

ORIGINAL RESEARCH

Associations between health promotion behaviors and multidimensional health among Chinese middle-school students—a study focusing on gender differences

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(Hua Tian)**Abstract**

Adolescence is a crucial period for establishing lifelong healthy behaviors, and unhealthy habits developed during adolescence can increase the risk of chronic diseases in adulthood. However, few is on the relationships between health promotion behaviors and multidimensional health in Chinese middle-school students, focusing on identifying gender-specific differences. This study employed a non-experimental, correlational design using online surveys to collect data from 179 middle-school students and 103 teachers. Data analysis was conducted using SPSS v20, including ordinal logistic regression analysis, Chi-square tests and *t*-tests. The results indicate that approximately 43.7% of middle-school teachers perceive that rural students as having effective health promotion behaviors. Female students demonstrated higher levels of health promotion behaviors than males, with significant gender differences observed in health responsibility behavior ($p = 0.011$) and interpersonal relationships ($p = 0.025$). However, no gender differences were found in the multidimensional health of rural middle-school students. Both male and female students showed concerning levels of physical health, with only 38.2% of males and 37.78% of females rated as good or excellent. Notably, life appreciation behavior was identified as the only significant predictor of multidimensional health among these students, indicating that higher scores in this domain correlate with better health. Health educators and policymakers are advised to account for gender differences in the development and delivery of health promotion initiatives aimed at adolescents, with a particular emphasis on fostering life appreciation. Interventions focused on these aspects may offer substantial potential in diminishing health risks in adulthood and enhancing overall lifelong well-being.

Keywords

Health promotion behaviors; Multidimensional health; Rural middle-school students; Middle-school teachers

1. Introduction

The World Health Organization (WHO) advocates for the support of lifestyle improvements through health promotion behaviors, identifying this approach as a key strategy for countries globally to address health challenges [1]. The adolescent period is crucial for establishing lifelong healthy behaviors and taking responsibility for healthcare, making a special time when risky may emerge. Good health promotion behavior is essential for an individual's quality and is significant determinant of health and happiness [2]. Adolescent health promotion behaviors encompasses not just disease prevention, such as maintaining a balanced diet, ensuring proper nutrition, and forming dietary habits [3], but also involves responsibility, valuing life, managing stress, seeking social support and the ability to search for health information online. Influential factors on health promotion behavior include self-efficacy,

self-esteem, perceived health status, levels of optimism and pessimism, eHealth literacy, the utilization of social media for health information, and health information—seeking behavior [4]. Importantly, gender is identified as a critical factor in adolescent health promotion, affecting health behaviors engagement in healthcare, and the quality of care received [5].

Currently, research participation is predominantly observed in the United States and European countries. Even in China, a significant portion of studies are performed on college students and chronic conditions in middle-aged and older populations, while research on middle school students is significantly lacking, which is seriously inconsistent with the current severe health of adolescents in China. The ongoing assessment of adolescent health promotion behaviors, encompassing nutrition, physical activity, social responsibility and stress management, is essential for the strategic planning and execution of appropriate care services tailored to adolescents across various

stages. Research has identified that the school based physical education and health promotion interventions exhibit gender specific effects on the physical performance of sixth grade students, yielding positive short-term outcomes for both genders [6]. Therefore, we performed this study to investigate the relationships and gender differences in health promotion behavior and multidimensional health among rural middle-school students in China to provide theoretical framework for targeted health interventions within this demographic.

2. Literature review

Adolescence is a critical phase characterized by rapid physical growth and cognitive development encompassing, not only physical and cognitive changes but also emotional, moral and spiritual development [7]. During this period, many lifelong health habits are established, including imbalanced diets, insufficient physical activity, poor mental health, high psychological stress, and sometimes violent behavior [8]. These unhealthy behaviors signal a long-term risk of chronic diseases in adulthood, with lifestyle factors, such as depression, anxiety and poor health-related quality of life being closely linked to elevated health risks [9]. Nearly two-thirds of premature deaths in early adolescence and one-third of adult illnesses can be attributed to unhealthy lifestyle habits and risky behaviors initiated during adolescence. Thus, the assessment and improvement of health-promoting behaviors among adolescents is a pivotal area of international research.

