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Original Paper

Translation and Validation of the Chinese Version of the Male Body Attitude Scale (MBAS)

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Abstract

Introduction: The Male body attitude scale developed and validated by Tylka and his colleagues in 2005 has been widely used as a reliable instrument exploring body attitudes related to low body fat, muscularity and height among adult males. However, there has been no research exploring whether the Male Body Attitude Scale is suitable or not to be generalized into the Chinese context.

Objectives: The current study is aimed to translate the original Male Body Attitude Scale into Chinese and validate the Chinese version among a sample of 410 Chinese adult males.

Method: CFA is conducted to validate the MBAS.

Results: The phase 1 CFA indicated that both the original three-factor structure and the two-factor structure consisting of muscularity and body fat of MBAS might not fit the current sample, so EFAs and phase 2 CFA were conducted and revealed that a new two-factor structure had acceptable model fit and can be used when accessing body attitudes among Chinese adult males. The ordinal Cronbach's was 0.90, 0.86, and 0.93 for the full scale, the Muscularity subscale and the Low body fat subscale, respectively.

Conclusions: The MBAS is a reliable indicator to assess male body attitudes.

Keywords

Chinese adult male, male body attitude scale, confirmatory factor analysis

1. Introduction

The Male Body Attitude Scale (MABS) is a well-developed instrument of assessing how adult male perceive and appraise their bodies (Tylka, Bergeron, & Schwartz, 2005). The total male body attitude scale consists of three distinctive constructs or subscales, which are muscularity, low body fat and height respectively. Muscularity refers to male' perception and evaluation about muscle mass at

globally or discrete areas of one' body. It is worth noting that the subscale of muscularity mainly focuses on measuring muscularity from the waist-up, such as arms and chest. Low body fat refers to whether the subject dissatisfy with his body fat at various area of his body. Height refers to males' attitudes towards or whether they hope to become taller. Muscularity, low body fat as well as height play essential roles in measuring males' body attitudes concurrently, which is why the author developed three subscales in the male body attitude scale.

The MBAS is a self-report questionnaire, scoring on a 6-point likert scale, whichranges from 1 representing never to 6 representing always. There are 24 items constructing the total MBAS, among which the low body fat subscale contains 8 items and the muscularity subscale contains 10 items and the height subscale contains 2 items. Besides, the rest of 4 items are not belong to any subscale but include in the total score of the scale, as they assess the globally body attitudes. The arrangement of items in the MBAS is rational, as the number of items in different MABS subscales is positively correlated to the relative importance of the subscales. That is to say, the more items the dimension contains, the more important the dimension is. It is able to learn from the MNAS scale that the muscularity is the most important factor in the total scale (Cafri & Thompson, 2004) and the second most important factor of the total scale is the low body fat.

The development and validation of male body attitude scale had profound influence in the field of studying male' body image at that time, as it broke the predicament that there were lack of available instruments that are able to assessment male' perception and assessment of his body.

At that time, considerable research has found out that not only do females perform anxiety or dissatisfaction towards their bodies, but also males possess negative attitudes towards their bodies and the body images even do harm to males ' psychological health. What' more, solid empirical evidence proposed by scholars have proven that there are gender differences towards body attitudes. (Andersen et al., 2000; Vartanian, Giant, & Passino, 2001). For instance, females are more likely to exhibit longing to lose weight and become thinner, while males pay a lot of attention to decreasing body fat as well as increasing muscle mass (Andersen et al., 2000). On the other hand, males and females perform different needs regarding to improving discrete body areas. To be specific, males have strong desire to gain muscle from waist -up, such as arms and chest, but females are likely to focus on losing body fat from waist-down, such as legs or hips (McCabe & Ricciardelli, 2001). Due to the gender difference of body images, although there were a large number of instruments, which reflect theoretical models of female body attitude and were tailored to assess females' body dissatisfaction, it is inappropriate and invalid to apply them to assess males' body attitudes.

Before the development of male body attitude scale, the contradiction between the upsurge of investigation attention in male body attitudes and the absence of convincing measurements assessing dissatisfaction towards body image developed from theoretical models of males' body attitudes and standardized and validated through male samples remained unsettled. The existing instruments tailored

to explore male body images possess salient shortcomings and unable to fulfill research needs. For instance, the drive for muscularity scale proposed by McCreary and Sasse in 2000 is used to measure that males are motivated to increase muscle mass. However, there are two points of prominent problems of applying DMS to assessing male' body attitudes. On the one hand, the DMS contains comparative items assessing males' behaviors towards gaining muscle, such as lifting weights and taking in protein supplements, so it is considered not a purely attitudinal measurement but a compound type instrument including both attitudes and behaviors, which is supported by factor analysis indicating that DMS includes two factors: drive for muscularity factor and behavioral factor. On the other hand, perhaps drive for muscularity and attitudes towards body image are supposed to be regarded as two different constructs that are mutually correlated but not overlap (Stanford & McCabe,2002), as there are empirical evidence implying that men show desire to lose fat and increase muscle mass spontaneously (Pope et al., 2000). Therefore, it is reasonable to take both body fat and gaining muscle into consideration when assessing males' body image attitude. It is a pity that the DMS did not contain any items tailored to measuring losing fat (Cohane & Pope, 2001).

