

The Mediating Role of Intuitive Eating on the Association Between Self-control and Sociocultural Attitudes Towards Appearance Among Chinese College Students: a Cross-sectional Study

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Study protocol

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Abstract

Background: In China, people pay more and more attention to their body image, and most people have a negative attitude towards their appearance. This study aimed to explore the relationship of self-control, intuitive eating, and sociocultural attitudes towards appearance among Chinese college students. We further aimed to assess whether intuitive eating mediates the association between research self-control and sociocultural attitudes towards appearance.

Methods: A cross-sectional study was conducted among 1510 college students in a medical university during September–December 2020. Self-administered questionnaires including Self-control Scale (SCS), Intuitive Eating Scale-2 (IES-2), and Sociocultural Attitudes Towards Appearance Questionnaire-3 (SATAQ-3) were completed by students. Correlation, multiple linear regression, and structural equation modeling were used in data analyses.

Results: The mean sociocultural attitude towards appearance score was 43.91 ± 7.74 among the participants. After adjusting for the demographic factors, self-control accounted for 17.4% of the variance in sociocultural attitudes towards appearance, while intuitive eating explained an additional 2.6% of the variance. Self-control had a direct effect ($\lambda = -0.57, P < 0.01$) and an indirect effect ($\lambda = -0.11, P < 0.01$) on sociocultural attitudes towards appearance. Intuitive eating functioned as a partial mediator in the relationship between self-control and sociocultural attitudes towards appearance among Chinese students. The mediation role accounted for 16.41% of the total effect.

Conclusions: Improving self-control is good for adjusting appearance attitudes, and one way to do this is to suppress intuitive eating. College students should improve their self-control and use it in ways other than suppressing intuitive eating.

Background

The sociocultural attitudes towards appearances scale measures stress caused by social media influencing a person's attitude to his or her appearance, internalizing a social point of view into his or her own.[1] In recent years, as the nation's material needs have been met, people have begun to pay more attention to their body image. Research shows that people generally have negative feelings about their image, a low degree of dissatisfaction, depression, anxiety, and even suicidal behavior, which greatly affects people's physical and mental health.[2-6] Faced with this body image anxiety, the general public is only aware of the need to change their body image, rarely aware of the excessive publicity media and their information overload on society. María Calado A believes that adolescents' body dissatisfaction is influenced by social media through awareness and internalization of thin ideals. Nouri, M et al.'s study shows that American women are the same as those in the previous study. [7-10] College students are generally young, more concerned about their image than other groups, and have more contact with media information. Today, surrounded by media information, various kinds of propaganda are full of people's thoughts, especially the young age of college students. They do not develop more confident and firm values and are more susceptible to social judgment. They are internalizing the media's aesthetic standards into their ideas.[6, 11-14] Self-control is defined as the individual's general ability to overcome temptations, resist entertainment, focus on work, and maintain healthy habits to control impulses. Studies have shown that the higher the score of self-control, the higher the average score, the better the ability to adapt, the less binge eating and drinking, the better the interpersonal and interpersonal skills, and the better the emotional response.[15] The internalization of media propaganda by college students under the influence of society is related to their self-control ability, which is manifested in their weak emotional control ability and their dependence on the outside world for emotional control. Social media, with its rich social content and advanced technology, has increasingly become an important way for people to regulate their emotions. [16] In addition, the ability to control behavior also acts as an internal cause to affect the social media needs of college students. Individuals with greater self-control can better regulate and control their motivations, and they may resist the temptation to satisfy their social media needs.[17] At the same time, research by Rodgers, R. F et al. has shown that people with high self-control are more engaged at work, more distant from media messages, more confident and stronger in their values, and less susceptible to social influence than people with low self-control.[18] Therefore, this study investigates the relationship between self-control and the change of body attitude caused by social influence to improve self-control, control emotion better, resist the temptation of entertainment, and pay less attention to social media, to increase the inner concern and self-confidence of college students, to obtain a more positive aesthetic attitude, to reduce the negative attitude of college students to their body image, and to promote their mental health.

