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Appearance Comparison, Body Appreciation, and Adolescent Depressive Symptoms: Roles of Gender, Age, and Body-Mass Index

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Objective: This study aimed to examine the association between appearance comparison and adolescent depressive symptoms, the mediating role of body appreciation, and the moderating roles of gender and body-mass index (BMI) among adolescents in different age groups.

Methods: A cross-sectional sample of 2645 Chinese students aged 12–16 years (44.7% girls) participated. The measurements included depressive symptoms, appearance comparison, body appreciation, weight, and height. Multigroup path analysis was used to examine the moderated mediation model.

Results: Compared with boys, adolescent girls presented greater levels of appearance, which increased with age. Body appreciation mediated the association between appearance comparison and depressive symptoms in girls, whereas appearance comparison directly correlated with depressive symptoms in boys. Body appreciation decreased with increasing BMI in boys but remained relatively stable in girls. Similar patterns were observed among junior and senior high school students.

Conclusion: This study underscores the significant relationship between appearance comparison and adolescent depressive symptoms, suggesting varied mechanisms based on gender and BMI levels.

Keywords: appearance comparison, body appreciation, adolescent depressive symptoms, gender difference, age group difference, body-mass index

Introduction

Depression is one of the most common psychological problems among adolescents,[1] as it impairs daily functioning, threatens academic performance and interpersonal relationships, and is related to other psychological problems.[2] Thus, preventing depression is an important goal in promoting the mental health of adolescents.

Body Appreciation and Depression in Adolescence

Body appreciation refers to individuals' appreciation for, protection and acceptance of, and connection with their physical selves.[3] As a positive indicator of body image, body appreciation signifies a unique relationship between self-compassion and adaptive coping in response to stressors related to body image;[4] therefore, body appreciation is not simply equivalent to the opposite of negative body image. An increasing number of studies have examined the effects of body appreciation

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and reported that body appreciation predicts depression among adults.[5] However, research on the development of body appreciation and its association with depression in adolescence is relatively limited.[6]

Adolescence is a critical and vulnerable stage of body appreciation development.[7] With pubertal maturation, adolescents experience dramatic changes in their appearance.[8] Moreover, they are more sensitive to social standards of attractiveness and are more concerned with weight and appearance through the influence of families, peers, and the media. Specifically, highly visual social media posts, such as highly edited images, increasingly and significantly influence adolescents' body image.[9] Therefore, determining how sociocultural factors influence the development of body appreciation and depression in the context of adolescents' biological and psychological developmental features is important.

Tripartite Sociocultural Influence Model and the Developmental-Sociocultural Framework

The tripartite sociocultural influence model (TSIM)[10] is a widely used theory that illustrates sociocultural influences on body image. According to the TSIM, people become aware of idealized body norms through the influence of peers, family, and the media. Appearance comparison and the internalization of body ideals are critical pathways linking exposure to appearance-related information and poor body image. This theory could be applied to people of various ages but does not emphasize the biological and psychological characteristics of adolescents.

The developmental-sociocultural framework extends the TSIM by integrating elements from sociocultural and psychological theories and biological factors, specifically in adolescence.[11] First, it underscores the importance of gender-related sociocultural pressures and developmental as well as social processes in adolescence. For adolescent girls and boys, idealized body norms differ, and the effects of social pressures on body image and depression may also differ. Second, biological factors, such as pubertal development, were considered. As the onset of puberty usually occurs in early adolescence (12–14 years), adolescents at this stage may face greater challenges in psychological adaptation. Body mass index (BMI) is also a biological factor commonly considered to influence body image and mental health. On the basis of this framework, we focused on how appearance comparisons related to body appreciation and depression in adolescents differ by gender, age group, and BMI.

Effects of Appearance Comparison

According to social comparison theory,[12] humans evaluate personal value by comparing themselves to others. Appearance comparison refers to an individual's tendency to compare their appearance with that of others. This is particularly important during adolescence because adolescents' bodies change with pubertal development.[13] They are also at a critical period of developing a self-concept, for which information from peers is highly influential.[14]

Appearance comparison is considered one of the most dominant risk factors for poor body image on the basis of the developmental sociocultural framework and the TSIM. Although social comparison can be upward or downward, upward comparison is more common in appearance-based comparisons.[15] As the use of social media has become increasingly common, social media-based appearance comparisons have become more prominent among teenagers.[16] Adolescents tend to internalize societal beauty ideals as aesthetic standards and use them to evaluate their appearance.[17] Therefore, a higher level of appearance comparison is usually related to lower body appreciation[18,19] and greater depressive symptoms.[20] Based on the theoretical framework and existing evidence, we propose that appearance comparison is related to adolescents' depressive symptoms through the mediation of body appreciation.