In additional to the DMS, the suitability of applying the somatomorphic matrix in assessing males' body attitude is questionable. The somatomorphic matrix (Cafri & Thompson, 2004) is a computerized program where the x axis of this program represents muscularity while the Y axis of this program represents low body fat. Participants are required to find out 4 distinctive body images in the research procedure, which are the body image representing themselves, the body image representing the general man, the body image representing their ideal body and the body image representing the most popular body perceived by the females respectively (Gruber, Pope, Borowiecki & Cohane, 1999). Although the somatomorphic matrix contains body fat factor and muscularity factor which is superior than DMS, it performs dissatisfying test-retest reliability (Cafri, Roehrig &Thompson, 2004). The inadequate stability of somatomorphic matrix called into question its validity, because an instrument's reliability is positively correlated to its validity. When the reliability of a measure descends, the validity of this measure would also decline (Nunnally & Bernstein, 1994).

Researches in accordance with the criteria proposed by Cafri and Thompson in 2004 concerning to theoretical models of male body image and making reference to the DMS and the somatomorphic matrix developed the male body attitude scale that possesses unique superiors comparing to the existing instruments. Firstly, the MBAS contains essential components constructing the whole male body attitude construct (the muscularity, low body fat and height), suggesting that the MBAS is a psychometrically sound instrument (Mazzeo, 1999). Secondly, the MBAS contains items tailored to assessing body dissatisfaction and preoccupation, which are different types of body image attitudes relating to measuring body image dissatisfaction (Pruzinsky & Cash,2002). Last but not least, not only does the MBAS measure male' attitudes towards globally body, but also it assesses male' attitudes towards discrete areas of body, such as legs, arms, hips ,chest, shoulders and etc.

Exploring factor analyses was conducted with the purpose of validating the structure of MBAS among 294 samples (N=294). The principal axis together with the varimax rotation had been applied into the initial factor analysis, which suggested that the muscularity, low body fat and height were able to extracted, as their eigenvalues are all less than 1.0. .After completely running the preliminary factor analysis, the authors figured out that there were two items tailored to measure attitudes towards muscularity performing ineligible factor loading values, which were below 0.4. In additional to these 2 items, there were 3 items tailored to assess the globally body attitudes indicating the values of factor loading below 0.4 more than a factor. Therefore, those 5 items mentioned before were eliminated due to fail to reach the involving criteria, remaining 24 items that were qualified to enter the second factor analysis. The results of the second factor analysis indicated that the factor of muscularity accounted for 19.0% of the variance with an eigenvalue of 4.4 and the factor of low body fat accounted for 36.2% of the variance with an eigenvalue of 8.3 and the factor of height accounted for 7.4% of the variance with an eigenvalue of 1.7 and the combination of these three factors accounted for 62.6% of the variance.

The following is a cross-validation study, in order to replicate the result mentioned above, the author conducted a confirmatory factor analysis with a sample of 241 males in a special way, which is developing testlets from the low body fat subscale and the muscularity subscale rather than using the single items from the MBAS. The author went along with this approach as it possessed several salient advantages (Floyd & Widaman, 1995). Firstly, testlets are able to decrease the error of parameter estimates and the the number of parameters needed to be estimated. Secondly, the indicators created by testlets are more reliable and possess more determinate rotational results. Lastly, testlets is a affective way in solving obstacles of item distributions as suggested by Floyd and Widaman in 1995. Testlets were formed in terms of the content of items and in the way of logically categorizing items with the subscale measured the same content. There are four testlets constructed by items from the muscularity subscale and item 1 assessing global attitudes towards muscle, which were specified to load on a muscularity factor. The low body fat factor included three testlets that are selected from the low body fat subscale. As for the height factor, testlest cannot be form as there are only 2 items tailored to assess attitudes towards height. Eventually, the results suggested that fit indices were acceptable (x2/df= 2.29, CFI = 0.98, TLI = 0.97, SRMR = 0.04, RMSEA = 0.06), strongly proving that the three-factor model possess high fitting degree with the actual MBAS.

As for reliability of the MBAS, the authors used internal consistency and test-retest reliability as indexes to indicate the MBAS possesses good reliability. The Cronbach's α for the total scale and diverse subscales of MBAS are quite good, which are ranging from 0.9 to 0.91 for the total scale, from 0.9 to 0.94 for the low body fat subscale, from 0.89 to 0.91 for the muscularity subscale, and from 0 .66 to 0 .88 for the height subscale. Besides, the MBAS has been retested over a two-week period to determine the rest-retest reliability of the instrument. The results of the test-retest reliability are quite satisfying, with r=0.91 for the total scale, r=0.88 for the muscularity subscale, r= 0.94 for the low body

fat subscale, and r =0.81 for the height subscale, suggesting that the MBAS is quite stable across time.