In 1986, the WHO held the inaugural Global Health Promotion Conference in Ottawa, Canada, formally introducing the term of “health promotion”. This concept encompasses a range of social behaviors and strategies aimed at engaging various societal components—including members, departments, communities, families and individuals through administrative and organizational means, to share the responsibility of health maintenance and promotion. In 1987, Pender proposed the concept of health-promoting lifestyle, describing it as actions individuals undertake to maintain or enhance their health, achieve self-satisfaction, and realize their potential self-actualization [10]. Nola *et al.* [11] (1990) further distinguished that health promotion behavior from disease prevention, characterizing it as all individual actions aimed at sustaining and improving well-being, happiness, and health levels.

Research has identified gender disparities in health promotion behaviors among adolescents. An examination of college students’ life appreciation revealed its association with both physical activity and stress management, with the correlation being stronger in males compared to females [12]. The COVID-19 pandemic, which resulted in school closures, increased the risk of obesity among adolescents due to reduced physical activity, with females experiencing a more significant increase than males [13]. In Iran, risky health behaviors are observed more frequently among male adolescents than females [14]. A study focusing on health behavior in rural middle and high schools in Pennsylvania, USA, found that female students showed greater interest in weight loss and healthy eating or cooking practices, whereas male students were more inclined towards weightlifting [15]. Furthermore, the health promotion behavior of adolescents is influenced

by the level of eHealth literacy. In Turkey, strong positive relationship between eHealth literacy and the health promotion behaviors of adolescents was found, including health responsibility, engagement in sports activities, nutrition, spiritual growth, interpersonal relationships, and stress management [16]. In China, the eHealth literacy has significant gender difference among university students, and those with high eHealth literacy have a higher ability to participate in health-related behaviors [17, 18]. Generally, female adolescents have more positive health promotion behaviors than male adolescents [19], but they often lag behind male adolescents in terms of sports and physical activity [20, 21].

Adolescence is a critical developmental period for individuals to establish lifelong healthy behaviors and take responsibility for their healthcare. To this end, the relationship between health promotion behaviors and multidimensional health was explored, providing theoretical reference for formulating intervention strategies for adolescent physical and mental health, so as to achieve precise intervention in adolescent health.

3. Materials and methods

3.1 Design of study

This non-experimental association study was performed using questionnaires referenced from literature with slight modifications, and the addition of demographic information. They were distributed to rural middle-school students and middle-school teachers in the Henan province of China in October 2023 and lasted for approximately 8 weeks. The health promotion behavior data of rural middle school students included self-reports from students and teacher reports.

3.2 Questionnaire

The student and teacher questionnaires were distributed online using Wenjuanxing software (<https://www.wjx.cn/>). Links to the questionnaires were sent to student class WeChat groups, inviting voluntary and anonymous participation. A total of 222 rural middle-school students were recruited and voluntarily participated in the survey, with parental consent obtained for all student participants. Additionally, 103 middle school teachers participated voluntarily. Participants were deemed ineligible if their questionnaire responses were incomplete, such as entirely, unanswered questions, incomplete demographic information, or if they did not belong to the target group of rural middle-school students. Incomplete submissions were excluded ($n = 43$) resulting in 179 valid student questionnaires, achieving a response rate of 80.63% and 103 valid teacher questionnaires, with a response rate of 100%.

Participant recruitment was conducted as follows: researchers distributed the questionnaire link to student class WeChat groups during weekends to recruit voluntary participants. For teacher participants, the questionnaire links were sent to class groups associated with the 2019, 2020 and 2021 “National Training Plan” to engage middle-school teachers on a voluntary basis. Participation in the questionnaire was anonymous, voluntary and unpaid. Middle-school students and teachers interested in participating were able to freely and independently complete the questionnaire

using their computers or smartphones.

