



Effects of a healthy lifestyle and behavior-related knowledge intervention on college students in Huai'an City, Jiangsu Province

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Background: This study aimed to evaluate the effect of a health education intervention on healthy lifestyle and behavior-related knowledge among college students.

Methods: We used an epidemiological experimental research design and multistage random cluster sampling. The health education intervention was conducted in the intervention group for two semesters. The pass rates on the healthy lifestyle and behavior knowledge questionnaire before and after the intervention were compared and analyzed using the chi-square test and logistic regression.

Results: The pass rate significantly increased by 11% in the intervention group, compared to 4.7% in the control group. Single factor analysis showed that pass rates increased in 7 subgroups of the intervention group but not in those of the control group. Pass rates experienced an upward trend in 8 subgroups of both the intervention and control groups. However, the pass rates did not improve in only one subgroup (i.e., ethnic minorities) of either the intervention or control group. Multiple regression analysis showed that in the intervention group, urban residence [odds ratio (OR), 1.394; 95% confidence interval (95% CI), 1.205–1.612], female sex (1.486; 1.292–1.708), having low-educated parents (1.682; 1.061–2.666), having high-educated parents (1.627; 1.024–2.585), belonging to the Han ethnic group (2.142; 1.317–3.484), and having a household income of $\geq 7,000$ yuan (1.246; 1.105–1.405) were positively associated with higher pass rates. In the control group, the pass rate among sophomores was 1.291 (1.152–1.447) times higher than that among freshmen. Students from the Han ethnic group had a higher pass rate than those from ethnic minorities (1.291; 1.152–1.447). In the intervention group, the pass rate was 1.587 (1.410–1.786) times in the end-line survey than in the baseline survey.

Conclusions: Health education intervention can improve the pass rate on healthy lifestyle and behavior questionnaires among college students. College students can actively improve their lifestyles and behaviors using the existing health information and health education methods.

Keywords: Healthy lifestyle and behavior; pass rate; college students; Huai'an City

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Introduction

Unlike primary and secondary school students, college students have more freedom because they tend to be less strictly managed by parents and teachers. However, they lack self-discipline and basic living skills. As a result, they may take up unhealthy lifestyles, for example having low levels of physical activity, having unbalanced diets, or indulging in online games (1), which severely affect their health. With the changes in the disease spectrum and the death spectrum, chronic non-communicable diseases have become the main causes of death. Besides, health education at the core of various disease prevention measures is becoming increasingly strategic (2). The World Health Organization clearly states that behavior and lifestyles determine 60% of a person's health and longevity (3); hence, the promotion of healthy lifestyles and behavior plays the core role in health education (2). Therefore, it is of great importance to carry out health education interventions in college students and study their results. In 2015, we adopted experimental epidemiology as the research method to conduct a health education intervention study in college students in Huai'an City. This study aimed to evaluate the effect of a health education intervention on healthy lifestyle and behavior-related knowledge among college students.

Methods

Subjects

The participants in our study included freshmen and sophomores studying at colleges in Huai'an City.

Study methods

Sampling method

In this study, we used the multi-stage cluster random sampling method to randomly select four colleges in Huai'an city. Then, two of the four colleges were randomly assigned to the experimental group and the other two to the control group. Based on the sample size, corresponding classes were randomly selected as per the academic level (i.e., freshman or sophomore). Finally, all of the students from those classes were recruited in the survey.

Survey method

Through questionnaire factor analysis, KMO value was 0.897, Cronbach's alpha reliability coefficient was 0.774, and the validity and reliability were high. The investigators

included staff from Huai'an City Center for Disease Control and Prevention, and those working in such departments as student affairs offices, student unions, and youth league committees. Respondents fill in informed consent.

Assessment criteria

The total score of the questionnaire is 100 points. A student's knowledge of healthy lifestyles and behavior is considered to be qualified if he or she scores at least 60 points. The rate of surveyed college students scoring 60 points or higher is the student pass rate on the health knowledge questionnaire.