So far, the MBAS has been widely applied into various researches concerning male body images and attitudes and quite a lot of convincing results have been achieved, strongly promoting the development of psychological subfields relating to male body image attitudes. For instance, the MBAS are generalized into Spanish adolescent male samples and empirical proven to be a reliable instrument in the Spanish context (Sepulveda, et al., 2017). What is more, Ryan and his colleagues (2011) have used 2 independent online Irish samples to examine the psychometric propensity of the revised MBAS. The confirmatory factor analyse revealed that the revised MBAS with a 15-item, 3-factor solution(low body fat, muscularity, and height) best fits the data and performs good internal consistency and construct validity, implying that the revised male body attitude scale served as a convincing indicator of male attitudes towards their body image. With the purpose of figuring out whether male' sexual orientation might affect their perception and preoccupation of physical appearance, Aaron and his colleagues (2009) conducted a confirmatory factor analyse among a sample of 207 self-identified gay man, suggesting that both the original three-factor model and the two-factor model comprised of low body fat and muscularity are able to describe the data well, so the MBAS is a useful indicator in assessing gay men's body image attitudes.

Therefore, the hypothesis of the current research is mainly two-sided. (a) It is expected that the factor solution of the Chinese version of MABS is similar to the original MBAS, which is a three-factor structural model, with low body fact, muscularity and height. (b) It is predicted that the construct validity and incremental validity of the Chinese version of MBAS are able to verified throughout exploring the relationship between the Chinese version of MBAS and other well-developed instruments, such as the drive for muscularity scale (DMS), the body image inflexibility (BI-AAQ), the psychological impairment (CIA), the eating disorder symptomatology (EDE-QS), the thinness oriented body dissatisfaction (EDI-BD) and the psychological distress (K6).

2. Method

2.1 Participants

Participants were 406 adult males who became from Chinese Mainland. The average age of the whole participants was 28.53 years old (SD=5.56, ranging from 53 to 18). The average height of the participants was 175.22 cm (SD=4.27, ranging from 154 to 187). The average weight of the participants was 68.39kg (SD= 17.37, ranging from 47.5kg to 100kg). The average BMI of participants was 22.28 (SD=2.80, ranging from 15.87 to 32.96).

2.2 Demographics

Participants are instructed to complete a demographic questionnaire where participants are supposed to report their age, weight, height as well as their nationality. For instance, the participants would be asked that "How would you describe your weight?" (too light, slightly light, normal, slightly heavy,

overweight). The body mass index (Nuttall, 2005) is able to be calculated in accordance with participants' self-reported height and weight, with the computational formula of BMI: (BMI = weight [kg]/height[m]2).

2.3 Measures

In addition to the Chinese version of MBAS, the following instruments would be applied to the current study:

The Drive for Muscularity Scale (DMS) is proposed by McCreary and Sasse (2000) with the purpose to assess males' motivation level towards the behaviors and beliefs concerning to gaining muscle. The DMS is comprised with 2 distinctive subscales, which are muscularity oriented body image (MBI) subscale and muscularity behaviors (MB) subscale respectively. These 2 subscales represent different dimensions referring to the total DMS, as the MBI subscale is developed to assess male' perception and attitudes towards the muscle mass while the MB subscale is more related to male' behaviors towards gaining muscle. The DMS is a self-reported scale, which scores on a six-point likert scale, ranging from never to always. The total DMS contains 15 items and the MBI scale contains 7 items and the MB subscale contains 7 items. The score of each subscale is able to calculated by averaging the total items from the corresponding subscale and high score indicated that the subject possess strong motivation towards gaining muscle. The psychometric propensity of DMS is determined through confirmatory factor analysis, indicating that the two-factor structural model containing muscularity attitudes and behaviors of DMS is able to well describe the male sample in the study. The previous studied also strongly proven that the DMS possesses good internal consistency reliability and convergent, factorial, and discriminant validity. The reliability of DMS has been determined with a 276 male sample, with Cronbach's α of total scale and subscales ranging from 0.81 to 0.88. According to what is mentioned above, it is reasonable to draw a conclusion that the DMS is a trustworthy indicator to measure male' attitude and behavior towards gaining muscle.

The Clinical Impairment Assessment (CIA) is a well-developed instrument regarding to secondary impairment of psychosocial functioning resulted from eating disorder psychopathology. Besides, its unique superiority is mainly two-folded, comparing to other diverse measures assessing the similar construct. On the one hand, CIA assesses the clinical impairment caused by the full range of eating disorder psychopathology comprehensively. On the other hand, CIA asks participants that what influences would be brought by the eating disorder psychopathology to 3 different domains of daily life, which are personal domain, cognitive domain and social domain respectively. The CIA is a self-reported instrument, containing 16 items regarding to psychosocial impairment secondary to features of an eating disorder. Items were rated on a four-point Likert scale, ranging from 0 to 3 and 0 represents not at all while 3 represents a lot. The total score of CIA could be considered as a global index of psychosocial impairment cross cognitive, personal and social domains caused by eating disorder psychopathology during the latest 28 days. High scores indicate severe psychosocial

impairment. It is determined that rating on a score of 16 represents a good eating disorder case status via signal detection analysis, including a specificity of 86% and sensitivity of 76%. Subsequently, this cut point is empirically supported by a study with clinical and community samples. Last but not least, the psychometric propensity of CIA is validated with a sample collected from a transdiagnostic treatment trial, indicating that the CIA possesses high internal consistency, test-retest reliability, construct validity, discriminant validity and sensitivity to change. For instance, the Cronbach's alpha is 0.94 for the total CIA and 0.89 for the impairment of personal domain, 0.89 for the impairment of social domain and 0.84 for the impairment of cognitive domains respectively. Therefore, the CIA is a reliable indicator to assess patients' psychosocial impairment relating to eating disorder psychopathology.