The reliability and validity of the questionnaires were confirmed through statistical measures. The student questionnaire yielded a Cronbach's Alpha of 0.901, and a Kaiser-Meyer-Olkin (KMO) measure of 0.921, indicating high reliability and sampling adequacy. Similarly, the teacher questionnaire had a Cronbach's Alpha of 0.920, and a KMO measure of 0.861, further evidencing good reliability and validity for both instruments.

3.3 Participants

3.3.1 Rural middle-school students

The survey targeted eighth grade students from a rural middle school in Shangshui County, Zhoukou City, China. The male to female ratio is equivalent, with 49.7% and 50.3%, respectively (Table 1). The educational level of their parents is relatively low. These students reside at the school on weekdays (Monday to Friday) and spend weekends at home. Predominantly, their families rely on agriculture as their primary source of income, with many parents opting to seek employment away from home. Thus, during weekends, the students primarily reside with elderly family members.

TABLE 1. Rural student demographic characteristics (n = 179).

Characteristics	Frequency	Proportion (%)
Gender		
Male	89	49.7
Female	90	50.3
Age	13.68 ± 0.613	
Parental educational level		
Junior high school and below	136	76.0
Senior middle-school	27	15.1
Polytechnic school	8	4.5
Junior college	3	1.7
University/college/above	5	2.8

3.3.2 Middle-school teachers

The questionnaire respondents from the teaching staff were middle-school biology teachers who had participated in the "National Training Plan" conducted by Xinyang Normal University during the years 2019, 2020 and 2021 (Table 2). These educators, having several years of teaching experience in middle schools situated in rural, town, county and urban areas within Henan province, possess significant expertise, making them reliable in assessing the health promotion behaviors of their students with a high degree of scientific accuracy and objectivity.

3.4 Measures

TABLE 2. Middle-school teacher demographic characteristics (n = 103).

Characteristics	Frequency	Proportion (%)
Middle-school zones		
Village/town	48	46.6
County	40	38.8
Urban	15	14.6
Gender		
Male	34	33.0
Female	69	67.0
Education		
Junior college	14	13.6
University/college	70	68.0
Postgraduate	19	18.4
Length of teaching		
0–5	40	38.8
6–10	12	11.7
11–15	7	6.8
>15	44	42.7

3.4.1 Multidimensional health

The multidimensional health of rural middle-school students includes three dimensions (**Supplementary Table 1**): self-reported health, physical health, and mental health [22]. Self-reported health is a subjective evaluation of one's overall health status. It is measured by the response to questions such as "What do you think of your current health status?" with five options ranging from "very unhealthy, unhealthy, general and relatively healthy" to "very healthy" assigned values from 1 to 5, respectively. A higher score reflects a better self-reported health status. Physical health is assessed through questions such as "Do you feel energetic?" while mental health is evaluated using questions such as "Are you full of hope for your future life?". There were five options for the two questions, which were assigned a value from 1 to 5, "never, rarely, sometimes, often and always", with higher scores on these dimensions indicating better physical and mental health.

3.4.2 Health promotion behaviors

Health promotion behaviors of rural middle-school students include six dimensions (**Supplementary Table 2**): exercise behavior, dietary and nutritional behavior, health responsibility behavior, interpersonal relationship behavior, stress management behavior and life appreciation behavior [23]. Each domain comprises five items, rated on a Likert scale from 1 ("strongly disagree") to 5 ("strongly agree"), yielding scores ranging from 5 to 25. In addition to the self-report of health-promotion behaviors among rural middle school students, this study also included teachers' evaluations of health-promoting behaviors of rural middle school students (**Supplementary Table 3**), including six dimensions mentioned above. Each dimension contains one question, and each question ranges from 1 for "very poor" to 5 for "excellent", with higher scores

indicating better health promotion behaviors.

3.5 Data analysis

Ordinal logistic regression analysis, Chi-square tests, and *t*-tests were conducted using SPSS v20 (IBM, Armonk, NY, USA) Descriptive statistics, including means, standard deviations (SD), frequencies and proportions, were also calculated.

