-point Likert rating scale (never=1 point, sometimes=2 points, usually=3 points, and always=4 points). The total score range of the HPB Questionnaire is between 52 and 208, and a higher score means better health status. Participants who obtained a score of 97% and above (201.78-208) were placed in the "good" group, those with a score of 75%-97% (150.7-201) were placed in the "acceptable" group, and participants with a lower score were placed in the "weak" group. Walker and Hill-Polerecky<sup>17</sup> measured the validity and reliability of the original version of this scale, and its total test-retest reliability was reported to be 0.93(8). Overall, this scale had a high internal consistency, and its Cronbach's alpha coefficient was between 0.92 and 0.94. Mohammadi et al<sup>18</sup> performed the validity and reliability of the translated version of this scale in Iran. The internal consistency with Cronbach's alpha coefficient for the total scale was 0.95, and its external stability, which was measured by the test-retest method after 3 weeks, was reported to be 0.93.

The questionnaire was sent by e-mail and completed by participants in both intervention and control groups before and 8 weeks after the intervention. The data obtained from the pre-intervention phase were analyzed and the possibilities, limitations, and educational needs of participants were identified. The intervention included e-learning based on the empowerment model that encompassed all domains of health promotion collected.

### Intervention

The educational content was compiled using reliable sources and approved by 8 faculty members of Guilan University of Medical Sciences. The educational content includes responsibility and providing solutions to increase individuals' responsibility for health (first session), principles of proper nutrition (second session), the necessity of doing physical activity and exercise (third session), interpersonal