Potential Moderating Effect of Gender

Social norms regarding body type shape individuals' desired physical features and perceptions of attractiveness. Like Western beauty standards, Chinese women consistently idealize a thin body type,[21] whereas men prefer a muscular and lean physique.[22] Physical attractiveness is more emphasized among women and girls in society because of gendered norms and roles.[8,11] It is widely reported that adolescent girls have more conversations about appearance and are more likely to engage in appearance comparisons than boys are.[23]

The effects of appearance comparison on body image might also differ for adolescents of different genders. Some studies find that adolescent girls are more vulnerable to the negative influences of appearance comparisons. For example, adolescent girls are more likely to have higher-level body dissatisfaction when exposed to images of thin ideals of the female gender,[24] whereas adolescent boys are not negatively influenced by idealized male images or discussions with peers.[25] However, research findings in this area are inconsistent, with some studies indicating that both boys and girls are equally impacted by social comparison.[26] Because the association between appearance comparison and body image is examined more often among females, the effects of appearance comparison and body appreciation are less clear for males. This study aimed to clarify the moderating effect of gender on the association between appearance comparison and body appreciation. On the basis of previous results, we hypothesize that appearance comparison is a stronger predictor of body appreciation among adolescent girls than adolescent boys.

Potential Moderating Effect of BMI

BMI is a measure of weight in relation to height and is used to evaluate whether an individual is overweight. Because thinness is idealized in social norms, individuals with higher BMIs usually face greater social pressure, such as weight stigma;[27] therefore, they tend to report lower-level body appreciation.[28]

In addition to the main effect on body appreciation, BMI might also influence the relationship between appearance comparison and body appreciation. A previous study revealed that individuals with a high BMI internalize socially preferred standards of thinness more than their counterparts with a low BMI do;[29] they might feel disadvantaged in appearance comparison and be more vulnerable to the negative impact of appearance comparison on body appreciation. Therefore, we propose that BMI moderates the association between appearance comparison and body appreciation. The link is stronger for individuals with high BMI.

Related to the gendered sociocultural pressures, the moderating effect of BMI needs to be considered among adolescents of both genders. Because the idealized thin body shape is more emphasized in girls, girls with high BMIs may face greater disadvantages in social comparison, leading to a more pronounced relationship between appearance comparison and body appreciation.

Therefore, we proposed a three-way interaction effect of appearance comparison, gender, and BMI on body appreciation in adolescents. Specifically, the negative association between appearance comparison and body appreciation is the strongest among adolescent girls with high BMIs.

Role of Age Group in the Moderated-Mediation Model

Age groups should be considered when examining the association between appearance comparison and body appreciation during adolescence for several reasons. First, pubertal maturation is an important trigger for body shape changes and could influence adolescents' body image.[30] Early puberty may be a more challenging period for girls because it entails an increase in the fat–muscle ratio, which moves many girls away from an idealized thin body shape. For boys, height and muscle mass increase during puberty, which brings them closer to the muscular male ideal. Thus, the influence of pubertal maturation on the development of body appreciation might differ between girls and boys during early adolescence (12–14 years old). Second, social pressure related to appearance increases with age among adolescents. With increasing age, adolescents are increasingly aware of idealized body shapes valued by mass media and engage more in appearance-related conversations with peers and family members. This is particularly true for girls. According to previous findings, students in the middle of adolescence (15–17 years old) are the most likely to compare their appearance with that of others.[17] However, whether the associations between appearance comparison and body appreciation and depressive symptoms differ among adolescents of different age groups remains unclear.

Overview of the Present Study

This study aimed to investigate the associations among appearance comparison, body appreciation, and adolescent depressive symptoms, with a specific focus on examining the roles of gender, BMI, and age group in the model. On the basis of the TSIM and the developmental-sociocultural framework, we propose the following four hypotheses (see Figure 1):

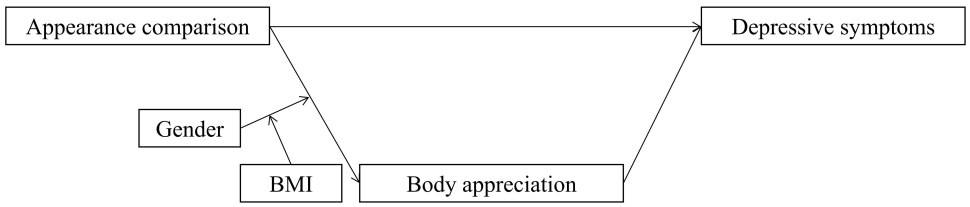

Figure 1 The hypothesized model.
Abbreviation: BMI, body mass index.

