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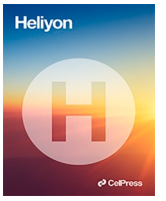

Research article

Cognition, affect, and behavioural changes among university students after 10 new guidelines were issued in China: An exploratory study

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ABSTRACT

Objectives: Since late 2019, the coronavirus disease 2019 (COVID-19) epidemic has become a common public health concern globally. China has entered a new phase of prevention and control with the implementation of the 10 new guidelines epidemic prevention policy in early December 2022. The resurgence of the outbreak may cause negative consequences on the behaviour of university students. This study aimed to assess the relationship between cognition, affect, and behavioural changes among university students and the related influencing factors after 10 new guidelines were issued, as well as the difficulties or concerns encountered in the current epidemic prevention process. It also provides a reference for the government to formulate targeted epidemic prevention strategies.

Methods: This study is a cross-sectional investigation. Self-designed questionnaires were distributed to students of a university in Hangzhou between December 25, 2022, and March 13, 2023, using convenience and snowball sampling methods for online surveys. Data analysis involved descriptive analysis, non-parametric tests, correlation, multiple linear regression, and content analyses.

Results: University students had a moderate to high level of cognition about COVID-19 and a medium level of affect. However, the level of behavioural changes was low and the average score was 2.33 (2.00, 3.00). Multiple linear regression analysis revealed that female sex, higher grade, medical specialty, affective factor, and cognitive factor were influencing factors of behavioural changes, which accounted for 35.7% of the variance in behavioural change. Difficulties or concerns included apprehension (84.8%), lack of information (39.3%), and uncertainty about the future (55.1%).

Conclusions: The prevention behaviour of university students has slackened. Evidence-based tailored policy development is indicated. This study suggested that schools and the government can improve the effectiveness of epidemic prevention among university students by adjusting the strategy of epidemic prevention policy formulation, broadening the channels of epidemic prevention information dissemination, and improving the mechanism of "government-community-school-family" collaborative governance.

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1. Introduction

Since the outbreak of the coronavirus disease 2019 (COVID-19), this virus has spread worldwide to become a global health crisis [1]. Governments nationwide and regionally have enacted a series of measures to control COVID-19 spreading. Based on the characteristics of main epidemic virus mutations and the dynamic epidemic situation in China, the Chinese government optimized the 20 measures previously released on November 7, 2022. The government released 10 new measures on December 7, 2022, which named the Notice on Further Optimising the Implementation of Measures for the Prevention and Control of the New Coronary Pneumonia Epidemic (10 New Guidelines) [2]. The 10 new guidelines and other policies released subsequently indicated that the name of "COVID-19 pneumonia" will be changed to "COVID-19 infection" [3,4]. Furthermore, full-scale nucleic acid screening and isolation measure implementation for COVID-19 infection will no longer be conducted. Light cases and individuals with asymptomatic infection without serious underlying disease can be isolated at home. The policies also consider that schools free of an outbreak should carry out regular offline instructional activities.

China has entered a new phase of prevention and control with the implementation of 10 new guidelines epidemic prevention policy. In the past four years, the COVID-19 epidemic in China has been at a low prevalence state. After 10 new guidelines were issued, the number and rate of positive nucleic acid tests for COVID-19 nationwide peaked on 22 and December 25, 2022 (6.94 million, 29.2%) [5]. The resurgence of the outbreak has caused anxiety and panic in the community, prompting universities nationwide to implement measures such as online teaching and an early end-of-the-semester to reduce infections among university students and prevent on-campus outbreaks.

Previous studies have indicated that cognition is the basis of the formation of affect and mindsets [6], and guides human behaviour [7]. For infectious diseases, whether the individual protective behaviour changes largely depends on the belief in epidemiological phenomena, which is derived from the cognition of the pandemic situation [8]. For example, university students with higher cognition of COVID-19 take more proactive precautions [9–11]. Furthermore, compared with non-medical students, medical students with a deeper understanding of COVID-19 have resulted in more positive behavioural changes [12]. In addition, prevention behaviour changes can be influenced by emotions [13,14]. It has been reported that about 20% of university students have shown anxiety during the COVID-19 pandemic [15], which is much higher than the level in normal time (5.5%) [16]. Negative emotions can prompt positive behaviour changes [17,18]. Optimism's defensive position makes the public cope with the pandemic easier [19,20].

