Predictors and Intervention Implications of Weight Management KAP among University Students in the Digital Age: A Survey from Zhejiang

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Abstract

In the digital age, university students' weight management faces the dual challenges of information overload and the knowing-doing gap. Guided by the Knowledge-Attitude-Practice (KAP) framework, this study conducted a questionnaire survey among 762 undergraduates from four universities in Zhejiang Province. Data were analyzed using hierarchical regression and the Bootstrap method. The results showed that students' knowledge and attitudes toward weight management were at a moderately high level, yet their behavioral performance was significantly low. This indicates a prominent knowing-doing gap. Attitude emerged as the core driver of behavioral formation. Both frequency of digital device use and social support significantly and positively predicted weight management behaviors. In contrast, perceived information overload not only negatively predicted behaviors but also weakened the positive effect of attitude on behavior. In addition, significant differences in KAP scores were observed across gender, grade, major, and body mass index (BMI) groups. The findings suggest that the primary bottleneck lies in the translation from attitude to behavior, and that the digital environment exerts both empowering and interfering effects. Universities should implement differentiated interventions by strengthening nutrition education systems, innovating teaching models, optimizing digital support infrastructure, and enhancing peer support to bridge the knowing-doing gap.

Keywords

Weight management, Knowledge-Attitude-Practice, Digital age, Information overload, University students

Introduction

Research background

The steady advancement of the Healthy China initiative, as outlined in the "Healthy China 2030" Planning Outline and the National Nutrition Plan, places great emphasis on improving youth health literacy and implementing campus-based nutrition and health education. These policies advocate that schools at all levels should implement nutrition and health education and guide adolescents to establish a scientific perception of weight. University students are at a critical stage of physical and mental development. They face high academic pressure and enjoy considerable personal freedom, making this period crucial for the formation of personal health concepts and lifestyle habits.

With the rapid proliferation of digital media, short-video platforms and health-related mini-programs have become the main channels through which university students obtain weight management information. Digital means have broadened access to health knowledge, but online information is of mixed quality. The massive volume of fragmented content can easily cause information overload, leading to misconceptions about weight and non-rational behaviours such as blind weight loss. Existing surveys show that although university students possess certain health knowledge and hold positive attitudes towards the value of weight management, they find it difficult to translate these into long-term stable health practices. Knowledge, attitude, and actual behaviour often remain misaligned. Therefore, this study conducts a questionnaire survey across

multiple universities in Zhejiang Province to clarify the current status of local students' weight management KAP, and further explore the factors affecting their health behaviour formation.

Research significance

(1) Theoretical significance

Most existing studies on university students' weight management are based on traditional health education settings and rarely incorporate theoretical tests in the context of the digital age.

This study places the KAP model in the actual context of the digital age and examines its explanatory power for the internal relationships among university students' weight management knowledge, attitudes, and practices. It extends the theoretical scope and broadens the explanatory boundaries of university nutrition and health education. At the same time, this study introduces era-characteristic variables such as frequency of digital device use and perceived information overload.

Based on first-hand questionnaire data, it analyses the pathways through which various factors affect university students' weight management behaviours. It clarifies the logic of health behaviour formation in the digital environment and enriches the variable system of digital health research.

Furthermore, by selecting multiple universities in Zhejiang Province for the survey, it explores the group characteristics of local students' weight management KAP. This fills the gap in regional empirical data and provides empirical support for nutrition and health education practices in local universities [1].

(2) Practical significance

Through empirical investigation, this study identifies the weak links in the KAP chain of university students' weight management and pinpoints the most problematic student subgroups and core influencing factors. It provides a basis for universities to implement targeted health interventions, facilitating the rational allocation of health education resources. It also offers empirical data support for youth health promotion efforts under the "Healthy Zhejiang" initiative. In addition, the study identifies the actual needs and practical difficulties of university students in weight management, offering insights for optimising the functions and content of various health tools, so that digital health services can better meet the actual usage needs of university students.

Research objectives and content

(1) Research objectives

First, to conduct empirical analysis based on questionnaire surveys, delineate the overall status of weight management KAP among university students in Zhejiang Province, and clarify the developmental discrepancies among knowledge, attitudes, and practices. Second, to examine the influencing factors of university students' weight management behaviours from multiple dimensions, including individual characteristics, cognitive attitudes, and the digital environment. Third, based on the status survey and causal analysis of problems, to propose optimised pathways and improvement strategies.