Health education intervention

In collaboration with the Municipal Department of Education and relevant colleges, Huai'an City Center for Disease Control and Prevention carried out this health education intervention program in 2015. The baseline survey was conducted from late April to early May of this year. Then, health education interventions, focusing on healthy lifestyles, health knowledge and concepts, and health skills, were conducted for students in the intervention colleges for two semesters. During the intervention period, two large-scale health education lectures were organized in these two colleges, with an audience of more than 3,000 college students. Eight health knowledge exhibition boards were made and exhibited for nearly 4 months. Besides, more than 9,000 copies of three types of leaflets were produced and distributed, focusing mainly on sexual, reproductive, and mental health, together with 66 items of health literacy, safety emergency, and common disease prevention. More than 1,000 copies of two types of posters named "Strengthening Health Education to Improve Health" were printed. More than 2,600 copies of 26 types of health window materials, more than 600 copies of six types of publicity pictures, and more than 3,000 health education books were distributed.

Quality control

We explained to the students about the purposes of this study, informed them about its confidentiality, and asked them to sign the informed consent forms. Students were then requested to complete the questionnaires independently and carefully under strict invigilation. After the survey, the questionnaires were checked for both

Table 1 Codes and assignments of values to variables in the logistic regression model

Code	Variable	Assignment of values
Y	Healthy lifestyle and behavior knowledge	Fail = 0; pass = 1
X ₁	Area of residence	Rural = 0; urban = 1
X ₂	Gender	Male = 0; female = 1
X ₃	Major	Liberal arts = 0; sciences = 1
X ₄	Parents' highest education level	Illiterate or barely literate = 0; primary school = 1; secondary School = 2; high school/vocational school/polytechnic school or above = 3
X ₅	Ethnic group	Han group = 0; Minority groups = 1
X ₆	Annual per-capita household income (yuan)	<7,000 = 0; ≥7,000 = 1
X ₇	Before or after the intervention	Baseline = 0; end-line = 1

completeness and consistency of response. Finally, the rate of qualified questionnaires was 99.3%.

Statistical analysis

In this study, data were entered using EpiData 3.02 and analyzed using SPSS 17.0. The Chi-squared test was used for univariate analysis, while logistic regression for multivariate analysis, with healthy lifestyle and behavior knowledge (pass = 1; fail = 0) as the dependent variable. The variables found to be statistically significant in univariate analysis were included as independent variables in the multivariate logistic regression analysis model. They included area of residence, gender, major, parents' highest education level, ethnic group, annual per-capita household income, and before or after the intervention (*Table 1*). A P value equal to or less than 0.05 was considered statistically significant.

Results

General characteristics of participants

The baseline survey had the participation of 4,527 college students (2,306 in the intervention group and 2,221 in the control group). Meanwhile, 4,890 college students were recruited in the end-line survey (2,308 in the intervention group and 2,582 in the control group). The ratio of urban-to-rural students before the intervention was 1:3.15, compared to 1:3.44 after the intervention. The ratios of freshmen to sophomores before and after the intervention were 1:1.16 and 1:1.08, respectively. Students majoring in liberal arts accounted for 36.6% before the intervention and

37.3% after the intervention, whereas those majoring in sciences constituted 63.4% and 62.7%, respectively. Almost all college students participating in both surveys belonged to the Han ethnic group (both 98.1% before and after the intervention). None of these four characteristics were significantly different between the two surveys ($P>0.05$). The highest education level of the students' parents was high school or above (46.7% before the intervention *vs.* 44.4% after the intervention), followed by secondary school (42.0% before the intervention *vs.* 43.9% after the intervention) (*Table 2*).

Comparison of pass rates before and after the intervention

After the intervention, the student pass rates on the healthy lifestyle and behavior knowledge questionnaire in the 7 subgroups (i.e., female, freshman, liberal arts, illiterate or barely literate, primary school, and secondary school) statistically significantly improved in the intervention group ($P<0.05$), but not in the control group ($P>0.05$). However, the pass rates in 8 subgroups, namely rural, urban, male, sophomore, sciences, high school or above, the Han ethnic group, the household income of ≥7,000 yuan, and household income, all improved in both the intervention and control groups. The increase in the pass rates among students from ethnic minority groups after the intervention was not statistically significant in both groups (*Table 3*).