However, for those who do not have strong self-control ability or are not aware of their negative feelings about appearance was associated with media information, most people adopt weight loss to change their figure so that the actual figure is close to the social standard of beauty.[19] In Santos, I. et al.'s study, more than half of the women and a third of the men were trying to lose weight. Diet control is one of the most common and easy ways to lose weight. [20-22] However, studies have shown that dieting, while effective at changing body image, can be detrimental to physical and mental health, such as low bone density, menstrual disorders, eating disorders, and nutritional deficiencies.[23-26] The concept of the intuitive diet was first proposed by Gast and Hawks in the 1980s as the anti-diet movement developed. [27, 28] The researchers point out that intuitive eating is an innate dietary mechanism, based on the body's natural sense of hunger and fullness, against conscious diet control. It holds that dieting, a diet dominated by emotion and purpose, is an act incompatible with the actual needs of the body. Dieting is a mechanism of counterintuitive eating. There has been much research on diet, social attitudes to appearance, media attention, and self-control. [25] However, less research has been done on the relationship between self-control, intuitive eating, and appearance attitudes. In the control diet, self-control ability is a very important factor, even determines whether it can achieve the anticipated effect. The purpose of this study was to investigate the relationship between intuitive eating and socially influenced appearance attitudes and the mediating role of intuitive eating in self-control and appearance attitudes. At the same time, the relationship between self-control and appearance attitude was explored from the perspective of intuitive eating. This will help the public to understand more clearly the mediating factors of self-control affecting appearance attitudes and to understand the pros and cons of this approach so that college students can act in ways that are more beneficial to them.

Methods

Study design and sample

A cross-sectional study was conducted on 1510 college students in Jinzhou Medical University, Liaoning province, from September to December 2020. Based on the criteria proposed by Kendall in 1975(that is, 10 times the number of projects), a total of 57 projects were involved in three measurements, which required a sample survey of 570 college students. Given the large margin of error in the convenient sampling, a total of 1510 college students participated in this study. This does not include questionnaires with a completion rate of less than 80% or poor writing quality. Finally, a total of 1,465 questionnaires were available.

Measures

Measurement of self-control

Self-Control Scale (SCS)[15]: The scale is valid and reliable for detecting self-control.[15, 29] The Chinese version translated by Tan, S.H. et al. has good reliability and validity for Chinese students. The scale includes 19 items and five dimensions: (1) impulse control (IC), (2) health habits(HH), (3) rejecting temptations(RT), (4) focus on work(FW), and (5) temperance entertainment(TE). The scale is a 5-point Likert scale. The score of impulse control ranged between 6 and 30, the score of health habits ranged between 3 and 15, the score of rejecting temptations ranged between 4 and 20, the score of focus on work ranged between 3 and 15, the score of temperance entertainment ranged between 3 and 15. The total score of this scale ranged between 19 and 95, higher scores suggest stronger self-control. In this study, Cronbach's alpha was 0.859.

Measurement of intuitive eating

Intuitive Eating Scale-2(IES-2) The scale is a valid and reliable scale for detecting intuitive eating. [30, 31] The Chinese version translated by Ma, X. et al. has good reliability and validity for Chinese students. This scale has 23 items and four subscales: (1) eating for physical rather than emotional (EPR), (2) unconditional permission to eat (UPE), (3) reliance on hunger and satiety cues (RHSC), and (4) body-food choice congruence(B-FCC). Each item of the scale ranged between 1 and 5. The score of eating for physical rather than emotional ranged between 6 and 30, the score of unconditional permission to eat ranged between 8 and 40, the score of reliance on hunger and satiety cues ranged between 6 and 30, the score of body-food choice congruence ranged between 3 and 15. The total score of this scale ranged between 23 and 115, Higher scores were associated with eating more closely to the body's perceived needs rather than mood. In this study, Cronbach's alpha was 0.841.

Measurement of sociocultural attitudes towards appearance

Sociocultural Attitudes Towards Appearance Questionnaire-3(SATAQ-3): The Chinese version translated by Liu, D.Q. et al. has good reliability and validity for Chinese students. [1] This scale has 15 items and three subscales: (1) pressure, (2) internalization, and (3) media attention (MA). Each item of the scale ranged between 1 and 5. The score of pressure ranged between 7 and 35, the score of internalization ranged between 5 and 25, the score of media attention ranged between 3 and 15. The total score of this scale ranged between 15 and 75. Higher scores were associated with greater pressure from social influences on their attitudes towards appearance. In this study, Cronbach's alpha was 0.807.

Statistical analysis

The final data was managed and analyzed by SPSS 25.0 (IBM Corporation, Armonk, NY, USA) and AMOS 22.0 (IBM Corporation, Armonk, NY, USA). After the invalid questionnaire was excluded, 1465 questionnaires were analyzed. Descriptive statistics for sociodemographic variables, scores of self-control, intuitive eating, and sociocultural attitudes towards appearance were described by frequencies, percentages, means, and standard deviations. The study used Pearson's correlation coefficients to analyze the relationship between the self-control subscales, intuitive eating subscales, and sociocultural attitudes towards appearance subscales. Multiple linear regression was used to evaluate whether self-control and intuitive eating could significantly affect the outcome variable of sociocultural attitudes towards appearance. And finally, structural equation modeling (SEM) was used to test further the hypothetical relationships between three latent variables ("self-control", "intuitive eating", and "sociocultural attitudes towards appearance"), and the process of parameter estimations could exclude measurement error. Maximum likelihood (ML) was utilized to estimate these parameters in the model.