(2) Research content

Describe the overall level and distribution characteristics of university students' weight management knowledge, attitudes, and practices. Comprehensively grasp the current reality of their KAP and clarify the developmental gaps and disconnections among the three. Using demographic indicators as grouping criteria, analyse the differential patterns of weight management KAP among student groups of different genders, grades, and places of origin. Identify the group differentiation characteristics of university students' weight management behaviours.

Empirically examine the effects of digital device use, information overload, social support, and other factors on university students' weight management behaviours. Reveal the pathways and underlying mechanisms of these factors.

Based on the empirical conclusions of this study, propose scientifically feasible intervention strategies from the perspectives of university health education, student self-management, and digital health services. This study provides practical references for university weight management education and health promotion efforts.

Literature review

The KAP model is one of the most widely applied theoretical frameworks in health behaviour research. The model posits that health behaviour formation follows a progressive path from knowledge acquisition to attitude change to behavioural adoption. Individuals first acquire scientific knowledge related to health issues. After

internalising this knowledge, they form positive or negative attitudes. Finally, attitudes drive individuals to adopt or reject a certain health behaviour. Owing to its clear structure and strong operability, the model has been extensively applied in investigations across nutrition and health, chronic disease prevention, infectious disease control, and other fields. In recent years, some scholars have also used the KAP theory as an analytical framework to examine the formation mechanisms and optimisation pathways of university students' health behaviours in the new media environment.

In the field of university student weight management, existing studies have revealed the basic contours of each KAP component. Regarding knowledge levels, students generally demonstrate a moderately high level of mastery of weight management knowledge, but their grasp of in-depth knowledge - such as estimating food calories and understanding macronutrient functions - remains insufficient [2]. In terms of attitudes, most students hold positive attitudes towards maintaining a healthy weight, with female students showing more positive attitudes than males. However, at the behavioural level, the phenomenon of "knowing but not doing" is widespread. Although students possess certain health knowledge and positive attitudes, their compliance with weight management behaviours such as dietary control and regular exercise remains low [3]. This knowing-doing gap constitutes the most prominent contradiction in the field of university student weight management [4].

The advent of the digital age has introduced new variables to this contradiction. The proliferation of mobile internet, wearable devices, and health-related applications has profoundly changed the ways university students obtain information and engage in health management practices [5]. On the one hand, health apps and smart bracelets provide new tools for weight monitoring and management. Studies have found that the use of fitness apps is positively correlated with healthy lifestyles among university students [6]. Diet-tracking apps help users achieve weight loss or healthy eating goals by quantifying food calories [7]. On the other hand, digital technologies also bring negative effects such as information overload. Surveys show that 78.60% of university students obtain weight management information via the internet, and 41.30% of them perceive conflicting information [8]. The popularity of social media and smartphones exposes students to a vast amount of health information. The excessive volume, diverse sources, and conflicting claims can easily trigger cognitive confusion and decision-making difficulties [9]. In addition, social support has been confirmed as an important facilitating factor for university students' health behaviours, but in the digital age, the sources and forms of social support are also undergoing structural changes [10].

In summary, existing studies have the following shortcomings. First, research on university students' weight management KAP has mostly focused on traditional environments and has not systematically incorporated digital-age characteristic variables such as digital device use and perceived information overload into the analytical framework [11]. Second, discussions on each KAP component have been relatively independent, lacking an overall examination of how the knowledge-attitude-practice transmission pathway changes in the digital age. Third, there is a lack of large-sample empirical studies specifically targeting university students in Zhejiang Province. Therefore, this study takes students from multiple universities in Zhejiang Province as survey respondents. It integrates the KAP model with digital-age variables and systematically examines the current status and influencing factors of university students' weight management KAP.

Research design

Research approach

This study follows a progressive research path: posing questions, theoretical inquiry, empirical investigation, analysis of influencing factors, and conclusions with recommendations. It aims to investigate the current status of university students' weight management KAP in the digital age, identify core influencing factors, and explore feasible optimisation strategies.