H1: Body appreciation mediates the association between appearance comparison and adolescent depressive symptoms.

H2: Gender moderates the relationship between appearance comparison and body appreciation. Specifically, the effect of appearance comparison is stronger among adolescent girls.

H3: BMI moderates the relationship between appearance comparison and body appreciation. Specifically, the effect of appearance comparison is stronger in adolescents with a high BMI.

H4: The three-way interaction effect of appearance comparison, gender, and BMI on body appreciation is significant. The moderating effect of BMI is less pronounced among adolescent boys compared with that of girls.

To explore the role of age groups, we examine the hypothesized moderated mediation model for junior and senior high school students separately without any hypotheses.

Methods

Participants and Procedure

This study was approved by the Ethics Committee of the Affiliated Hospital of Jining Medical University. According to the requirements of the mediation model using a bias-corrected bootstrap test, the minimum sample size required was 1024 to achieve the following criteria: small effect size (coefficient=0.10 for paths a, b and c'), power=0.8, and *alpha*=0.05.[31] A multistage sampling method was employed. First, a county with average GDP in Shandong Province was selected through typical sampling. Second, five junior high schools, two senior high schools, and one vocational high school in this county were chosen through stratified sampling to cover adolescents varying in ages and educational placements. Finally, clustering sampling was used to investigate all the students within these schools. Students voluntarily participated in the survey. Consent was obtained from all the adolescents and their parents. Data were collected in November 2022, that is, in the middle of the semester. Data collection for all the schools was completed within two weeks. Students were asked to complete paper-based questionnaires in class under the supervision of teachers. The teachers received instruction on survey administration and underwent training before data collection. They informed the students about the purpose of the test, emphasizing that the survey was used for research purposes only and would not impact their treatment at school. Students were instructed to answer questions on the basis of their genuine thoughts and feelings, with teachers offering help in case of any comprehension difficulties without providing explicit or implicit answers to the questions. Research assistants measured the height and weight of the participants after questionnaire administration. The students were thanked for their participation. The data were entered into EpiData 2.1, and double entries were used to ensure data entry accuracy.

A total of 2800 adolescents were recruited, 2730 of whom returned the questionnaires. After questionnaires with more than one-third of the answers missing and those providing consistent answers for most questions were excluded, 2645 questionnaires were used in the analyses. In the final sample, there were 1226 boys (46.4%) and 1183 girls (44.7%); 236 students did not identify their gender. The students were aged 12–16 years, with an average age of 14.11 years (*SD*=1.22). Among them, 574 (21.8%) were in Grade 7, 388 (14.7%) were in Grade 8, 1175 (44.7%) were in Grade 9, 164 (6.0%) were in Grade 10, and 330 (12.5%) were in Grade 11; another 9 students did not indicate their grade. Parental education levels were also collected. The education levels of mothers were as follows: 758 (28.8%) students

reported primary school education, 1162 (44.1%) reported junior high school education, 374 (14.1%) reported senior high school education, and 172 (6.5%) reported college or higher education. There were 169 students reporting that they were unaware of their mother's education attainment, and 10 did not answer this question. The education levels of fathers were as follows: 371 (14.1%) students reported primary school education, 1305 (49.3%) reported junior high school education, 555 (21.0%) reported senior high school education, and 243 (9.2%) reported college or higher education. A total of 166 students indicated that their father's educational attainment was unknown, and five did not respond to this question. With regard to subjective socioeconomic status assessment, a minority of the participants −55 (2 0.1%)-perceived their family income as high; the majority-1766 (66 0.8%)- considered it above average; while a significant proportion-570 (21 0.6%)- regarded it below average; only a few-240 (9 0.1%)-reported low family income; finally,14 individuals chose not to disclose their response for this item.

Measures

Depressive Symptoms

The Chinese version of the Depression Self-Rating Scale for Children (C-DSRSC) was used in this study to measure depressive symptoms.[32] This scale was selected because it was developed specifically for children and adolescents and is applicable for measuring depressive symptoms among Chinese adolescents aged 8–16 years.[33] In addition, its reliability and validity are satisfactory, and the norm has been established in China . There are 18 items on the DSRSC, which are rated on a three-point Likert scale (0=never, 2=always). The total score was calculated and used for further analyses, with higher scores indicating higher depression levels. The scale's internal consistency was good in this study (Cronbach's α=0.84).

