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Original

Body shape model, physical activity and eating behaviour

I. Jáuregui Lobera[1,3], S. Tomillo Cid[2], M.ª J. Santiago Fernández[3] and P. Bolaños Ríos[3]

[1]Department of Molecular Biology and Biochemical Engineering. Bromatology and Nutrition Unit. Pablo de Olavide University. Seville. [2]Armed Forces Base. Cádiz. Spain. [3]Institute of Behavioural Sciences. Seville. Spain.

Abstract

Objectives: **Research on the influence of body shape model on adolescent males is scarce. The current study aimed to assess this influence among adult males involved in intense physical activity and to determine its relationship to eating behaviour. Possible variations between 1998 and 2008 were also analysed.**

Method: **A total of 950 males (672 in 1998 and 278 in 2008), all aspiring professional soldiers, were studied using the Questionnaire of Influences on Body Shape Model (CIMEC-V) and the Eating Attitudes Test-40 (EAT-40), as well as by assessing their physical/sporting activity and body mass index (BMI).**

Results: **Scores on the CIMEC-V were significantly correlated with the EAT-40 and BMI. As regards physical activity the only positive correlation referred to gym-based exercise. A cluster analysis revealed two subgroups with respect to physical activity, BMI, and scores on the CIMEC-V and EAT-40. One of them scored higher on these three variables and they also had a BMI > 25. The comparative study of data from 1998 and 2008 showed significant changes in some variables.**

Conclusions: **Generally, the results differ considerably from those reported for younger samples (which would suggest a lower risk of disordered eating behaviour). However, there is a higher risk group in which the influence of body shape models, physical activity and eating behaviour are related to greater body volume. The influence of the body shape model on males has increased, especially as regards the influence of friends and in terms of behaviours aimed at weight loss.**

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Correspondence: Ignacio Jáuregui Lobera.
Department of Molecular Biology and Biochemical Engineering.
Bromatology and Nutrition Unit.
Pablo de Olavide University.
Virgen del Monte, 31.
41011 Sevilla. Spain.
E-mail: ijl@tcasevilla.com

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MODELO ESTÉTICO CORPORAL, ACTIVIDAD FÍSICA Y CONDUCTA ALIMENTARIA

Resumen

Objetivos: **La investigación sobre la influencia del modelo estético corporal en varones adolescentes es escasa. El presente estudio analiza tal influencia en varones con intensa actividad física y su influencia en la conducta alimentaria. También fueron analizadas las posibles variaciones entre 1998 y 2008.**

Método: **Un total de 950 varones (672 en 1998 y 278 en 2008), aspirante a soldado profesional, fueron evaluados usando el Cuestionario de Influencia del Modelo Estético Corporal (CIMEC) y el Test de Actitudes Alimentarias (EAT), así como evaluando su actividad físico-deportiva y el Índice de Masa Corporal (IMC).**

Resultados: **Las puntuaciones del CIMEC correlacionaron significativamente con el EAT-40 y el IMC. En cuanto a la actividad física, la única correlación positiva fue la referente a la actividad física en el gimnasio. El análisis de conglomerados mostró dos grupos con respecto a actividad física, IMC y puntuaciones del CIMEC-V y EAT-40. Uno de ellos puntuó más en esas tres variables, presentando un IMC > 25. La comparación de datos de 1998 y 2008 mostró cambios significativos en algunas de las variables.**

Discusión: **Los resultados difieren considerablemente de los recogidos en muestras de menos edad (lo que podría indicar menos riesgo de alteraciones alimentarias). Sin embargo, hay un grupo de mayor riesgo en el que la influencia del modelo estético corporal, la actividad física y la conducta alimentaria están relacionados con un mayor volumen corporal. La influencia del modelo estético en varones ha aumentado, especialmente la de los amigos y la relacionada con conductas dirigidas a perder peso.**

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Palabras clave: *Trastornos de la conducta alimentaria. Imagen corporal. Factores de riesgo. Actividad física. Diferencias de género.*

Abbreviations

CIMEC: Questionnaire of Influences on Body Shape Model.

CIMEC-V: Questionnaire of Influences on Body Shape Model-Males.

BAT: Body Attitudes Test.

EAT: Eating Attitudes Test; EAT-26: Eating Attitudes Test-26 items; EAT-40: Eating Attitudes Test-40 items.

BMI: Body Mass Index.

CIMOV-2: Armed Forces Training Centre, number 2.

EDE: Eating Disorders Examination.

ANOVA: Analysis of Variance.

