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A dual-focus validation of visual body image assessment tools and their link to eating disorders in Chinese young males

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The current work aimed to identify the applicability of Male Body Scale (MBS) and Male Fit Body Scale (MFBS) among young Chinese men, exploring the characteristics of body dissatisfaction in this demographic as well as its impact on eating disorders (EDs). The paper questionnaire survey and comprehensive data analysis of 977 participants showed that MBS and MFBS had good reliability and validity. Additionally, 69.8% of young men in China were dissatisfied with fat and 82.8% were dissatisfied with muscle. Body dissatisfaction in the fat dimension could significantly predict the level of EDs, while body dissatisfaction in the muscle dimension could significantly predict the drive level for muscularity. Furthermore, Chinese young men who pursued thin ideals had significantly higher ED scores than those who pursued larger/adipose ideals and were satisfied with their bodies in healthy weight groups. The social norm of "thinness as beauty" may be exacerbating the physical and psychological stress on young men, which is likely to lead to unhealthy eating behaviors and the development of EDs.

Keywords Thin ideal, Muscular ideal, Body dissatisfaction, Chinese young men, Eating disorders

Discussions surrounding body image have increasingly become a focal point of public attention in contemporary society^{1,2}. However, women's body image issues are regarded as the core of mainstream discourse^{3,4}. Recently, modern media and culture have imposed additional standards on male body image, particularly in terms of fat and muscle⁵. The portrayal in movies, advertisements, and social media frequently presents the ideal male body figure^{5,6}, which is typically depicted as lean, strong, and muscular^{7,8}. The pressure from peers and family is increasingly influencing men's perception of their bodies, resulting in men feeling dissatisfied with their bodies^{9,10}. These social pressures impact men's self-identity and alter their pursuit of the ideal body¹¹. Furthermore, these pressures may trigger eating disorders (EDs) and other mental health issues, such as anxiety and depression¹².

The pursuit of the ideal male body figure varies globally, particularly across different cultures. In Western society, people prefer a highly muscular upper body (V-shaped torso) and lower body fat levels that accentuate muscle definition¹³. In contrast, large body sizes are often seen as symbols of wealth and health in some non-Western cultures¹⁴. Globalization is influencing these cultural disparities¹⁵, with non-Western societies adopting Western muscle standards. For example, Indian men are striving for the low-fat, high-muscle mass physique typical of Western men, a significant shift from their previous ideals, as indicated by a study on the transformation of Indian men's ideal body Fig¹⁶. These studies exhibit the diversity in men's perceptions of ideal body shape. The dissemination and integration of global culture are altering the norms for male body image.

Body dissatisfaction is a prevalent issue among men^{17,18}. A survey conducted among Brazilian adults reveals that 74% of Brazilian men are dissatisfied with their body image¹⁹. Similarly, a study in China finds that 35.2% of male college students experience body dissatisfaction²⁰. Additionally, Chinese men may engage in more social comparisons as they spend more time on social network services, which contributes to a high prevalence of body dissatisfaction²¹.

Overall, men are influenced by social media, family, peers, and cultural factors, which affect their satisfaction with their bodies and may develop EDs. This phenomenon is becoming increasingly evident in China as well. Young Chinese men are also exposed to such environments^{22–24} and face body dissatisfaction. The body image perceptions of young Chinese men are being significantly impacted by the evolution of socio-cultural norms and the widespread penetration of social media²². Exploring the characteristics of body dissatisfaction among young

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Chinese men in depth is crucial for understanding the mental health status of this demographic and developing appropriate intervention measures.

Body dissatisfaction and EDs

The public has historically underestimated the prevalence of EDs in men, with a long-standing emphasis on female EDs²⁵. However, recent studies indicate an increasing prevalence of EDs in men. A cross-cultural international study shows the prevalence of EDs is 19.4% among women (the prevalence rate of broadly defined EDs, i.e., the overall prevalence rate encompassing all types of EDs) and 13.8% among men²⁶. Furthermore, the incidence, prevalence, and disability-adjusted life years (DALYs) of EDs (EDs refer to the collective term for three specific disorders: anorexia nervosa, bulimia nervosa, and binge EDs) in men increase by 54.97, 68.88, and 69.75%, respectively. These changing rates are significantly higher than those of women, according to a research report on Chinese adolescents aged 10 to 24 from 1990 to 2019²⁷. This discrepancy is attributed to the stereotype that categorizes EDs as female issues. Consequently, there has been a lack of attention to EDs in men, and this stereotype deters men from seeking help or receiving diagnosis²⁸.

EDs characterized by abnormal eating behaviors and an excessive focus on food, weight, and body shape, represent a complex syndrome with high mortality and a propensity for chronicity²⁹. The detrimental effects of EDs extend beyond physical health, profoundly impacting emotional regulation and psychological functioning^{30,31}. The close association with body image is particularly noteworthy among these effects³². Body image refers to an individual's perceptions, thoughts, and feelings about their body³³. Negative body image, or body dissatisfaction, has been extensively documented as a critical precursor to the development of EDs^{34–37}. This association has been particularly validated among young populations. Research on Chinese university students has found a significant positive correlation between body dissatisfaction and dietary restraint behaviors³⁸. Additionally, body dissatisfaction has been identified as a significant predictor of EDs³⁶. Global cross-cultural studies further reveal that Asian university students exhibit higher levels of body dissatisfaction compared to their American and European peers, along with a stronger tendency toward weight-loss behaviors³⁹. This phenomenon suggests that socio-cultural factors may play a pivotal role in the interaction between body image and EDs.