Multivariate logistic regression analysis

According to the binary logistic regression model, six factors were closely associated with the pass rates in the

Table 2 Characteristics of college students in Huai'an City in the baseline and end-line surveys

Characteristics	Baseline survey (n=4,527), n (%)	Endline survey (n=4,890), n (%)
Area of residence		
Rural	3,437 (75.9)	3,789 (77.5)
Urban	1,090 (24.1)	1,101 (22.5)
Gender		
Male	2,086 (46.1)	2,150 (44.0)
Female	2,441 (53.9)	2,740 (56.0)
Academic level		
Freshman	2,430 (53.7)	2,544 (52.0)
Sophomore	2,097 (46.3)	2,346 (48.0)
Major		
Liberal arts	1,656 (36.6)	1,825 (37.3)
Sciences	2,871 (63.4)	3,065 (62.7)
Parents' highest education level		
Illiterate or barely literate	106 (2.3)	104 (2.1)
Primary school	405 (8.9)	468 (9.6)
Secondary school	1,900 (42.0)	2,145 (43.9)
High school/vocational school/polytechnic school, or above	2,116 (46.7)	2,173 (44.4)
Ethnic group		
Han group	4,442 (98.1)	4,799 (98.1)
Minority groups	85 (1.9)	91 (1.9)
Annual per-capita household income (yuan)		
<7,000	2,333 (51.5)	2,883 (59.0)
≥7,000	2,194 (48.5)	2,007 (41.0)

intervention group (*Table 4*), compared to only three factors in the control group (*Table 5*).

Discussion

In the 21st century, with the changes in people's lifestyles, new diseases have sprung up, which imposes new requirements on medical workers (4). Healthy lifestyles and behavior are vital not only for disease prevention but also for physical and mental health promotion (5). They also exert a positive effect on the growth of college students (6). Generally, the behavior changes of individuals and groups are complex and long-lasting (7), but health education

interventions can effectively promote the formation of healthy behavior patterns (8).

The Chi-squared analysis of this study implied that the pass rates on the healthy lifestyle and behavior knowledge questionnaire improved in 7 subgroups of the intervention group, but not in the corresponding ones of the control group (the difference was not statistically significant). It can be said that students in these 7 subgroups were more willing to accept the intervention, and the effect of the intervention was positive. The pass rates in 8 subgroups improved in both the intervention group and the control group. This indicates that college students accumulated their health knowledge from the existing health education channels,

Table 3 Student pass rates on the healthy lifestyle and behavior knowledge questionnaire before and after the health education intervention (%)

Characteristics	Intervention group (%)			Control group (%)		
	Before intervention (n=2,306)	After intervention (n=2,306)	P	Before intervention (n=2,221)	After intervention (n=2,582)	P
Area of residence						
Rural	37.3	49.3	0.000	46.1	50.0	0.016
Urban	48.4	57.0	0.003	45.6	53.2	0.016
Gender						
Male	32.5	44.6	0.000	45.4	50.3	0.010
Female	44.1	54.2	0.000	46.9	51.1	0.057
Academic level						
Freshman	37.4	51.7	0.000	44.4	46.6	0.254
Sophomore	43.3	50.8	0.000	48.1	55.3	0.001
Major						
Liberal arts	46.1	51.0	0.016	46.3	51.4	0.099
Sciences	34.0	51.5	0.000	45.9	50.5	0.006
Parents' highest education level						
Illiterate or barely literate	13.3	46.8	0.000	34.4	43.9	0.294
Primary school	34.0	48.5	0.004	34.4	43.9	0.294
Secondary school	41.0	49.6	0.000	48.0	51.5	0.114
High school/vocational school/polytechnic school, or above	40.2	53.5	0.000	45.3	50.9	0.011
Ethnic group						
Han group	40.6	51.5	0.000	46.2	50.9	0.001
Minority groups	20.5	37.5	0.084	34.1	39.2	0.617
Annual per-capita household income (yuan)						
<7,000	38.3	47.4	0.000	45.8	48.5	0.168
≥7,000	42.4	56.4	0.000	46.2	54.0	0.000
Total	40.2	51.2	0.000	46.0	50.7	0.001