Introduction

Research has consistently reported the relevance of socio-cultural influences with respect to a thin body image, especially in girls,[1] and it has been shown that dieting in order to obtain an ideal body constitutes the greatest risk for the development of eating disorders. Body image and identity develop in early childhood under the influence of various factors,[2-8] and family eating behaviour, weight and body concerns, and certain symptoms such as depression are all risk factors for developing eating disorders. Indeed, the family context is considered a primary psychosocial influence as regards vulnerability to eating disorders.[9-11]

Research on the influence of prevailing body-image stereotypes has centred on young females and tools have been designed to assess this influence in both normal and clinical populations.[12] One such tool, the Questionnaire of Influences on Body Shape Model (CIMEC), was subsequently adapted (CIMEC-V) for use with males[13] and has been validated for assessing socio-cultural influences on body image in adolescents (females and males) and patients with eating disorders. A comparative study of these influences on young males and females showed significant gender differences,[14] and similar significant differences between patients with anorexia nervosa and controls have also been reported.[13] Although less widely recognised, body dissatisfaction among boys is a fact. However, the way in which social factors can determine such dissatisfaction has yet to be studied in detail. It is sometimes expressed as a desire for thinness or as the longing for a muscular build.[15]

Research in a population of 12-to 21-year-old females[16] has shown that scores on the CIMEC are more altered than are those obtained on the Body Attitudes Test (BAT) or the Eating Attitudes Test-40 (EAT-40). Cultural differences have also been analysed and studies have found differences between Mexican and Spanish adolescent girls with risk behaviour for eating disorder and body-image development, as well as higher levels of body dissatisfaction in Latin-American compared with Spanish adolescents. These findings have been attributed to a greater influence of socio-cultural factors among Latin-American adolescents.[17,18]

An interesting finding is that the CIMEC-V correlates with instruments such as the EAT-26 but not with BMI.[13] As the correlation between the EAT and BMI has been extensively documented in adolescents,[19] it would seem that in males the relationship between social influences and eating behaviour is not significantly determined by body size. Generally, young males would be less vulnerable to peer pressure that promotes weight control.

Sport and physical activity are also usually included as potential risk factors for the appearance of eating disorders. According to most research on the subject there are three possible mechanisms that might explain the relationship between sports activity and eating disorders: a) Individuals might be attracted toward sport as a way of hiding their pathology behind behavioural stereotypes already associated with a given sporting activity. Thus, an efficient method for losing weight would be obtained; b) There could be a causal relationship, as in activity anorexia, or a cause generated by a pressure in some sports to lose weight; or c) The relationship could also be akin to a precipitating factor, with vulnerability in certain individuals leading them to eating disorders through intense sporting activity.[20]

Another issue is the difference in potential risk associated with different sporting disciplines. In this regard it has been found that aesthetic sports (such as rhythmic and artistic gymnastics, artistic skating, synchronised swimming, dance and ballet) increase the risk for eating disorders, and several studies report a high prevalence (12-23%) of eating disorders among practitioners of these activities. A combination of excessive physical activity with a pressure to lose weight in activities that emphasise body image, weight and thinness is a deciding factor in the emergence of eating disorders.[21,22]

The general aim of this study was to analyse the influence of body image and its relationship to eating disorders in a group of males involved in intense sporting activity. The specific objectives were: a) to analyse different areas of influence that might be affecting the relationship between body image, sporting activity and eating behaviour; b) to establish possible risk subgroups according to the degree of influence of the body shape model, eating attitudes, physical exercise and BMI; and c) to analyse any differences in the influence of this body shape model as reported by a similar group of males ten years later.

Methods

Participants

Participants were 950 males (672 in 1998, and 278 in 2008), aspiring professional soldiers aged between 18 and 25 years (mean = 20.11) and recruited from the

Armed Forces Training Centre, number 2 (CIMOV-2) in Camposoto (San Fernando, Cadiz) and the Armed Forces Base in Cadiz. All of them had been declared fit following standard aptitude entry tests, and psychiatric disorder and drug use had been ruled out in all cases.

Instruments

The Questionnaire of Influences on Body Shape Model (CIMEC-V) and the Eating Attitudes Test-40 (EAT-40) were administered, and information about physical exercise was collected using an adapted version of the Eating Disorders Examination (EDE), a semi-structured interview.[23]

The version of the CIMEC-V used has 40 items, each of which has three possible responses *(A great deal, Slightly or Not at all)*. The instrument explores the following areas of influence: a) attitudes toward losing weight; b) body-related anxiety; c) interpersonal influences; d) influence of ideal body models; e) family influences; f) influence of friends; g) influence of advertising; h) concerns related to fatness; i) concerns about being thin; and j) influence of social models. In the study in which the original instrument (the CIMEC) was adapted for males the resulting CIMEC-V showed adequate reliability (Cronbach's alpha > 0.70), as well as adequate criterion validity in terms of its correlations with the EAT.

