ORIGINAL ARTICLE

Health-Promoting Lifestyle Education Based on the Theory of Planned Behavior to Improve Students' Health Literacy

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Cite this article:

Jalambadani Z, Farmanabadi AA, Mahmoudi R. Health-Promoting Lifestyle Education Based on the Theory of Planned Behavior to Improve Students' Health Literacy. Int Rev Lifestyle Med. 2026;1(2):40-47.
https://doi.org/10.22034/irlm.2026.591523.1011

Article history

Received: 13 Jul 2026
Revised: 27 Jul 2026
Accepted: 08 Aug 2026

Abstract

Background and Objective: Health literacy is a critical determinant of health outcomes, particularly among future healthcare providers. This study aimed to evaluate the effectiveness of a lifestyle educational intervention, grounded in the Theory of Planned Behavior (TPB), on enhancing health literacy among medical sciences students in Iran.

Methods and Materials: A quasi-experimental study was conducted with 80 medical sciences students, equally divided into intervention (n=40) and control (n=40) groups. Data were collected using a demographic questionnaire, the Short Test of Functional Health Literacy in Adults (S-TOFHLA), and a TPB-based construct questionnaire. Measurements were taken at baseline (pre-test) and following the intervention (post-test). Data analysis was performed using SPSS, with statistical significance set at $p < 0.05$.

Results: The educational intervention significantly increased mean scores across all TPB constructs, including attitudes, subjective norms, perceived behavioral control, and behavioral intention, as well as overall health literacy. Pre-intervention literacy levels were categorized as follows: 53% adequate, 18% marginal, and 9% inadequate. Analysis of covariance (ANCOVA), after controlling for pre-test variables, revealed significant differences in total health literacy scores and its specific dimensions at post-test ($p < 0.001$).

Conclusion: The lifestyle educational intervention based on the Theory of Planned Behavior was effective in significantly improving health literacy among medical sciences students. These findings suggest that integrating TPB-based educational programs into medical curricula can be an effective strategy for promoting health literacy and improving health-related behaviors in future medical professionals.

Keywords: Health Literacy; Theory of Planned Behavior; Health Promotion; Students, Medical; Educational Interventions; Lifestyle; Health Behavior.

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Introduction

Health literacy is the ability to obtain, read, understand, and use healthcare information in order to make appropriate health decisions and follow instructions for treatment [1]. Because health literacy is a primary contributing factor to health disparities, it is a continued and increasing concern for health professionals [2]. The 2003 National Assessment of Adult Literacy (NAAL) conducted by the US Department of Education found that 36% of participants scored as either "basic" or "below basic" in terms of their health literacy and concluded that approximately 80 million Americans have limited health literacy [3].

A health-promoting lifestyle responds to a personal, conscious, and voluntary decision that is shaped by parents during the first years of life. Later, the decision is influenced by friends, teachers, and the school environment. University students may acquire unhealthy eating habits and become addicted to licit or illicit drugs. It is also common that they undervalue exercise, health responsibility, and nutritional issues [4]. A literature review revealed that most undergraduate health promotion interventions were primarily focused on a single health issue in England and Latin America [5].

Furthermore, the effectiveness of health education interventions depends to a large extent on the correct use of theories and models in health education science. Theories and models in health education science are bases for designing and implementing educational interventions through which the effects of educational interventions can even be measured and behaviors can be predicted [6]. Among the theories and models in health education science, the theory of planned behavior (TPB) is a complete and appropriate theory of behavioral change [6].

According to this theory, behavioral intention is the most important determinant of a person's behavior. Behavioral intention to perform a specific behavior is formed when people believe that performing that behavior has positive valuable consequences for them (attitude toward the behavior), influential and important people in their life think that the behavior should be done (subjective norms), and also performing that behavior is under their voluntary control (perceived behavioral control) [7].

Since the effectiveness of the TPB in changing lifestyles of different groups has been confirmed, and people are affected by important people in their lives, including family members, friends, and health care workers to perform health-promoting behaviors, and the TPB considers these influential factors with the subjective norms construct, the present study selected the TPB as a conceptual framework to evaluate whether an educational intervention based on the TPB with a focus on health-promoting lifestyles can promote the health literacy of medical sciences students. This study evaluated whether an educational intervention based on the Theory of Planned Behavior could improve health literacy among medical sciences students in Iran.