Moreover, a decrease in the number of confirmed cases and mortality rates can affect public perceptions and emotions toward COVID-19, thus influencing behavioural changes [21]. Additionally, university students have different beliefs, emotions, and protective behaviour in response to the epidemic at different stages [22]. A similar result was obtained in Chen's study [23]. He stated that after China optimized its COVID-19 response measures, the factors related to the psychological symptoms of university students differed from previous studies. Therefore, it is reasonable to speculate that this major change in China's epidemic prevention policy may lead to changes in university students' protective behaviour to some extent.

However, few researchers have used both cognitive and affective factors as variables in one study, though it has been revealed that they influence university students' behaviour during the COVID-19 epidemic. Moreover, studies examining public behavioural changes during the COVID-19 epidemic have focused on its early stages. Fewer studies have investigated public behavioural changes during the regular prevention and control phases in China, especially with university students as participants [24,25]. Despite nearly 3 years of regular epidemic prevention and control phases, whether university students continue to value pandemic prevention behaviour remains questionable.

Therefore, this study raises the following two questions: (1) What is the role of cognition and affective in predicting behavioural change in Chinese university students after COVID-19 policy optimization? (2) What difficulties do university students encounter in the current pandemic prevention process? This study aimed to bridge this research gap and provide universities and relevant government departments with a reference for developing school prevention guidelines.

2. Methods

2.1. Aims

The purpose of this study was to.

1. Explore the effect of 10 new guidelines on the relationship between the cognition, affect, and behavioural changes among university students towards home isolation after COVID-19 infection and identify the factors influencing these changes.
2. Identify the difficulties or concerns college students encounter during the current vaccination process.

2.2. Study design

This study is designed as a cross-sectional survey.

2.3. Participants

University students with different majors at a university in Hangzhou were selected to complete the questionnaire. According to the national subject classification, researchers are divided into two categories: medical students (major in nursing, clinical medicine,

preventive medicine, etc.) and non-medical students (major in economics, preschool education, business administration, etc.). Based on the empirical method of multiple regression analysis, a sample size of 10∼20 is required for each variable [26]. Considering 20% inefficiency and the 13 variables in this study, the estimated sample size should be 156–312 cases. Finally, a total of 506 university students participated in the survey.

2.4. Survey instrument

According to the guidelines for home isolation for individuals with COVID-19, relevant documents, guidelines from the National Health Commission, and foreign references [4,27,28], the research team designed and developed a questionnaire in conjunction with the study objectives. Then the research team invited 10 university students to conduct semi-structured interviews on the cognitive, affect, and behavioural changes of home isolation after COVID-19 infection and preliminarily determined the questionnaire structure and content. Three experts reviewed the designed questionnaire (one nursing teacher, one nursing supervisor, and one associate chief physician). The invited experts met the following criteria: (1) had more than 10 years of relevant professional experience; (2) had a doctorate or a senior professional title; (3) were willing to participate. Pre-survey that included 40 university students was conducted in December 2022. After that, the research team conducted a pre-survey on 40 university students in December 2022 to ascertain the comprehensibility of the questionnaire and form the final questionnaire. The questionnaire's reliability measured using Cronbach's alpha (α) was 0.80 and validity measured using KOM was 0.82.

The questionnaire comprised five sections.

1. Cover sheet: Contents include the purpose of the study, team contact information, informed consent, anonymity guarantee, etc. Participants voluntarily completed the questionnaire and submitted their responses via a cell phone or computer.
2. Demographic information: This section included 11 entries, such as sex, grade, major, COVID-19 vaccination status, and COVID-19 infection status.
3. Knowledge of home isolation after COVID-19 infection: This section assessed participants' knowledge of how to protect individuals living with who had COVID-19 infection, administer medication after infection, and disinfect the home after home isolation is completed. Eight items were scored on a 5-point Likert Scale, ranging from "not at all aware" to "fully aware", with higher scores indicating greater awareness of home isolation following COVID-19 infection.
4. Affective factors: this section measured participants' anxiety levels, concerns about contracting infection with a new crown, and concerns about sequelae arising from the infection. Seven items were scored on a 5-point Likert Scale, ranging from "not worried at all" to "very worried", with higher scores indicating a higher level of worry about new infection.
5. Behavioural changes: this section determined the changes in participants' behaviour regarding the frequency of wearing masks, washing hands, and going outside, compared with before the COVID-19 policy change. Six items were assigned a score of 1∼3 on a 3∼point Likert Scale, ranging from "decrease" to "increase", with higher scores indicating more behavioural changes.
6. Open-ended questions: What difficulties or concerns have you encountered in the current prevention process of the COVID-19 pandemic?

