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BMI and social avoidance: The mediating roles of body dissatisfaction and self-esteem

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Abstract: This study aimed to explore the mediating roles of body dissatisfaction and self-esteem on the relationship between body mass index (BMI) and among female college students. Using a cross-sectional study design, 669 Chinese female college students completed the Body Mass Index, the Body Image States Scale, the Self-Esteem Scale, and the Social Avoidance and Distress Scale. The results showed that body dissatisfaction partially mediated the relationship between BMI and social avoidance. Additionally, body dissatisfaction and self-esteem together formed a serial mediation pathway between BMI and social avoidance. In other words, BMI shows a direct association with social avoidance among female college students, as well as indirect associations through the simple mediation of body dissatisfaction and the serial mediation of body dissatisfaction and self-esteem. Findings suggest that increased body satisfaction and self-esteem can reduce social avoidance among female college students.

Keywords: College students; body mass index; body dissatisfaction; self-esteem; social avoidance

Introduction

Social avoidance has become a prevalent phenomenon among college students, garnering significant attention in contemporary psychological research. A survey by China Youth Daily revealed that 64.2% of young adults display psychological or behavioral "social hesitation," characterized by a tendency to avoid social interactions (Wang, 2023). Existing research has identified both individual factors (e.g., self-perception, emotions, self-esteem) and environmental factors (e.g., family dynamics, negative life events) as contributors to social avoidance (Liu et al., 2024a; Huang et al., 2025; Guo & Wu, 2021; Shang et al., 2025; Yuan et al., 2022; Zheng et al., 2025). Social avoidance is defined as an individual's deliberate avoidance of social situations, manifesting as withdrawal or escape behaviors (Shang et al., 2025). However, individual factors have primarily focused on internal self-perceptions, with less attention paid to external self-attributes, such as body weight, height, or appearance. Previous studies have demonstrated a significant association between body mass index (BMI) and social avoidance (Soni & Behmani, 2018). Higher BMI is associated with lower levels of physical activity, and most female students fail to meet the recommended physical activity guidelines, which may further contribute to increases in BMI (Yuniarti et al., 2024). Among female college students, higher BMI is often linked to body dissatisfaction (Davis et al., 2022) and lower self-esteem (Kiviruusu et al., 2016), which may increase the likelihood of social withdrawal. Therefore, it is important to examine how BMI influences social avoidance among female college students.

Mediating effect of body dissatisfaction

Body dissatisfaction mediates the relationship between BMI and social avoidance. Body dissatisfaction refers to negative emotional experiences related to one's physical appearance, such as distorted perceptions of body shape or excessive preoccupation with weight (Brechan & Kvalem, 2015; Zhang et al., 2024). In contemporary Chinese culture, social media has amplified the slim-body ideals represented by trends such as the "A4 waist" (a waist as narrow as an A4 sheet of paper), "peach hips" (round and lifted hips), and "chopstick legs" (extremely slim legs). Female college students who are frequently exposed to these idealized body images are more likely to engage in upward social comparisons, which can lead to a stronger fixation on having a low BMI and increased, ongoing body dissatisfaction. Sociocultural theory posits that cultural beauty standards shape individuals' body image through processes such as social comparison and internalization (Heinberg et al., 1999; Zhang et al., 2024). Based on this theory, a higher BMI may make it harder for female college students to match the thin ideal emphasized by media, which can increase their likelihood of experiencing body dissatisfaction (Porras-Garcia et al., 2020; Zhang et al., 2022). When female college students develop negative beliefs such as "I don't look good enough" or "Others will judge me," they are more likely to avoid social interactions to reduce the possibility of negative evaluation. Therefore, body dissatisfaction can be viewed as a key psychological process through which BMI influences social avoidance.

Mediating effect of self-esteem

Self-esteem, another critical factor, has been identified as a key mediator in the relationship between BMI and social avoidance. Existing research has shown that BMI is negatively associated with self-esteem (Pilafova et al., 2007), and a 26-year longitudinal study further found that higher and increasing BMI among young females was associated with lower and slower-growing self-esteem

(Kiviruusu et al., 2016). Self-Determination Theory suggests that self-esteem tends to be lower when it is built on malleable attributes such as physical appearance (Crocker et al., 2003). Consequently, college students whose self-esteem is tied to physical attributes like weight or height tend to exhibit lower self-esteem. Moreover, self-esteem has also been found to significantly and negatively predict social avoidance (Guo & Wu, 2021; Shang et al., 2025), with lower self-esteem female students more likely to avoid social situations due to concerns about negative evaluation (Yousaf, 2015).