Appearance Comparison

The Physical Appearance Comparison Questionnaire (PACS) is a widely used instrument that assesses the tendency to compare one's own appearance to the appearance of others in social situations.[34] The Chinese version of the PACS has been validated and used in studies focusing on Chinese participants.[17] There are five items on the scale, which are rated on a five-point scale (1=never, 5=always). The total score was used in the analyses, with higher scores indicating a greater tendency to perform appearance comparisons. The scale's internal consistency was good in this study (Cronbach's α=0.86).

Body Appreciation

The Body Appreciation Scale-2 (BAS-2)[3] is a positive body image measure that was revised on the basis of the BAS and has improved psychometric properties.[3] It was used to evaluate adolescents' body appreciation in this study. There were ten items in the scale and the items were rated on a five-point Likert scale (1=never, 5=always), with higher scores indicating higher-level body appreciation. The Chinese version of the BAS-2 is reliable and valid.[35] The scale's internal consistency was good in this study (Cronbach's α=0.95).

Statistical Analyses

SPSS 18.0 and Mplus 8.0 were used for data analysis. Descriptive statistics were conducted to describe the participants' demographic characteristics. Pearson's correlation analyses were used to examine the relationships between the main variables. Analyses of variance (ANOVAs) were conducted to compare demographic differences in depressive symptoms, appearance, and body appreciation. Differences between cases with and without missing data were compared via *t* tests. All the analyses above were conducted with SPSS 18.0, and listwise deletion was used to handle the missing data. The measurement invariance of the PACS and BAS-2 across gender and age groups was examined to ensure the psychometric equivalence of appearance comparison and body appreciation before further analyses. Measurement invariance was examined at four levels: 1) configural invariance (to examine structural similarity), 2) metric invariance (to examine factor loading equality), 3) scalar invariance (to examine intercept equality), and 4) error invariance (to examine error variance equality). The goodness-of-fit criteria included CFI≥0.90, TLI≥0.90, RMSEA≤0.08, and SRMR≤0.08.[36] Model invariance was evaluated using $\Delta\chi^2$ significance or CFI≤ 0.010 and RMSEA ≤ 0.015 as

criteria.[37] The hypothesized model, with body appreciation as the mediator and gender and BMI as moderators, was tested via path analysis. The mediating effects of body appreciation were examined via the bootstrap method with 5000 repeated samples and a 95% confidence interval. Simple slope tests were conducted for significant moderating effects of gender and BMI. Age group was used as a grouping variable to examine potential differences in model fit through moderated moderated-mediation analysis. Cross-group equivalence was assessed on the basis of measurement invariance criteria. Measurement invariance examination and path analysis were conducted via Mplus 8.0, and full information maximum likelihood (FLML) was used to address missing data. Prior to formal data analysis, common method bias was evaluated via Harman's single-factor method, which revealed no evident bias.[38]

Results

Preliminary Analyses

Measurement Invariance of PACS and BAS-2

For the PACS, the unidimensional factor structure was examined first. The unifactor model fit the data well (χ^2=15.89, df=5, RMSEA=0.028, SRMR=0.006, CFI=0.998, and TLI=0.997). Gender was used as the grouping variance to examine measurement invariance across gender groups. Table 1 shows that the model fit well, supporting configural invariance. When item loadings were constrained to be identical for girls and boys, the model still fit the data well. Moreover, there were minimal changes in RMSEA and CFI (less than 0.010), indicating metric invariance across gender groups. However, scalar invariance was not supported when intercepts were further constrained for the girls' and boys' models because of a larger change in RMSEA. After the intercepts of two items were freed, the model fit improved, and partial scalar invariance was achieved.

Measurement invariance across age groups was examined via the same procedure. As shown in Table 1, configural, metric, scalar, and error invariance were achieved.

Table 1 Measurement Invariance of the PACS and the BAS-2 Across Gender and Age Groups

	χ^2	df	RMSEA	CFI	TLI	SRMR	ΔCFI	ΔRMESA
MI of the PACS across gender groups								
Configural invariance	16.84	10	0.026	0.999	0.998	0.007		
Metric invariance	42.00	14	0.040	0.996	0.994	0.030	0.003	0.014
Scalar invariance	96.64	18	0.060	0.987	0.986	0.030	0.009	0.020
Partial scalar invariance	44.46	16	0.038	0.995	0.994	0.031	0.001	0.002
MI of the PACS across age groups								
Configural invariance	17.87	10	0.024	0.999	0.998	0.007		
Metric invariance	24.03	14	0.023	0.999	0.998	0.014	0	0.001
Scalar invariance	44.12	18	0.033	0.996	0.996	0.019	0.003	0.010
Error variance invariance	55.11	23	0.032	0.995	0.996	0.023	0.001	0.001
MI of the BAS-2 across gender groups								
Configural invariance	480.03	56	0.078	0.979	0.967	0.022		
Metric invariance	513.76	65	0.075	0.978	0.970	0.042	0.001	0.003
Scalar invariance	610.01	74	0.077	0.974	0.968	0.054	0.004	0.002
Error variance invariance	646.24	84	0.074	0.973	0.971	0.072	0.001	0.003
MI of the BAS-2 across age groups								
Configural invariance	578.78	56	0.083	0.977	0.963	0.022		
Metric invariance	596.28	65	0.078	0.976	0.967	0.029	0.001	0.005
Scalar invariance	618.95	74	0.074	0.976	0.971	0.042	0	0.004
Error variance invariance	655.56	84	0.071	0.975	0.973	0.038	0.001	0.003