The etiology of EDs remains unclear, but research suggests that they result from a complex interplay of biological, psychological, and cultural or environmental factors⁴⁰. Pressures from social environments (e.g., appearance-focused families, peers, and media) lead individuals to internalize societal appearance ideals and engage in social comparisons based on appearance. These behaviors ultimately result in body dissatisfaction, as indicated by the Tripartite model by Thompson (1999)⁴¹. These negative perceptions of body image heighten the probability of viewing calorie restriction as an acceptable response to environmental pressures. Eventually, abnormal eating behaviors like dietary restriction appear⁴². The link between body dissatisfaction in men and EDs has garnered attention in recent years. Men who are dissatisfied with their bodies are more likely to develop ED behaviors, including overeating, restrictive dieting, and excessive muscle-building^{43,44}.

Men express dissatisfaction in ways that differ from women, focusing on building muscle rather than pursuing thinness^{45,46}. When men are not satisfied with their muscle mass, especially if they have a strong desire for an ideal body figure, their drive to gain muscle intensifies. This increased motivation reduces the perceived gap between their current figure and the desired state^{47,48}. However, this quest may lead to various disordered eating habits (e.g., restrictive dieting and overexercise^{49,50}), a phenomenon particularly common among athletes and fitness enthusiasts⁵¹. Furthermore, body dissatisfaction, strongly associated with mental health problems (e.g., anxiety and depression), is considered a key factor in exacerbating disordered dietary behaviors⁵². For instance, individuals may resort to improper coping strategies (e.g., overeating and excessive dieting) to manage their mood when they face mental health issues arising from body dissatisfaction⁵³. This behavior stems from men's fear and dissatisfaction with insufficient muscle mass or a high body fat percentage (BFP), which are perceived as undesirable body images. These perceptions increase psychological distress and worsen EDs^{33,54}.

The relationship between body mass index (BMI) and EDs has been well-documented in numerous studies. Individuals with higher BMIs tend to exhibit a greater risk of developing EDs⁵⁵. Specifically, Rosenvinge (2012) found that individuals classified as obese score about two point three times higher on ED measures compared to those with healthy weight BMIs⁵⁵. This finding has been further supported by subsequent studies. For instance, Banna's (2021) research on Bangladeshi university students revealed that individuals categorized as obese or overweight have a higher risk of EDs compared to those with healthy weight or underweight BMIs⁵⁶. Similarly, Melisse, B. (2022) identified significant differences in ED scores across different BMI groups, with higher BMI groups scoring significantly higher on ED measures⁵⁷.

Body dissatisfaction appears to play a critical role in this relationship. Individuals with higher BMIs tend to experience greater body dissatisfaction^{38,58–60}. This dissatisfaction is linked to the pursuit of a thin ideal body type and may trigger unhealthy weight control behaviors and disordered eating^{57,61}. More importantly, this body dissatisfaction, driven by the pursuit of a thin ideal, tends to exacerbate a vicious cycle of dieting and weight control^{61–63}.

Literature on body dissatisfaction and EDs is relatively limited in China⁴³, with research specifically focusing on men being even more scarce. Consequently, it is crucial to further investigate body dissatisfaction and EDs in this demographic and understand the distinct dynamics between these two aspects⁶⁴.

Dissatisfaction scale of male body

Selecting the right tools is crucial for accurately assessing men's body dissatisfaction. Researchers have developed and validated various evaluation methods, including questionnaire-based scales and visual scales, with the latter being preferred for their simplicity and fewer questions^{65,66}. Stunkard Figure Rating Scale (SFRS) has been one of the most frequently used visual scales over the past three decades. It quantifies body dissatisfaction by having participants choose an image that closely matches their body figure and then comparing the image with their

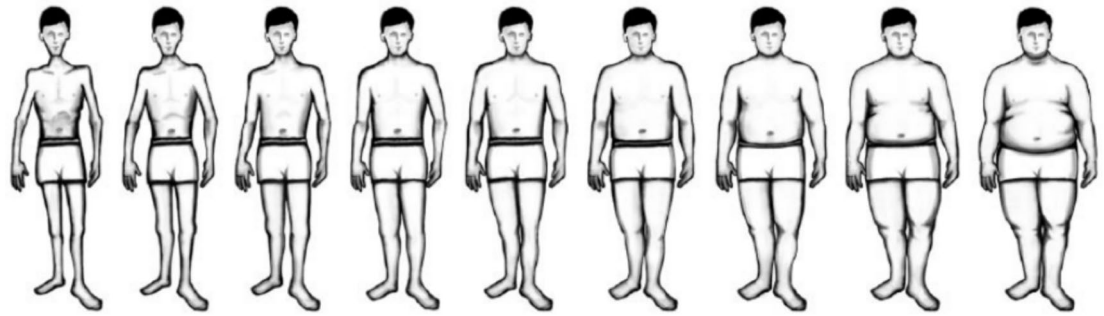


Fig. 1. Male body scale (MBS).

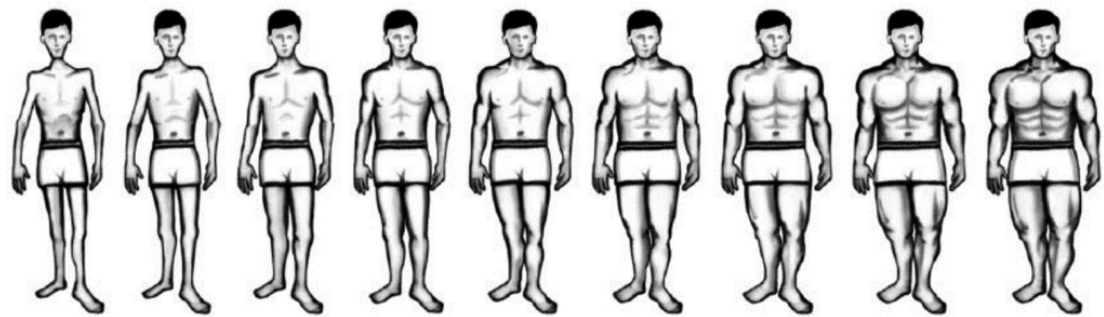


Fig. 2. Male fit body scale (MFBS).

ideal body figure. However, SFRS primarily concentrates on the fat dimension and does not incorporate the muscle dimension^{65,67,68}. Thus, Cafri and Thompson introduced the somatomorphic matrix⁶⁹ in 2004. This computerized assessment measures satisfaction with both muscle and fat. Nonetheless, it requires participants to choose from an extensive array of images, which is time-consuming.