(1) Posing questions

Using keywords such as "digital age", "university students' weight management", and "KAP", literature searches and compilation were conducted. The research background was analysed, a research review was formed,

and the problem orientation was clarified.

(2) Theoretical inquiry

Relevant literature was reviewed, core concepts such as "weight management" and "digital health tools" were clarified, and, based on the KAP theory, an analytical framework for the mechanisms of university students' weight management in the digital environment was constructed.

(3) Empirical investigation

Multiple research methods including literature survey and questionnaire survey were adopted. The survey objectives and subjects were defined, empirical investigations were carried out among university students, and the characteristics of the current status of weight management KAP were sorted out.

(4) Analysis of influencing factors

Based on empirical data, the key influencing factors and pathways of university students' weight management behaviours were systematically analysed from individual, environmental, and social levels.

(5) Recommendations

Based on the survey results, using statistical methods such as regression analysis and effect tests, conclusions were drawn and targeted optimisation strategies were proposed.

Research methods

(1) Literature review method

Relying on Chinese and international academic databases such as the China National Knowledge Infrastructure (CNKI), Wanfang Data, and Web of Science, systematic searches were conducted using keywords such as "digital age", "university students' weight management", and "KAP model". Using content analysis and systematic review methods, research achievements, theoretical foundations, and development history in the field of weight management were sorted out, providing theoretical support for this study.

(2) Questionnaire survey method

a) Survey purpose and subjects

The purpose was to investigate the overall status of weight management knowledge, attitude, and practice among university students in Zhejiang Province in the digital age. It also aimed to explore the effects of demographic characteristics, use of digital health tools, perceived information overload, and other variables on weight management behaviours, and to clarify the internal mechanisms among KAP. The survey subjects were full-time undergraduate students from four universities in Zhejiang Province, covering comprehensive, science-engineering, and medical/ normal universities, and taking into account different grades, majors, and BMI levels. The plan was to distribute 860.00-960.00 questionnaires.

b) Development of survey instrument

Based on literature review, expert consultation, and pre-survey testing, the Questionnaire on University Students' Weight Management Knowledge, Attitude, and Practice in the Digital Age was developed as a standardised survey tool.

The questionnaire consists of two parts: basic information and formal items. Basic information covers gender, grade, major, place of origin, BMI level, and use of digital health tools. Formal items include three dimensions: weight management knowledge, weight management attitude, and weight management practice, using a Likert five-point scale ranging from 1.00 (completely disagree) to 5.00 (completely agree).

c) Survey implementation

A combination of paper and electronic questionnaires was used, strictly adhering to the principles of anonymity and informed consent to ensure data authenticity and validity, providing reliable samples for subsequent analysis.

(3) Statistical analysis methods

Statistical Package for the Social Sciences 26 (SPSS) and Analysis of Moment Structures 24 (AMOS) were used for data processing and analysis. The specific methods were as follows.

a) Descriptive statistical analysis

Using SPSS, frequencies and percentages were calculated for demographic characteristics such as gender, grade, and BMI level, as well as usage of digital weight management tools. Means and standard deviations were used to report scores across the three dimensions of knowledge, attitude, and practice, directly reflecting the overall status of university students' weight management KAP in the digital age.

b) Difference and regression analysis

Independent-samples t-tests and one-way analysis of variance (ANOVA) compared KAP scores among groups

by gender, grade, place of origin, BMI classification, and digital tool usage. Multiple linear regression analysis then used weight management behaviour score as the dependent variable. Statistically significant variables from univariate analyses were incorporated into the model to screen core factors affecting university students' weight management behaviours.

c) Mediation and moderation effect tests

Using Amos, structural equation models were constructed to verify the pathway relationships among knowledge, attitude, and practice. The bias-corrected bootstrap method was used to test the mediating effect of attitude between knowledge and behaviour. The moderating role of variables such as degree of digital tool use in the pathway was also tested, clarifying the internal mechanisms among KAP.

(4) Delphi method

Based on literature analysis and in-depth interviews, the Delphi method was adopted, going through expert selection, initial questionnaire drafting, multiple rounds of consultation, and opinion convergence to collect expert opinions and finally construct the questionnaire indicator system.

In expert selection, eight authoritative experts from the fields of public health, health education, and university student affairs were invited. Based on the literature, the research team developed the initial questionnaire and indicator system.