Methods and Materials

The present research was a quasi-experimental pre–post intervention-controlled study which was conducted to "study the effect of lifestyle educational intervention based on the TPB on promoting the health literacy of medical sciences students". The statistical population consisted of all medical sciences students covered by the 24-hour Comprehensive health services center in Iran. Inclusion criteria of the study were as follows: 18-30 years of age, having a minimum of primary school literacy, access to WhatsApp messenger program, and also the ability to use this technology by the participants themselves and a family member, not having a severe physical or mental illness, not participating in similar studies or training

classes in the last 6 months, and having the consent to participate in the study. Exclusion criteria: incomplete questionnaires, absence from more than one training session, unwillingness to continue cooperation, the occurrence of adverse events, and loss of access to WhatsApp during the educational intervention.

The number of samples was 40 in each intervention and control group. Multi-stage sampling was performed, so that two urban health posts affiliated to the 24-hour Comprehensive health services center in Iran were randomly divided into intervention and control groups. Then, a list of medical sciences students with the inclusion criteria was prepared in each group (intervention and control). A list of names was compiled in a separate list for each group, and 40 medical sciences students were selected from each health center by simple random sampling. The data collection tool consisted of 4 parts.

The first part included a demographic questionnaire, including age, marital status, education level, job status, ethnicity, family economic status, and the number of family members. The second part was a researcher-developed questionnaire a researcher-made questionnaire that was developed based on the TPB constructs and divided into four sections, including 1) Attitude towards behavior (18 items), 2) subjective norms (12 items), 3) perceived behavioral control (26 items), and 4) behavioral intention (5 items). This questionnaire had a total of 61 items that were designed based on a 5-point Likert scale. Scoring of items ranged from completely disagree (score 1) to completely agree (score 5). In some items, scoring was done in reverse. The minimum and maximum scores on this scale were 58 and 290, respectively.

The validity of the questionnaire was ensured by determining their formal and content validity. To evaluate the face validity, the questionnaire was completed by 10 persons with similar characteristics to those in the target group (they met the inclusion criteria), and ambiguous parts and difficult words and phrases were modified based on their opinion. The content validity was evaluated using coefficients of content validity ratio (CVR) and content validity index (CVI).

CVR above 0.72 and CVI above 0.79 were retained. Moreover, 20 study participants were asked to complete the questionnaire to evaluate the reliability of the questionnaires, and Cronbach's alpha coefficient was calculated subsequently. Cronbach's alpha coefficient for the questionnaire was determined at 0.86 which indicates reliability. Cronbach's alpha coefficient for the whole questionnaire and each construct of the questionnaire was higher than 0.7.

The third part included the Short Test of Functional Health Literacy in Adults [8] is an abbreviated version of the Test of Functional Health Literacy in Adults [9]. The TOFHLA consists of 17 Numeracy items and 3 prose passages (with 50 Cloze items) designed to measure patients' ability to read and understand the things they commonly encounter in the health care setting using actual materials like pill bottles and appointment slips (i.e., health literacy). The S-TOFHLA, which consists of 4 Numeracy items and 2 prose passages (with 36 Cloze items), was developed using an item selection process based on data from a large study that used the TOFHLA [9]. Numeracy items were selected based upon the perceived importance and frequency of the task in the health care setting, the proportion of patients who answered items incorrectly, and the perceived ease of administration. The maximum time for administration was reduced from 22 minutes to 12 minutes. The S-TOFHLA demonstrated good reliability and validity in a sample of hospital patients (PsycTests Database Record (c) 2020 APA, all rights reserved).

The panel of experts above was used to assess the content validity quantitatively. The content validity ratio (using the criteria of

essentiality), and the content validity index (using the criteria of relevance, clarity, and simplicity) were also calculated. Questions with content validity ratios of greater than 0.75 and content validity indexes of greater than 0.79 were accepted [10]. Cronbach's alpha coefficient was used to evaluate the reliability of the questionnaire. To this end, the questionnaires were given to 30 individuals in the target group, and Cronbach's alpha values above 0.70 were considered acceptable [10].