Ralph-Nearman C developed the Male Body Scale (MBS) and the Male Fit Body Scale (MFBS) in 2018. These scales, consisting of nine body contour images each, are designed to assess men's body dissatisfaction⁶⁶ from two unique perspectives (Figs. 1 and 2). The first image in each scale illustrates the figure of anorexia patients, while the ninth image shows the body contours of obese and weight-lifting males, respectively. Each scale features body contour images that increase the size by 10%. MBS and MFBS provide body figure scales that increase in a systematic proportion, which addresses the limitations of previous scales. For instance, scales that rely on cultural foundations (e.g., language-based questionnaires) or those using unrealistic, cartoonish, headless, unbalanced, and disproportionate body images, as well as tools that are time-consuming in measuring body dissatisfaction. Considering the limitations of existing scales, the current work validates the suitability of MBS and MFBS for Chinese young men in accurately assessing body dissatisfaction across different dimensions.

Research objectives

Modern media, culture, and social networks significantly influence the body image standards of young men^{22–24}. Body dissatisfaction, especially concerns about muscle mass and fat percentage, has become prevalent among them. This dissatisfaction impacts mental health, potentially leading to EDs and related psychological problems. The current work aims to validate the reliability and validity of two scales (MBS and MFBS) among young male populations and further explore the characteristics of body dissatisfaction in Chinese young males and its relationship with EDs.

Based on the reliability and validity of the MBS and MFBS demonstrated in the samples of English-speaking males, the current work proposes **H1**: The MBS and MFBS exhibit good reliability and validity among young Chinese men, specifically: (a) the current body size in MBS and MFBS is significantly correlated with BMI and BFP. (b) The body dissatisfaction scores of MBS are negatively correlated with the EDs, and the body dissatisfaction score of MBS is an important predictor of EDs. (c) The body dissatisfaction scores of MFBS are positively correlated with the total score of drive for muscularity, and the body dissatisfaction score of MFBS is an important predictor of muscularity tendency. (d) MBS and MFBS have high test–retest reliability among Chinese young males. Given that existing research has shown differences in eating disorders among individuals with different BMI groups, the current work proposes **H2**: Among Chinese young men, individuals in different BMI groups exhibit significant differences in ED scores. Given that the pursuit of ideal body types—especially the “thin ideal”—may trigger eating disorder problems such as dieting and weight control, the current work

proposes **H3**: Within the same BMI range, young men who pursue the thin ideal have significantly higher ED scores than those who pursue the large ideal or are satisfied with their body.

Material and method

Authorization and ethical review

Professor Ralph-Nearman C, the creator of the original scale, approved the revisions in the work. Subsequently, body contour images with the original proportion were received via email. Adhered to the Declaration of Helsinki, the current work has obtained ethical clearance from the Examining Committee of Shenyang Sport University (Ethical Approval Number: 202406).

Participants

The current work utilized stratified sampling through paper questionnaires, drawing participants from comprehensive universities, universities of science and engineering, normal universities, and art universities. A total of 1,097 men participated in on-site data collection, including undergraduates, graduate students, and faculty from these universities. Of the 1,097 questionnaires collected, those showing consistent and irregular data were removed. Ultimately, 977 questionnaires were valid. These participants, aged between 18 and 25 years ($M = 18.958$ and $SD = 1.154$), had a BMI (weight (Kg)/height (m^2)) ranging from 14.13 to 48.84 ($M = 22.883$ and $SD = 4.101$) and a BFP ranging from 5.120 to 46.780 ($M = 15.620$ and $SD = 4.934$). In the second stage (3–4 weeks later), 95 participants were retested for test–retest reliability. Following the exclusion of invalid data, 87 *valid datasets were retained, with participants aged 18–22 years ($M = 18.790$ and $SD = 0.878$) and a BMI range of 15.43–36.63 ($M = 23.472$ and $SD = 4.631$).*

Measurement

Male Body Scale (MBS), consisting of nine male body contour images, is used to assess participants' thin-ideal (desiring less body fat than they currently have), larger/adipose ideal (desiring more body fat than they currently have), and fat-related body dissatisfaction⁶⁶. These images progress from the thinnest (anorexic males) to the most adipose (obese males). Each adjacent body contour increases the width (fat) by 10%, with the height unchanged (Fig. 1). Participants are required to answer two questions regarding these images. (1) Select the figure that most closely resembles your current figure. (2) Select the figure that best aligns with your ideal body figure. Fat-related body dissatisfaction is determined by subtracting the current figure from the ideal one. This scale has been validated in the samples of English-speaking males, demonstrating good reliability⁶⁶.

Male Fit Body Scale (MFBS), consisting of nine male body contour images, is employed to evaluate participants' lean-ideal (desiring less body muscle than they currently have), larger/muscular ideal (desiring more body muscle than they currently have), and muscle-related body dissatisfaction⁶⁶. These images progress from the thinnest (anorexic males) to the strongest (weight-lifting males), respectively. Each adjacent body contour increases the width (muscle) by 10%, with the height unchanged (Fig. 2). Participants are required to answer two questions regarding these images. (1) Select the figure that best matches your current figure. (2) Select the figure that closely resembles your ideal body figure. Muscle-related body dissatisfaction is calculated by subtracting the current figure from the ideal one. This scale has been validated in the samples of English-speaking males, demonstrating good reliability⁶⁶.

