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# The effect of mobile social media on the mental health status of Chinese international students: an empirical study on the chain mediation effect

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## Abstract

**Purpose** To explore the impact of mobile social media on the psychological well-being of Chinese international students and analyze the mechanisms of influence to enhance their overall psychological health and social interactions in a foreign environment.

**Methods** Convenience sampling was employed, using questionnaires on Mobile Social Media, Psychological Resilience, Body Image, Health Goal Setting, Physical Activity Level, and Mental Health Status as measurement tools. Data were gathered from 378 Chinese international students across 33 universities in South Korea, including Kangwon National University, Myongji University, Kunsan National University, Seoul National University, and Chonbuk National University. Confirmatory factor analysis, correlation analysis, common method bias testing, and chain mediation effect analysis were conducted using SPSS and AMOS 23.0.

**Results** Mobile social media has significant indirect effects on the mental health of international students through various factors: psychological resilience and physical activity level (effect 'adg'=0.080, 95% CI [0.029, 0.144]), body image and physical activity level (effect 'beg'=0.122, 95% CI [0.044, 0.247]), and health goal setting and physical activity level (effect 'cfg'=0.255, 95% CI [0.123, 0.428]).

**Conclusion** The study shows that mobile social media benefits the mental health of Chinese international students by enhancing psychological resilience, physical activity, body image perception, and health goal setting. Collaboration between educational institutions and social media platforms is recommended to promote physical activity among international students. This collaboration can involve sharing encouraging messages, joining health communities, setting goals, and providing accessible exercise resources. Utilizing mobile apps or social media for tracking progress and goal-setting can also improve self-management skills.

**Keywords** Mobile social media, Psychological resilience, Body image, Health goal setting, Physical activity level, Mental health status

## Introduction

In the digital age, mobile social media has profoundly reshaped social behaviors and information acquisition, becoming integral to daily life. Statistics from the Chinese Ministry of Education show that nearly 6.56 million Chinese students studied abroad from 1978 to

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2019, making them significant users of international mobile social media. However, these students face unique cultural, linguistic, social, and academic challenges, impacting their mental health [1].

While existing research highlights the impact of mobile social media on mental health, it predominantly focuses on domestic students, neglecting Chinese international students [2]. This group encounters cultural differences, academic pressure, and social difficulties abroad. High psychological resilience can help them manage stress, adapt more quickly, and reduce mental health issues [3, 4]. Moreover, body image, influenced by diverse cultural aesthetics, plays a role in self-esteem and anxiety levels [5]. Setting health goals and engaging in moderate physical activity are also beneficial for mental health [6, 7].

This study explores the combined impact of mobile social media, psychological resilience, body image, health goal setting, and physical activity on the mental health of Chinese international students. By constructing a comprehensive model, we aim to reveal the interactions among these factors, providing new insights and strategies to improve the mental health of Chinese international students. This research fills a gap in the literature and offers valuable theoretical and practical references for future studies on international student mental health.

## Literature review and research hypotheses

### Chained mediation effect of psychological resilience and physical activity level

#### *Impact of mobile social media on psychological resilience*

Mobile social media refers to online social networks and platforms used for disseminating information through social interactions [8]. These media platforms provide individuals with the means to interact with others through mobile applications or mobile browsers, allowing them to connect, share, and communicate anytime and anywhere, thereby enhancing the flexibility and convenience of social interactions.

Psychological resilience refers to an individual's ability to maintain a stable mental health state when facing stress, difficulties, setbacks, or adversity in life, and to quickly recover and adapt from adverse experiences [9]. Psychological resilience can enhance an individual's ability to cope with life stress and adversity, alleviate negative emotions, promote positive emotions, accelerate recovery from adversity, and improve mental health [10].

The impact of mobile social media on psychological resilience is complex and multifaceted, influenced not only by individuals' usage patterns on social media but also by the characteristics of the social media platforms themselves [11, 12]. The platforms provided by mobile

social media enable individuals to stay connected with friends, family, and social networks [13]. This social support can have positive psychological effects when facing challenges and stress, promoting the development of psychological resilience. By sharing experiences and emotions on social media and receiving support and understanding from others, individuals can better cope with life's difficulties [14].

### *Psychological resilience and its relationship with physical activity level*

Physical activity level refers to the extent of an individual's participation in physical exercise in daily life, including frequency, intensity, duration, and type of activities [15, 16]. It reflects the individual's level of engagement in exercise and physical activities, covering various forms of physical activities ranging from light daily activities to more intense exercise training [16].