4. Results

4.1 Middle-school teachers' evaluations on student health promotion behaviors

As shown in Table 3, the proportion of responses rated as excellent or good varied across different behaviors: exercise behavior (43.7%), dietary and nutritional behavior (51.5%), health responsibility behavior (45.7%), interpersonal relationship behavior (65.0%), stress management behavior (52.5%), and life appreciation behavior (60.2%). According to middle-school teachers, rural middle-school students exhibited a range of good health promotion behaviors, with the lowest at 43.7% and the highest at 65.0%.

The Chi-square test results revealed significant correlations between students' exercise behavior ($p = 0.005$) and dietary and nutritional behavior ($p = 0.006$) with the educational background of teachers. Other demographic characteristics of teachers, including the geographical location of the middle school, gender and years of teaching experience, did not show a significant relationship with their evaluations of health promotion behaviors, suggesting that teachers' assessments of rural middle-school students' health promotion behaviors could be largely unaffected by their demographic characteristics.

4.2 Gender differences in students' health promotion behaviors and multidimensional health

Among male and female rural middle-school students (Table 4), the three highest-rated health promotion behaviors were dietary and nutritional behavior ($p = 0.214$), life appreciation behavior ($p = 0.130$), and interpersonal relationship behavior ($p = 0.025$), with exercise behavior being rated the lowest ($p = 0.758$). Significant gender differences were observed in two of the six health promotion behavior dimensions: health responsibility behavior ($p = 0.011$) and interpersonal relationship behavior ($p = 0.025$). Females exhibited higher levels of health promotion behaviors compared to males.

Table 5 reveals that the Chi-square test found no significant gender differences in the multidimensional health of rural middle-school students. Specifically, 58.43% of male students and 47.78% of female students reported good overall health. Physical health was reported as good by 38.2% of males and 37.78% of females. Mental health was reported as good by 51.69% of males and 58.89% of females. These findings indicate that male students reported the poorest physical health but the best overall health, whereas female students reported the best mental health and the poorest physical health. The concern for physical health status among both male and female rural middle school students highlights the need for targeted interventions.

4.3 Associations between health promotion behaviors with multidimensional health

Using SPSS software, three ordinal logistic regression analyses were conducted to examine the relationships between health promotion behaviors and multidimensional health among rural middle-school students in China (Table 6). The analyses revealed that exercise behavior and life appreciation behavior were positively and significantly related to students' self-reported health. Additionally, exercise behavior, dietary and nutritional behavior and life appreciation behavior showed

TABLE 3. Teachers' evaluations on student health promotion behaviors (n = 103, %).

Characteristics	Exercise behavior	Dietary and nutritional behavior	Health responsibility behavior	Interpersonal relationship behavior	Stress management behavior	Life appreciation behavior
Dimensions						
Very poor	2 (1.9)	2 (1.9)	3 (2.8)	1 (1.0)	1 (1.0)	1 (1.0)
Poor	11 (10.7)	14 (13.6)	9 (8.7)	6 (5.8)	14 (13.6)	6 (5.8)
General	45 (43.7)	34 (33.0)	44 (42.7)	29 (28.2)	34 (33.0)	34 (33.0)
Good	31 (30.1)	38 (36.9)	36 (35.0)	51 (49.5)	42 (40.8)	42 (40.8)
Excellent	14 (13.6)	15 (14.6)	11 (10.7)	16 (15.5)	12 (11.7)	20 (19.4)
<i>p</i>						
Middle-school zones	0.395	0.190	0.250	0.428	0.158	0.207
Gender	0.190	0.752	0.609	0.283	0.630	0.537
Education	0.005	0.006	0.474	0.266	0.191	0.474
Length of teaching	0.300	0.433	0.938	0.991	0.461	0.897

Note. *p* value obtained using Chi-square test.

TABLE 4. Gender differences in students' health promotion behaviors (n = 179).