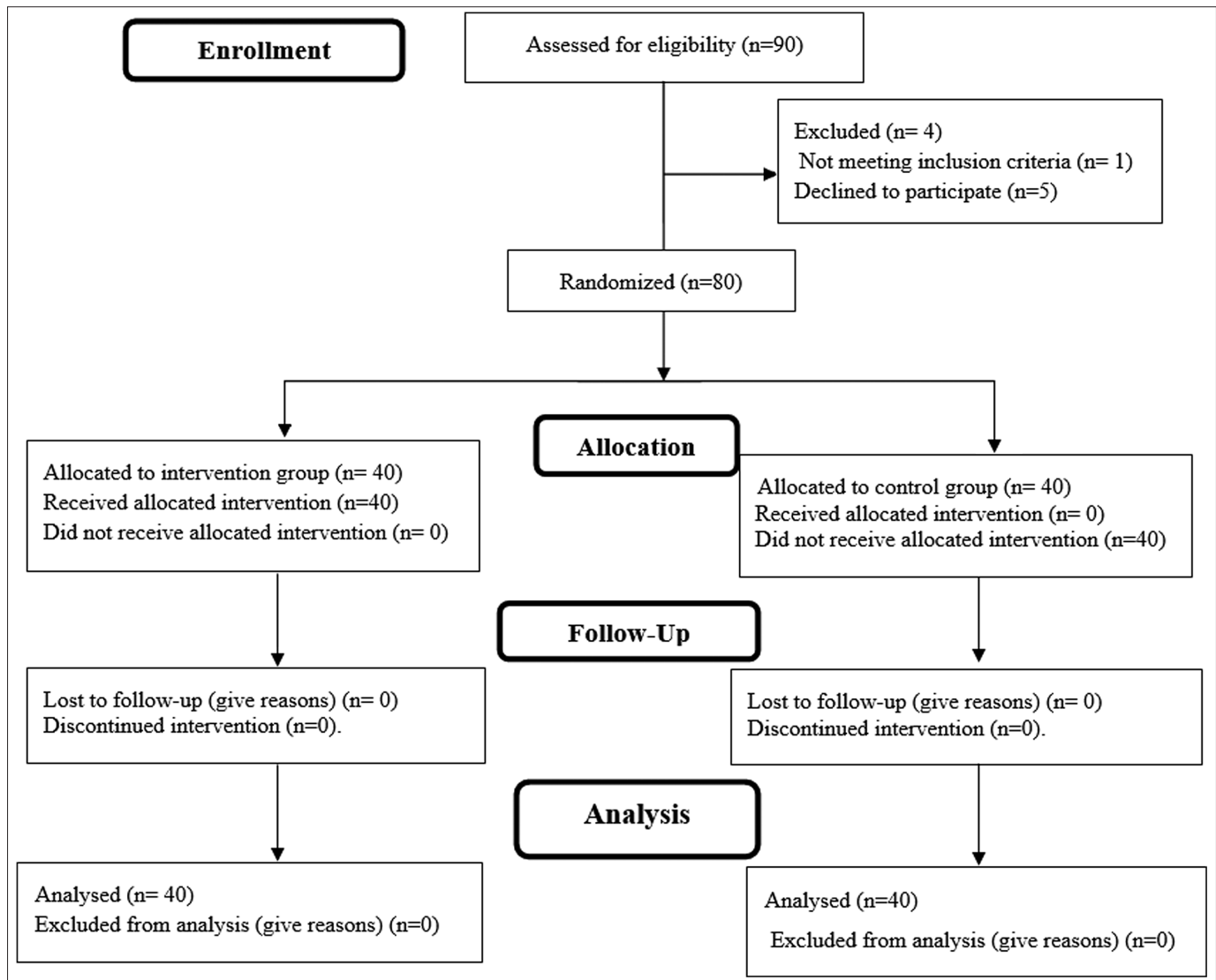


Figure 1. Consort flow diagram.

relationships and the required skills for adaptive interpersonal communication (fourth session), stress management and control and ways to deal with it (fifth session), and the definition of spiritual growth and health, the necessity of the existence of spirituality (sixth session).

Due to coronavirus disease 2019 pandemic precautions and according to the Iran Ministry of Education's directions, the course was delivered remotely. Camtasia® 2020 Education, a screen recording and video editing software, developed by TechSmith Corporation (Okemos, Mich, USA) was utilized to design the e-lectures. The recorded files were presented by one of the researchers (corresponding author) during 6 sessions (1 session per week, each lasting 1 hour) and e-mailed to the participants in the intervention group.

The HPLP-II was completed for a second time by all participants 8 weeks after the intervention using the self-reporting method. The control group did not receive any intervention from the researcher. Pre-intervention and post-intervention data were compared between the 2 groups given the research objectives.

The empowerment model was performed according to the educational needs and based on the 4 steps (perception of threat, problem-solving, educational program, and evaluation) for the intervention group.

The empowerment model was implemented in the following steps:

The first step in implementing the empowerment model was to increase adolescents' perception of health threats, which also includes their knowledge and awareness about the negative consequences of unhealthy behaviors (obesity, physical inactivity, excessive drinking, and insufficient sleep). Therefore, the group discussion sessions were held with participants and their active family members via Skyroom for each of the domains of HPB.

For the second step of the empowerment model, several problem-solving methods were introduced through the practical display of required skills to the participants (for example, performing the relaxation technique) to increase self-control.

Educational participation was the third stage of the empowerment model. The goal of this stage was to motivate and encourage to participate in educational programs.

The evaluation step included evaluating the effectiveness of the course on the HPB of the participants. For this stage, the HPLP-II was completed for both the intervention and control groups before and after the intervention.

### Ethical Considerations

Research-related information (a statement that participation in research is voluntary; information about ensuring data protection/confidentiality/privacy, including duration of storage of personal data; details of the nature and purpose of the research; the expected duration of the subject's participation; a detailed description of study intervention and of any experimental procedures, also blinding and randomization; probable risks and benefits associated with research participation; researcher contacts for any further answers to pertinent questions about the research; and any other information that seems necessary for an informed decision to be taken by the subject) was presented to enable students to voluntarily decide whether or not to participate as a research subject.

### Statistical Analysis

Data were analyzed using the Statistical Package for the Social Sciences (SPSS) version 16 (IBM SPSS Statistics for Windows, Version 16.0. Chicago, IL, USA). To evaluate the normality of the data and the homogeneity of variances, the Kolmogorov–Smirnov test was used. Statistical analysis was performed using descriptive statistics (frequency, mean, and standard deviation). In this study, to compare individual and social

variables between the control and intervention groups, the independent *t*-test was used for quantitative variables, and the chi-square test (or Fisher's exact test) was used for qualitative variables. The mean scores of HPLP II and subscales were compared between the control and intervention groups before education using the independent *t*-test and after education using analysis of covariance (ANCOVA). The paired *t*-test was used to compare the mean scores of HPLP II in each intervention group before and after the intervention. Spearman correlation was used to determine the correlation between HPLP II dimensions with demographic characteristics in the control and intervention groups. All statistical tests were one-sided. The significance level (*P*-value) was .05.