To gain trust and cooperation, sufficient explanations were given to the samples about the research purpose and methods during the telephone call, and they were assured that their participation in the study would be completely voluntary, and if they did not want, they could leave the study, and their information would be kept confidential by the researcher. After obtaining informed written consent, a pre-test was held among the intervention and control groups. During the pre-test, a direct link to the electronic form of demographic information questionnaire, health-promoting lifestyle questionnaire by Walker (only questions about the two dimensions of physical activity and spiritual growth), the Short Test of Functional Health Literacy in Adults (S-TOFHLA), and a researcher-made questionnaire based on the constructs of the TPB, and knowledge about physical activity and spiritual growth were given to them via WhatsApp.

According to the results of analysis of pre-test data and based on the constructs of the TPB. The first, the members of the intervention group were divided into four 10-individual groups, and a group was created in WhatsApp for each group, and the training sessions were held in five 45-minute sessions for the intervention group, and a 60-minute session for one of their family members about physical activity and spiritual growth over 2 months.

A night before each session, the education content, audio and video files, and assignments were sent to each individual's private profile as well as each group's public space, and they were asked about the time of tomorrow's session between 8 a.m. to 8 p.m. Finally, the group members discussed the material, exchanged ideas and assignments, asked and answered questions, and reported their practical activities online. The control group also received their routine care according to the integrated care guide for medical sciences students in Iran (the designed training package was given to the control group with a brief explanation after the study to maintain ethical considerations). One month after the educational intervention, the questionnaires were re-completed in the same way as the pre-test stage by the intervention and control groups to conduct the post-test. A telephone call was made with the participants every two weeks to review the training content and remind them to perform the taught healthy behaviors during the three months of waiting. The data obtained from the two intervention groups and the control group were inserted into SPSS 22 and finally analyzed.

Results

Based on the results, there was no statistically significant difference between the intervention and control groups in terms of age, family size, marital status, education level, job status, ethnicity, and family economic status at the pre-intervention assessment ($p > 0.05$) (Table 1).

Table 1 - Comparison of demographic information in two groups at the pre-intervention phase

Qualitative variable		Intervention group n (%)	Control group n (%)	p
Marital status	Single	8(20.5)	5(12.5)	[a]0.36
	Married	32(80.0)	35(87.5)	
	Elementary	3(7.5)	5(12.5)	[b] 0.22

Educational status	Middle school	5(12.5)	11(27.5)	
	High school & Diploma	18(45.0)	16(40.0)	
	University	14(35.0)	8(20.0)	
Employment status	Housewife	29(72.5)	34(85.0)	[a]0.20
	Government employee	6(15.0)	5(12.5)	
	Self-employed	5(12.5)	1(2.5)	
Ethnicity	Azeri Turks	30(75.0)	36(90.0)	[a]0.14
	Kurds	10(25.0)	4(10.0)	
Family income status	Low	6(15.0)	8(20.0)	[b] 0.83
	Medium	25(62.5)	23(57.5)	
	Good	9(22.5)	9(22.5)	
Quantitative variable		Mean±SD	Mean±SD	
Age (year)		67.50±8.02	66.00±6.44	[c] 0.13
Number of family members		3.90±1.29	3.62±1.07	[c] 0.13

Furthermore, there was no statistically significant difference between the intervention and control groups in terms of mean scores of attitude (towards physical activity and spiritual growth), subjective norms (about spiritual growth), perceived behavioral control (about physical activity), behavioral intention (about physical activity and spiritual growth), and Health literacy at the pre- educational intervention phase ($p > 0.05$) (Tables 2).