The Kessler (K6) non-specific distress scale is a widely used instrument to screen for psychological distress(Kessler et al.,2002). It contains 6 items totally , rating on a five-point likert scale ranged from 1 to 5 and 1 represents all of the time while 5 represents none of the time. Items in the K6 are tailored to pinpoint participants' mental perception in the latest 4 weeks, including sad, anxiety, hopeless, restless, worthless, hard to cheer up and etc. Reverse-scored coding is applied into the K, the total scores of K6 are supposed to be reversed on a scale from 0 to 4 and then are summed all together to create an index of psychological distress. As K6 used unweighted sum of item scores, the range of the total score of K6 is from 0 to 24. The higher scores indicates that the participants perform more severe mental distress, such as depression and anxiety. It has been demonstrated that the psychometric properties of K6 are quite stable across many socio-demographic sub-samples, suggesting K6 possesses good external validity and is able to generalized into different contexts. The region below the Receiver Operating Characteristic (ROC) revealed strong discrimination among community cases and non cases from DSM or SCID disorders , suggesting that the discriminant validity of K6 is good. The scores of respondents were categorized into 4 status, which are at low risk, at moderate risk, at high risk or very high risk. The range from 12 to 24 of scores in k6 is regarded as very high risk with a stratum-specific likelihood ratios (SSLR) of 8.9 to 65. The lower limit of K6 is set at 13 in order to make operable the definition of a severe mental disease, which is determined as having met the diagnostic criteria for a DSM-IV disorder in the latest 12 months and has suffered from significant psychological impairment, afflicting an estimated 6 percent of U.S. adults (Prochaska et al.,2012).

Receiver operating characteristic curve analysis determined that K6≥5 was the optimal lower threshold for indicating moderate mental distress (Kessler et al., 1996). In the context of China, K6 has been proven to have convincing reliability, with Cronbach's alpha at 0,84 and the test-retest reliability at 0.79 with 53 days interval (Zhang & Li,2020).

The Eating Disorder Inventory (EDI-2) proposed by Garner in 1991 is a 64 item self-report questionnaire, which is tailored to assess eating attitudes as well as behaviors correlated with eating disorders. The items are rated on a six-point likert scale, ranging from 0 representing never to 5

representing always. The total EDI-2 contains 11 subscales. For the purpose of the present study, only one subscale was used: the Body Dissatisfaction (EDI-BD). The EDI-BD contains 9 items that are tailored to measure the desire to become thinner. The items on the EDI-BD reflect dissatisfaction with body parts that tend to be of concern to females (stomach, legs, hips, and waist) and the individual's figure as a whole. Test-retest reliability ranges between 0.71 and 0.97, and the instrument has demonstrated with sufficient construct validity. Cronbach's alpha is 0 .81 for the EDI-BD subscale.

The Eating Disorder Examination-Questionnaire Short (EDE-QS) is a shortened version of the original Eating Disorder Examination Questionnaire (EDE-Q) (Gideon et al., 2016; Fairburn & Beglin, 1994). The EDE-QS contains 12 items tailored to measure respondents' clinical symptoms related to eating disorder in the past 7 days. Items are rated on a four-point response scale ranging from 0 to 3. The EDE-QS has been verified to possess good psychometric propensities. The Cronbach's alpha is 0.913 for the EDE-QS with a sample of 559 participants, implying reliable internal consistency. Item-total correlations range from 0.43 to 0.80 and item deletion would not cause a significant increase on reliability. In additional to the internal consistency, the test-retest reliability also indicated that EDE-QS is a quite stable instrument cross time. A study aiming at figuring out a cut point of scores that is able to applied in screening for potential eating disorder patience in the context of community concluded that a score of 15 is proven to be a reasonable threshold with ensuring the best trade-off between sensitivity (0.83) and specificity (0.85), and good positive predictive value (0.37) for the EDE-QS (Prnjak et al., 2020). In the Chinese context, researches have developed Chinese version of EDE-QS and validated its psychometric propensities, suggesting that the EDE-QS is a good indicator to detect the eating disorder symptoms of respondents from Chinese population with high reliability and validity (He, Sun &Fan, 2021).

The Body Image-Acceptance and Action Questionnaire (BI-AAQ) is tailored to assess psychological inflexibility corresponding feelings and beliefs related to body image (Sandoz et al., 2013). BI-AAQ contains 12 items rated on a seven-point Likert scale ranging from 1 representing never true to 7 representing always true. Items of BI-AAQ are applied from other general AAQ versions. Submit items total correlation analysis, including principal factor analysis (PFA) and parallel analysis (PA) for projects that are generally related to the project. The results showed that the single factor structure accounted for 34.4% of the variance, and 26 factor loads were higher than 0.40.Therefore, with the purpose of generating a shorter measurement, 12 items with factor loads exceeding 0.60 were kept. Lastly, the versions of 12 items were re-tested among which PFA and PA are duplicates. The results indicates that the single-factor solution is quite stable, which accounts for 54% of the variance (Sandoz et al., 2013). The Cronbach's alpha is 0.92 and 0.93 in the original study, suggesting that the BI-AAQ is a reliable indicator to access body image inflexibility.