Research indicates that various traits of psychological resilience, such as positive attitude, self-regulation, adaptive thinking, social support, goal setting, self-efficacy, and flexibility, can influence individuals' levels of physical activity from multiple perspectives [17]. Firstly, psychological resilience plays an important role when facing fatigue. Budisavljevic et al. (2023) found that compared to oncologists with lower psychological resilience, oncologists in Croatia with higher psychological resilience experienced significantly lower levels of fatigue [18]. Secondly, individuals with high psychological resilience have higher stress thresholds [19] and are often able to recover more quickly from setbacks due to injury or training [20]. These individuals can adjust their ways of thinking and actively face difficulties, thus adapting better to new exercise requirements. Additionally, individuals with high psychological resilience can often set clearer goals and maintain focus, achieving their goals through positive self-regulation [21], which is crucial for improving physical activity levels. Lastly, athletes with high psychological resilience are better equipped to handle competitive pressure during competitions. They can remain calm, focused, and less susceptible to external distractions, thereby enhancing their athletic performance [22, 23].

### Chained mediation effect of body image and physical activity level

Body image is the sum of an individual's perceptions, attitudes, and emotional responses towards their own physical appearance, shape, size, and function. It encompasses subjective views of one's appearance and emotional experiences and self-evaluations related to one's own body [24, 25].

### ***Impact of mobile social media on body image***

Research reveals that mobile social media plays a significant role in shaping individuals' body image [26]. Some social media accounts are dedicated to promoting positive body image messages, encouraging acceptance of diverse body types and appearances, suggesting that mobile social media may serve as a platform for fostering positive body awareness and self-esteem [27]. Additionally, mobile social media accounts related to health and fitness can provide individuals with valuable health information, exercise inspiration, and encouragement, motivating them to actively engage in physical exercise and promoting physical health [28]. Furthermore, the diverse content on mobile social media, including various body types, appearances, and lifestyles, helps broaden individuals' awareness of body diversity and fosters a more inclusive and open-minded body concept [29].

However, some scholars argue that the widespread dissemination of idealized and beautified body standards on mobile social media often has negative effects on individuals [30, 31]. It is precisely because of these idealized body images presented on mobile social media that individuals often experience psychological health issues such as body dissatisfaction, low self-esteem, and anxiety [32, 33]. In psychological and sociological research, potential negative impacts of mobile social media on individuals' body image have been identified [34]. Social interactions such as photo editing, body comparisons, comments, and likes on mobile social media can profoundly influence individuals' body perception and self-esteem [35]. Additionally, the body standards promoted on mobile social media have led some individuals to experience excessive body pressure, resulting in unhealthy behaviors such as extreme dieting and excessive exercise in order to conform to the idealized body ideals advocated by mobile social media [36–38].

### ***Impact of body image on physical activity level***

The relationship between body image and physical activity level is complex. Body image can influence individuals' confidence and motivation for physical exercise [39]. This is because confidence and motivation play crucial roles in physical exercise [40], and body image is one of the key factors closely associated with them [41]. Positive body image is closely related to higher confidence and positive motivation. When individuals feel satisfied and confident about their bodies, they are generally more willing to actively engage in physical exercise because they believe in their ability to make progress and enjoy the benefits of exercise [42].

Positive body image not only affects the psychological aspect but also directly influences the execution and performance of exercise, promoting balance in physical, emotional, psychological, and spiritual abilities [43–45]. Conversely, negative body image may lead to tension and anxiety, thereby adversely affecting exercise performance [46–48]. Additionally, positive self-perceptions may inspire individuals to engage more actively in physical activity, thereby enhancing physical fitness levels; conversely, negative body image may serve as a barrier to participating in physical activity, hindering physical fitness improvement.

In the end, individual satisfaction with one's body can largely be seen as a key driving force for promoting positive physical activity behavior, while dissatisfaction with one's body may serve as a barrier to engaging in physical activity [49, 50].

### **Chained mediation effect of health goal setting and physical activity level**

#### ***Impact of mobile social media on health goal setting***

Health goal setting refers to the specific, measurable goals or plans individuals establish in pursuit of improved health conditions, often involving adopting a series of positive health behaviors, lifestyle changes, or achieving specific health indicators [51].

Mobile social media has various impacts on setting and achieving health goals in today's society. Firstly, social media platforms provide individuals with convenient access to acquiring and sharing health-related information [52, 53]. Individuals can easily access knowledge on nutrition, exercise, mental health, and more, and share their health goals and experiences with others. This flow of information encourages individuals to pay more attention to and understand health issues, helping them set clearer health goals [54]. Secondly, mobile social media provides users with a community platform, enabling them to share their health goals with friends, family, or like-minded individuals. By sharing goals, progress, and challenges, users can receive support and encouragement from their social networks, thereby being more motivated to pursue their health goals. Additionally, some mobile social media platforms combine users' health data and personal preferences to provide personalized health advice [55], helping users set health goals tailored to their needs and lifestyles, and offering practical suggestions to achieve these goals.