2.5. Data collection

Convenience sampling and snowball sampling were used to distribute the online questionnaire from December 25, 2022, to March 13, 2023. First, we completed the questionnaire on the system "Questionnaire Star" (https://www.wjx.cn) and exported the questionnaire in the form of a link and QR code. This system is widely used for academic research in China that collects online data anonymously. Next, we shared a link or a QR code on WeChat, the most popular instant messaging social tool in China, and invited participants to complete the questionnaire. To encourage participation, participants were given an easy-to-understand home isolation guide after completing the questionnaire. Participants then voluntarily shared the link with others in their WeChat contacts who were willing to complete the questionnaire. To ensure the accuracy of the information, the study adopted the following strict quality control measures: i) Each IP address could only submit one questionnaire; ii) all questions must be answered to ensure the completeness of the questionnaire; iii) a minimum answer time of at least 90 seconds; iv) eliminate questionnaires with all the same options; and v) two researchers independently reviewed the questionnaires and excluded invalid ones. Finally, the actual sample included 506 cases, of which 484 were valid, resulting in an effectiveness rate of 95.7%.

2.6. Data analysis

SPSS software (version 23.0) was used to analyze the data. Descriptive statistics were performed on demographic characteristics. Frequency analysis was used to show the response rate of variables, and the median was used to describe the central tendency measure of the data. Mann–Whitney *U* test and Kruskal–Wallis H test were conducted to evaluate differences among participants with different demographic characteristics. Spearman correlation analysis was performed to analyse the relationship between cognition, affect, and behavioural changes. Then, take the statistically significant variables identified in univariate analysis as single variables and construct a multiple linear regression model to clarify the factors influencing behavioural changes. Differences were considered significant at $p < 0.05$. According to the keyword frequency analysis of the Questionnaire Star platform, the answers to the open-ended question are repeatedly read and analyzed. A new category is formed after summarizing similar results, and then the new category is further summarized as the final integration results.

3. Results

3.1. Demographic characteristics

Table 1 presents the demographic characteristics of the university students. The mean age of participants was 21.89 ± 1.89. The main characteristics of the participants were female (n = 260, 53.7%), non-medical major (n = 364, 75.2%), senior (n = 178, 36.8%), non-only child (n = 291, 60.1%), and living with family (n = 424, 87.6%). Although participants had received COVID-19 vaccination (n = 474, 97.7%), nearly a third of participants had not received COVID-19 booster shot vaccination. More than three-quarters of the participants knew that they, their family members, or friends had been infected with COVID-19. About 10% of the participants viewed COVID-19 information for more than an hour per day.

3.2. Scores on each dimension and univariate analysis of influencing factors of university students' behaviour change

The average score of university students' behaviour change after 10 new guidelines were issued was 2.33 (2.00, 3.00). The average cognition and affect scores were 2.69 (2.00, 3.00) and 2.50 (2.00, 3.00), respectively.

Table 2 also shows the results of the univariate analysis. There were significant differences in the scores between sex, grade, major (e.g. female vs. Male: 2.50 vs. 2.17, $p < 0.01$; medical major vs. non-medical major: 2.50 vs. 2.33, $p = 0.009$; freshman vs. sophomore vs. junior vs. senior vs. graduate [grade one] vs. graduate [grade two] vs. graduate [grade three]: 2.17 vs. 2.33 vs. 2.17 vs. 2.33 vs.2.00 vs. 2.33 vs. 2.50 vs. 2.67, $p = 0.003$).

3.3. Correlation analysis of influencing factors

Spearman's correlation analysis was conducted to analyze the correlation between behavioural changes, cognition, and the affect of university students regarding home isolation after COVID-19 infection after 10 new guidelines were issued. Table 3 indicates that the behavioural changes of university students after 10 new guidelines were issued were positively correlated with the cognition (r = 0.414, $p < 0.01$) and affect (r = 0494, $p < 0.01$) aspects regarding home isolation after COVID-19 infection.