Results

Descriptive statistics

A total of 1510 questionnaires were distributed and 1465 of them were valid. The effective response rate was 97%. Of the 1,465 college students, 274(18.70%) were aged 18 or younger, 307(20.96%) were aged 19, 379(25.87%) were aged 20, and 505(34.47%) were aged 21 or older. The mean (Standard Deviation, SD) age of the sample was 20.14 (1.88) years. The sample consisted of 474 freshmen (32.35%), 472 sophomores (32.22%) and 519 juniors (35.43%). Age, grade and scholarship, etc., are shown in Table 1(See Table 1).

Table 1
Frequency distribution of demographic characteristics (n = 1465)

Variables	Group	n	%
Age	≤ 18	274	18.70
	19	307	20.96
	20	379	25.87
	≥ 21	505	34.47
Gender	Male	160	10.92
	Female	1305	89.08
Only Child	Yes	642	43.82
	No	863	58.91
Grade	Freshman	474	32.35
	Sophomore	472	32.22
	Junior	519	35.43
Residence	Urban	648	44.23
	Rural	817	55.77
Smoke	No	1423	97.13
	Casual	34	2.32
	Often	8	0.55
Drinking	No	1073	73.24
	Casual	384	26.21
	Often	8	0.55
State of Health	Very Bad	21	1.43
	Bad	76	5.19
	General	714	48.74
	Good	507	34.61
	Very Good	147	10.03
Scholarship	No	963	65.73
	Yes	502	34.27
Speed of Eating	Fast	648	44.23
	Medium	582	39.73
	Slow	235	16.04
Eating Regularity	Yes	1187	81.02
	No	278	18.98

Comparison of different dimensions of self-control scale for students with different characteristics in Table 2 (See Table 2). There were significant differences in self-control scores of health habits between male and female college students ($t = 5.488, P = 0.019$). There were significant differences in health habits and focus on work subscales between only-child and non-only-child college students on the self-control scale ($P < 0.05$). There were significant differences in the scores of self-control among different grades of college students ($P < 0.05$). There was a significant difference in impulse control scores between the students who got a scholarship and those who did not ($t = 5.511, P = 0.019$).

Table 2
Comparison of different dimensions of SCS for students with different characteristics(n = 1465)

Characteristics	Group	Impulse control	F/t value	P value	Health habits	F/t value	P value	Resist temptation	F/t value	P value	Focus on the work	F/t value	P value	Temper
Age	≤ 18	19.10 ± 4.53	0.170	0.917	8.90 ± 2.30	0.507	0.678	12.07 ± 2.05	0.765	0.514	9.24 ± 1.68	0.901	0.440	9.93
	19	19.15 ± 4.29			8.95 ± 2.22			12.25 ± 2.00			9.05 ± 1.60			9.99
	20	19.08 ± 4.14			8.99 ± 2.08			12.24 ± 1.93			9.23 ± 1.58			10.07
	≥ 21	18.95 ± 3.97			8.82 ± 2.16			12.29 ± 1.94			9.21 ± 1.72			10.02
Gender	Male	19.22 ± 3.99	0.726	0.394	9.06 ± 1.94	5.488	0.019	12.70 ± 1.87	0.022	0.881	9.39 ± 1.60	0.391	0.532	9.70
	Female	19.04 ± 4.21			8.89 ± 2.20			12.17 ± 1.98			9.16 ± 1.66			10.05
Only Child	Yes	18.98 ± 4.37	1.914	0.167	8.85 ± 2.26	4.634	0.032	12.14 ± 2.05	1.851	0.174	9.26 ± 1.74	7.209	0.007	9.79
	No	19.11 ± 4.04			8.95 ± 2.10			12.30 ± 1.90			9.13 ± 1.58			10.19
Grade	Freshman	19.70 ± 4.54	8.660	0.000	9.18 ± 2.27	5.709	0.003	12.26 ± 2.10	0.445	0.641	9.35 ± 1.80	3.251	0.039	10.46
	Sophomore	18.88 ± 3.77			8.84 ± 2.07			12.27 ± 1.84			9.10 ± 1.50			9.83
	Junior	18.64 ± 4.15			8.72 ± 2.16			12.16 ± 1.96			9.13 ± 1.63			9.76
Scholarship	No	19.12 ± 4.34	5.511	0.019	8.90 ± 2.21	0.449	0.503	12.12 ± 1.99	0.009	0.924	9.12 ± 1.69	0.205	0.651	10.07
	Yes	18.93 ± 3.89			8.91 ± 2.11			12.43 ± 1.91			9.33 ± 1.57			10.02

Comparison of scores in different dimensions of college students' intuitive eating with different characteristics (Table 3) (See Table 3). Except for the scholarship, there was no significant difference in the scores of intuitive eating among college students with different characteristics.