However, mobile social media may also bring about some adverse effects on health goal setting, which require attention and vigilance. Research indicates that the use of mobile social media may lead individuals to face challenges in social comparison and anxiety [56]. This could

be because mobile social media often inundate users with others' health achievements and beauty standards, potentially causing users to feel dissatisfied with their own bodies and health, leading to social comparison and body anxiety. Consequently, some individuals may set unrealistic or extreme health goals, disregarding individual differences, merely to conform to the standards on mobile social media. Additionally, it is important to note that despite the abundance of health-related information on mobile social media, its credibility poses certain challenges. Individuals may be influenced by irresponsible health advice, resulting in the setting and practice of incorrect health goals, and even potentially having negative impacts on physical health.

**Impact of health goal setting on physical activity level**

The establishment of health goals plays a crucial role in enhancing physical activity levels. This is because clear health goals provide individuals with a clear direction, making it easier for them to understand why they should engage in physical activity and what outcomes to expect. This clarity helps to inspire individuals to participate in and sustain their motivation for physical activity [57].

Impact of setting health goals on enhancing physical activity levels can be explained from multiple perspectives. Firstly, setting achievable health goals tends to stimulate positive exercise motivation, making individuals more willing to engage in physical activity [58, 59]. With clear health goals, individuals are generally more likely to maintain interest in exercising and experience satisfaction from achieving their goals, thereby enhancing the enthusiasm for physical activity. Secondly, health goal setting facilitates the planning and implementation of more effective physical activity plans. Setting goals encourages individuals to choose appropriate modes, intensities, and frequencies to better achieve their health goals, thereby improving the effectiveness of physical activity and producing more significant health benefits. Thirdly, health goal setting helps cultivate healthy behavioral habits [60]. By incorporating physical activity into individuals' life goals, it gradually

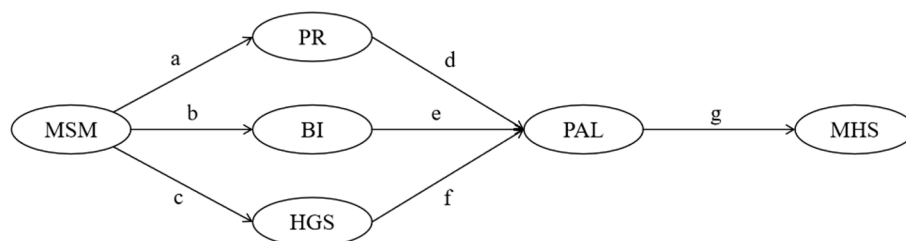
becomes a conscious lifestyle rather than a temporary effort, which helps ensure the long-term maintenance of physical activity levels. Lastly, health goal setting is closely related to the level of psychological well-being [61]. Achieving health goals through physical activity can alleviate issues such as stress, anxiety, and depression, thereby promoting overall psychological health. Additionally, during the implementation of health goals, social support has a positive impact on physical activity levels, so individuals typically persist in achieving their health goals through support from friends, family, or social networks.

**Impact of physical activity level on mental health status**

Level of mental health is a relatively subjective concept, typically used to describe an individual's overall state at the psychological level [62]. According to the World Health Organization (WHO), mental health not only refers to the absence of mental illness, but also encompasses various aspects such as adaptability to life, quality of social relationships, stability of emotional experiences, and capacity for self-realization [63].

The impact of physical activity level on mental health status can be elucidated from several aspects. Firstly, higher levels of physical activity are associated with improved mental health and elevated mental health status. Physical activity activates the reward circuitry [64] and increases peripheral dopamine [65], norepinephrine, and serotonin levels, promoting the release of endorphins, which help enhance mood, alleviate anxiety, and depression [66]. Secondly, regular physical activity helps regulate the circadian rhythm, improve sleep quality, alleviate insomnia issues, and provide an outlet for releasing negative emotions, thus aiding in emotional regulation. Lastly, through physical activity, individuals can improve body shape, enhance self-esteem, and confidence, which can have a positive impact on mental health [67].

Based on this, the research model (Fig. 1) and research hypotheses H1, H2, H3 are proposed.



**Fig. 1** Research Model. MSM: Mobile Social Media; PR: Psychological Resilience; BI: Body Image; HGS: Health Goal Setting; PAL: Physical Activity Level; MHS: Mental Health Status; Effect 'adg': MSM → PR → PAL → MHS; Effect 'beg': MSM → BI → PAL → MHS; Effect 'cfg': MSM → HGS → PAL → MHS

H1: There is a significant chained mediation effect (effect 'adg') of psychological resilience and physical activity level of Chinese international students between mobile social media and mental health status. H2: There is a significant chained mediation effect (effect 'beg') of body image and physical activity level of Chinese international students between mobile social media and mental health status. H3: There is a significant chained mediation effect (effect 'cfg') of health goal setting and physical activity level of Chinese international students between mobile social media and mental health status.