### Results

In this study, the data of 80 female students (40 in the intervention group and 40 in the control group) were statistically analyzed. The demographic characteristics of the study participants are described in Table 1. The mean age of the intervention group was  $15.8 \pm 2.7$  (age range=12-19 years) and that of the control group was  $16.1 \pm 1.3$  (age range=12-19 years). The mean age of the father and mother participants was  $43.1 \pm 4.1$  and  $39.8 \pm 2.6$  years, respectively. The

**Table 1.** Characteristics of Participants in 2 Groups

Variables	Intervention Group		Control Group		<i>P</i>	
	Number (Individuals)	%	Number (Individuals)	%		
Age (years, mean $\pm$ SD)	$15.8 \pm 2.7$		$16.1 \pm 1.3$		.37	
Education center	Public	21	52.5	23	57.5	.19
	Private	19	47.5	17	42.5	
Grade	Primary high school	18	45	19	47.5	.25
	Secondary high school	22	55	21	52.5	
Study field	Math	9	22.5	10	25	.44
	Experimental	11	27.5	13	32.5	
	Humanities	10	25	8	20	
	Vocational	10	25	9	22.5	
Area or residence	City	36	90	38	95	.28
	Suburbs	4	10	2	5	
Father's level of education	Illiterate	2	5	1	2.5	.29
	Primary	1	2.5	3	7.5	
	Middle school degree	3	7.5	1	2.5	
	Diploma	25	62.5	18	45	
	University educated	9	22.5	17	42.5	
Father's job	Unemployed	1	2.5	0	0	.17
	Worker	8	20	12	30	
	Farmer	3	7.5	1	2.5	
	Clerk	6	15	9	22.5	
	Self-employed	22	55	18	45	
Mother's level of education	Illiterate	0	0	0	0	.31
	Primary	4	10	1	2.5	
	Middle school degree	2	5	3	7.5	
	Diploma	10	25	13	32.5	
	University educated	24	60	23	57.5	
Mother's job	Housewife	18	45	24	60	.22
	Worker and farmer	1	2.5	2	5	
	Clerk	17	42.5	14	35	
	Self-employed	4	10	0	0	
Income	Equal	16	40	11	27.5	.53
	Outcome > income	24	60	29	72.5	
	Income > outcome	0	0	0	0	
Living with parents	Yes	38	95	29	97.5	.68
	No	2	5	1	2.5	

\*Testing significant change between control and experimental groups which is significant at the .05 level.

**Table 2.** Comparison of the Mean Score (SD) of HPLP II and Subscales Before and After Intervention in 2 groups

HPLP II and Subscales	Before Intervention			After Intervention		
	Mean $\pm$ SD		<i>P</i> *	Mean $\pm$ SD		<i>P</i> **
	Intervention Group	Control Group		Intervention Group	Control Group	
Health responsibility	27.14 $\pm$ 5.12	29.12 $\pm$ 4.38	.12	26.34 $\pm$ 4.03	21.82 $\pm$ 4.67	.01
Physical activity	17.26 $\pm$ 4.31	19.11 $\pm$ 5.02	.1	23.03 $\pm$ 4.11	16.97 $\pm$ 4.14	.001
Stress management	21.12 $\pm$ 4.03	22.36 $\pm$ 4.23	.1	24.03 $\pm$ 4.18	23.76 $\pm$ 5.35	.1
Spirituality growth	26.12 $\pm$ 5.47	25.58 $\pm$ 6.03	.32	27.39 $\pm$ 4.12	26.45 $\pm$ 5.14	.2
Interpersonal relationships	25.03 $\pm$ 5.02	26.74 $\pm$ 5.25	.25	28.25 $\pm$ 3.04	22.11 $\pm$ 4.49	.01
Nutrition	22.31 $\pm$ 4.04	25.37 $\pm$ 5.113	.01	27.86 $\pm$ 4.17	23.51 $\pm$ 4.68	.001
Total HPLP II	146.86 $\pm$ 26.28	151.41 $\pm$ 21.26	.11	164.3 $\pm$ 24.13	149.7 $\pm$ 33.31	.002

HPLP II, Health-Promoting Lifestyle Profile II; SD, standard deviation.  
 \*Independent *t*-test.  
 \*\*Analysis of covariance.

majority of participants in the intervention (52.5%) and control (57.5%) groups educated in public schools. Approximately more than half of the participants in the intervention (55%) group were graduates and the participants in the control (52.5%) groups were in secondary high school. The field of study of most of the participants in the intervention (27.5%) and control (32.5%) groups was experimental sciences. Most participants in the intervention (95%) and control (97.5%) groups reported living with parents.