Table 3
Comparison of scores in different dimensions of college students'IE with different characteristics(n = 1465)

Characteristics	Group	EPR	F/t value	P value	UPE	F/t value	P value	RHSC	F/t value	P value	B-FCC	F/t value	P value
Age	≤ 18	3.13 ± 0.47	0.543	0.653	3.12 ± 0.49	1.028	0.379	3.29 ± 0.58	0.723	0.538	3.09 ± 0.61	0.282	0.838
	19	3.08 ± 0.45			3.06 ± 0.41			3.31 ± 0.54			3.11 ± 0.61		
	20	3.09 ± 0.49			3.09 ± 0.48			3.32 ± 0.63			3.08 ± 0.60		
	≥ 21	3.11 ± 0.50			3.10 ± 0.45			3.35 ± 0.60			3.11 ± 0.66		
Gender	Male	2.99 ± 0.55	0.061	0.805	3.03 ± 0.53	0.084	0.772	3.28 ± 0.65	2.296	0.130	3.18 ± 0.67	0.912	0.340
	Female	3.11 ± 0.47			3.10 ± 0.45			3.33 ± 0.59			3.09 ± 0.62		
Only child	Yes	3.09 ± 0.51	2.742	0.098	3.10 ± 0.49	3.678	0.055	3.30 ± 0.62	1.207	0.272	3.10 ± 0.66	3.371	0.067
	No	3.11 ± 0.46			3.09 ± 0.43			3.34 ± 0.58			3.09 ± 0.59		
Grade	Freshman	3.10 ± 0.44	0.142	0.867	3.09 ± 0.46	0.175	0.840	3.31 ± 0.58	0.175	0.839	3.08 ± 0.62	0.483	0.617
	Sophomore	3.09 ± 0.48			3.09 ± 0.41			3.33 ± 0.56			3.09 ± 0.58		
	Junior	3.11 ± 0.52			3.10 ± 0.49			3.34 ± 0.64			3.12 ± 0.67		
Scholarship	No	3.10 ± 0.49	0.151	0.698	3.07 ± 0.49	5.612	0.018	3.31 ± 0.61	1.887	0.170	3.08 ± 0.63	0.028	0.867
	Yes	3.10 ± 0.47			3.14 ± 0.39			3.35 ± 0.56			3.13 ± 0.62		

EPR: eating for physical rather than emotional; UPE: unconditional permission to eat; RHSC: reliance on hunger and satiety cues; B-FCC: body-food choice congruence.

Comparison of scores in different dimensions of college students' sociocultural attitudes towards appearance with different characteristics (Table 4) (See Table 4). The difference in pressure scores between only-child and non-only-child college students was statistically significant ($t = 8.110, P = 0.004$). Different grades of college students in the pressure and media attention two dimensions of the scores difference were statistically significant ($P = 0.000$). There was a significant difference in media attention scores between the students who got a scholarship and those who did not ($t = 6.557, P = 0.011$).

Table 4
Comparison of scores in different dimensions of college students' SATAQ with different characteristics(n = 1465)

Characteristics	Group	Pressure	F/t value	Pvalue	Internalization	F/t value	Pvalue	Media attention	F/t value	Pvalue
Age	≤ 18	9.19 ± 2.44	1.653	0.175	15.14 ± 3.54	0.659	0.578	19.17 ± 5.28	1.907	0.126
	19	9.02 ± 2.25			15.13 ± 3.41			18.96 ± 5.62		
	20	9.31 ± 2.19			15.31 ± 3.24			19.26 ± 5.62		
	≥ 21	9.38 ± 2.44			15.42 ± 3.48			19.84 ± 5.67		
Gender	Male	8.33 ± 2.18	1.097	0.295	14.76 ± 3.50	0.009	0.926	18.74 ± 5.00	2.615	0.106
	Female	9.36 ± 2.33			15.34 ± 3.40			19.46 ± 5.64		
Only Child	Yes	9.41 ± 2.45	8.110	0.004	15.37 ± 3.49	0.307	0.579	19.86 ± 5.56	0.919	0.338
	No	9.13 ± 2.24			15.21 ± 3.36			19.01 ± 5.57		
Grade	Freshman	8.91 ± 2.28	9.911	0.000	15.25 ± 3.42	0.372	0.690	18.15 ± 5.45	19.275	0.000
	Sophomore	9.26 ± 2.18			15.20 ± 3.29			19.64 ± 5.31		
	Junior	9.56 ± 2.48			15.38 ± 3.53			20.28 ± 5.74		
Scholarship	No	9.13 ± 2.39	0.143	0.705	15.24 ± 3.48	0.057	0.812	19.09 ± 5.73	6.557	0.011
	Yes	9.49 ± 2.23			15.36 ± 3.30			19.93 ± 5.25		