Table 1
Demographic characteristics.

Variables		Number (Total, n = 484)	Proportion (%)
Sex	Male	224	46.3
	Female	260	53.7
Major	Non-medical student	364	75.2
	Medical student	120	24.8
Grade	Freshman	34	7.0
	Sophomore	82	16.9
	Junior	61	12.6
	Senior	178	36.8
	Senior fifth	3	0.6
	Graduate (grade one)	60	12.4
	Graduate (grade two)	37	7.6
	Graduate (grade three)	29	6.0
Only child or not	Yes	193	39.9
	No	291	60.1
Who do you live with	Family	424	87.6
	Friend	40	8.3
	Live alone	20	4.1
Whether COVID-19 vaccination was received	Yes	474	97.7
	No	11	2.3
Whether a COVID-19 booster shot vaccination was received	Yes	342	70.0
	No	142	29.3
COVID-19 infection status	Yes	379	78.3
	No	76	15.7
	Uncertain	29	6.0
Whether family members have been infected with COVID-19	Yes	431	89.0
	No	37	7.6
	Uncertain	16	3.4
Whether friends have been infected with COVID-19	Yes	441	91.1
	No	28	5.8
	Uncertain	15	3.1
Time spent on COVID-19 information	<0.5 h	288	59.5
	0.5–1 h	148	30.6
	1–2 h	32	6.7
	2–3 h	10	2.1
	>3 h	6	1.1

*Notes: *Descriptive statistics*.

Table 2
Univariate analysis of influencing factors of university students' behaviour change.

Variables		Scores [M(P25,P75)]	U/z	*P*
Sex			−6.101	<0.01
	Male	2.17(1.80,2.50)		
	Female	2.50(2.20,2.70)		
Major			−2.603	0.009
	Non-medical student	2.33(2.00,2.70)		
	Medical student			
Grade			21.192	0.003
	Freshman	2.17(2.00,2.50)		
	Sophomore	2.33(2.00,2.70)		
	Junior	2.17(1.80,2.50)		
	Senior	2.33(2.10,2.70)		
	Senior fifth	2.00(2.00,3.30)		
	Graduate (grade one)	2.33(2.00,2.70)		
	Graduate (grade two)	2.50(2.00,2.70)		
	Graduate (grade three)	2.67(2.30,2.80)		
Only child or not			−0.959	0.337
	Yes	2.33(2.00,2.70)		
	No	2.33(2.00,2.70)		
Who do you live with			1.368	0.505
	Family	2.33(2.00,2.70)		
	Friend	2.33(2.00,2.50)		
	Live alone	2.42(2.00,3.00)		
Whether COVID-19 vaccination was received			−0.286	0.775
	Yes	2.33(2.00,2.71)2.50(2.20,2.70)		
	No			
Whether a COVID-19 booster shot vaccination was received			−0.178	0.859
	Yes	2.33(2.00,2.70)		
	No	2.33(2.00,2.70)		
COVID-19 infection status	Yes	2.33(2.00,2.70)	1.657	0.437
	No	2.33(2.00,2.71)		
	Uncertain	2.17(2.00,2.60)		
Whether family members have been infected with COVID-19			1.035	0.596
	Yes	2.33(2.00,2.70)		
	No	2.33(1.80,2.70)		
	Uncertain	2.25(1.90,2.50)		
Whether friends have been infected with COVID-19			3.199	0.202
	Yes	2.33(2.00,2.70)		
	No	2.25(1.80,2.50)		
	Uncertain	2.33(2.00,2.50)		
Time spent on COVID-19 information			3.640	0.457
	<0.5 h	2.33(2.00,2.70)		
	0.5–1 h	2.33(2.00,2.71)		
	1–2 h	2.33(1.80,2.70)		
	2–3 h	2.42(1.80,2.70)		
	>3 h	2.59(2.30,2.90)		

Notes: Mann-Whitney *U* test、Kruskal-Wallis H test.

Table 3
Correlation analysis: Each dimension of influencing factors of university students' behavioural changes.

	Behavioural change
Cognition	0.414
Affect	0.494

*Notes: Spearman correlation analysis.