Actual body indices

Participants are asked to report their height (cm) and weight (kg), with measurements precise to two decimal places. BMI and BFP are calculated using these measurements according to specific equations. BMI is obtained by dividing height by the square of weight. BFP is computed using the following equation: $1.2 \times BMI + 0.23 \times \text{age} - 5.4 - 10.8 \times \text{gender}$ (male = 1; female = 0).

Eating disorder examination questionnaire (EDE-Q6.0)

EDE-Q6.0, a self-reporting tool comprising 28 items^{70,71}, is employed to evaluate the key psychopathological features and behaviors associated with EDs over the past 28 days. It utilizes a 7-point scale (ranging from 0 = no days to 6 = every day) for the 22 behavior-evaluating items, which are categorized into four subscales: restraint, eating concern, shape concern, and weight concern. An additional six items assess the frequency of ED behaviors. The overall severity of EDs is determined by averaging the scores from these four subscales. The Chinese version of EDE-Q6.0 has demonstrated excellent reliability⁷², with the following statistical measures: overall Cronbach $\alpha = 0.934$ and KMO = 0.929. The reliability statistics for the four subscales are as follows: restraint ($\alpha = 0.893$; KMO = 0.864), eating concern ($\alpha = 0.832$; KMO = 0.765), shape concern ($\alpha = 0.884$; KMO = 0.873), and weight concern ($\alpha = 0.794$; KMO = 0.774).

Drive for muscularity scale (DMS)

DMS, developed by McCreary D R and Sasse D K in 2000⁴⁷, comprises 15 questions and is divided into two subscales: attitude and behavior. All questions are reverse-coded and scored on a 6-point Likert scale, with response options ranging from 1 (always) to 6 (never). The total score is the average of all question scores, with higher scores indicating a stronger tendency towards muscularity. The Chinese version of DMS has shown ideal reliability in Chinese male groups⁷³, with Cronbach α of 0.837. The attitude subscale has Cronbach α of 0.838, and the behavior subscale achieves Cronbach α of 0.816.

Procedure

Two experts specializing in psychometrics and cross-cultural studies joined 18 Chinese young men in discussions. They discussed whether the graphics in MBS and MFBS aligned with the aesthetic preferences and

cultural perceptions of Chinese men. Moreover, whether these graphics accurately represent the current and desired body figures of Chinese men was explored. The participants were able to accurately recognize the body figures represented by the graphics (ranging from emaciated to larger obese figures and from emaciated to lean to larger muscular figures). The graphics in the scales represented the current and ideal body figures, indicating the suitability of MBS and MFBS within the Chinese cultural context.

Questionnaire distribution was performed during the mid-semester break to mitigate the potential interference of academic stress on the outcomes. Written informed consent was obtained from all participants before questionnaire distribution. Participants were informed of the nature of research and their right to withdraw at any time. The questionnaire was printed on both sides of an A3 sheet to reduce any emotional distraction from page turning. The on-site data collection was managed by the research team.

In the first stage, participants provided their height and weight and selected a body contour image that aligned with their current and ideal body figures on MBS (emaciated-larger obese) and MFBS (emaciated-larger muscular), respectively. Then, they were asked to choose the images that most accurately represented their current and ideal body contours from the combined set of these two scales (totaling 18 images). Finally, the EDE-Q6.0 and DMS questionnaires were completed. A subset of participants was retested in the second stage (3–4 weeks after the initial test) to examine the test–retest reliability of the scales. The retest sample was selected through random sampling, with 95 participants randomly chosen from the initial sample to complete the MBS and MFBS scales again.

Data analysis

The current work utilized IBM SPSS Statistics 26 for data analysis. Initially, all data underwent normality testing, followed by descriptive statistical analysis, including frequency distribution, mean, range, and standard deviation. Levene's test was employed to assess the homogeneity of variance in independent samples *t*-tests, ensuring that the assumptions were met. Scatter plots were initially employed to visually assess the linear relationship between independent and dependent variables in multiple linear regression analysis, which evaluated the fulfillment of the linearity assumption. Subsequently, the variance inflation factor (VIF) was calculated to assess multicollinearity issues. Additionally, Q-Q plots were utilized to visually inspect the normality of residuals, and the Durbin-Watson test was applied to evaluate the independence of residuals. This process ensured the robustness of the regression model. Levene's test was first used to assess the homogeneity of variance in one-way ANOVA. If the assumption of homogeneity of variance was met, post-hoc tests were conducted using Tukey's test (for equal sample sizes between groups) or Scheffé's test (for unequal sample sizes between groups). If the assumption of homogeneity of variance was not met, Welch's test was applied, and post-hoc tests were conducted using Games-Howell (for significantly different sample sizes between groups) or Tamhane's T2 (for similar sample sizes between groups) for multiple comparisons.

Results

Current body figure and ideal body figure

Current body figure: In all, 50.56% of men feel that MBS optimally represents their current body figure, while 42.68% find MFBS more appropriate. An additional 6.76% believe that both scales accurately depict their current body figure. **Ideal body figure:** About 78.3% of men prefer MFBS for their ideal body figure, whereas 14.94% favor MBS. Similarly, 6.76% think both scales are suitable for reflecting their ideal body figure.

When a larger/muscular ideal body type is presented on the MFBS, males consistently choose the larger ideal body type, rather than opting for a larger/adipose body type on the MBS (Table 1). A total of 69.8% of young men express dissatisfaction with their body fat (43.6% thin-ideal; 26.2% larger/adipose ideal), while 82.8% are dissatisfied with their muscle mass (7.7% lean-ideal; 75.1% larger/muscular ideal). This suggests that the ideal body type for young Chinese males is typically larger and more muscular.