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An independent *t*-test was used for comparing groups before intervention. After the intervention, ANCOVA was used with adjusting the baseline values. There was no significant difference in the HPLP-II score between the intervention and control groups at baseline. However, there was no significant change in the control group (151.41  $\pm$  21.26 to 149.7  $\pm$  33.31), and after the intervention, the healthy behavior level of participants increased (146.86  $\pm$  26.28 to 164.3  $\pm$  24.13, *P* < .001).

The scores of health responsibility (26.34  $\pm$  4.03 vs. 21.82  $\pm$  4.67, *P* < .01), physical activity (23.03  $\pm$  4.11 vs. 16.97  $\pm$  4.14, *P* < .001), nutrition (27.69  $\pm$  4.09 vs. 20.61  $\pm$  5.12), and interpersonal relationships (28.11  $\pm$  4.34 vs. 19.58  $\pm$  6.8, *P* < .01) in the intervention group were significantly higher than those in the control group. There was no statistically significant difference between the intervention and control group in dimensions of stress management (24.03  $\pm$  4.18 vs. 23.76  $\pm$  5.35) and spiritual growth (27.39  $\pm$  4.12 vs. 26.45  $\pm$  5.14) (Table 2).

The mean differences of HPLP II and subscales before and after intervention in the 2 groups were statistically significant (*P* < .001) (Table 3).

**Table 3.** Comparison of the Mean Differences of HPLP II and Subscales Before and After Intervention in 2 Groups

HPLP II and Subscales	Group	Mean Difference	SD*	<i>P</i> **
Nutrition	Intervention	-29.600124	5.44238	<.01
	Control	-2.76826	2.43146	.32
Physical activity	Intervention	39.42683	2.28948	<.01
	Control	25.68332	6.12223	<.26
Stress management	Intervention	-24.13580	10.79512	<.09
	Control	-1.92731	3.29816	.12
Spirituality growth	Intervention	4.91944	8.76727	<.001
	Control	0.45093	3.17567	.35
Interpersonal relationships	Intervention	-27.93266	11.62759	<.001
	Control	-24.27257	7.62852	<.03
Health responsibility	Intervention	-19.53623	7.17442	<.001
	Control	0.47346	5.23717	.23
Total HPLP II	Intervention	-28.21862	4.71653	<.001
	Control	0.57946	4.52731	.41

\*Standard deviation.

\*\*Paired *t*-test.

There was a significant relationship between household income, educational level, and HPB (Table 4).

The findings showed that there was no significant difference between the groups of intervention and control before the educational intervention concerning HPB in different dimensions. There was a statistically significant difference between the intervention and control groups concerning the dimensions of responsibility, physical activity, nutrition, and interpersonal relationships after the educational intervention, but no significant differences were observed in the dimensions of stress management spiritual, and growth.

## Discussion

The implementation of the empowerment-based e-learning program led to improving the area of health responsibility in the intervention group. These results are consistent with the results of study by Ahmadizade et al.<sup>19</sup> The results of study Ahmadizade et al<sup>19</sup> indicated that educating and providing adequate information to adolescents resulted in increasing their responsibility and improving their performance in self-care and promoting health-related behaviors. The results of study by Kahtari et al<sup>20</sup> also support these findings. Based on the results of the Iranian studies, a very limited number of adolescents had enough information in the field of how to do proper self-care.<sup>21,22</sup> Adolescents' low mean age and lack of awareness of their role in improving HPB led to their low health responsibility.<sup>20</sup> The implementation of the educational intervention led to increasing HPB in the dimension of physical activity. Today's facilities and lifestyle, particularly in urban regions (due to devices such as computers, televisions, etc.), have caused adolescents and the youth to show less desire for physical activity.<sup>21</sup> One of the most effective ways to encourage the youth to do more physical activity (as the most important element of a healthy lifestyle) is by implementing educational programs.<sup>22</sup> The findings of Kang's<sup>23</sup> studies also supported these results, but these results were inconsistent with those of Solhi et al's<sup>24</sup> study, showing that the interventions could not significantly change and improve