3.4. Multiple linear regression analysis of influencing factors

The behavioural changes of university students after 10 new guidelines were issued were used as the response variables, and sex, grade, major, affect, and cognition regarding home isolation after COVID-19 were used as the independent variables to conduct multiple linear regression analysis. Table 4 indicates that sex, grade, major, cognition, and affect are positive predictors for behavioural changes. Being a woman ($\beta = 0.188$, $p < 0.001$), having a higher grade ($\beta = 0.134$, $p < 0.001$), being a medical major ($\beta = 0.087$, $p < 0.05$), being more worried about COVID-19 ($\beta = 0.348$, $p < 0.001$), and having more awareness of home isolation of COVID-19 ($\beta = 0.316$, $p < 0.001$) were significant predictors of greater behavioural changes among university students after 10 new guidelines were

Table 4
Multiple linear regression analysis: cognition, affect, and behavioural changes among university students.

Independent variable	B	Standard error	Beta	t	*P*
Constant	0.582	0.113	–	5.139	<0.01
Sex	0.166	0.034	0.188	4.893	<0.01
Grade	0.031	0.009	0.134	3.633	<0.01
Major	0.088	0.039	0.087	2.286	0.023
Affect	0.264	0.029	0.348	9.238	<0.01
Cognition	0.223	0.027	0.316	8.343	<0.01
R^2	0.357				
After adjustment R^2	0.351				
***F* value**	$F = 53.193$, $p < 0.01$				

*D-W value: 1.899.
**Multiple linear regression analysis*.

issued.

3.5. Difficulties or concerns encountered

In total, 178 participants (36.8%) provided valid responses. The results revealed three main difficulties or concerns, including concerns (84.8%), lack of information (39.3%), and uncertainties about the future (55.1%). Table 5 summarises the results.

4. Discussion

This study revealed that grade, major, and sex influenced the behavioural changes of university students after 10 new guidelines were issued. Specifically, senior grade, medical specialty, and being female influenced behavioural changes among university students.

Compared with non-medical students, senior medical students were more likely to adopt behavioural changes to avoid COVID-19 infection. This may be because senior medical students who have undergone systematic medical training are more aware of the dangers posed by COVID-19 than non-medical students. Dashii's study also confirms this view [29]. Moreover, this study was conducted during a national outbreak, and senior medical students were undergoing or had completed their hospital internships where they had more exposure to patients with confirmed or suspected COVID-19 infection. Faced with a high risk of infection in their work environment, medical students implement stringent protective measures to ensure their health. This also means that senior medical students are more likely to adopt more behavioural changes to protect themselves from COVID-19 infections.

In addition, women were more likely than men to adopt behavioural changes, such as washing hands frequently, wearing masks, and staying at home more often [30]. World Health Organization has previously indicated that the epidemic can be viewed from a gender perspective, as COVID-19 does not affect men and women in the same way. A few studies discovered that sex significantly affected risk perception and coping mechanisms. Women have higher levels of fear towards COVID-19 and higher levels of risk perception than men and will experience more negative emotions and threat perceptions in response to COVID-19 [30,31]. Therefore, they have a stronger willingness to take more precautionary measures to avoid infection.

Our study also revealed moderate negative emotions among university students, explaining 49.4% of the behavioural changes. This finding is consistent with those of Yıldırım and Ahorsu [32,33], who discovered that negative emotions can prompt changes in public behaviour. In our study, 78.3% of university students had COVID-19 infection, and 89.1% of university students' family members had COVID-19 infection. The high infection rate among university students and their families may have contributed to their moderate levels of negative emotions. Furthermore, some students were in a critical period of further education and employment during the

Table 5
Difficulties or concerns encountered.

Theme	perception	Total n(%)
Concern		151 (84.8)
	Concern about the safety of booster vaccination	27(15.2)
	Concerned about the effect of booster vaccination	25(14.0)
	Concern about COVID-19 infections due to an inability to receive booster vaccination because of scheduling conflicts	5(2.8)
	Concern that internship in the hospital will result in repeated infection with COVID-19	67(37.6)
	Concern regarding the ability to cope with the sudden huge increase in workload at the hospital	27(15.2)
Lack of information		70(39.3)
	Not knowing the indications for booster vaccination	39(21.9)
	Not knowing the places where booster vaccinations can be received	7(3.93)
	Not sure if herbal tonics can prevent COVID-19 infections	24(13.5)
Uncertainty of the future		98(55.1)
	Confusion about whether to change majors	16(9.0)
	Uncertainty of career direction	24(13.5)
	Confusion regarding finding a job	58(32.6)

study period, and the pandemic disrupted their plans for graduate school and job recruitment. The COVID-19 infection may also bring about after-effects, which to some extent adds to the concerns of university students. Self-protective behaviour, such as wearing masks, washing hands frequently, and going outside less often, can reduce viral spread [34–36]. The simplicity and ease of self-prevention behaviour may encourage university students to implement precautionary measures to avoid contracting COVID-19 infections and change their behaviour.