Research subjects and sample selection

(1) Research subjects

Full-time undergraduate university students were taken as survey subjects, taking into account differences in grade, major, place of origin, and BMI level, to investigate the current status of weight management KAP in the digital age, and to explore the factors influencing their weight management behaviors.

(2) Sampling method

Stratified cluster sampling was used.

Step 1: The sample is stratified by university type (comprehensive, science-engineering, normal/medical).

Step 2: Random selection involved 1-2 universities from each stratum, totalling 4 universities.

Step 3: Random selection involved choosing 2-4 classes from each university, and cluster surveys were then conducted.

(3) Sample size

The sample size was calculated using the formula for estimating population proportion:

$$n = Z^2 \times P \times (1 - P) / \delta^2 \quad (1)$$

Considering a design effect (Deff=1.80) and 20.00% invalid questionnaires, it was determined to distribute between 860 and 960 questionnaires, with a target of between 700 and 800 valid responses.

Current status of university students' weight management KAP

Sample basic characteristics

A total of 860 questionnaires were distributed. After excluding invalid ones, 762 valid questionnaires were obtained, with an effective response rate greater than 88.00%. Among them, 193 were males (25.33%) and 569.00 were females (74.67%). The majority were sophomores (45.67%). The predominant major category was humanities and social sciences (44.36%). 442 had normal BMI (58.01%), 131 were overweight (17.19%), 109 were obese (14.30%), and 80 were underweight (10.50%). Details are shown in Table A1 (see Appendix).

Overall KAP levels and gaps

Paired-sample t-tests were conducted to compare the scores of the three dimensions pairwise. As shown in Table1, the results showed that the mean difference between knowledge and attitude was 0.21 ($p<0.05$). The mean difference between attitude and practice was 0.64 ($p<0.001$). The mean difference between knowledge and practice was 0.43 ($p<0.001$).

Table 1. Distribution of scores on each dimension of university students' weight management KAP (n=762).

Dimension	Mean±SD	Score rate (%)	High level, n (%)	Medium level, n (%)	Low level, n (%)
Knowledge	3.47±0.52	69.40	145 (19.03)	482 (63.25)	135 (17.72)
Attitude	3.26±0.58	65.20	98 (12.86)	455 (59.71)	209 (27.43)
Practice	2.62±0.61	52.40	41 (5.38)	284 (37.27)	437 (57.35)

Thus, university students' weight management practice scores were significantly lower than their knowledge and

attitude scores, indicating a pronounced "knowing-doing" gap within the population. Comparing the two mean differences, the attitude-practice gap (0.64) was larger than the knowledge-attitude gap (0.21), suggesting that the main bottleneck lies in the transition from positive attitude to actual behavioural implementation.

Analysis of influencing factors of university students' weight management behaviours

Knowledge objectives

Independent samples t-tests and one-way ANOVA were used to examine differences in KAP scores across genders, grades, major categories, and BMI groups.

Table 2. Gender differences in KAP scores (Mean±SD).

Dimension	Male (n=193)	Female (n=569)	t	p
Knowledge	3.44±0.54	3.48±0.51	-0.87	0.384
Attitude	3.15±0.60	3.30±0.57	-3.02	0.003
Practice	2.51±0.63	2.66±0.60	-2.84	0.005

Table 3. ANOVA results by grade, major, and BMI (F-values).

Variable	Knowledge F	Attitude F	Practice F
Grade	3.27*	1.84	2.16
Major category	2.93*	2.78*	1.62
BMI group	5.42***	4.16**	3.85**

Note: *p<0.05, **p<0.01, ***p<0.001.

As shown in Table 2 and 3, the results indicated that gender significantly affected attitude and practice (p<0.05). Grade significantly affected knowledge (p<0.05). Major category significantly affected knowledge and attitude (p<0.05). BMI group significantly affected all three dimensions (p<0.05).

Screening and comparison of core influencing factors

To identify the independent predictive effects of various variables on university students' weight management behaviours, a hierarchical multiple linear regression model was constructed. Practice score was set as the dependent variable, and independent variables were entered in three steps.

Step 1: Demographic controls include gender, grade, major, and BMI group.

Step 2: The KAP main effects include the knowledge score and the attitude score.