Construct validity related to actual body measurements

Construct validity is evaluated by the degree of agreement among BMI, BFP, and the current body figure. The current body figure on MBS positively correlates with BMI and BFP ($r_1 = 0.754$ and $P < 0.01$; $r_2 = 0.753$ and $P < 0.01$) (Table 2). The same holds for the current body figure on MFBS, showing a significant positive correlation with BMI and BFP ($r_1 = 0.459$ and $P < 0.01$; $r_2 = 0.462$ and $P < 0.01$). Notably, Chinese adult males with lower BMI and BFP tend to perceive their current body figure as thinner on MBS and MFBS.

Construct validity related to the drive for muscularity

Construct validity is identified by the correlation between the body dissatisfaction scores and ideal body figures from MBS and MFBS and the scores reflecting the drive for muscularity. Body dissatisfaction scores from both MBS and MFBS significantly correlate with DMS scores, with MFBS showing a stronger correlation than MBS (Table 3). The correlation between the MBS ideal body figure and DMS score is $r = 0.073$ ($P < 0.05$), while the correlation between the MFBS ideal body figure and DMS score is $r = 0.434$ ($P < 0.01$). In summary, MFBS exhibits a stronger positive correlation with the drive for muscularity compared to MBS in terms of body dissatisfaction scores and ideal body figures.

Body dissatisfaction scores from MBS and MFBS are used as independent variables, while the DMS scores are the dependent variable in the multivariate regression analysis. Statistical assumptions are tested to ensure the applicability of the regression analysis. Data meet the assumption of normal distribution, with the Durbin-Watson statistic close to 2, collinearity VIF less than 5, $B = 0.443$, $t(974) = 14.929$, and $P < 0.001$. These results suggest that the regression assumptions are satisfied. The body dissatisfaction score on the MFBS is a significant predictor of muscularity-oriented attitudes. The higher the body dissatisfaction on the muscularity dimension, the higher the muscularity-oriented attitudes an individual pursues. In contrast, the body dissatisfaction score

Index		Minimal value	Maximum value	Mean	Standard deviation
Age	977	18	25	18.958	1.154
MBS (current)	977	1	9	4.948	1.543
MFBS (current)	977	1	9	4.262	1.271
MBS (ideal)	977	2	8	4.599	0.819
MFBS (ideal)	977	2	9	5.646	1.459
MBS (dissatisfaction)	977	−4	3	−0.35	1.451
MFBS (dissatisfaction)	977	−4	7	1.384	1.498
DMS	977	1.00	5.930	2.729	0.801
Restraint	977	0	6	1.185	1.474
Eating Concern	977	0	6	0.908	1.269
Shape Concern	977	0	6	1.47	1.377
Weight Concern	977	0	6	1.357	1.333
EDE Global	977	0	6	1.234	1.211

Table 1. Descriptive statistics. *MBS* male body scale, *MFBS* male fit body scale, *current* current figure, *ideal* ideal figure, *dissatisfaction* ideal figure minus current figure, *DMS* drive for muscularity, *EDE global* eating disorder examination questionnaire global scores.

	M	SD	MBS (current)	MFBS (current)
MBS (current)	4.948	1.543	1	
MFBS (current)	4.262	1.271	0.574**	1
BMI	22.883	4.101	0.754**	0.459**
BFP	15.62	4.934	0.753**	0.462**

Table 2. The correlation among current body type choices, BMI, and BFP. *represents $p < 0.05$; **represents $p < 0.01$. *MBS* Male Body Scale, *MFBS* Male Fit Body Scale, *current* current figure, *ideal* ideal figure, *BMI* Body Mass Index, *BFP* Body Fat Percentage.

	1	2	3	4	5	6	7	8	9
MBS (dissatisfaction)	1								
MFBS (dissatisfaction)	0.282**	1							
MBS (ideal)	0.186**	0.078*	1						
MFBS (ideal)	−0.113**	0.631**	0.298**	1					
DMS	0.169**	0.456**	0.073*	0.434**	1				
Restraint	−0.259**	−0.031	−0.047	0.154**	−0.214**	1			
Eating concern	−0.292**	−0.04	−0.014	0.143**	−0.149**	0.654**	1		
Shape concern	−0.403**	−0.032	−0.015	0.155**	−0.148**	0.656**	0.755**	1	
Weight concern	−0.413**	−0.039	−0.025	0.154**	−0.156**	0.619**	0.733**	0.924**	1
EDE global	−0.383**	−0.040	−0.029	0.170**	−0.187**	0.831**	0.877**	0.935**	0.917**

Table 3. Correlation among ideal body type choices, body dissatisfaction, muscularity-oriented attitudes, and EDs across various dimensions. *represents $p < 0.05$; **represents $p < 0.01$. *MBS* Male Body Scale, *MFBS* Male Fit Body Scale, *ideal* ideal figure, *dissatisfaction* ideal figure minus current figure, *DMS* drive for muscularity, *EDE Global* eating disorder examination questionnaire global scores.

from MBS does not accurately predict this drive, with coefficients of $B = 0.024$, $t = 1.470$, and $P = 0.142$. Therefore, the MFBS score is a key predictor of DMS. Higher levels of body dissatisfaction with muscle mass indicate a stronger desire for muscularity.

Construct validity associated with EDs

The correlation between body dissatisfaction scores and EDs identifies the construct validity associated with EDs. In terms of ideal body type choices, only the selection of an ideal body type on the MFBS is significantly correlated with EDs and their various dimensions ($r = 0.143\text{--}0.170$; $P < 0.01$) (Table 3). When young Chinese males choose a larger and more muscular body type as their ideal, the risk of EDs increases. The MBS body dissatisfaction score negatively correlates with the overall score of EDs ($r = -0.365$; $P < 0.01$), including subscales of restraint (e.g., limiting and avoiding food intake), eating concerns (e.g., intense craving for

food, fear of overeating, and guilt after losing control over eating), shape concerns (e.g., dissatisfaction with body figure and its perceived importance), and weight concerns (e.g., the desire to lose weight and the significance attached to body weight) ($P < 0.01$). In contrast, the MFBS body dissatisfaction score does not correlate with the total ED score or the related subscales ($P > 0.05$). Young Chinese males who select a thinner ideal body type on the MBS (rather than a larger/adipose ideal body type) relative to their perceived current body type have a higher risk level for EDs. Only the MBS body dissatisfaction score significantly predicts the severity of EDs, with $B = -0.319$, $t(975) = -12.939$, and $P < 0.001$. Overall, fat-related body dissatisfaction is a significant predictor of EDs among Chinese young men.