However, the relationship between negative emotions and behavioural changes remains controversial. Several studies revealed that negative emotions inversely predict behavioural changes [37,38]. Additionally, it has also been suggested that behavioural changes are unrelated to an individual's psychological status [39]. Behavioural changes can persist even after the epidemic is under control and the psychological state returns to pre-epidemic levels. These results may be because of the differences in time points measured in each study and the cultural differences in influencing factors.

We found that university students had a moderate to high level of knowledge about COVID-19, and this knowledge level was a positive predictor of behavioural change. Moreover, 90.1% of university students spent 0∼1 hour a day searching for new COVID-19-related information, indicating concern about their COVID-19 knowledge. Effective government propaganda and increased access to knowledge may contribute to the higher cognitive levels of university students. Alsoghair et al. [40] stated that greater access to COVID-19-related knowledge leads to higher knowledge about the disease, easier assessment of the threat COVID-19 poses, and the formation of valid beliefs that can lead to behavioural changes. However, our study discovered that university students possessed good knowledge about home isolation following COVID-19 infection, yet their behavioural changes were low. This indicates that acquiring relevant knowledge and information alone does not necessarily translate into behavioural changes and that individual beliefs and action power require improvement [41,42]. Therefore, universities can leverage their high organizational efficiency, plasticity in educational targets, and social communication advantages to actively conduct activities such as COVID-19 lectures and health classes. By enriching the content and form of these activities and providing deep participation experiences, these efforts could promote changes in the beliefs and action power of individual university students, thus facilitating behavioural changes.

In our study, the low level of behavioural changes among university students indicated that the increase in preventive behaviour after 10 new guidelines issued was not encouraging. The COVID-19 epidemic in China was at a low prevalence state before this COVID-19 policy change, which could have led to an inevitable decline in the importance of university students attached to the pandemic. The emergence of pandemic fatigue can also reduce the frequency of protective behaviour adopted by university students [43,44]. More than 90% of the public have completed the full course of vaccination against COVID-19, and more than 55% have completed the first dose of booster vaccination [45]. The high vaccination rate for COVID-19 may reduce the public's assessment of the threat level of COVID-19 and an underestimation of its hazards. Nearly 80.0% of university students in this study have been infected with COVID-19. The specific antibodies produced after infection can give the body immunity for some time [46]. This may also be one of the reasons for the low level of behavioural changes. Moreover, some studies have pointed out that inappropriate information dissemination channels (i.e. interpersonal channels and mass channels) [47], low health literacy level [48], weak ability to acquire information [49], low-risk perception [50], and poor family communication orientation [51]may also hinder university students from taking active epidemic prevention behaviors. The current low level of behavioural changes among university students and other possible underlying causes precisely also indicate that previous policies, measures, or publicity methods are not applicable time at present and that the government and schools need to adjust their strategies to improve the behaviour of university students against the epidemic.

Furthermore, we asked university students open-ended questions about difficulties or concerns they encountered in pandemic prevention and control to explore possible factors affecting their behaviour and the measures that the government should implement. The study discovered that 36.8% of the university students expressed various degrees of difficulty or concern. Among them, approximately 84.8% of university students expressed concerns, including worries about the safety and effectiveness of booster vaccinations, the possibility of multiple COVID-19 infections, and the ability to handle hospital overloads. A certain degree of apprehension can promote behavioural changes; however, excessive anxiety can lead to psychological burdens. Our study discovered that 55.1% of university students expressed uncertainty about their future, especially in finding a job. Affected by the pandemic, students in certain majors are experiencing difficulties in finding employment and are entertaining the idea of switching majors or changing career paths. University students tend to choose conservative job options with stable salaries and good benefits, such as party and governmental organizations, state-owned enterprises, and institutions[52,53]. Finally, 39.3% of university students felt they lacked information, including not knowing the indications for booster vaccinations, the locations where they could receive booster vaccinations, and whether herbal tonics could prevent COVID-19 infections. These findings, to a certain extent, provided reference for the government and schools in formulating policies or documents.