Abbreviations: MI, measurement invariance; PACS, the Physical Appearance Comparison Questionnaire; BAS-2, the Body Appreciation Scale-2; RMSEA, Root Mean Square Error of Approximation; CFI, Comparative Fit Index; TLI, Tucker-Lewis Index; SRMR, Standardized Root Mean Square Residual.

For the BAS-2, a unidimensional factor structure was examined. The results indicated that the unifactor model fit the data well (χ^2=488.37, df=28, RMSEA=0.078, SRMR=0.020, CFI=0.980, TLI=0. 0.967). Measurement invariance across gender and age groups was achieved at all four levels according to Chen's criteria (see Table 1).

Comparisons Between Cases with and without Missing Data

Among the final sample, BMI data were missing for 495 cases, gender information was missing in 236 cases, depressive symptoms values were missing in 179 cases, body appreciation scores were missing in 115 cases, and grade information was missing in 9 cases. Differences between cases with and without missing data were compared. The results revealed that individuals who did not provide height and weight measurements had higher levels of depressive symptoms (t (642.20) = −2.85, p < 0.01) and lower levels of body appreciation (t (667.17) = 3.49, p < 0.01) than those who provided these measures did. The participants who did not report their gender also reported higher levels of depressive symptoms (t (2464) = −2.11, p = 0.035) and higher BMI values (t (2148) = −1.97, p = 0.050) than did those who provided this information. Furthermore, individuals who did not answer the body appreciation questionnaire reported higher levels of depressive symptoms (t (2464) = −2.39, p = 0.017). Similarly, participants who missed the depression scale reported lower body appreciation (t (177.17) = 2.81, p = 0.005).

Gender and Age Group Differences in Depressive Symptoms, Appearance Comparison, and Body Appreciation

An ANOVA was conducted to test the differences in depressive symptoms, appearance comparison, and body appreciation by gender, age group, and their interactions. The results revealed a significant gender difference in depressive symptoms (F (1, 1844) = 16.01, p<0.001, η^2=0.009), with adolescent girls reporting higher levels of depression than boys did (p<0.05). Additionally, there was a significant main effect of age group on depressive symptoms (F (1, 1844) = 4.58, p=0.013, η^2=0.002), indicating that junior high school students reported higher levels of depression than senior high school students did (p<0.05). However, the interaction effect between gender and age group was not significant (F (1,1844) = 0.01, p=0.905).

For appearance comparison, the gender difference was significant (F (1, 1953) =11.21, p=0.001, η^2=0.006). Compared with boys, adolescent girls were more inclined to compare their appearance with that of others (p<0.05). The age group difference in the appearance comparison was also significant (F (1, 1953) = 6.20, p=0.013, η^2=0.003). Senior high school students were more likely to compare their appearance with that of junior high school students (p<0.05). The interaction effect between gender and age group was significant (F (1, 1953) = 4.25, p=0.039, η^2=0.002). Specifically, the gender difference in appearance comparison was not significant for junior high school students, whereas girls presented significantly greater appearance comparisons than boys did at the senior high school stage.

With respect to differences in body appreciation, junior high school students reported lower-level body appreciation than did senior high school students (F (1, 1879) = 8.03, p<0.005, η^2=0.004), whereas gender differences in body appreciation were not significant (F (1, 1879) = 0.008, p=0.930). The interaction effect between gender and age group was also not significant (F (1, 1879) = 0.19, p=0.666).

Correlations Among the Main Variables

The correlations between the main variables are presented in Table 2. Appearance comparison had a weak negative correlation with body appreciation (r= −0.10, p<0.01) and a weak significant positive correlation with depression (r=0.21, p<0.01). There was a moderately significant negative correlation between body appreciation and depression (r= −0.51, p<0.01). BMI did not significantly correlate with body appreciation or depression.