Differences between BMI, thin-ideal, and larger/adipose ideal in EDs

Participants are categorized into four groups based on their BMI: the underweight group ($\text{BMI} < 18.5$), the healthy weight group ($18.5 \leq \text{BMI} < 24.0$), the overweight group ($24.0 \leq \text{BMI} < 28.0$), and the obesity group ($\text{BMI} \geq 28.0$). The current work examines the assumptions of normality and homogeneity of variance before the analysis. Data meet the normality assumption, but the homogeneity of variance assumption is not satisfied ($F = 37.687$; $P < 0.001$). Therefore, Welch ANOVA is used for the analysis. Different BMI groups significantly affected ED scores (Welch $F = 37.488$; $p < 0.001$), and the hypothesis is supported (Fig. 3). Since the group sizes are unequal, post-hoc comparisons are conducted using the Games-Howell method. This method is considered a reliable choice when variances are unequal and there are significant differences in group sizes⁷⁴. The obesity group and overweight group have higher ED scores based on the Games-Howell test. The ranking of ED scores across the groups is as follows: obesity group > healthy weight group > underweight group; and overweight group > healthy weight group > underweight group.

Fat-related body dissatisfaction is significantly associated with EDs. Variations in EDs are explored among young men aspiring to thin ideals (desiring less body fat than they currently have), larger/adipose ideals (desiring more body fat than they currently have), and those who are satisfied with their bodies (perceiving their ideal body as the same as the current body) within the same BMI range. The one-way analysis of variance and independent sample T-tests are separately conducted. Data meet the normality assumption. Except for the homogeneity of variance in the obese group, the assumption of homogeneity of variance does not hold for the other three groups (underweight, healthy weight, and overweight groups); therefore, Welch ANOVA is applied to these three groups. Additionally, the Games-Howell post hoc test is used for pairwise comparisons due to the unequal number of participants in each subgroup within the BMI categories of these three groups. Participants in the obesity and underweight groups do not have obvious differences in ED scores regardless of their thin ideal, larger/adipose ideal, or body satisfaction (Fig. 4). Significant differences were found among the subgroups (Welch $F = 3.997$; $P < 0.05$) in the overweight group. Post hoc comparisons revealed that the scores for EDs were significantly higher in the thin-ideal subgroup than in the body satisfaction subgroup. However, there is no significant difference in ED scores between these pursuers and those who are larger/adipose with their bodies. Furthermore, participants with these three ideals exhibit significantly different ED scores (Welch $F = 24.510$; $P < 0.001$) in the healthy weight group. Individuals with thin ideals score the highest on EDs according to the Games-Howell test. The ranking of ED scores across different ideals is as follows: thin ideal > larger/adipose ideal; thin ideal > body satisfaction.

Test-retest reliability

The test-retest reliability of the scales is established through the correlation between the current body figure, ideal body figure, and body dissatisfaction score in the first stage and those in the second stage (3–4 weeks later). The correlation coefficients on MBS for the current body figure, ideal body figure, and body dissatisfaction in the two stages are 0.862, 0.655, and 0.717, respectively (all $P < 0.01$). Similarly, the correlation coefficients on MFBS for the current body figure, ideal body figure, and body dissatisfaction are 0.831, 0.869, and 0.793, respectively (all $P < 0.01$). The test-retest reliability of both scales is classified as strong if these correlations are categorized

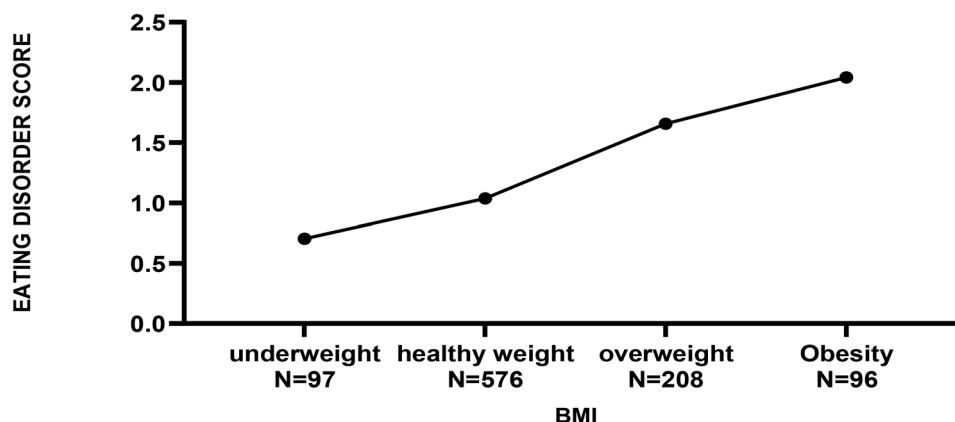


Fig. 3. Scores of eating disorders across different BMI categories. *Note:* Figure compares eating disorder scores across different BMI categories (i.e., underweight, healthy weight, overweight, and obese). Underweight ($\text{BMI} < 18.5$); healthy weight ($18.5 \leq \text{BMI} < 24.0$); overweight ($24.0 \leq \text{BMI} < 28.0$); obese ($\text{BMI} \geq 28.0$).