Taking into account the difficulties, level of behavioural changes, and influencing factors of university students in the process of epidemic prevention, the government and the university should take into full consideration the actual situation of university students when formulating the relevant measures for epidemic prevention and differentiate them from the previous stages. For example, there is a need to change the focus of information on COVID-19, and to change the way or channel through which information is pushed out. During the normal prevention and control phase of the pandemic, the Chinese government disseminated information about COVID-19, such as the way COVID-19 spread, how to prevent it, etc. However, at this stage, especially after 10 new guidelines had been issued, the government needs to conduct publicity through different media (including but not limited to traditional media, community outreach, and emerging media), different channels, and different means. Furthermore, the following key points should be emphasized in the publicity: (1) changes in the current stage of prevention policy and the focus on prevention and control; (2) how to carry out proper home isolation after a COVID-19 infection; (3) strengthening the information related to vaccination (e.g., its role, effect, place of vaccination, and conditions of vaccination); (4) personal protection should not be slackened at all times.

Schools should leverage their information dissemination advantages to target different grades and majors and share medical

knowledge related to infectious diseases or public health emergencies in information channels commonly used by university students, such as the school's WeChat public website and Ding Talk work groups. Moreover, the schools should strengthen the content construction of these channels and expand multiple forms and carriers. Additionally, schools should pay attention to the psychological condition of university students and carry out psychological counseling and psychological assistance work at regular intervals, with school professionals providing different forms of psychological counseling services, such as online psychological counselling, offline counselling, or offline lectures. It is worth mentioning that the "government-community-school-family" collaborative governance mechanism should be improved. China has a unique political culture and authoritative government, in which the public has a high degree of trust. Therefore, a health service network centered on the government, with the community, school, and family as the radial surfaces, should be developed, so that the entire society can share the responsibility of preventing epidemics.

5. Limitations

This study has some limitations.

i) This study adopted a cross-sectional design, limiting its ability to elucidate a causal relationship between variables [54].
ii) Owing to the epidemic, this study was conducted only within Hangzhou City and did not use probability sampling, limiting the generalisability of the results. Therefore, caution should be taken when generalizing the findings to a wider group of students.
iii) Various measures were taken to quality control the questionnaire in this study. The web-based data did not differ from the results of the on-site paper and pencil data collection; however, the quality of the web-based data remains questionable [55].
iv) Online surveys are subject to a "volunteer effect", where participants choose the questionnaires that interest them to fill out; hence, selection bias cannot be ruled out [56].

6. Conclusions

This study investigated the relationship between cognition, affect, and behavioural changes among university students after 10 new guidelines were issued and the related influencing factors. We discovered that the level of behavioural changes among university students was low after the COVID-19 policy. Furthermore, we discovered that female, senior, and medical students were influential factors in increasing the level of behaviour change among university students. Additionally, cognition and affect positively predicted behavioural changes among university students. After the issue of 10 new guidelines, the COVID-19 epidemic in China is at a prevalence state, while the epidemic prevention behaviour of university students is at a low level. Therefore, it is extremely important to have targeted epidemic prevention policies and effective prevention measures when returning to school. This study proposes targeted measures and suggestions based on the results of the study, intending to provide a reference basis for accurately improving the effectiveness of epidemic prevention in the university student population.

Declarations

Ethical considerations

This study was reviewed and approved by the Ethics Committee of Hangzhou Normal University, with the Approved number: 2023022. This study strictly follows the principle of anonymity and voluntariness, the data collected is for academic use only, and participants have the right to withdraw from the study at any time. In addition, each participant has provided an online informed consent form.

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Data availability statement

The data are available from the corresponding author on reasonable request.

CRediT authorship contribution statement

Ziyu Sun: Writing – review & editing, Writing – original draft. **Yibao Zhang:** Investigation, Data curation. **Wenjuan Zhang:** Investigation. **Jiaqi Wang:** Investigation. **Yuhong Wu:** Supervision.

Declaration of competing interest

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in this paper.

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