2.4 Procedure

The translation procedure of MBAS is strictly following the back translation procedure with international guidelines (Swami & Barron, 2019). Firstly, the original English version of MBAS is translated into Chinese by 2 professional translators who acknowledge psychology as well as psychopathology independently. Then the Chinese version of MBAS would be translated back to English by another translator good at both English and Chinese. After that, those translators who take part into the back translation procedure are grouped together to figure out whether there are discrepancies between the forward version and back-translated version of the MBAS. Translators should discuss in accordance with the questionable items and find out solutions like eliminating or revising the questionable items. It is worth to mentioned that the retained items formed the final version of MBAS should possess identical translated and back-translated versions of the items. Finally, the final version of the MBAS is applied to a pilot test to ensure that the scale is good enough to applied into a larger research sample.

The questionnaire used in the current study consists of 7 different inventories, with the Chinese version of MBAS ahead and followed by other 6 criteria-validity scales. Questionnaires are released through the network platform called Credemo. All of the respondents were required to sign the informed consent before filling out the questionnaire. The research is conducted with guarantee of anonymity. Participants should not receive any bonus after finishing the questionnaires. Last but not least, the whole procedure of the current research has reached approval by the by the institutional board.

2.5 Analysis

Firstly, the confirmatory factor analysis (CFA) is conducted to explore a reasonable factor solution for the Chinese version of MBAS. R 4.0.0 (R Core Team, 2020) was used to conduct data analysis. laavan (Rosseel et al., 2017) and psych (Revelle, 2017) packages were used for CFA, WLSMV estimator was used. Secondly, Pearson correlation is conducted to explore the construct validity of the Chinese version of MBAS via SPSS 26 for windows. Lastly, multiple linear regression (MLR) is conducted to explore the incremental validity of the Chinese version of MBAS via SPSS 26 for windows.

2.6 Result

Phase 1 Confirmatory Factor Analysis Results of CFA showed that the original three-factor structure had poor model fit, with $\chi 2 = 1703.36$ ($df = 167$, $p < .001$), CFI = 0.80, TLI = 0.78, SRMR = 0.10. As suggested in previous literature (Sepulveda at al., 2017; Blashill & Vander, 2009) the height dissatisfaction factor with only two items can be removed. We further examined the two-factor structure. Results showed that the two-factor structure also had poor model fit, with $\chi 2 = 1605.83$ ($df = 153$, $p < .001$), CFI = 0.80, TLI = 0.77, SRMR = 0.11. The poor model fits indicate that the factor structure of the MBAS as shown in the original study might not fit the current sample. Thus, we decided to explore the factor structure by using exploratory factor analysis (EFA).

Exploratory Factor Analysis By using the caTools package (Tuszynski & Khachatryan, 2013), the full sample was split into two halves randomly , with one half for EFA (n = 203) and the other for CFA (n = 203). The original 22 items of the MBAS entered subsequent EFAs (i.e., the 2 items about height dissatisfaction were removed before EFAs).

EFAs were conducted with ordinary least squares (OLS) and oblimin methods.

We removed items presenting low factor loadings (less than .40) and/or having cross-loadings (greater than .40) on two or more factors, EFAs were conducted iteratively until all items were highly and clearly load on only one factor. Finally, 16 items were retained in the final EFA model. The 16 items showed a clear two-factor structure (See Figure 1 for the Scree plot) and all items highly loaded on the intended actors (See Figure 2). In line with previous literature, the first factor was labeled as muscularity and the second factor was labeled as low body fat.