Chain-mediating role of body dissatisfaction and self-esteem

Furthermore, body dissatisfaction is an important determinant of self-esteem. Prior studies have shown that body dissatisfaction is significantly associated with lower self-esteem (Porras-Garcia et al., 2020) and can negatively predict girls' self-esteem (Paxton et al., 2006; Yu & Liu, 2019). According to the theoretical model proposed by Fernández-Bustos et al. (2019), objective physical characteristics such as BMI affect psychological adaptation and behavioral outcomes through their impact on body dissatisfaction and subsequent self-concept. Accordingly, BMI can be viewed as a key objective physical indicator, with higher BMI often triggering more negative evaluations of one's appearance and body shape, which in turn lowers self-esteem. Based on these findings, female college students with higher BMI are more likely to experience body dissatisfaction, which may lead to more negative self-evaluations and reduced self-esteem. Lower self-esteem, in turn, may increase social avoidance due to heightened concerns about negative evaluation. Thus, female college students with higher BMI may become trapped in a cycle of "body dissatisfaction–low self-esteem–high social avoidance", which not only undermines social support but also poses risks to mental health.

Goals of the study

The study aimed to explore the mediating role of body dissatisfaction and self-esteem between BMI and social avoidance. The following hypotheses were tested in the study:

Hypothesis 1: *Body dissatisfaction mediates the relationship between BMI and social avoidance, such that higher BMI is associated with greater body dissatisfaction, leading to higher social avoidance.*

Hypothesis 2: *Self-esteem mediates the relationship between BMI and social avoidance, such that higher BMI is associated with lower self-esteem, leading to higher social avoidance.*

Hypothesis 3: *Body dissatisfaction and self-esteem play a serial mediating role in the association between BMI and social avoidance, such that higher BMI increases body dissatisfaction, which subsequently reduces self-esteem and leads to greater social avoidance.*

Methods

Participants and setting

A total of 669 (see Table 1 for characteristics). Participants included freshmen, sophomores, and juniors, representing majors such as arts, education, management, engineering, and social sciences.

Table 1. Demographic characteristics of participants ($N = 669$)

Variables.	.	N.	%.
Gender	Female	669	100
Age	≤18 years old	168	25.11
	20 years old	234	34.98
	21 years old	205	30.64
	≥21 years old	62	9.27

Measures

Body mass index (BMI)

Participants provided their age, height, and weight, and BMI was calculated as weight (kg) divided by the square of height (m²) (Zhang et al., 2022). In this study, participants' BMI ranged from 12.82 to 33.30 kg/m² ($M = 20.25$, $SD = 2.96$ kg/m²).

Body image states scale (BISS)

Body dissatisfaction was assessed using the Chinese version of the Body Image States Scale, originally developed by Cash et al. (2002) and adapted by Yang et al. (2010). The scale comprises six items (e.g., "Right now, I feel extremely dissatisfied with my physical appearance") rated on a 9-point Likert scale (1 = extremely dissatisfied, 9 = extremely satisfied). Items 1, 3, and 5 are reverse-scored, while items 2, 4, and 6 are positively scored, with higher total scores indicating greater body dissatisfaction. The adapted scale has demonstrated good reliability (Jia & Chen, 2024). In this study, the Cronbach's α coefficient for the BISS was 0.81.

Esteem scale

Self-esteem was measured using the Chinese version of the Rosenberg Self-Esteem Scale, originally developed by Rosenberg (Morris, 1965) and adapted by Wang et al. (2010). The scale consists of 10 items (e.g., "I have a positive attitude toward myself") rated on a 4-point Likert scale (1 = strongly disagree, 4 = strongly agree). Items 3, 5, 8, 9, and 10 are reverse-scored, with higher scores indicating more positive self-evaluations. The adapted scale has shown good reliability (Yu & Liu, 2019). In this study, the Cronbach's α coefficient for the SES was 0.82.

Social avoidance and distress scale (SAD)

Social avoidance was assessed using the social avoidance subscale of the Chinese version of the Social Avoidance and Distress Scale, originally developed by Watson and Friend (Watson & Friend, 1969) and adapted by Wang et al. (2009). The subscale includes 14 items (e.g., "I try to avoid formal social occasions") scored on a binary scale (0 = no, 1 = yes), with seven items reverse-scored. Higher scores indicate greater social avoidance. The adapted subscale has demonstrated good reliability (Lin et al., 2022; Liu et al., 2024b). In this study, the Cronbach's α coefficient for the social avoidance subscale was 0.80.