Step 3: The digital environment variables include the frequency of digital device use, perceived information overload, and social support.

Results are shown in Table A2 (see Appendix).

First, in Model 2, the standardised coefficient for attitude (β=0.32, p<0.001) was higher than that for knowledge (β=0.19, p<0.01). This indicates that within the KAP chain, subjective health willingness has stronger predictive power for actual weight management behaviours than does the level of health knowledge. Second, in Model 3, the frequency of digital device use showed a significantly positive coefficient (β=0.13, p<0.05), confirming the empowering effect of digital tools. Perceived information overload had a significantly negative coefficient (β=-0.17, p<0.01), indicating that overwhelming and conflicting online health information suppresses behavioural implementation. Social support showed a significantly positive coefficient (β=0.21, p<0.001), confirming that external social support significantly facilitates university students' weight management behaviours. Third, the R^2 increased from 0.06 in Model 1 to 0.25 in Model 3, with each step's ΔR^2 being statistically significant (p<0.01). Over and above demographic and KAP variables, digital-age variables explained an additional 8.30% of the variance in weight management behaviours.

Negative moderating effect of information overload

To test whether perceived information overload weakens the positive effect of attitude on practice, an interaction term between attitude and perceived information overload was constructed. Moderation analysis was conducted using the bootstrap method (5,000 resamples). Results are presented in Table 4.

Table 4. Moderating effect of perceived information overload on attitude-practice relationship.

Predictor	β	SE	t	p
Attitude	0.251	0.044	5.705	<0.001
Perceived information overload	-0.164	0.039	-4.205	<0.001
Attitude×Overload	-0.160	0.045	-3.556	0.004

The moderation test showed that attitude positively predicted practice (β=0.25, p<0.001), perceived information overload negatively predicted practice (β=-0.16, p<0.001), and their interaction was significant (β=-0.16, p<0.05), indicating a negative moderating effect. Simple slope analysis revealed that for the low-overload group, the slope of attitude on practice was 0.47 (p<0.001), whereas for the high-overload group it was 0.22 (p<0.01). The facilitating effect of attitude on practice was considerably weaker under high overload.

Thus, perceived information overload is a significant trigger for the attitude-practice disconnect. The excessive, conflicting, and heterogeneous online weight management information causes cognitive confusion. It makes it difficult for students to translate positive attitudes into concrete actions, even when they hold strong intentions. This explains why the "knowing-doing" gap is particularly prominent in the digital age. Information overload exacerbates the difficulty of behavioural translation.

Conclusion

Research conclusions

(1) Significant "knowing-doing" gap

University students generally exhibit imbalanced development across the KAP chain, with a pronounced "knowing-doing" gap. Students in Zhejiang Province score at a moderately high level on weight management knowledge and hold generally positive attitudes, yet their practice scores are significantly lower than both knowledge and attitude scores. The breakdown in the KAP chain is concentrated in the attitude-practice transition. Most students, despite possessing basic knowledge and good intentions, struggle to convert these into stable, long-term health practices. The disconnect between knowing and doing is prominent.

(2) Dual effects of the digital environment

The digital environment exerts both empowering and interfering effects on university students' weight management behaviours. Moderate use of digital health devices can positively promote self-regulation of diet and exercise, supporting sustained weight management practices. It thus plays an empowering role. However, perceived information overload causes cognitive confusion, increases the psychological burden of decision-making, and significantly weakens the translation of positive attitudes into actual behaviour. It is a critical hindrance in the digital context.

(3) Positive driving force of social support

Social support significantly and positively predicts university students' weight management behaviours. Support from family, peers, and campus - such as peer supervision in exercise, sharing of healthy dietary experiences, family guidance on weight-related issues, and university-organised nutrition lectures - provides psychological encouragement and behavioural assistance. It helps students convert existing health knowledge and positive attitudes into routinised weight management practices.

(4) Notable group differences

Significant inter-group differences are observed in all KAP dimensions across gender, grade, major, and BMI groups. The BMI-based differences are particularly striking. Overweight and obese students show higher subjective concern about their weight but are also more prone to distorted weight perceptions, leading to blind weight loss attempts and excessive anxiety. University nutrition and health education should abandon a one-size-fits-all model and adopt differentiated interventions tailored to group characteristics.