including newspapers, television, health lectures, and bulletin boards. Conversely, the effect of the intervention on college students from ethnic minorities was not obvious. This might be due to their poor family conditions (9). Some studies have suggested that low family income may lead to low levels of health or behavioral literacy, or the adoption of unhealthy lifestyles (10,11). As a result, college policies such as “student grants and loans” should give appropriate preference to minority students so that they have sufficient

economic resources to increase their health investment.

In practice, colleges should: (I) take the initiative to cooperate with community hospitals and local health education institutions; (II) carry out health education activities through college league committees, student unions, and student societies; and (III) make full use of new media to widely publicize the knowledge of healthy lifestyles and behavior with audiovisual contents at the core (12). In addition, they should create a supportive

Table 4 Logistic regression analysis of factors influencing pass rates in the intervention group of college students in Huai'an City

Factor	β	S.E.	Wald χ^2	P	OR (95% CI)
Area of residence	0.332	0.074	20.063	0.000	1.394 (1.205–1.612)
Gender	0.396	0.071	31.017	0.000	1.486 (1.292–1.708)
Major	–0.059	0.066	0.815	0.367	0.942 (0.828–1.072)
Parents' highest education level					
Illiterate or barely literate	–	–	–	–	1.000
Primary school	0.413	0.253	2.665	0.103	1.512 (0.920–2.484)
Secondary school	0.520	0.235	4.889	0.027	1.682 (1.061–2.666)
High school/vocational school/polytechnic school, or above	0.487	0.236	4.241	0.039	1.627 (1.024–2.585)
Ethnic group	0.762	0.248	9.427	0.002	2.142 (1.317–3.484)
Annual per-capita household income	0.220	0.061	12.860	0.000	1.246 (1.105–1.405)
Before or after the intervention	0.462	0.060	58.438	0.000	1.587 (1.410–1.786)

Table 5 Logistic regression analysis of factors influencing pass rates in the control group of college students in Huai'an City

Factor	β	S.E.	Wald χ^2	P	OR (95% CI)
Academic level	0.255	0.058	19.246	0.000	1.291 (1.152–1.447)
Ethnic group	0.473	0.219	4.682	0.030	1.605 (1.046–2.463)
Before or after the intervention	0.183	0.058	9.857	0.002	1.200 (1.071–1.345)

environment for students so that the latter would become followers, practitioners, carriers, and disseminators of health culture (13). Accordingly, they can elevate health knowledge to health beliefs (14), actively engage in disseminating health knowledge, and affect people around them with positive health behavior. Publicity is indispensable to make every college student understand that bad individual health behavior is a major pathogenic factor, thereby fostering their awareness of the threat of diseases (15). Students must be well aware of the benefits of behavioral changes. For instance, college students should pay more attention to dietary structures and healthy diet in that a healthy dietary model is particularly critical for maintaining physical health (16). Moreover, they should also do more physical exercise to improve their health (17–19). Even when students have already grasped health knowledge and beliefs, behavior changes remain a big challenge to them (15). Therefore, school doctors and other professionals should be encouraged to play their due roles in intervening and correcting bad behavior of college students in order to

improve their health literacy and skills (20). Policy-oriented health education interventions should also be performed to facilitate the development of healthy lifestyles among college students (21).

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Footnote

Conflicts of Interest: All authors have completed the ICMJE uniform disclosure form (available at <http://dx.doi.org/10.21037/jphe.2019.12.03>). The authors have no conflicts of interest to declare.

Ethical Statement: The authors are accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are

appropriately investigated and resolved. The center for Disease Control and prevention of Huai'an City encoded the personal information of the population. According to ethical standards, the survey is in line with the declaration of Helsinki (as revised in 2013).

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