Characteristics	Male	Female	<i>p</i>
Exercise behavior	12.90 ± 4.401	13.11 ± 4.784	0.758
Dietary and nutritional behavior	18.24 ± 4.938	19.09 ± 4.175	0.214
Health responsibility behavior	14.91 ± 5.147	16.82 ± 4.840	0.011
Interpersonal relationship behavior	16.98 ± 5.370	18.66 ± 4.547	0.025
Stress management behavior	16.85 ± 5.102	17.44 ± 5.073	0.439
Life appreciation behavior	17.37 ± 5.714	18.60 ± 5.079	0.130
Total	97.25 ± 26.759	103.72 ± 23.947	0.090

Note. *p* values were derived using *t*-test.

TABLE 5. Gender differences in students' multidimensional health (n = 179).

Characteristics	Self-reported health			Physical health			Mental health		
	Male	Female	<i>p</i>	Male	Female	<i>p</i>	Male	Female	<i>p</i>
Very poor	5	1		8	4		11	2	
Poor	5	5		13	16		8	4	
General	27	41	0.171	34	36	0.792	24	31	0.062
Good	33	27		22	22		18	20	
Excellent	19	16		12	12		28	33	

Note. *p* values were obtained using Chi-square test.

TABLE 6. Ordinal logistic regression analysis (n = 179).

Characteristics	Self-reported health		Physical health		Mental health	
	(B, <i>p</i>)	(B, <i>p</i>)	(B, <i>p</i>)	(B, <i>p</i>)	(B, <i>p</i>)	(B, <i>p</i>)
Exercise behavior	0.166	0.001	0.097	0.049	0.040	0.479
Dietary and nutritional behavior	0.086	0.081	0.132	0.006	0.024	0.620
Health responsibility behavior	-0.034	0.566	-0.016	0.796	0.003	0.960
Interpersonal relationship behavior	-0.015	0.778	-0.133	0.010	-0.059	0.309
Stress management behavior	0.016	0.746	0.092	0.061	-0.011	0.847
Life appreciation behavior	0.166	0.003	0.212	<0.001	0.494	<0.001
Gender (Ref: male)	-0.391	0.210	-0.014	0.964	0.593	0.075
Age	-0.075	0.764	-0.338	0.176	-0.282	0.289
Parental educational level (Ref: Junior high school and below)						
University/college/above	0.931	0.371	1.359	0.173	0.707	0.572
Junior college	-2.304	0.032	-0.588	0.577	-0.304	0.777
Polytechnic school	-0.477	0.480	0.247	0.716	0.762	0.316
Senior middle-school	0.152	0.714	-0.041	0.918	0.672	0.130

positive and significant associations with students' physical health. Conversely, interpersonal relationship behavior exhibited a negative and significant relationship with physical health. Life appreciation behavior also demonstrated a positive and significant correlation with mental health.

Overall, life appreciation behavior was identified as the only factor consistently and significantly affecting self-reported health, physical health and mental health among the participants. A higher life appreciation behavior score was associated with improved multidimensional health.

5. Discussions

This study investigated the relationships and gender differences in health promotion behaviors and multidimensional health among rural middle-school students in China to determine the multidimensional health of this population, identify predictive health-promoting behaviors for multidimensional health outcomes, and offer a theoretical foundation for future targeted interventions.

Adolescence is a pivotal period for the development of social and emotional habits, along with healthy practices that are essential for mental well-being. According to the WHO,

half of all mental disorders in adults worldwide originate by the age of fourteen. Furthermore, about 14% of the global adolescent population aged 10–19 suffers from mental disorders [24]. Adolescents from experiencing, multidimensional poverty face a 50% higher risk of developing mental health problems compared to those from non-impooverished backgrounds [25]. Significant risk behaviors and health issues have been documented among rural youth, particularly those from impoverished and ethnic minorities [26]. Notably, approximately 33% of adolescents in the slums of Lucknow, India, face severe mental disorders [27]. Without timely intervention, mental health problems initiated in adolescence can persist into adulthood, impairing physical and mental health and diminishing the prospects for a fulfilling adult life.