## Methodology

### Sample size calculation

The sample size was calculated using the formula for descriptive cross-sectional studies, determined by the Leslie Kish formula for single proportion sample [68], as follows:

$$n = \frac{Z^2 \cdot p \cdot (1 - p)}{E^2}$$

$n$  = the required sample size

$Z = 1.96$  (corresponding to a 95% confidence level)

$p = 0.5$  (expected sample proportion)

$E = 0.05$  (expected margin of error)

The calculated sample size is approximately 384.16. According to Tehranineshat et al. (2021), the non-response rate for all items should be between 0 and 5% [69].

### Participants

This study employed convenience sampling to distribute questionnaires. Traditional random sampling methods may result in low response rates and answers that are not truthful. While theoretically all studies should use random sampling, in practice, this is nearly impossible. This is especially true for hard-to-reach populations. Convenience sampling offers advantages such as rapid implementation, low cost, and high flexibility [70]. Therefore, convenience sampling was used, selecting 378 Chinese international students from 33 universities in South Korea, including Kangwon National University, Myongji University, Kunsan National University, Seoul National University, and Jeonbuk National University. To ensure the quality of the questionnaire data, this study employed anonymous completion and paid questionnaire survey methods (3,000 Korean won or equivalent coffee voucher per person), utilizing Google Forms and the SurveyStar website to distribute and collect 383 questionnaires. Five invalid questionnaires, including duplicates and responses deemed unreliable, were excluded, resulting in 378 valid questionnaires, with an effective rate of 98.69%. The deadline for questionnaire collection was December 26, 2023.

Among the 378 Chinese international students, the average age was 22.81 years ( $SD = 3.53$  years), with 164 males, accounting for 43.4%. The mobile social media platforms used included TikTok, Little Red Book, microblog, WeChat Video Account, Bilibili, Fit in Korea, Fitness Fast, MyV, Wave, and Strong On.

### Measurements

The measurement tools in this study were adapted from relevant scales developed by previous researchers. The Adolescent Mobile Social Media Scale developed by Wang, Lei (2015) was adapted into a scale for mobile social media usage among international students (3 items) [71]; the Children's Psychological Resilience Scale developed by Gardiner et al. (2019) was adapted into a scale for psychological resilience among international students (3 items) [72]; the Patient Body Image Scale developed by Hopwood et al. (2001) was adapted into a scale for body image among international students (4 items) [73]; the Health Belief Model Scale developed by Villar et al. (2017) was adapted into a scale for health goal setting among international students (3 items) [74]; the Exercise Benefits Scale developed by Sechrist et al. (1987) was adapted into a scale for physical activity level among international students (3 items) [75]; and the Psychological Well-being Scale developed by Ryff (1989) was adapted into a scale for mental health status among international students (3 items) [76]. The translation and localization process of the questionnaire followed internationally recognized guidelines for cross-cultural adaptation, including translation, back-translation, expert committee review, and pre-testing steps [77–79]. The item content is scored on a 7-point Likert scale, where 1 represents 'completely disagree' and 7 represents 'completely agree'. The validity of the scales was assessed using confirmatory factor analysis in SPSS, and Cronbach's  $\alpha$  coefficients ranged from 0.808 to 0.872, indicating good reliability. Preliminary results indicate that the measurement tools are highly applicable to the international student population.

### Data analysis

This study utilized the Windows versions of SPSS and Amos 23.0 statistical software for analysis. Firstly, to eliminate the influence of common method bias, we conducted a common method bias test. Subsequently, we utilized Confirmatory Factor Analysis (CFA) to validate the structural validity of the measurement tools used. Then, we conducted descriptive statistical analysis on the data, including computing measures such as mean, standard deviation, and frequency distribution. In order to explore the relationships between variables, correlation analysis was also performed. Finally, we



employed chain mediation effect analysis to investigate the comprehensive impact of mobile social media, psychological resilience, body image, health goal setting, and physical activity level on the mental health status of Chinese international students.

**Results**

**Common method bias and fit test**

The study employed self-reported data, which may lead to common method bias. To address potential common method bias, data collection was conducted anonymously. We performed Harman’s single-factor test to assess the potential impact of common method bias on study outcomes [80]. The results indicated that the first factor accounted for 36% of the variance, which is below the threshold of 40%. Therefore, we believe that common method bias is not significant in this study, further confirming the reliability of the model.