Procedure

The study was approved by the Research Ethics Committee of the School of Educational Science, Neijiang University, and all procedures adhered to ethical guidelines. Participation consented to the study with assurances voluntariness and confidentiality. They completed the survey on the Wenjuanxing platform (https://www.wjx.cn/).

Data analysis

Data were entered and analyzed using SPSS 23.0. Harman's single-factor test was conducted to assess common method bias (using the standard 40% threshold), followed by descriptive statistics and correlation analyses. Mediation effect analysis was conducted using Model 6 of the PROCESS 3.3 macro plugin in SPSS (Hayes, 2013), with 5000 repeated bootstrap samples to calculate 95% confidence intervals.

To assess potential common method bias, Harman's single-factor test was conducted. All items from the Body Image States Scale, Self-Esteem Scale, and Social Avoidance and Distress Scale were subjected to exploratory factor analysis. In the unrotated factor solution, six factors had eigenvalues greater than 1, with the first factor accounting for 25.41% of the variance, which is below the critical threshold of 40% (Podsakoff et al., 2003). Thus, no significant common method bias was detected in this study.

Results

Descriptive statistics and correlation analysis

Participants ranged in age from 17 to 22 years, with height ranged from 145 to 182 cm ($M = 160.45$, $SD = 5.57$ cm) and weights ranged from 34 to 86 kg ($M = 52.09$, $SD = 7.67$ kg). Participants' self-reported BMI ranged from 12.82 to 33.30 kg/m² ($M = 20.25$, $SD = 2.96$). Based on the BMI thresholds outlined in the National Student Physical Health Standard for female college students, 8.07% were classified as underweight (BMI $\leq$ 17.1), 81.47% as healthy weight (17.2 $<$ BMI $<$ 23.9), and 10.46% as overweight or obese (BMI $\geq$ 24.0).

Correlation analyses revealed significant associations among the study variables. BMI was negatively correlated with self-esteem ($r = -0.18$, $p < 0.001$) and positively correlated with both body dissatisfaction ($r = 0.29$, $p < 0.001$) and social avoidance ($r = 0.34$, $p < 0.001$). Self-esteem was negatively correlated with both body dissatisfaction ($r = -0.50$, $p < 0.001$) and social avoidance ($r = -0.45$, $p < 0.001$), while body dissatisfaction was positively correlated with social avoidance ($r = 0.40$, $p < 0.001$). No significant correlations were found between age and any of the study variables. The means, standard deviations, and correlation matrix for all variables are presented in Table 2.

Mediation effects of body dissatisfaction and self-esteem

BMI was specified as the independent variable, social avoidance as the dependent variable, and body dissatisfaction and self-esteem as mediators to evaluate their mediating roles. The VIF values for body dissatisfaction, self-esteem, and social avoidance were 1.09, 1.41, and 1.34, respectively, and all tolerance values were greater than 1, indicating no multicollinearity concerns. Regression analyses revealed that when BMI, body dissatisfaction, and self-esteem were simultaneously included as predictors of social avoidance, BMI significantly and positively predicted social avoidance (standardized regression coefficient $\beta = 0.23$, $p < 0.001$), body dissatisfaction significantly and positively predicted social avoidance ($\beta = 0.17$, $p < 0.001$), and self-esteem significantly and negatively predicted social avoidance ($\beta = -0.33$, $p < 0.001$). These results are summarized in Table 3.

The significance of the mediating effects was tested using the bias-corrected percentile bootstrap method with 5000 resamples. The mediating effect of body dissatisfaction was significant ($\beta = 0.05$), with a 95% confidence interval (CI) of (0.03, 0.08), accounting for 14.71% of the total effect. Thus, Hypothesis 1 was supported. The mediating effect of self-esteem was not significant ($\beta = 0.01$), with a 95% CI of (−0.01, 0.04), accounting for 2.94% of the total effect. Therefore, Hypothesis 2 was not supported. These results are summarized in Table 4.

Chain mediation effects

Chain mediation effects as shown in Table 4 and Figure 1, the chain mediating effect of body dissatisfaction and self-esteem between BMI and social avoidance was significant ($\beta = 0.05$), with a 95% confidence interval (CI) of (0.03, 0.07), accounting for 14.71% of the total effect. Therefore, Hypothesis 3 was supported.