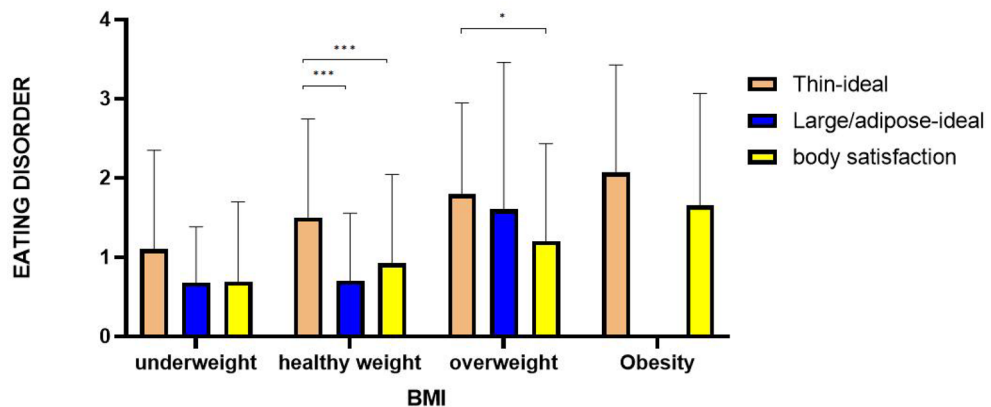


Fig. 4. Impacts of BMI categories and different body type ideals (thin ideal, large/adipose ideal, and body satisfaction) on eating disorder scores. *Note:* Figure compares ED scores across different BMI categories (underweight, healthy weight, overweight, obese) for thin body type ideal (orange bars), larger/adipose body type ideal (blue bars), and body satisfaction (yellow bars). Thin ideal (ideal body type has less fat than the current body type), body satisfaction (ideal body type matches the current body type), or larger/adipose ideal (ideal body type has more fat than the current body type).

into strong, medium, or weak levels. This indicates excellent test–retest reliability for both scales among Chinese young men.

Discussion

MBS and MFBS have demonstrated their effectiveness based on the results presented. These scales are suitable for measuring fat- and muscle-related body dissatisfaction among Chinese young men. Research results support our hypothesis.

Construct validity: Chinese young men with lower BMI and BFP tend to choose a thinner current body figure on both MBS and MFBS. The ideal body figure and body dissatisfaction score on MFBS strongly correlate with DMS. Besides, the body dissatisfaction score on MFBS significantly predicts a stronger drive for muscularity among young men. The body dissatisfaction score on MBS negatively correlates with the total ED score as well as other dimensions of EDs. These results indicate that young men can use the MBS and MFBS to choose the body figure that best represents their current and ideal body figures, and to measure body dissatisfaction across different dimensions. These findings are consistent with those from previous studies conducted on Western male populations⁶⁶.

Test–retest reliability: The current body figure, ideal body figure, and body dissatisfaction as assessed by the two scales exhibit a medium-intensity correlation between the first and second stages. Consequently, MBS and MFBS, with their high test–retest reliability, are effective in measuring body dissatisfaction among Chinese young men. These findings are consistent with previous studies on MBS and MFBS in English-speaking Western male populations⁶⁶. Overall, MBS and MFBS, demonstrating strong construct validity and test–retest reliability within the Chinese young male population, serve as tools for assessing their dissatisfaction with body fat and muscle.

The current work found that 69.8% of young men express dissatisfaction with their fat levels, with 43.6% desiring a thin ideal and 26.2% opting for a larger body figure. The dissatisfaction rate is even higher at 82.8% in terms of muscle mass, with 7.7% aspiring for a lean ideal and 75.1% preferring a larger/muscular body figure. Chinese young men show a pronounced preference for slim (less fat) or larger/muscular body figure, which echoes the preferences observed in Western societies^{13,75}. This preference shift indicates a weakening of the traditional Chinese cultural protection against body image dissatisfaction⁷⁶.

Social culture and the media are pivotal in shaping this phenomenon, with the media exerting a particularly significant influence^{5,77}. A Chinese study highlights that new media shapes individuals' perceptions of beauty to some extent and intensifies body dissatisfaction by impacting peer and family relationships⁶. The social stereotype associating obesity with negative attributes contributes to the pursuit of thin body figures, apart from the influence of social media and celebrities. A slim figure is viewed as a symbol of health, whereas a larger figure is linked to unhealthy lifestyles, which are perceived as a flaw reflecting laziness or a lack of self-discipline⁷⁸. Consequently, the quest for a slimmer figure has become a personal aspiration for men.

The combination of traditional Chinese masculinity and modern fitness trends fuels the popularity of muscular body figures among young men. This figure is now viewed as a symbol of strength and responsibility, and it is considered a key manifestation of masculinity in the blend of traditional and modern male ideals⁷⁹. A significant number of young men in China now experience body dissatisfaction due to social and media influences, often expressing a desire for a leaner, more muscular figure.

Fat-related body dissatisfaction is significantly associated with EDs, whereas muscle-related dissatisfaction does not show a direct correlation based on research findings. Firstly, the societal beauty standard that favors thinness⁷⁷ and the stigma attached to obesity⁸⁰ in Chinese culture lead men to experience greater psychological

stress when they are dissatisfied with their body fat. This results in the adoption of extreme measures (e.g., restrictive dieting) to alter their physical appearance. Secondly, muscle-related dissatisfaction is expressed as a pursuit of strong, masculine ideals^{81,82}. Achieving this is primarily reliant on exercise and healthy eating habits, rather than on pathological eating behaviors. As Huang's (2023) study suggests, Chinese young men do not directly equate a muscular figure with a personal appeal. Consequently, dissatisfaction with muscle mass does not impact their eating behaviors or self-esteem⁸³. Furthermore, the body dissatisfaction scores of MBS show a significant negative correlation with EDs and their dimensions. This might be because the EDE-Q measurement focuses on behaviors and psychological aspects related to the pursuit of thinness (e.g., fear of weight gain, food avoidance, and desire for weight loss). Therefore, individuals with higher body dissatisfaction (tending towards the thin ideal) in MBS are at a higher risk of EDs (higher EDE-Q scores). This aligns with the conclusions drawn from MBS studies in Western male populations⁶⁶.