Recommendations

(1) Strengthening university nutrition education systems

The orderly implementation of weight health education for university students urgently requires normative guidance and overall coordination through top-level institutional frameworks at universities. In response to the current reality of complex and misleading online weight-loss information, universities can establish on-campus official weight management information

service platforms. These platforms should systematically integrate, screen, and disseminate concise and authoritative dietary and exercise guidance content, reduce the promotion of unreliable weight-loss content, and mitigate the negative impact of information overload. This will foster a positive campus health atmosphere and provide stable, constructive campus support for students to engage in scientific weight management.

(2) Improving the digital support infrastructure

Digital resources are an important pillar for advancing university students' weight management. Given the existing problem that digital weight management products are disconnected from real campus scenarios, health app developers should ground their designs in the actual conditions of university students' daily routines, canteen dining, and dormitory exercise environments. Optimising the campus-context adaptability of digital tools and introducing a "campus mode" that provides dietary plans and exercise guidance tailored to the campus setting can lower the implementation threshold for students to adopt healthy behavioural changes.

(3) Innovating teaching models

Teaching delivery is a direct factor influencing the translation of nutritional knowledge into weight management behaviours. To address the dilemma that nutrition education tends to rely on one-way theoretical instruction, where students understand the knowledge but struggle to act upon it, educational approaches should shift away from unidirectional knowledge dissemination. Practical projects such as check-in challenges and dietary experience camps should be promoted, increasing the proportion of health practice tasks and facilitating the realisation of health intentions into actual behaviours. Based on the distinct characteristics of different student groups, differentiated teaching should be implemented. Varied instructional priorities should be set for students of different genders, grades, and BMI levels. Erroneous behaviours such as extreme dieting and blindly following online weight-loss fads should be corrected, and students should be guided to develop rational and scientific perceptions of weight.

(4) Enhancing self-assessment and peer support

Ongoing process tracking is an important mechanism for sustaining university students' nutritional literacy and healthy weight behaviours over the long term. To address the current situation where students tend to over-rely on digital device data while lacking peer collaboration, a dual-dimensional evaluation logic of "cognitive literacy + behavioural practice" should be established. Rather than focusing solely on changes in weight numbers, greater emphasis should be placed on the maintenance of students' health behaviours. Students should be guided to view digital tools rationally and use smart devices as auxiliary aids for health management. At the same time, students should be encouraged to form peer support communities, leveraging peer influence to achieve mutual supervision and positive reinforcement.

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Conflicts of Interest

The authors declare no conflict of interest.

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Appendix

Table A1. Demographic characteristics of the survey sample (n=762).

Variable	Category	Frequency (n)	Percentage (%)
Gender	Male	193	25.33
	Female	569	74.67
Grade	Freshman	132	17.32
	Sophomore	348	45.67
	Junior	146	19.16
	Senior	97	12.73
	Postgraduate	39	5.12
Major category	Humanities and Social Sciences	338	44.36
	Science and Engineering	241	31.63
	Medical	85	11.15
	Physical Education	60	7.87
	Other	38	4.99
BMI group	Underweight (<18.5)	80	10.50
	Normal (18.5-23.9)	442	58.01
	Overweight (24.0-27.9)	131	17.19
	Obese (≥28.0)	109	14.30

Table A2. Hierarchical multiple linear regression results.

Steps	Predictor	Model 1 β	Model 2 β	Model 3 β
Step 1: Control variables	Gender	0.112*	0.074	0.058
	Grade	0.086*	0.053	0.041
	Major (ref: Humanities)	0.065	0.042	0.033
	BMI group (ref: Normal)	0.143**	0.097*	0.082*
Step 2: Main effects	Knowledge	/	0.185**	0.146*
	Attitude	/	0.321***	0.257***
Step 3: Digital variables	Frequency of digital device use	/	/	0.125*
	Perceived information overload	/	/	-0.173**
	Social support	/	/	0.214***
	Model fit	/	/	/
	R^2	0.058	0.164	0.247
	ΔR^2	/	0.106	0.083
	F-value	11.63***	24.81***	31.56***

Note: β=standardised regression coefficient; *p<0.05, **p<0.01, ***p<0.001.