The mediation analysis confirmed that body dissatisfaction and self-esteem mediate the relationship between BMI and social avoidance, with a total indirect effect of $\beta = 0.11$, accounting for 32.35%. The total indirect effect comprises two significant pathways: one through body dissatisfaction alone ($\beta = 0.05$, 14.71%) and another serially through body dissatisfaction and self-esteem ($\beta =$ 0.05, 14.71%).

Discussion

This study found that BMI is associated with social avoidance among female college students, both directly and indirectly affects through body dissatisfaction and self-esteem. First, BMI shows an indirect association with social avoidance through the mediating role of body dissatisfaction, supporting Hypothesis 1. Specifically, higher BMI is associated with greater body dissatisfaction, which is in turn correspond to higher levels of social avoidance. This result can be explained through an integrated perspective combining sociocultural theory and cognitive-behavioral theory. Sociocultural theory emphasizes that individuals internalize the societal "thin ideal" through social comparison, shaping their subjective evaluations of their bodies (Heinberg et al., 1999; Zhang et al., 2024). In East Asian cultural that place strong value on thinness (e.g., China, South Korea), studies have found that female college students with higher BMI tend to experience heightened body dissatisfaction (Zhang et al., 2022). Cognitive-behavioral theory further suggests that body dissatisfaction, as a form of negative self-perception, evokes concerns about others' evaluations and consequently results in avoidance-oriented behaviors. Integrating these two perspectives, when female college students perceive their BMI as falling short of culturally

Table 2. Means, standard deviations, and correlations among study variables ($N = 669$)

Variable	$M \pm SD$	1	2	3	4	5
Age	19.22 ± 0.99	1				
BMI	20.25 ± 2.96	−0.03	1			
Self-Esteem	28.73 ± 7.15	−0.05	−0.18***	1		
Body Dissatisfaction	27.99 ± 3.72	0.04	0.29***	−0.50***	1	
Social Avoidance	10.88 ± 6.67	0.03	0.34***	−0.45***	0.40***	1

Note. ***$p < 0.001$.

Table 3. Regression analysis of variable relationships in the mediation model

Outcome variable	Predictor variable	R	R^2	F	β	t
Body dissatisfaction	BMI	0.29	0.08	60.32***	0.29	7.77***
Self-Esteem	BMI	0.50	0.25	112.51***	−0.04	−1.10
Self-Esteem	Body dissatisfaction	–	–	–	−0.49	−14.01***
Social avoidance	BMI	0.54	0.30	91.39***	0.23	6.76***
Social avoidance	Body dissatisfaction	–	–	–	0.17	4.28***
Social avoidance	Self-Esteem	–	–	–	−0.33	−8.69***

Note. ***$p < 0.001$. All data has been standardized.

Table 4. Results of chain mediation pathways of BMI, Body Dissatisfaction (BD), Self-Esteem (SE) and Social Avoidance (SA)

Pathway	β	*Boot SE*	Boot CI lower	Boot CI upper	Relative mediation effect
Total indirect effect	0.11	0.02	0.07	0.15	32.35%
BMI → BD → SA	0.05	0.01	0.03	0.08	14.71%
BMI → SE → SA	0.01	0.01	−0.01	0.04	2.94%
BMI → BD → SE → SA	0.05	0.02	0.03	0.07	14.71%

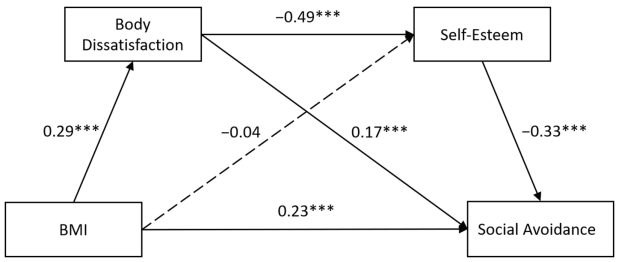

Figure 1. Path diagram illustrating the mediating roles of body dissatisfaction and self-esteem. *Note*. Dashed lines indicate non-significant paths ($p > 0.05$); ***$p < 0.001$.

idealized body standards, they are more likely to engage in upward comparisons and develop body dissatisfaction; this negative appraisal heightens their fear of being judged and leads to social avoidance. Moreover, social media reinforces thinness-oriented beauty norms and may intensify appearance-based comparisons, thereby amplifying the impact of BMI on body dissatisfaction and subsequent social avoidance.