Model Testing

The moderated-mediation model was examined using appearance comparison as the predictor, depression as the criterion, body appreciation as the mediator, and gender and BMI as moderators. The educational levels of both parents and subjective family socioeconomic status were used as covariates because these variables were significantly related to adolescent depressive symptoms.

Table 2 Correlations of the Main Variables

	M	SD	1	2	3	4	5	6
1. gender	–	–	1					
2. age	14.21	1.52	0.004	1				
3. BMI	22.38	4.72	−0.05*	0.08*	1			
4. appearance comparison	2.13	0.56	0.06*	0.05*	0.01	1		
5. body appreciation	39.05	10.51	−0.01	0.07*	−0.03	−0.09**	1	
6. depressive symptoms	11.22	6.25	0.12**	−0.06*	0.003	0.20**	−0.51**	1

Note: *p*<.05, *p*<.01.
Abbreviation: BMI, body-mass index.

To examine age group differences in model fit, the age group (junior high school vs senior high school) was used as the grouping variable to perform path analyses. Model 1 is the original model based on a free estimation. In Model 2, path coefficients were set equal for junior and senior high school students. The results indicated that the model fit was good for both models (Model 1: χ^2=14.06, df=8, CFI=0.992, TLI=0.956, RMSEA=0.028, SRMR=0.009; Model 2: χ^2=29.33, df=19, CFI=0.986, TLI=0.968, RMSEA=0.024, SRMR=0.022). The difference in model fit was not significant ($\Delta\chi^2/\Delta df$=1.39, p=0.170). Thus, the hypothetical model was equivalent for adolescents in these two age groups.

The model's standardized path coefficients are shown in Figure 2. In the first half of the mediation path (ie, appearance comparison-body appreciation), although appearance comparison was not significantly related to body appreciation, the moderation effect of gender was significant, as indicated by the significant effect of the interaction term (appearance comparison* gender) on body appreciation (β = −0.21, p =0.003). As the other moderator, BMI was also significantly associated with body appreciation (β = −0.17, p =0.025), and its moderation effect was marginally significant (β =0.14, p =0.054). In the second half of the mediation path (body appreciation-adolescent depressive symptoms), body appreciation was negatively associated with adolescent depressive symptoms (β = 0.50, p< 0.01). In addition, the direct effect of appearance comparison on adolescent depressive symptoms was significant (β =0.16, p <0.01).

Table 3 presents the results of the mediation analyses. As shown, the conditional indirect effect of body appreciation on the relationship between appearance comparison and depression was significant for girls but not for boys, regardless of BMI level.