The sample size of 378 and the number of latent variables being 6. Although having a sample size over 200 and a large number of variables can lead to an excessively

large  $\chi^2$  value and poor fit, the fit indices of this model calculated by AMOS 23.0 all meet the standards. The results (Table 1) demonstrate that the model fit is satisfactory.

**Confirmatory factor analysis and correlation analysis**

The study conducted Confirmatory Factor Analysis (CFA) on all measurement indicators. Following the suggestion by Joreskog & Sorbom (1989), items with factor loadings below 0.45 were recommended for removal [81]. After conducting this operation, the following are the results of the CFA analysis in Table 2: In this study, the factor loadings (standardized loadings Std.) ranged from 0.633 to 0.946, indicating significant associations between all measurement indicators and their respective latent factors. The Composite Reliability (CR) ranged from 0.792 to 0.905, indicating high internal consistency of each latent factor and strong correlations among their constituent variables. The Average Variance Extracted (AVE) ranged from 0.535 to 0.760, indicating that latent factors explained a large portion of the variance in their

**Table 1** Fitted value

$\chi^2$	df	$\chi^2 / df$	GFI	AGFI	CFI	NFI	TLI	RMSEA
368.471	145	2.541	0.902	0.872	0.948	0.917	0.939	0.064

**Table 2** Confirmatory factor analysis

Latent Variable	Observed Ariable	Unstd	S.E	Z	P	Std	SMC	CR	AVE	Cronbach’s $\alpha$
MSM	MSM1	1				0.748	0.560	0.889	0.730	0.845
	MSM2	1.164	0.067	17.486	***	0.946	0.895			
	MSM3	0.991	0.058	17.131	***	0.857	0.734			
PR	PR1	1				0.905	0.819	0.905	0.760	0.857
	PR2	1.02	0.047	21.577	***	0.854	0.729			
	PR3	0.911	0.042	21.623	***	0.855	0.731			
BI	BI1	1				0.727	0.529	0.820	0.535	0.808
	BI2	1.13	0.082	13.727	***	0.862	0.743			
	BI3	0.869	0.072	12.028	***	0.684	0.468			
	BI4	1.141	0.102	11.172	***	0.633	0.401			
HGS	HGS1	1				0.688	0.473	0.792	0.561	0.820
	HGS2	1.264	0.112	11.271	***	0.816	0.666			
	HGS3	0.969	0.085	11.345	***	0.738	0.545			
PAL	PAL1	1				0.847	0.717	0.861	0.677	0.872
	PAL2	1.118	0.064	17.544	***	0.932	0.869			
	PAL3	0.828	0.059	14.128	***	0.667	0.445			
MHS	MHS1	1				0.757	0.573	0.796	0.565	0.872
	MHS2	1.062	0.09	11.779	***	0.753	0.567			
	MHS3	1.165	0.099	11.76	***	0.745	0.555			

MSM Mobile social media, PR Psychological resilience, BI Body image, HGS Health goal setting, PAL Physical activity level, MHS Mental health status

\*\*\*  $p < 0.001$

**Table 3** Basic information and correlation analysis

	M	SD	Skew	Kurtosis	AVE	1	2	3	4	5	6
1.MSM	6.123	0.936	-0.999	0.030	0.730	<b>0.854</b>					
2.PR	6.228	0.950	-1.498	2.733	0.760	.477**	<b>0.872</b>				
3.BI	5.743	0.938	-0.397	-0.488	0.535	.566**	.523**	<b>0.731</b>			
4.HGS	6.168	0.847	-0.741	-0.491	0.561	.610**	.548**	.589**	<b>0.749</b>		
5.PAL	6.134	0.818	-0.777	-0.111	0.677	.694**	.590**	.587**	.652**	<b>0.823</b>	
6.MHS	5.668	1.042	-0.409	-0.738	0.565	.404**	.400**	.391**	.388**	.472**	<b>0.752</b>

The bold italic represents the square root values of Average Variance Extracted (AVE)

MSM Mobile social media, PR Psychological resilience, BI Body image, HGS Health goal setting, PAL Physical activity level, MHS Mental health status

\*\*  $p < 0.01$

constituent variables, demonstrating high accuracy of latent factors in measuring observed variables.