All participants are categorized into four groups according to their BMI: obesity, overweight, healthy weight, and underweight. A distinct correlation is observed between these categories and EDs (Fig. 3), and the research findings support our hypothesis. The risk of EDs will be higher after the weight exceeds the healthy weight range. The current work investigates variations in EDs among young men aspiring to thin ideals (fat-related body dissatisfaction manifests as a desire for a slimmer figure), larger/adipose ideals (fat-related body dissatisfaction is characterized by a pursuit of a fuller figure), and those who are satisfied with their bodies within the same BMI range. In both the obese and underweight groups, young men with different ideal body types do not show significant differences in ED scores. These findings reject our original hypothesis. The eating behaviors of participants in these two extreme groups follow a certain fixed pattern⁸⁴, which is less influenced by fat-related body dissatisfaction.

The eating behaviors of obese individuals follow a consistent pattern, which is associated with high reactivity to food, reduced sensitivity to satiety, a drive to eat for reward, and eating behaviors linked to negative emotions, as identified in research by Pasquale E K. The interplay of these factors contributes to the development of specific eating behavior patterns within the obese population⁸⁵. Consequently, comprehensive interventions are required for addressing EDs in the obese⁸⁴. The results show some variations in the overweight group. The thin ideal and the body satisfaction yield significantly different outcomes, suggesting that differing body ideals impose varying psychological burdens on young men within the overweight BMI range. The thin ideal aligns more closely with the socially accepted ideal body image. However, this ideal necessitates stricter dietary control or restrictions, which elevates the risk of EDs⁸⁶.

The findings for the healthy weight group are particularly striking. The thin ideal emerges as the highest-scoring category, significantly surpassing both body satisfaction and larger/adipose ideal groups. Men who aspire to thin ideals are at a greater risk of developing EDs compared to those who embrace larger/adipose ideals or are content with their current figure. This trend underscores the pervasive cultural influence that equates thinness with beauty^{87,88}. The relentless pursuit of a thinner body may psychologically distress men, which leads to pathological dietary behaviors^{12,89}. Moreover, men with a preference for larger/adipose ideals and body satisfaction within the healthy weight BMI range exhibit a lower risk of EDs. Larger/adipose ideal, to some extent, may have a protective effect on the physical and mental health development of men. As Ku (2022) pointed out, intrinsic life goals (focusing on personal growth and intrinsic values rather than socially promoted perfect images) significantly protect men's body satisfaction compared to extrinsic goals (e.g., pursuing physical attractiveness)⁹⁰. Men who aspire to be bigger often do not critically evaluate their current body shape excessively but instead show relative acceptance of their current physical state, demonstrating a positive body image. Consequently, they may adopt a more balanced and natural approach to eating⁹¹ and intuitive eating⁹². These findings also validate our hypothesis. This finding holds significance for future cognitive interventions. Cognitive dissonance-based interventions have demonstrated efficacy in reducing the internalization of the ideal male body image, which alleviates body dissatisfaction, the risk of EDs^{93,94}, and muscle dysmorphia⁹⁵.

In summary, Hypotheses 1 and 2 were supported, suggesting that the MBS and MFBS demonstrated good reliability and validity among young Chinese males. Meanwhile, significant differences in ED scores were found among Chinese young men across different BMI groups. Hypothesis 3 was partially supported: specifically, within the healthy weight and overweight groups, young men who pursue the thin ideal have significantly higher ED scores than those who pursue the larger/adipose ideal or are satisfied with their body. These findings offer key guidance for creating interventions and clinical practices for young Chinese males. In the healthy weight and overweight BMI groups, young men pursuing the thin ideal show significantly higher ED scores than those chasing the large/adipose ideal or satisfied with their bodies. Future targeted education can correct the "thinness as beauty" notion, ease the psychological burden of unrealistic thinness pursuit, and encourage acceptance of diverse male body types. This may reduce EDs incidence in this population. However, establishing a conclusive link between these interventions and EDs incidence requires sustained efforts and more empirical research.

Limitation

Although the current work provides insights into EDs among Chinese young men with different body ideals, there are still some limitations. First, the use of self-report scales may introduce social desirability bias and inaccuracies in BMI values, affecting data reliability. Future research will incorporate objective measurement methods (e.g., actual weight measurement or clinical assessment) to improve accuracy. Second, the lack of a control group in the current work prevents direct comparisons between individuals affected by EDs and those unaffected. Future studies can adopt a randomized controlled trial (RCT) design to explore the causal relationship between body ideals and EDs. Additionally, the short time span of data collection limits the ability to capture the long-term impact of body ideals on the development of EDs. Longitudinal studies will be conducted. Finally, although the current work focuses on Chinese young men, the generalizability of the conclusions needs further

verification. Future research should expand to different age groups and broader populations, incorporating cognitive intervention strategies to explore effective ways of reducing the risk of EDs.

Conclusion

The current work identified the high construct validity and test–retest reliability of MBS and MFBS for Chinese young men. These scales evaluated their thin ideals, muscular ideals, and body dissatisfaction. Body dissatisfaction related to fat and muscle was widespread among Chinese young men. The desired figure tended to be slim or more muscular. Chinese young men have a higher risk of EDs when their weight exceeds the healthy weight BMI range. Moreover, young men fixated on thin ideals within the healthy weight and overweight groups were at a higher risk for EDs.

Data availability

The datasets used during the current study are available from the corresponding author upon reasonable request.

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Author contributions

G.B.D performed the analysis and drafted the manuscript, provided scientific guidance. J.H.W helped edit the manuscript. Collect and analyze data. S.Y.S helped acquire the data. All authors reviewed the manuscript.

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Declarations

Competing interest

The author(s) declare no competing interests.

Additional information

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