The correlation between these variables is shown in Table 5(See Table 5). The results show that the score of self-control was negatively correlated with the score of pressure ($r=-0.328\sim-0.011$, $P<0.01$) and media attention ($r=-0.485\sim-0.085$, $P<0.01$) and positively correlated with internalization score ($r=0.079\sim0.150$, $P<0.001$). Intuitive eating score was positively correlated with pressure ($r=0.214\sim0.328$, $P<0.01$) and media attention score ($r=0.199\sim0.292$, $P<0.01$) and negatively correlated with the score of internalization ($r=-0.259\sim-0.167$, $P<0.01$).

Table 5
Correlation between self-control intuitive eating and sociocultural attitudes towards appearance

		Pressure	Internalization	Media attention
Self-control	Impulse control	-0.310**	0.137**	-0.445**
	Health habits	-0.284**	0.150**	-0.340**
	Resist temptation	-0.011	-0.201**	-0.085**
	Focus on the work	-0.192**	0.092**	-0.318**
	Temperance entertainment	-0.328**	0.079**	-0.485**
Intuitive eating	EPR	0.293**	-0.259**	0.242**
	UPE	0.326**	-0.188**	0.292**
	RHSC	0.328**	-0.167**	0.219**
	B-FCC	0.214**	-0.198**	0.199**
EPR: eating for physical rather than emotional; UPE: unconditional permission to eat; RHSC: reliance on hunger and satiety cues; B-FCC: body-food choice congruence. **The correlation is significant at the 0.01 level (2-tailed).				

Multiple Regression Analysis

Using sociocultural attitudes towards appearance as explanatory variables, sociodemographic characteristics as control variables, self-control and intuitive eating as major significant variables, a three-time repeated multiple linear regression analysis was used (Table 6) (See Table 6). According to Model 1, the variables of age, gender, only child, grade, and scholarship significantly contributed to sociocultural attitudes towards appearance, and a total of 4.2% of the criterion variance was explained ($F=13.92$, $P<0.001$). Based on Model 1, multiple linear analysis in Model 2 showed that five subscales of self-control were significantly and negatively related to sociocultural attitudes towards appearance, and a total of 21.4% of the criterion variance was explained ($F=40.79$, $\Delta R^2=0.174$, $P<0.001$). Model 3 was run with the intuitive eating dimensions added based on Model 2. Five subscales of self-control and four subscales of intuitive eating were identified as significant relevant variables of sociocultural attitudes towards appearance ($F=33.604$, adjusted $R^2=0.238$, $\Delta R^2=0.026$, $P<0.001$). Thus, intuitive eating played a moderating role in the relationship between self-control and sociocultural attitudes towards appearance.

Table 6
Results of the multiple linear regression analysis variable.

		Model 1				Model 2				Model 3	
Dependent	Variables	Se	B(95%CI)	t	P	Se	B(95%CI)	t	P	Se	B(95%CI)
General data	Age	0.161	-0.346(-0.663, -0.030)	-2.145	0.032	0.148	0.071(-0.220,0.362)	0.479	0.632	0.146	0.058(-0.229,
	Gender	0.644	2.845(1.582,4.108)	4.418	0.000	0.588	2.829(1.676,3.982)	4.812	0.000	0.583	2.754(1.610,;
	Only Child	0.405	-1.351(-2.145, -0.557)	-3.337	0.001	0.369	-1.046(-1.770, -0.321)	-2.831	0.005	0.364	-1.026(-1.740, -0.312)
	Grade	0.307	1.583(0.981,2.186)	5.158	0.000	0.284	0.600(0.043,1.156)	2.113	0.035	0.280	0.640(0.091,;
	Scholarship	0.465	0.129(-0.783,1.041)	0.277	0.782	0.425	0.666(-0.167,1.499)	1.569	0.117	0.419	0.509(-0.313,
Self-control	IC					0.060	-0.229(-0.346, -0.112)	-3.845	0.000	0.059	-0.180(-0.296, -0.064)
	HH					0.104	-0.031(-0.235,0.174)	-0.294	0.769	0.107	0.050(-0.160,
	RT					0.099	-0.218(-0.412, -0.024)	-2.205	0.028	0.104	-0.393(-0.596, -0.189)
	FW					0.138	-0.123(-0.394,0.149)	-0.887	0.375	0.137	-0.072(-0.340,
	TE					0.106	-0.987(-1.195, -0.778)	-9.271	0.000	0.106	-0.984(-1.191, -0.777)
Intuitive eating	EPR									0.479	-0.660(-1.599,
	UPE									0.525	1.601(0.571,;
	RHSC									0.372	1.127(0.398,;
	B-FCC									0.357	0.715(0.015,;
F value					13.919		40.792				
P value					0.000		0.000				
Adjusted R ²					0.042		0.214				
ΔR ²					0.046		0.174				

IC: Impulse control; HH: Health habits; RT: Rejecting temptations; FW: Focus on work; TE: temperance entertainment; EPR: eating for physical rather than emotional permission to eat; RHSC: reliance on hunger and satiety cues; B-FCC: body-food choice congruence.