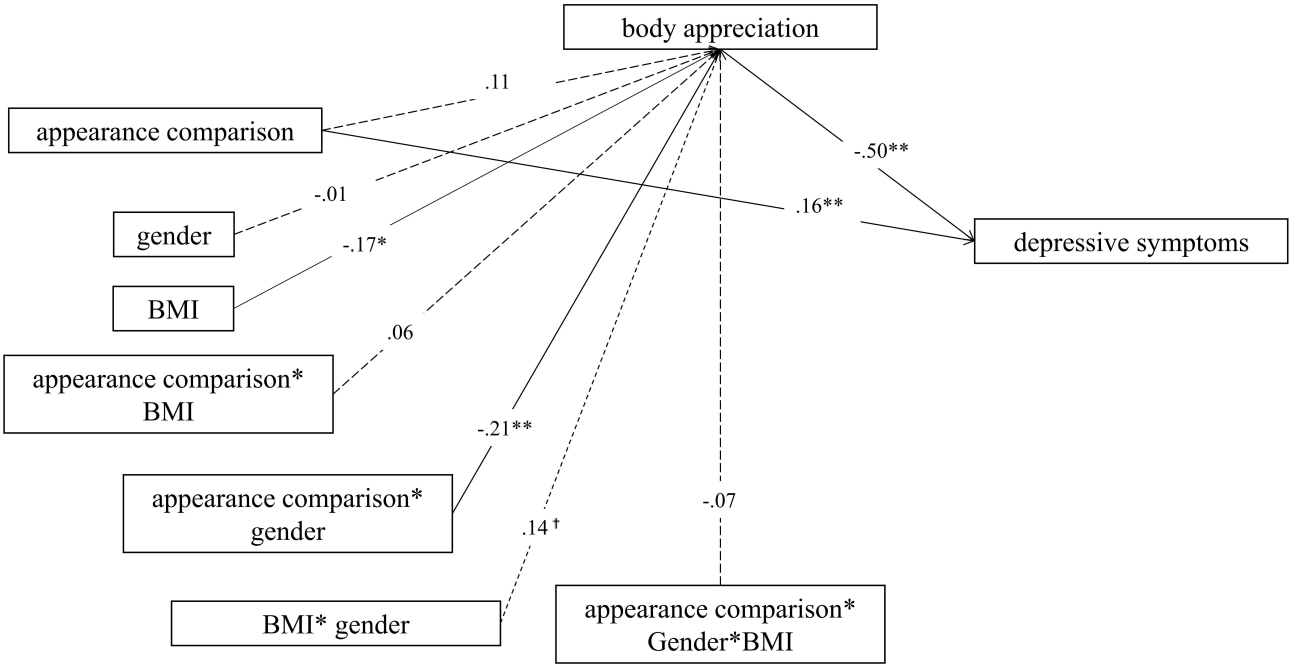

Figure 2 Standardized regression coefficients of the model.
Note: *p*< 0.05, *p*< 0.01, *p*† marginally significant. The solid lines indicate significant paths, and dashed lines indicate nonsignificant paths.
Abbreviation: BMI, body mass index.

Table 3 Conditional Indirect Effect of Appearance Comparison on Adolescent Depressive Symptoms for Boys and Girls

gender	BMI	Indirect effect	SE	95% CI
Male	Low	0.018	0.022	[−.025, 0.065]
	Mean	0.013	0.017	[−.019, 0.049]
	High	0.01	0.025	[−.043, 0.055]
Female	Low	0.069	0.020	[0.033, 0.110]
	Mean	0.094	0.016	[0.050, 0.112]
	High	0.139	0.023	[0.052, 0.143]

Abbreviation: BMI, body-mass index.

BMI moderated the association between appearance comparison and body appreciation. The results of the simple slope test revealed that appearance comparison was negatively associated with body appreciation for girls (β= −0.16, $p<0.01$), whereas the link was not significant for boys (β= −0.03, $p=0.324$). With respect to the marginally significant interaction effect between gender and BMI on body appreciation, body appreciation tended to decrease with increasing BMI for boys (β= −0.072, $p=0.016$) but was relatively stable for girls (β= 0.003, $p=0.097$).

Discussion

This study investigated students in the early and middle stages of adolescence (12–16 years) in junior and senior high schools to examine the association between appearance comparison and depressive symptoms, the mediating effect of body appreciation, and the potential moderating roles of gender and BMI.

The results revealed significant gender and age group differences in terms of appearance, with girls showing a greater tendency than boys do and senior high school students being more inclined than junior high school students are. Age and gender differences were also reported by Chen et al, in which greater tendencies in appearance comparison were found in girls in middle adolescence (14–17 years) than in their counterparts in early adolescence (10–13 years) and boys of the same age. Moreover, we also found a significant interaction effect, indicating that only adolescent girls exhibited an increased inclination for appearance comparison as they grew older. This finding aligned with the results of Sample 2 but contradicted those of Sample 1 in Chen et al. The inconsistent findings regarding the age * gender interaction effect on appearance comparison suggest that the tendency toward increased appearance comparison among adolescent girls may be more pronounced than that among boys, although the difference is not substantial. Gender differences in appearance comparison may be associated with greater social pressure related to the appearance experienced by females than males. Previous studies indicate that girls engage in more appearance-related conversations and face more peer criticism related to their appearance, which significantly affects their social adjustment.[8,39] The increasing tendency of appearance comparison in adolescent girls might be related to their biological development and greater involvement in the socialization of cultural norms related to appearance with age.

We found that body appreciation mediated the association between appearance comparison and adolescent depressive symptoms in girls but not in boys, which partly supports H1. This gender difference is also consistent with H2. This result is consistent with the developmental-sociocultural framework, which emphasizes gender-related sociocultural pressures and is generally in line with previous findings suggesting that appearance comparison is a more important predictor of body appreciation in females than in males.[40] Physiological development related to puberty entails an increase in the fat-to-muscle ratio and moves many girls away from the idealized thin body image; boys, on the other hand, are closer to the aesthetic standard owing to an increase in height and muscle mass.[22] As a result, adolescent girls are more likely to be frustrated in appearance comparisons and thus have lower body appreciation. From a social development perspective, adolescence is a critical period in the formation of self-awareness. Because the female gender's appearance is addressed in the mass media and discussed by family members and peers more frequently, appearance has become an important dimension influencing girls' self-evaluations.[41] Therefore, it is very important for the media to advocate healthy and diversified social norms for an ideal female body image. It is also vital to help adolescent girls accept their bodies and form positive body images and self-concepts through school psychoeducation.