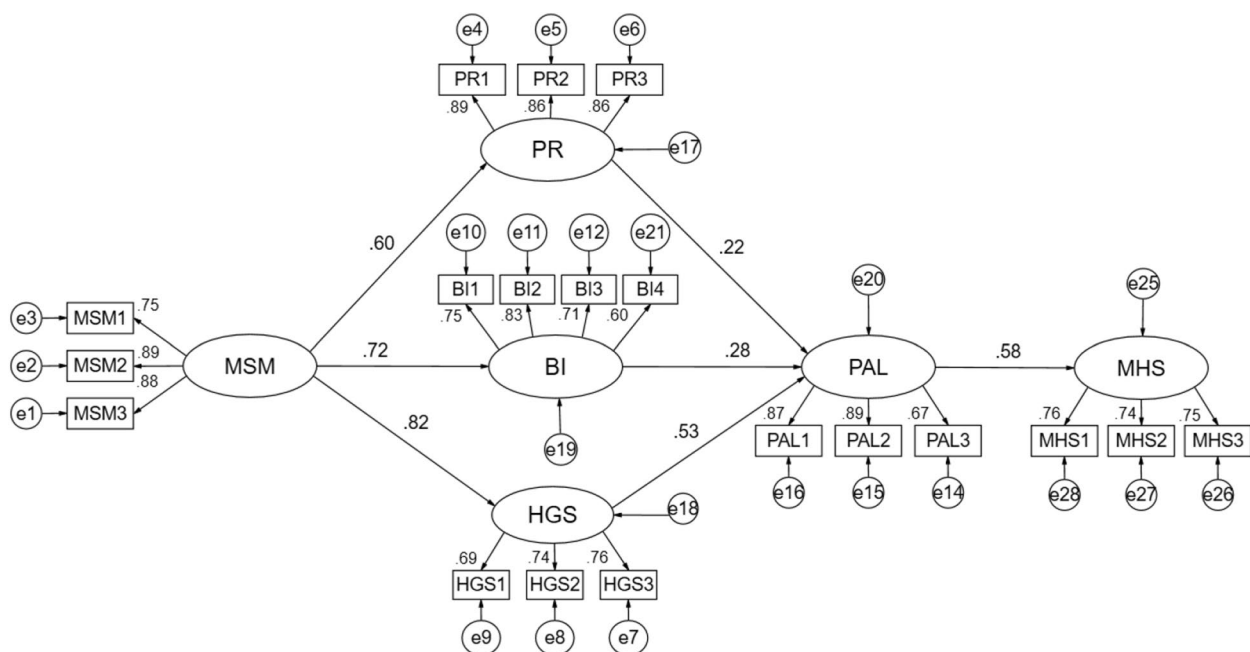
In summary, all six variables in this study exhibited good reliability and convergent validity, meeting the criteria proposed by Hair et al. (1998), namely, factor loadings (Std.) greater than 0.50, composite reliability (CR) greater than 0.60, and average variance extracted (AVE) greater than 0.50 [82].

According to the results in Table 3, the score ranges (M) of the six latent variables fall between 5.668 and 6.228, indicating that all latent variables from mobile social media to mental health status are within the positive evaluation range. The absolute range of skewness values is between 0.397 and 1.498, all of which are less than 2; the absolute range of kurtosis values is between 0.030 and 2.733, all of which are less than 8.00.

Therefore, according to conventional judgment criteria, this data can be considered as normalized data. Additionally, through the application of the Average Variance Extracted (AVE) method to analyze discriminant validity, it was found that the square root of the AVE for each variable exceeds the standardized correlation coefficient between it and the other variables, indicating good discriminant validity among the variables. The results on the diagonal in Table 3 demonstrate this, further confirming the reliability of this model.

**Mediation analysis**

According to Fig. 2, the direct effect of mobile social media on psychological resilience ( $\gamma=0.656, P<0.001$ ), body image ( $\gamma=0.726, P<0.001$ ), and health goal setting ( $\gamma=0.688, P<0.001$ ) is significant. The direct effect of psychological



**Fig. 2** Diagram of the Chained Mediation Model. MSM: Mobile Social Media; PR: Psychological Resilience; BI: Body Image; HGS: Health Goal Setting; PAL: Physical Activity Level; MHS: Mental Health Status

resilience on physical activity level ( $\gamma=0.189, P<0.001$ ), body image on physical activity level ( $\gamma=0.262, P<0.001$ ), and health goal setting on physical activity level ( $\gamma=0.578, P>0.05$ ) is significant. The direct effect of physical activity level on mental health status ( $\gamma=0.642, P<0.001$ ) suggests that psychological resilience, body image, and health goal setting play positive chained mediating roles between mobile social media and mental health status. To calculate the mediation effect more accurately, this study used structural equation modeling to analyze and test the mediation effect. First, the standard errors of the chained mediation effect were estimated using the Bootstrap method, and then the significance level of the chained mediation effect was further calculated. The results (Table 4) show that the total effect of mobile social media on mental health status is 0.457, with a standard error of 0.060 and an absolute value of Z value of 7.617, meeting the standard greater than 1.96. The 95% confidence interval [0.344, 0.583] does not include 0, indicating a significant total effect.