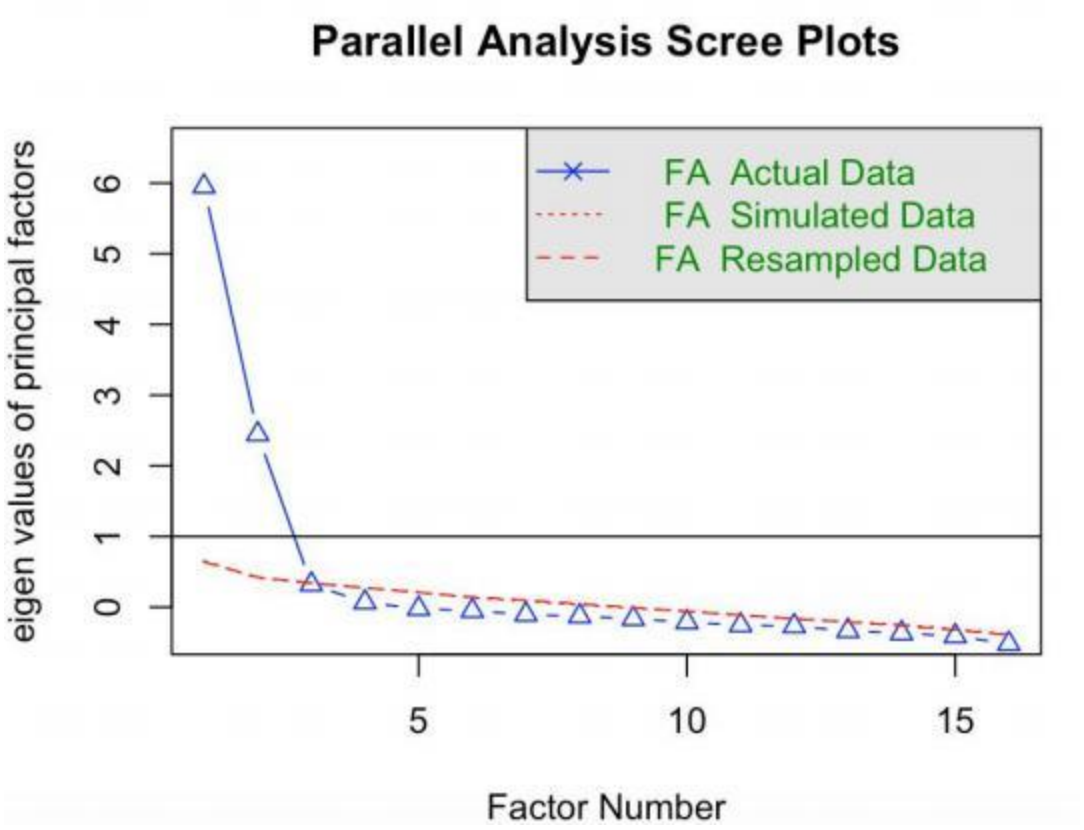

Figure 1. Scree Plot

Table 1. Standardized Factor Loadings and Factor Correlation for the Chinese Male Body Attitude Scale (*n* = 203)

Items	Standardized factor loadings	
	Low body fat	Muscularity
13.	**.92**	-.03
21.	**.88**	-.08
14.	**.82.**	.04
24.	**.80**	-.04
2.	**.78**	-.01
23.	**.71**	.08
22.	**.68**	.10
20.	**.67**	.09
9.	-. 11	**.82**
6.	.01	**.73**
16.	.05	**.73**
15.	.14	**.73**
3.	-.05	**.71**
11.	-.09	**.60**
5.	.27	**.48**
7.	.04	**.47**
Correlation between the two factors	.31***	

Note 1

Phase 2 Confirmatory Factor Analysis Results of CFA showed that the new two- factor structure had acceptable model fit, with $\chi 2 = 261.35$ (df= 103, $p < .001$), CFI =0.94, TLI = 0.93, SRMR = 0.08. The standardized factor loadings are shown in Figure 2.

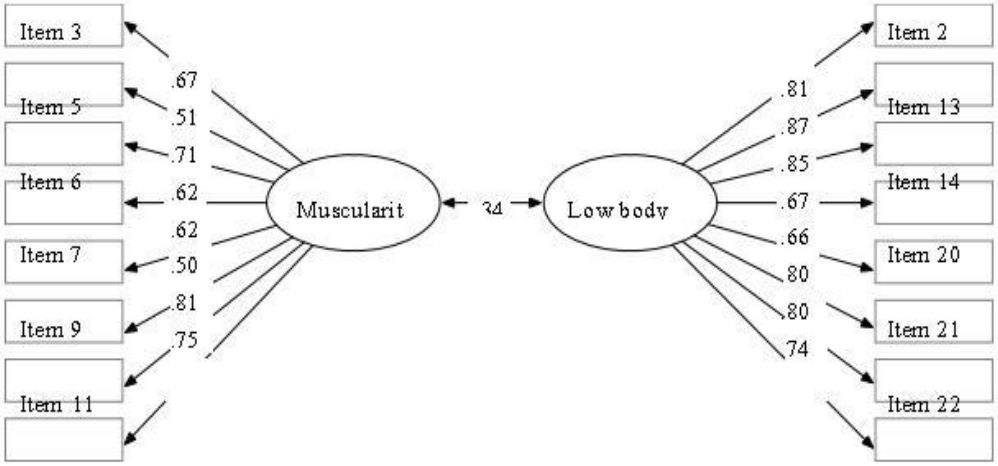

Figure 2. Standardized Factor Loadings of CFA

Reliability By using the total sample, the ordinal Cronbach's α was 0.90, 0.86, and 0.93 for the full scale, the Muscularity subscale and the Low body fat subscale, respectively.

Construct validity Construct validity of the Chinese version of MBAS is explored by conducting Pearson correlation among the MBAS and other existing instruments. The full MBAS is positively correlated with M-MBAS (r=0.76, p<0.001) and LBF-MBAS (r=0.86, p<0.001), providing good convergent validity. On the contrary, the week correlation between the M-MBAS and the LBF-MBAS (r=0.33, p<0.001) revealed discriminant validity. Besides, the full MBAS indicates moderate positive correlation with full DMS (r=0.52, p<0.001) and BI-AAQ (r=0.58, p<0.001) and full CIA (r=0.55,p<0.001) and EDE-QS (r=0.60, p<0.001). The full MBAS performs strong positive correlation with the EDI-BD (r=0.65, p<0.001). Likewise, the full MBAS shows week but still positive correlation with K6 (r=0.35, p<0.001) and BMI (r=0.36, p<0.001).