Table 2: Mean scores of the TPB constructs in the two groups at the pre- and post-intervention phases

Construct	Research phase	Groups		p
		Intervention Mean±SD	Control Mean±SD	
Attitude	Pre-intervention	41.02±6.68	41.42±4.37	[a]0.752
	Post- intervention	3.96±43.40	6.35±40.87	[*b]0.022
	p-within	[c]0.032	[c]0.567	
Subjective norms	Pre-intervention	36.90±6.29	36.87±5.87	[a]0.985
	Post- intervention	5.51±39.97	5.95±36.70	[*b]0.012
	p-within	[c]0.021	[c]0.871	
Perceived behavioral control	Pre-intervention	37.67±6.02	38.65±4.40	[a]0.411
	Post- intervention	5.64±40.05	4.64±38.72	[*b]0.088
	p-within	[c]0.022	[c]0.910	
Behavioral intention	Pre-intervention	36.25±5.94	37.30±5.00	[a]0.395
	Post- intervention	6.85±39.32	6.03±36.77	[*b]0.006
	p-within	[c]0.001	[c]0.526	

However, the results of intra-group comparison indicated that there was a statistically significant difference in the intervention group in terms of mean scores of all variables before and after the educational intervention ($p < 0.05$), while the difference was not statistically significant in the control group ($p > 0.05$) (Tables 3).

Table 3 - Mean score of Health literacy across the two groups (Pre- and post-intervention phases

Variable	Research phase	Groups		p
		Intervention Mean±SD	Control Mean±SD	
Health literacy	Pre-intervention	25.94±57.60	21.40±66.70	[a]0.091
	Post- intervention	21.29±68.29	21.69±66.40	[b]0.004*
	p-within	[c]0.001	[c]0.897	

Fifty three percent of students had adequate literacy, 18% marginal, and 9% inadequate literacy. After controlling for the pre-test variable effect, covariance analysis reflects significant difference in total health literacy score and its dimension at post-test ($p < 0.001$). Regarding the numeracy items of the S-TOFHLA, 79.5% of participants answered correctly to item 1, 95.1% for item 2 , 90% for item 3 (Appointment card) and 93.8% for item 4 (Correct medication taking). The mean score was 40.53 (SD=8.67) of the reading-comprehension passages and 4.34 (SD=0.96) of the numeracy items. The Chew screening measure consists of three questions, responses were scored on a scale from 0 to 4. The scores of item 1 were reversed. Then, the scores on the 3 items were added, therefore, the overall score ranged from 0 to 12. The higher scores indicate a lower health literacy level. The mean score was 6.25 (SD=2.5).

Discussion

This study found that the educational intervention was associated with improved health literacy among medical sciences students. The proportion with inadequate or marginal literacy reported in our sample was lower than proportions reported in some European and Iranian studies. These comparisons should be interpreted cautiously because the studies used different instruments: the S-TOFHLA assesses functional health literacy, whereas the HLS-EU questionnaire is self-reported and also addresses social dimensions and broader health-literacy competencies [11,12,13].

The reported association between the S-TOFHLA and the NVS supports construct validity. The Chew screening questions were only weakly associated with the S-TOFHLA and NVS, consistent with findings from a Turkish study [14]. These instruments may capture different aspects of health literacy [13], and self-report responses may be affected by social-desirability bias [15] or overconfidence [16]. Thus, the Chew measure may be useful as a brief indicator of patients' perceived functional-literacy difficulties, but its results should be interpreted cautiously.

In this study, older participants and those with lower educational attainment tended to have lower health-literacy scores, in keeping with previous research [11,12,17]. Income was also associated with health literacy in some analyses, although the association was not consistent across measures. Other studies have reported associations between health literacy and sex, income, and chronic illness [17,18,19]. These findings underscore the importance of considering population characteristics and the measurement instrument when interpreting health-literacy differences.

The present study has limitations. The findings are based on a quasi-experimental design and self-reported or questionnaire-

based measures; therefore, causal interpretation and generalizability should be made with caution. Further studies using larger and more diverse samples and longer follow-up are warranted.

Funding: None.

Study registration: N/A.

Competing interests: The authors declare no conflicts of interest.

Ethical approval: Ethical approval in this study, all procedures performed on human samples were conducted following the relevant guidelines and regulations of the Helsinki Declaration. The study protocol was approved by the Research Ethics Committee in Iran (IR.IAU.TJ.REC.1403.006).

Informed consent: Written informed consent was obtained from the participants for publication of this research.

Data sharing: Data are available upon reasonable request to the corresponding author. The data are not publicly available due to their containing information that could compromise the privacy of research participants.

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