Our analysis revealed that female participants displayed higher levels of health promotion behaviors than males, with significant gender differences observed in health responsibility behavior and interpersonal relationship behavior. The correlation between adolescent health promotion behavior, gender and health literacy is substantial [28]. Throughout adolescence, females typically exhibit a nuanced understanding of health, demonstrate a greater sense of health responsibility, and place a higher value on interpersonal relationships than males [29]. In contrast, males during this phase often show a tendency towards rebellion, preferring autonomy in their actions and exhibiting less concern for the perceptions of others [30]. Evidence from Chile corroborates that female adolescents engage in more proactive health promotion behaviors than males [31], indicating the necessity of acknowledging gender differences when developing and implementing health promotion strategies for adolescents. Customized approaches, such as the establishment of gender-specific educational settings, could be beneficial. It has been noted that many male adolescents resist participating in preventive health measures, are prone to risk-taking behaviors, and generally show a lack of health knowledge and awareness [11]. A study from Iran highlights these gender disparities, revealing that females and older adolescents are more susceptible to adopting unhealthy lifestyles [32], yet females consistently achieve higher overall scores in health promotion behavior than males [33].

Our findings also found that life appreciation behavior is the only factor that significantly influencing the multidimensional health outcomes of participants, including self-reported health, physical health and mental health. Notably, an elevated life appreciation score correlates with enhanced health across these dimensions. Life appreciation emerges as a critical element for cultivating a positive body image, interconnected with psychological factors such as self-reported health status, concerns about weight, familial influences and self-esteem [34]. Additionally, our findings reveal an inverse relationship between life appreciation and BMI, with young females exhibiting lower scores on life appreciation and being more prone to unhealthy BMI levels [35]. Investigations involving adolescents aged 12–19 from Denmark, Portugal and Sweden have demonstrated a positive link between life appreciation and key psychological outcomes, including self-esteem and mental health. Interestingly, male participants displayed superior physical appreciation abilities compared to girls [36], indicating a significant correlation between life appreciation

and gender [37].

This study has several limitations. First, its cross-sectional design limits the ability to infer causality between the study variables examined. Second, this study was targeted at eighth-grade students from one rural middle school in Zhoukou (China), and thus the results may not be representative for other seventh and ninth-grade middle school students and urban middle school students and cannot also represent all ordinary middle school students in China. Third, the reliance on self-reported questionnaires for data collection may introduce response bias, potentially affecting the reliability of the findings. Despite these constraints, the voluntary, anonymous participation of 179 rural eighth-grade students from varied classes and family backgrounds provides a diverse sample that offers preliminary insights into the health promotion behaviors of this population.

6. Conclusions

This study found that among rural middle-school students, females had higher health promotion behavior levels than males, with significant gender differences observed in health responsibility and interpersonal relationship behaviors. However, no gender differences were identified in the multidimensional health outcomes measured. Life appreciation behavior was identified as the only factor that can simultaneously predict the multidimensional health of rural middle-school students, indicating that higher scores are associated with better overall health among these students. Despite 43.7% of middle-school teachers believing that rural middle-school students have good health promotion behaviors, the analysis of the student self-reported questionnaire showed that rural middle-school students' physical health is worrying. These findings highlight the need for targeted intervention strategies to improve health outcomes among rural middle-school students. This research contributes valuable insights towards the formulation of such interventions.

AVAILABILITY OF DATA AND MATERIALS

The data presented in this study are available on request from the corresponding author.

AUTHOR CONTRIBUTIONS

RPD—conducted the questionnaire survey and collect data. HT—performed the statistical analysis and prepared all tables. JC—drafted the manuscript. All authors revised and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was performed in compliance with the Declaration of Helsinki. All procedures relevant to study participants were approved by Xinyang Normal University ethics committee (XFEC-2023-030). Participation was voluntary. Participants were informed of the study objective and context and provided

their parental written informed consent regarding privacy and information management policies.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

SUPPLEMENTARY MATERIAL

Supplementary material associated with this article can be found, in the online version, at <https://oss.jomh.org/files/article/1840320603378073600/attachment/supplementary%20material.docx>.

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