Structural Equation Modeling

To confirm the importance of total effect, indirect effect, and direct effect in the mediation model, the structural equation model covering three latent variables is given in Fig. 1 (See Fig. 1). Three measurement models were presented as follows: self-control as an exogenous latent variable influencing five exogenous observed variables (impulse control, health habits, rejecting temptation, focus on the work, and temperance entertainment) with respective measurement errors (e1-e5); intuitive eating as an endogenous latent variable influencing four endogenous observed variables (eating for physical rather than emotional (EPR), unconditional permission to eat (UPE), reliance on hunger and satiety cues (RHSC), and body-food choice congruence (B-FCC)) with respective measurement errors (e6-e9); sociocultural attitudes towards appearance as ultimate endogenous latent variables influencing three endogenously observed variables (pressure, internalization, and media attention) with respective measurement errors (e10-e12). The structural path hypothesis holds that self-control has direct and indirect effects on sociocultural attitudes towards appearance with an unexplained disturbance (e14) through intuitive eating with an unexplained disturbance (e13). Based on the modification indexes (MI), three measurement residual paths and the covariance between e3 and e2 (MI = 121.72), between e3 and e13 (MI = 134.82), and between e3 and e11 (MI = 79.485) were recommended for inclusion. Finally, the standardized path map is obtained (Fig. 2) (See Fig. 2). The five factor-loading parameters (0.25 ~ 0.79) in the self-control matrix, the four-factor-loading parameters (0.63 ~ 0.78) in the intuitive eating matrix, and the three factor-loading parameters (-0.13 ~ 0.80) in the sociocultural attitudes towards appearance matrix all attained significance ($P < 0.001$). The modified goodness-of-fit index shows that the mediation model fits the data well: CMIN/DF = 10.444, RMSEA = 0.08, GFI = 0.945, AGFI = 0.911, PGFI = 0.582. The results manifested that self-control had a significant direct effect on intuitive eating and sociocultural attitudes towards appearance. Meanwhile, intuitive eating had a significant direct effect on sociocultural attitudes towards appearance. According to the structural equation modeling, self-control had a significant direct effect on intuitive eating (-0.33, $P < 0.01$) and sociocultural attitudes towards appearance (-0.57, $P < 0.01$), and intuitive eating had a significant direct effect on the sociocultural attitudes towards appearance (0.32, $P < 0.01$). In addition, self-control had a significant, indirect effect (-0.33 × 0.32 = -0.11, $P < 0.01$) on the sociocultural attitudes towards appearance through intuitive eating. Self-control had a total impact of -0.67 on the sociocultural attitudes towards appearance and an impact of -0.11 produced by intuitive eating as a mediative variable. The structural equation model significantly explained 11% of the variance in intuitive eating and 55% of the variance in sociocultural attitudes towards appearance, show that an additional 16.41% of the variance in sociocultural attitudes towards appearance was explained by self-control through intuitive eating, excluding the measurement errors

of the observed variables. As shown in Table 7(See Table 7), the goodness of fit index of the structural equation is modified according to the results of previous studies. [32–34]

Table 7
Goodness-of-fit indexes of SEM

Goodness-of-fit indices	Default model	Modified model	Standard	Assessment
ECVI	0.598	0.107		acceptable fit
RMSEA	0.102	0.08	< 0.08	mediocre fit
AGFI	0.865	0.911	> 0.9	reasonable fit
GFI	0.912	0.945	> 0.9	reasonable fit
NFI	0.854	0.911	> 0.9	reasonable fit
CFI	0.862	0.919	> 0.9	reasonable fit
IFI	0.862	0.919	> 0.9	reasonable fit
TLI	0.821	0.888	> 0.8	acceptable fit
PNFI	0.66	0.663	> 0.5	acceptable fit
PGFI	0.596	0.582	> 0.5	acceptable fit
CMIN/DF	16.107	10.444		acceptable fit

Discussion

This study examined the relationship between self-control and sociocultural attitudes towards appearance, and the mediating role of intuitive eating in this relationship among college students. The large sample from Liaoning province has a very high efficiency (97%), which seems to provide a good representation of our study population and increase the generalizability of our findings.