H1: Mobile social media has a significant indirect effect on the mental health status of international students through psychological resilience and physical activity level (effect 'adg'=0.080), with a 95% CI [0.029, 0.144] excluding 0, indicating significance.

H2: Mobile social media has a significant indirect effect on the mental health status of international students through body image and physical activity level (effect 'beg'=0.122), with a 95% CI [0.044, 0.247] excluding 0, indicating significance.

H3: Mobile social media has a significant indirect effect on the mental health status through health goal setting and physical activity level (effect 'cfg'=0.255), with a 95% CI [0.123, 0.428] excluding 0, indicating significance.

**Discussion**

The findings of this study suggest that mobile social media has a positive impact on the mental health status of Chinese international students through psychological resilience

and physical activity level. Furthermore, it influences their mental health status positively via body image and physical activity level. Therefore, this study advocates for the establishment of a positive body image as a crucial factor in cultivating healthy self-confidence, positive motivation, superior athletic performance, high levels of fitness, and long-term exercise habits. Additionally, mobile social media positively affects the mental health status of Chinese international students through health goal setting and physical activity level.

Mobile social media may have a positive impact on the mental health status of Chinese international students through psychological resilience and physical activity level due to the following reasons:

- (1) Providing positive motivation and support. Mobile social media can serve as a platform to motivate and support international students to engage in physical activity [83]. Through social media, students can receive encouragement and support from others, share exercise experiences and achievements, thereby stimulating their interest and motivation to participate in physical activities;
- (2) Establishing a social network for healthy lifestyles. Mobile social media can help international students establish friendships and communities that care about healthy lifestyles, promoting interaction and communication among them [84, 85]. In such social networks, physical activity may be perceived as an important component of a healthy lifestyle, and students are likely to be influenced and encouraged by their peers to actively engage in physical activities [86, 87];
- (3) Providing exercise information and resources [88]. Mobile social media platforms typically offer abundant exercise information and resources, including exercise training videos, fitness plans, and sports equipment purchases. Through these information and resources, students can acquire knowledge and skills about physical activities, understand different ways and methods of exercise, thereby increasing their likelihood of participating in physical activities [89];
- (4) Promoting self-monitoring and goal setting [90, 91]. Mobile social media can be a tool for students to self-monitor and set goals. By sharing their exercise progress and goals on social media, students can develop a sense of respon-

**Table 4** Chained mediation effects

Hypothesis	Chained Mediation	Estimate	product of coefficients		Bias-Corrected		p
			S.E	Z	95% CI		
					Lower	Upper	
H1	effect 'adg'	0.080	0.029	2.759	0.029	0.144	0.002
H2	effect 'beg'	0.122	0.051	2.392	0.044	0.247	0.003
H3	effect 'cfg'	0.255	0.077	3.312	0.123	0.428	0.001
	total	0.457	0.060	7.617	0.344	0.583	0.001



sibility for themselves, improve self-management skills, and better adhere to physical activities; (5) The positive impact of physical activity. Physical activity has been proven to be beneficial for mental health [92], such as releasing stress and tension from the body, improving physical and mental fitness. Chinese international students can improve not only their physical health but also their confidence and positive emotions through participation in physical activities, thereby promoting the improvement of mental health status.

Mobile social media may have a positive impact on the mental health status of Chinese international students through body image and physical activity level for the following reasons:

(1) Positive motivational effect of body image: Body images on mobile social media platforms often portray positive, healthy, and energetic images, which may motivate individuals to actively engage in physical activity to achieve or maintain a body image that aligns with societal aesthetics and expectations [93]; (2) Social pressure and identity needs: Individuals on mobile social media platforms may receive affirmation and approval from others, leading to social pressure and identity needs that prompt individuals to adopt behaviors that conform to societal expectations, including actively participating in physical activity to maintain or improve body image; (3) Promotion of healthy lifestyles on social media: Information and promotions about healthy lifestyles, including fitness exercises and outdoor activities, are often disseminated on mobile social media platforms [94]. This dissemination of information may spark individuals' interest and motivation, encouraging them to actively engage in physical activity to achieve both physical health and a positive body image; (4) Motivational and encouraging role of social media: On social media platforms, individuals may receive motivation and encouragement from others [95], such as friends, idols, or influencers sharing their experiences and achievements in physical activity. These positive motivations and encouragements can inspire individuals to participate in physical activity [96, 97].