Table 2.Correlations among the Variables Included in the Current Study

	1	2	3	4	5	6	7	8	9	10	11
1. Full MBAS	-										
2. M-MBAS	.76***	-									
3. LBF-MBAS	.86***	.33***	-								
4. Full DMS	.52***	.64***	.26***	-							

	1	2	3	4	5	6	7	8	9	10	11
5. BI-AAQ	.58***	.38***	.54***	.48***	-						
6. Full CIA	.55***	.30***	.56***	.38***	.65***	-					
7. EDE-QS	.60***	.35***	.61***	.50***	.64***	.58***	-				
8. EDI-BD	.65***	.23***	.76***	.12*	.44***	.45***	.43***	-			
9. K6	.35***	.21***	.35***	.24***	.52***	.66***	.39***	.33***	-		
10. BMI	.36***	-.02	.54***	-.07	.16***	.12*	.28***	.47***	-.02	-	
11. Age	.02	-.06	.08	-.10*	-.10	-.10	-.05	.05	-.12*	.33***	-
Mean	3.09	3.50	2.68	3.14	15.69	9.08	10.20	28.18	5.43	22.28	28.53
SD	0.81	0.86	1.12	0.79	5.74	7.08	6.57	10.00	3.49	2.80	5.56

Note 2

Incremental validity Incremental validity of the Chinese version of MBAS is explored by conducting multiple linear regression (MLR). In general, 3 distinctive models are created in terms of different dependent variables. Firstly, the CIA is chosen to be the dependent variable and the age, BMI, EDI-BD, BI-AAQ, and K6 are regarded as predictive variables. The MLR reveals significant linear relationship among those variables ($F= 114.5$, $p<0.001$) and the predictive variables are accounted for 58% of the variance. When taking the MBAS as predictive variable into consideration, the linear relationship is still significant ($F= 102.24$, $p<0.001$) and the total predictive variables are accounted for 60% of the variance, with 2% increasing. Secondly, the EDE-QS is used to be dependent variable in the MLR model. The age, BMI, EDI-BD, BI-AAQ and K6 served as independent variables and regressed on the EDE-QS. The result indicates significant linear relationship among those variables ($F=67.25$, $p<0.001$) and the predictive variables are accounted for 45% of the variance. When taking the MBAS as predictive variable into consideration, the linear relationship is still significant ($F=67.77$, $p<0.001$) and the total predictive variables are accounted for 50% of the variance, with 5% increasing. Lastly, the DMS is used to be dependent variable in the MLR model. The age, BMI, EDI-BD ,BI-AAQ and K6 served as independent variables and regressed on the DMS. The result indicates significant linear relationship among those variables ($F=27.69$, $p<0.001$) and the predictive variables are accounted for 25% of the variance. When taking the MBAS as predictive variable into consideration, the linear relationship is still significant ($F=54.01$, $p<0.001$) and the total predictive variables are accounted for 44% of the variance, with 19% increasing.

Table 3. Incremental Contributions of the MBAS Scores to Relevant Criterion Variables

	F	Total R^2	ΔR^2	β
Criterion: psychological impairment (CIA)				
Step 1	114.50***	.58***	-	
Age				-.02
BMI				.01
Thinness-oriented body dissatisfaction (EDI-BD)				.14**
Body image inflexibility (BI-AAQ)				.37***
Psychological distress (K6)				.42***
Step 2	102.24***	.60***	.02***	
Age				-.02
BMI				-.01
Thinness-oriented body dissatisfaction				.06
Body image inflexibility				.30***
Psychological distress				.42***
MBAS scores				.19***
Criterion: Eating disorder symptomatology (EDE-QS)				
Step 1	67.25***	.45***	-	
Age				-.05
BMI				.17***
Thinness-oriented body dissatisfaction				.10*
Body image inflexibility				.52***
Psychological distress				.08
Step 2	67.77***	.50***	.05***	
Age				-.05
BMI				.14**
Thinness-oriented body dissatisfaction				-.04
Body image inflexibility				.41***
Psychological distress				.07
MBCQ scores				.32***
Criterion: Drive for muscularity (DMS)				
Step 1	27.69***	.25***	-	
Age				-.003
BMI				-.14*
Thinness-oriented body dissatisfaction				-.05
Body image inflexibility				.54***

Psychological distress				.02
Step 2	54.01***	.44***	.19***	
Age				-.01
BMI				-.20***
Thinness-oriented body dissatisfaction				-.32***
Body image inflexibility				.30***
Psychological distress				-.04
MBCQ scores				.64***