The media's over-promotion of a single aesthetic standard and the current trend towards thinness has led to a generally negative feeling about the body image of the public. Especially the college student crowd contacts the network extensively, can't well control oneself, discerns the information and the idea which receives. To a certain extent, these factors make college students vulnerable to social media and have negative feelings about their image. The same is true of young people in Brazil and Iran [35, 36]. The self-control scale includes the dimensions of focus on work and temperance entertainment, which shows the students' ability to control their attention to study and to pay less attention to entertainment information [15]. In this study, self-control is a negative association with sociocultural attitudes towards appearance. The results suggest that adjusting self-control ability can alleviate the negative emotions of college students' attitudes towards their appearance. The pressure on college students' attitudes towards appearance comes not only from excessive media attention but also from the fact that their actual figure is different from the public's standard of a figure. Hence, they often choose to control their diet to achieve the slimming effect [36]. When students go on a diet, they suppress their body's innate eating mechanisms, and the intuitive eating scale can reflect the degree to which actual eating patterns are inconsistent with the innate mechanisms [30, 37]. In this study, there was a significant positive correlation between intuitive eating and sociocultural attitudes towards appearance, suggesting that students could alleviate negative emotion about an appearance by suppressing the mechanism of intuitive eating. As shown in Fig. 2, intuitive eating partially explains the mediating role of self-control in appearance attitudes. This explains the mechanism by which self-control changes outward attitudes, namely, by controlling intuitive eating. However, dieting can do more harm than good for young people, with studies showing it can lead to eating disorders, menstrual disorders, and slow metabolism [23, 24, 38]. Therefore, society and the media should disseminate positive aesthetic standards to college students and encourage them to pay more attention to professional learning and inner improvement, it advocates applying self-control to other, healthier ways of changing body shape, such as exercise.

The current study has several limitations. First, because of the nature of cross-sectional studies, the causal relationship between self-control, intuitive eating, and sociocultural attitudes towards appearance could not be inferred. Second, because all the datasets we collect are self-reporting, participants may report too much or too little of their answers, which may influence our conclusions. Finally, the conclusions drawn from the study are based on normal college students, so it's not clear whether these findings can be replicated in other populations.

Conclusions

This study investigated the relationship between self-control, intuitive eating, and sociocultural attitudes towards appearance. In this study, self-control played a positive role in improving college students' sociocultural attitudes towards appearance, and intuitive eating played a mediating role between self-control and sociocultural attitudes towards appearance. Inhibition of intuitive eating plays a part in self-control in improving sociocultural attitudes towards appearance. However, intuitive eating is the body's natural response to hunger and satiety, and consciously suppressing it can harm the body. Therefore, higher self-control can help mitigate the negative effects of appearance attitudes, and social media should make students aware that suppressing intuitive eating is bad for their health when they want to change their appearance, advocate the application of high levels of self-control in other areas, such as exercise, emotional adjustment and so on.

Abbreviations

SCS: Self-control scale; IES-2: Intuitive eating scale-2; SATAQ-3: Sociocultural attitudes towards appearance questionnaire-3; IC: Impulse control; HH: Health habits; RT: Rejecting temptations; FW: Focus on work; TE : Temperance entertainment; EPR: Eating for physical rather than emotional; UPE: Unconditional permission to eat; RHSC: Reliance on hunger and satiety cues; B-FCC: Body-food choice congruence; MA: Media attention; IBM: International Business Machines; AMOS: Analysis of Moment Structure; SPSS: Statistical product and service solutions; NY: New York; USA: United States of America; SEM: Structural equation modeling ; ML: Maximum likelihood; SD: Standard deviation; MI: Modification indexes; CMIN: Likelihood-Ratio χ^2 ;DF:Degrees of freedom; RMSEA: Root mean square error of approximation; GFI: Goodness-of-fit index; AGFI: Adjusted Goodness-of-fit index; PGFI :Parsimony goodness-of-it index; ECVI: Expected cross-validation index; NFI: Normed fit index; CFI: Comparative fit index; IFI: Incremental fit index; TLI: Taker-Lewis index; PNFI: Parsimony-adjusted normed fit index.

Declarations

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Authors' contributions

SH, GLL and ZL designed the study. MJN and GLL collected the data. SH analyzed and interpreted the data, and prepared the manuscript draft. SH and ZL revised the manuscript. All authors read and approved the final manuscript.