**Table 4.** The Correlation of HPLP II Dimensions with Demographic Characteristics in 2 Groups

Demographic Variables	HPLP II in the Intervention Group		HPLP II in the Control Group	
	Spearman Correlation Coefficient	<i>P</i> *	Spearman Correlation Coefficient	<i>P</i> *
	Age	-0.018	.11	0.212
Education level	-0.611	.01	-0.017	.04
Household income	0.315	.03	0.133	.13

\**P* < .05.

HPB, including physical activity. The reason may be that the interventions have not been implemented systematically and based on the pre-intervention educational needs assessment. In the present study, the mean of the proper nutrition dimension in the intervention group after education had a noticeable increase compared to the control group, which may indicate the positive effect of the educational program on this group. These findings are consistent with the results of study by Vrdoljak et al<sup>25</sup> showing that education affected the improvement of adolescents' nutritional status, but they are not consistent with the findings of Hazavehei's<sup>26</sup> research that indicated the ineffectiveness of the education provided to university students in health variables, especially the nutrition dimension. The implementation of the desired educational intervention program did not affect the students' spiritual growth and did not lead to increasing or decreasing the tendency to this dimension. Whenever spiritual growth is applied to humans, it includes all his/her existential aspects, and many factors affect this growth.<sup>27</sup> The results of Chiou et al's<sup>28</sup> study entitled "The effect of the educational intervention using an interactive approach on behavior change" confirm these findings. However, this result was not consistent with the results of Lucchetti et al's<sup>29</sup> study concluding that various aspects of mental health affected individuals' religious attitudes and they were able to increase mental and spiritual health through educational interventions. The findings of the current study showed that the implementation of the desired educational intervention program did not have any effect on stress management, but the results of Heizomi et al's<sup>30</sup> study are not in line with these findings because the results of the mentioned study showed that holding counseling classes could be effective in promoting mental health, including youth stress control. Perhaps the reason for the ineffectiveness of the educational intervention on student stress management in this study can be attributed to the issue of the approximate co-occurrence of filling out the second stage questionnaire with students' exam days and the distortion of results by this issue. The findings of this study showed that the implementation of the desired educational intervention program directly affected students' interpersonal relationships. This result was consistent with the study of Thulaseedharan et al.<sup>31</sup> showing that the intervention had a positive effect on the mentioned variable and led to improved relationships and reduced depression. This study has the potential to make a meaningful contribution to the literature focused on understanding strategies for improving HPB, particularly among adolescents. As one of the first studies to use a sophisticated method such as empowerment-based e-learning on this topic, it has expanded our understanding of a new and available method, thus, broadening the scope of how prevention programs and efforts can meet the health needs of adolescents. Despite its strengths, the study has limitations that should be acknowledged. Differences among the participants in motives and interests might have affected their learning outcomes. However, subjects were randomly assigned to the intervention and control groups to minimize the effects of these variables. We only followed the participants for 8 weeks after the intervention had ended; therefore, long-term follow-up may produce different results.

The study results showed that the empowerment-based e-learning program was effective in the areas of health responsibility, physical activity, nutrition, and healthy interpersonal relationships. Comparing the scores of the dimensions of HPB in the intervention group showed that the most changes were related to the dimensions of responsibility, physical activity, nutrition, and interpersonal relationships, and the least changes were related to the area of stress management and spiritual growth, respectively. Given the effect of this educational approach, it is suggested that decision-makers and service providers in the field of health care use the results of the present study regarding adolescent health-promoting programs.

**Ethics Committee Approval:** This study was approved by the Guilan University of Medical Sciences Ethics Committee with the number "IR.GUMS.REC.1399.657" and date: March 10, 2021.

**Informed Consent:** Written informed consent was obtained from adolescents who participated in this study and their parents.

**Peer-review:** Externally peer-reviewed.

**Author Contributions:** Concept – Z.B., M.P.; Design – Z.B., M.P., M.R.; Supervision – Z.B., M.P.; Resources – Z.B., M.P.; Analysis and/or Interpretation – Z.B., M.P.; Writing Manuscript – Z.B., M.P., M.R.; Critical Review – M.R.

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