Note 3

3. Discussion

The present research aimed at conducting a confirmatory factor analysis on the Chinese version of MBAS with a quite large sample collected from Chinese population to determine whether it is reasonable to generalize the original MBAS to the Chinese context. The result of the present study indicated that the original three-factor structural model comprised of low body fat, muscularity and height is not suitable to fit the data from the current Chinese sample (Tylka, Bergeron, & Schwartz, 2005). Actually, several existing researches came up with consistent result that the original three-factor structural model poorly fits the sample data. For example, a study validated the psychometric propensities of the Spanish version of MBAS among Spanish adolescent sample via confirmatory factor analyse and its result suggested that the two-factor solution showed good model fit to the data after eliminating the height factor(Sepulveda at al.,2017).Besides, another study conducted among gay sample to validate the MBAS via CFAs indicated that both the original three-factor solution(low body fat, muscularity and height) and a two-factor solution(low body fat and muscularity) possess good model fit to the data (Blashill & Vander, 2009). For the above inconsistent results, some researchers proposed disagreements and doubts with the use of height subscale, because a factor with less than three items tends to be weak and unstable and a single factor is supposed to contains 3-5 items in order to guarantee the reliability and validity (Costello & Osborne, 2005). However, in the current study, after eliminating the height factor, the two-factor model still cannot fit the current sample data. Thus, we decided to explore the factor structure by using exploratory factor analysis (EFA). 22 items excluding 2 items from height factor are used to conduct factor loading. After deleting 6 items failed to meet the criteria in factor loading (presenting low factor loading or cross loading on more than one factor), the remaining 16 items showed a clear two-factor structure and all items highly loaded on the intended factors. The possible explanation for the above result might refer to the Chinese context, as the original items are developed based on the American sample and those items possess poor external validity and cannot be generalize into the Chinese context. On the other hand, some specific technical flaws might due to inconsistent results, too. For example, the translation procedure of the Chinese version of MBAS might exist some shortcomings, leading to ambiguous understandings of

respondents to the items. Besides, the criteria set for distinguishing valid questionnaires and invalid questionnaires are not strict enough, leading to decline representation of the sample data.

Pearson correlation is conducted among different instruments to explore the construct validity of the Chinese version of MBAS. The results indicate that the full scale of MBAS shows strong positive correlation to the LBF-MBAS and the M-MBAS, providing convergent validity. The low correlation between LBF-MBAS and M-MBAS indicates discriminant validity. What' more, the full MBAS shows moderate positive correlation to the DMS, BI-AAQ, CIA, EDE-QS and strong positive correlation to EDI-BD, suggesting concurrent validity.

Multiple linear regression models are applied to explore the incremental validity of the Chinese version of MBAS. CIA, EDE-QS and DMS are regarded as criterion variables and 3 different MLR models are developed. Actually, the previous 2 models with CIA and EDE-QS as criterion variables, the incremental contributions of the MBAS to relevant criterion variables are quite small. Therefore, only the third model with DMS as criterion variables is representative to demonstrate the incremental validity of the MBAS.

4. Limitations and Future Directions

Several limitations are supposed to be taken into consideration. Firstly, the current sample of study are collected from a network platform called Credemo, which should be regarded as simple random sampling. Therefore, different age groups may not account for the same proportion of the total sample. The average age of the whole participants was 28.53 years old (SD=5.56, ranging from 53 to 18), implying that the current sample is relatively young and lacks of representation. The results of the current study might raise questions when generalizing into relatively old people. It is appropriate for the future researches to apply stratified random sampling into this research topic in order to improve the representativeness of samples as well as the external validity. Secondly, in the confirmatory factor analysis, it is found out that both the original three-factor solution and the two-factor solution (deleting the height factor) have poor model fit to the current sample data. It is lacking of existing literature to support and interpret this result, as most of the previous literature focusing on validating the MBAS concluded that an original three-factor solution or two-factor solution (deleting the height factor) had good model fot to the sample data. A new-factor solution is used in the current study with eliminating 6 items. More researches should be done to figure out theoretical support to the new-factor solution. Thirdly, the current study explore the relationship between BMI and MBAS in order to find out empirical evidence referring to construct validity and incremental validity. However, the height and weight of respondents are self-reported, leading to deviations of the BMI. It has been demonstrated that the BMI calculated with measured height and weight is statistically different to BMI calculated with self-reported height and weight significantly (Danubio et al., 2008). Therefore, in the future study, it is rational to use measured height and weight to calculate BMI to decrease the deviation of results. Finally,

although the internal consistency of the Chinese version of MBAS is quite good, it does not mean that the reliability of the MBAS must be good either, as it leaves out other important index of reliability, the test-retest reliability. The test-retest reliability is used to predict whether the instrument is stable nor not cross time. Therefore, in order to figure out the stability of the Chinese version of MBAS, it is necessary to take the test- retest reliability into consideration in the future. It is reasonable to conduct a post-test with the Chinese version of MBAS in two-week interval because the original MBAS also received post-test in two-week interval (Tylka, Bergeron, & Schwartz, 2005).

5. Conclusion

In sum, the current research found out that the Chinese version of MBAS has a good model fit to a two factor structural model. The internal consistency of MBAS-C is good, supporting strong reliability. Besides, both the construct validity and incremental validity of MBAS-C are demonstrated with empirical evidence. Therefore, the MBAS-C is a good indicator to access male body image attitude in the Chinese adult male population.

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Notes

Note 1. Loadings greater than .40 were highlighted. *** $p<.001$.

Note 2. DMS = the Drive for Muscularity Scale BI-AAQ=Body Image Inflexibility CIA=Clinical psychological impairment EDE-QS=Eating Disorder Inventory EDI-BD=Body Dissatisfaction K6 = Psychological Distress

* $p<.05$, ** $p<.05$, *** $p<.001$.

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