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Availability of data and materials

The datasets used or analyzed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

Informed consent was obtained from all participants included in the study. The study was approved by the Institute of Jinzhou Medical University was conducted following the principles of the Declaration of Helsinki.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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Figures

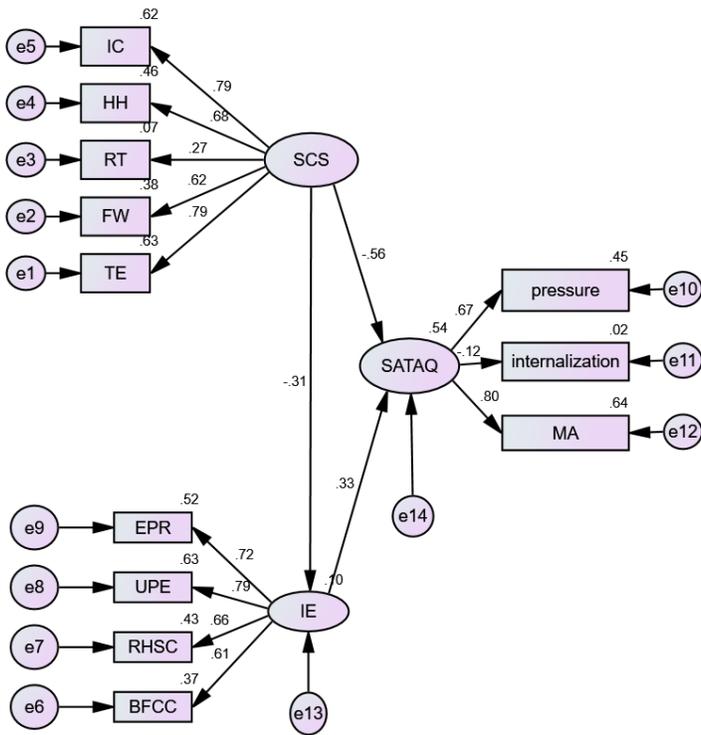


Figure 1
 The structural equation model is on the relationship among self-control, intuitive eating and sociocultural attitudes towards appearance. Data are standardized regression coefficients. IC: Impulse control; HH: Health habits; RT: Rejecting temptations; FW: Focus on work; TE: temperance entertainment; EPR: Eating for physical rather than emotional; UPE: Unconditional permission to eat; RHSC: Reliance on hunger and satiety cues; B-FCC: Body-food choice congruence; MA: Media attention; e1–e12: the measurement error of each observed variable to estimate latent variables. e13–e14: the residual that may affect the endogenous latent variables except the exogenous latent variables.

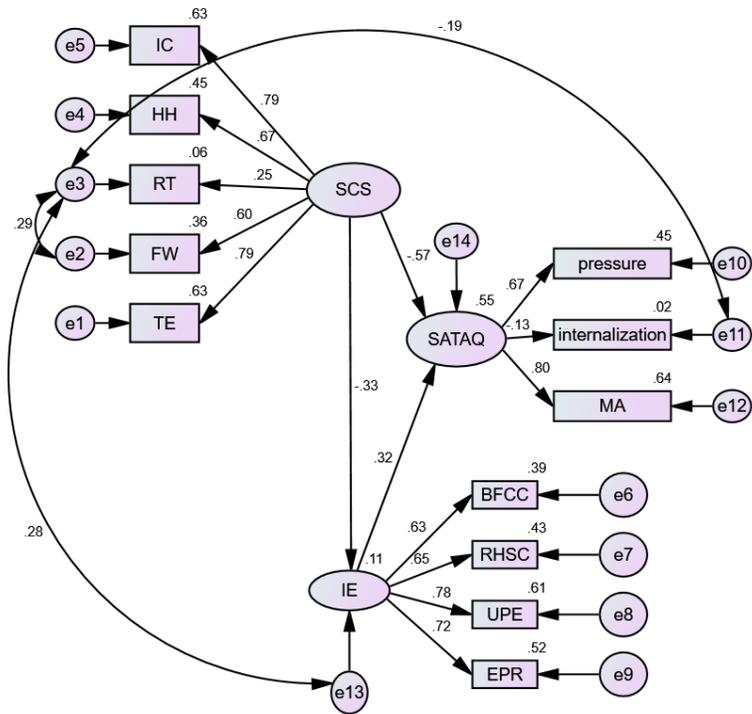


Figure 2

The modified structural equation model based on the modified index is concerned with the relationship between self-control, intuitive eating and sociocultural attitudes towards appearance. Data are standardized regression coefficients. IC: Impulse control; HH: Health habits; RT: Rejecting temptations; FW: Focus on work; TE: temperance entertainment; EPR: Eating for physical rather than emotional; UPE: Unconditional permission to eat; RHSC: Reliance on hunger and satiety cues; B-FCC: Body-food choice congruence; MA: Media attention; e1–e12: the measurement error of each observed variable to estimate latent variables. e13–e14: the residual that may affect the endogenous latent variables except the exogenous latent variables.