Mobile social media may positively influence the mental health status of Chinese international students through health goal setting and physical activity level for the following reasons:

(1) The motivating effect of goal setting: Mobile social media may provide information and inspiration for health goal setting, such as fitness enthusiasts sharing their experiences in setting and achieving health goals, or promoting healthy lifestyle campaigns. This informa-

tion and activity can inspire international students and motivate them to set and pursue health goals, including increasing physical activity; (2) Social pressure and need for recognition: On social media, international students may receive encouragement and recognition from others [98], such as friends, idols, or influencers on social networks sharing their experiences and achievements in setting health goals. These positive encouragement and recognition can stimulate the students' enthusiasm and prompt them to set and pursue health goals, which may include increasing physical activity; (3) The guiding role of goal setting: Health goal setting can help international students clarify the health goals they want to achieve and develop corresponding plans and actions [99]. On mobile social media, students can access relevant guidance and resources for health goal setting, enabling them to engage in physical activity more purposefully, thereby enhancing the effectiveness and sustainability of their activities [100]; (4) Social support and cooperative competition: On social media, students can share their health goal setting and progress with others and receive support and encouragement [101]. Additionally, engaging in cooperative competition or collective challenges with others can also promote the participation of Chinese international students in physical activity, enhancing their enthusiasm and motivation.

#### **Practical implications**

This study provides valuable insights for interventions aimed at enhancing the mental health of Chinese international students. Recommendations include promoting positive body image on mobile social media to encourage physical activity participation and facilitating health goal setting through relevant resources. Additionally, schools and communities can organize sports activities and utilize mobile social media for promotion to bolster student engagement.

#### **Theoretical implications**

The findings shed light on how mobile social media influences the mental health of Chinese international students, enriching our understanding of this relationship. This study offers theoretical support for mental health interventions and contributes to the fields of social psychology, health communication, and cross-cultural psychology, fostering academic exchange and collaboration.

#### **Research limitations**

Although this study yielded meaningful results, it also has some limitations. First, this study employed a cross-sectional design. Conducting a longitudinal study would provide deeper insights into the mechanisms by which mobile social media affects the mental health of Chinese

international students. Second, the findings are based on data from Chinese international students, and it remains unclear whether these results are applicable to international students from other countries. Future research could collect data from international students in various countries to enhance the generalizability of the findings.

## Conclusion

Mobile social media can indirectly impact the mental health status of international students by fostering psychological resilience and encouraging physical activity. Through avenues such as providing positive motivation and support, establishing social networks for healthy lifestyles, offering exercise information and resources, and promoting self-monitoring and goal setting, social media can help students overcome barriers to exercise and engage more effectively in physical activity, thereby enhancing their mental health status. Additionally, mobile social media positively influences the physical activity level of Chinese international students by shaping positive body images, providing information, motivation, and social pressure for healthy lifestyles, thereby contributing to their improved mental health status. Moreover, mobile social media positively affects the physical activity level of Chinese international students by providing inspiration, guidance, social support, and recognition for health goal setting, ultimately leading to enhanced mental health status.

Educational institutions should actively collaborate with social media platforms to promote the mental health and physical activity of international students. Creating dedicated health communities or pages on social media can provide positive motivation, support, and information, thereby encouraging students to adopt healthy lifestyles. Additionally, providing information and resources related to physical activity, such as fitness classes and workout videos, can make it easier for students to find inspiration and guidance for exercise. Social media activities that encourage students to set health goals and offer self-monitoring tools and guidance can help them effectively achieve these goals. Furthermore, enhancing the promotion of positive body images can inspire students to engage in physical activity through positive body image portrayals. Encouraging students to share their exercise experiences, achievements, and goals with each other can help build a supportive and encouraging social network. Implementing these measures will contribute to improving the overall health and adaptability of international students.

## Authors' contributions

C.M: Conceptualization, methodology, software, validation, formal analysis, investigation, resources, data curation, writing—original draft preparation, visualization. C.M: Conceptualization, methodology, software, validation,

formal analysis, investigation, resources, data curation, writing—original draft preparation, visualization. S.Z: Conceptualization, validation, formal analysis, investigation, data curation, writing—original draft preparation, writing—review and editing, supervision. S.Z: Conceptualization, validation, formal analysis, investigation, data curation, writing—original draft preparation, writing—review and editing, supervision.

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## Availability of data and materials

The datasets used and/or analysed during the current study available from the corresponding author on reasonable request.

## Declarations

### Ethics approval and consent to participate

All methods were conducted in accordance with the guidelines and regulations of the 1964 Helsinki Declaration and its later amendments. As this study does not involve intervention and carries low risk, ethical review and approval were waived by the Institutional Review Board at Kangwon National University. Informed consent has been obtained from all participants in this study.

### Consent for publication

Not applicable.

### Competing interests

The authors declare no competing interests.

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