In line with the tripartite sociocultural influence model, individuals with high BMIs reported lower body appreciation. This result is consistent with numerous studies focusing on samples of adolescents and adults.[6,28,42] The interaction term of BMI and gender was marginally significant. Specifically, body appreciation and BMI were more closely associated among boys than girls. This finding was inconsistent with the findings of He et al, who reported that the association between BMI and body appreciation was weaker in males than in females.[42] This result can be interpreted from two perspectives. First, we found that girls' body appreciation was generally low, especially among those with low BMIs. Girls may pursue an ultraslim body shape to achieve higher-level body appreciation, regardless of their BMI. Second, BMI has a significant effect on body appreciation in adolescent boys, who become more aware of social pressures related to appearance. In particular, boys with a high BMI who experience greater discrepancy in idealized body shape are more likely to develop a less positive body image. Similar results have also been reported in previous studies with adolescent boys as participants.[7] In contrast to H3, the interaction term between BMI and appearance comparison did not significantly predict body appreciation, indicating that the association between appearance comparison and body appreciation was consistent for participants with high and low BMI values. As inspired by previous findings, the discrepancy between actual body shape and ideal body shape is a strong predictor of body appreciation.[43] Influenced by thin-ideal internalization, the perception of discrepancy in body shape tended to deviate from the difference in BMI values. Researchers have reported that female college students select a larger figure for themselves than their BMI represents, while they select a slimmer figure for their ideal body than their ideal BMI represents.[44] The biased perception of body shape makes BMI less predictive of body appreciation, especially in the context of ideal body shape. Similarly, the three-way interaction was not statistically significant, suggesting that the relationship between appearance comparison and body appreciation was consistent for both males and females, regardless of their BMI. Therefore, H4 was not supported. This lack of significance is related to two factors: first, the lack of a significant effect of appearance comparison on body appreciation among boys, and second, the absence of a significant moderating effect of BMI on the relationship between appearance comparison and body appreciation in girls.

With respect to the age difference left for exploration, we found that the association patterns of the main variables seemed similar for adolescents in different age groups because the hypothesized models for junior and senior high school students were equivalent. This result indicates that the detrimental effects of appearance comparisons persist consistently from early to middle adolescence. Therefore, it is imperative to initiate guidance on ideal body image earlier, during early adolescence or even childhood, to prevent potential body image issues and their impact on mental health during this critical period.

This study had certain limitations. First, it used a cross-sectional survey to compare age group differences in appearance comparison and body appreciation; however, this study did not fully capture the developmental aspects of appearance comparison and body image because of the confounding effects of individual differences. A long-term longitudinal design should be considered in future research. Second, the comparison of appearance measured in this study did not clarify the direction of comparison. Although upward comparisons are common, the possibility that adolescents obtain higher-level body appreciation through downward comparison cannot be ruled out. Therefore, the effect of the appearance comparison in this study may have been underestimated. Third, in addition to body shape, other factors, such as facial features and clothing style, might also influence one's body appreciation through appearance comparison, however, these factors were not considered in this study. Moreover, in addition to BMI, the potential moderating role of the discrepancy between ideal and actual body shape in the relationship between appearance comparison and body image warrants further investigation in future studies. Finally, it is important to note that only retrospective self-reported data (with the exception of BMI measures) were collected in this study, which introduces common method bias and could be susceptible to memory bias. Future research could benefit from employing diary study designs for recording appearance comparisons or experimental designs for manipulating appearance comparisons to increase measurement accuracy.

Nevertheless, this study contributes to theory by clarifying the roles of gender, BMI, and age group in the associations between appearance comparison, body appreciation, and depressive symptoms. Practically, the results suggest that adolescent girls are more vulnerable to the negative effects of appearance comparison. Reducing appearance comparison and guiding the formation of healthy social norms toward female bodies may also be effective in improving body appreciation and reducing girls' depressive symptoms. Boys with high BMIs were also at greater risk of developing low body appreciation. To promote physical and mental health, it is important to recommend healthy weight loss methods while fostering a positive self-concept.

Data Sharing Statement

The datasets used and/or analyzed during the current study are available from the corresponding authors (Ting Zhou or Peipei Wang) upon reasonable request.

Ethics Approval and Consent to Participate

All participants provided informed consent prior to participation in the study. This study was approved by the Ethics Committee of the Affiliated Hospital of Jining Medical University (2022–04–C006) and complied with the Declaration of Helsinki.

Author Contributions

Qinliang Zheng and Meng Chen contributed equally to this work and were co-first authors. All authors made a significant contribution to the work reported, whether in the conception, study design, execution, acquisition of data, analysis and interpretation, or in all these areas; took part in drafting, revising or critically reviewing the article; gave final approval of the version to be published; agreed on the journal to which the article has been submitted; and agreed to be accountable for all aspects of the work.

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