Second, this study found that self-esteem did not significantly mediate the relationship between BMI and social avoidance, which is inconsistent with Hypothesis 2. BMI may not be directly related to reduced self-esteem but rather exerts its influence through body dissatisfaction (Tiggemann, 2005; Yu & Liu, 2019; Zhang et al., 2022). This result can be understood through sociocultural and cognitive-behavioral perspectives, which suggest that self-evaluation depends not only on objective physical attributes but also on individuals' cognitive appraisals of those attributes. As indicated by the concept of contingent self-worth (Crocker et al., 2003), appearance-based self-esteem relies more on subjective evaluations of one's body than on objective indicators such as BMI. Consequently, female college students with higher BMI may not exhibit lower self-esteem unless they have internalized societal beauty standards and experienced body dissatisfaction. Furthermore, although some studies have reported a direct association between BMI and self-esteem (Kristjánsson et al., 2010; Pilafova et al., 2007), other research has

found this relationship to be very weak (Moyon et al., 2024; Robert et al., 2024), which may be attributable to cultural differences or variations in age groups.

Finally, BMI is related to social avoidance among female college students through the serial mediation of body dissatisfaction and self-esteem, confirming Hypothesis 3. This indicates that BMI is linked to self-esteem via body dissatisfaction, which is then associated with social avoidance. Specifically, higher BMI tends to be associated with greater body dissatisfaction, which corresponds to lower self-esteem and subsequently higher levels of social avoidance. Conversely, lower BMI is associated with less body dissatisfaction, which corresponds to higher self-esteem and lower social avoidance. This result not only aligns with Cognitive Behavioral Theory but also corroborates prior research finding. Previous studies both domestically and internationally have indicated that higher BMI is associated with greater body dissatisfaction (Davis et al., 2022; Porras-Garcia et al., 2020; Zhang et al., 2022), that heightened body dissatisfaction tends to undermine self-esteem (Paxton et al., 2006; Yu & Liu, 2019), and that lower self-esteem is linked to increased social avoidance (Guo & Wu, 2021; Shang et al., 2025). Overall, BMI appears to contribute to higher levels of social avoidance among female college students, largely through the sequential effects of body dissatisfaction and self-esteem, with cognitive factors (i.e., body dissatisfaction) playing a pivotal role in this process.

Limitations and future research directions

This study has several limitations. First, the cross-sectional design limits the ability to establish causal relationships between variables. It is also possible that higher social avoidance reduces physical activity opportunities, potentially contributing to BMI increases over time. Future longitudinal studies are needed to validate these findings and to examine the potential bidirectional relationship between social avoidance and BMI. Second, only 8.07% of the female college students in this study were classified as underweight (BMI $\leq$ 17.1), which may limit the representativeness and generalizability of findings for this subgroup. Whether these findings can be generalized to underweight female college students warrants further investigation. Moreover, other psychosocial mechanisms such as fear of negative evaluation, rejection sensitivity, and internalized weight bias may also shape social avoidance and warrant examination in future research. In addition, the Weight Stigma Exposure Inventory (WeSEI) provides a new perspective for assessing how environmental factors (such as media content) contribute to individuals' awareness of weight stigma (Çarkıt et al., 2025). Future research may explore how such environmental cues interact with BMI and body dissatisfaction to ultimately influence social avoidance. Finally, interventions based on Cognitive Behavioral Therapy (CBT) have been shown to effectively improve women's body image satisfaction (Zamiri-Miandoab et al., 2021). Future studies could explore whether CBT-based body image interventions can enhance self-esteem and reduce social avoidance.

Conclusion

This study elucidates the mechanisms through which BMI influences social avoidance among female college students, contributing to the theoretical understanding of this research area. Practically, these findings highlight the impact of BMI on social avoidance in female college students, suggesting that interventions aimed at improving body satisfaction could reduce social avoidance. For university students, reducing appearance-based social comparisons on social media may help alleviate body dissatisfaction, thereby boosting self-esteem and reducing social avoidance. University counseling centers could integrate body image interventions and self-esteem enhancement programs to mitigate social withdrawal tendencies among female students. Although this study focused on female college students, similar mechanisms may apply to adolescents and other young adult populations experiencing body image concerns.

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Availability of Data and Materials: The data supporting the findings of this study are available from the corresponding author upon reasonable request.

Ethics Approval: The study was conducted in accordance with the principles of the Declaration of Helsinki. All participants were informed of the purpose of the study, and no foreseeable risks were involved. The present study was approved by the Academic Committee of Neijiang Normal University.

Conflicts of Interest: The authors declare no conflicts of interest.

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