The EAT-40 has 40 items related to eating attitudes which are rated on a six-point Likert scale (from *never to always)*. Of these response options, three are scored with 1, 2 or 3 and the rest with 0. The maximum possible score is therefore 120, and a higher score corresponds to greater severity of disorder. The clinical cut-off point is usually considered to be 30. Factors that group together different items are bulimic behaviours, body image with a tendency toward thinness, laxative use or abuse, induced vomiting, restricted eating, eating in secret and perceived social pressure when weight increases. The EAT is the most widely-used self-report questionnaire for detecting disordered eating behaviours and its test-retest reliability ranges between 77% and 95%, with its positive and negative prediction values being 82% and 93%, respectively.

Those parts of the EDE interview that refer to physical exercise assess the number of days on which an individual does physical exercise, the average and proportion of time (in minutes) per day that this individual spends doing that type of exercise (in this case, referring to the last six months), and the type of exercise done. For the present study we also asked about the time spent doing the exercise over the last six months and scored its intensity (again over the last six months) on a 1-4 scale (where 1 = mild and 4 = competitive level). Finally, we collected anthropometric data (weight and height) in order to calculate the body mass index (BMI); these data came from medical examinations carried out as part of the selection process.

Procedure

During their time at the Armed Forces Training Centre, number 2 (CIMOV-2) in Camposoto (San Fernando, Cadiz) in 1998, and at the Armed Forces Base in Cadiz in 2008, candidates sat anonymous, aptitude tests in the context of a selection process. Participants gave previous, written informed consent and the permission of the head of the CIMOV-2 was obtained. A total of 961 protocols were originally collected, but 11 of them were rejected because they were incomplete or incorrectly filled out.

Statistical analysis

In addition to a descriptive analysis, Pearson correlations were used to determine the degree of relationship between the CIMEC-V, BMI and the EAT-40. Specifically, Pearson coefficients were calculated to analyse the relationship between items from different areas of influence on the CIMEC-V and EAT-40 scores, as well as the relationship between time spent on different sporting activities and CIMEC-V scores. To simplify the data when exploring possible groupings, a cluster analysis was carried out using a non-hierarchical method and selecting BMI, the EAT-40, the CIMEC-V and weekly exercise time as variables. The difference between clusters was assessed by means of an analysis of variance (ANOVA) in order to study the validity of the clusters obtained. The differences between the data obtained from 1998 and 2008 were also evaluated via an ANOVA. All statistical analyses were performed using SPSS v.16.

Results

Table I shows the descriptive data from the present study, along with the different correlations (between

Table I
Descriptive data and correlations. From CIMOV-2 (1998) and the Armed Forces Base (2008)

	Mean, SD (n = 950)
Age	20.11 ± 1.76
BMI	23.69 ± 3.37
EAT-40	8.78 ± 4.67
CIMEC-V	11.40 ± 7.75
Pearson Correlations	
CIMEC-V/Age	-0.002
CIMEC-V/BMI	0.197*
CIMEC-V/EAT-40	0.227*

*p < 0.01.
BMI: Body mass index.
EAT-40: Eating Attitudes Test-40.
CIMEC-V: Questionnaire of Influences on the Body Shape Model-Males.

Table II
Characteristics of clusters 1 and 2

	Cluster 1 (n = 898)		*Cluster 2 (n = 52)*	
	Mean	*SD*	*Mean*	*SD*
BMI	23.35	3.18	25.36	3.76
EAT-40	7.33	2.87	15.28	5.54
CIMEC-V	9.86	5.71	18.22	11.24
Exercise/week (minutes)	641.10	485.12	704.24	549.17

BMI: Body mass index.
EAT-40: Eating Attitudes Test-40.
CIMEC-V: Questionnaire of Influences on Body Shape Model-Males.

Table III
Differences in BMI, amount of exercise and scores on the EAT-40, 1998-2008

	1998	*2008*
BMI	23.73 (3.25)	24.26 ± 2.71*
Exercise (hours/day)	1.63 (1.30)	1.43 (1.19)*
Jogging (hours/week)	1.22 (1.12)	1.53 (1.26)*
Gymnasium (hours/week)	0.85 (0.57)	1.80 (1.70)**
Soccer (hours/week)	2.17 (1.02)	1.70 (0.97)*
EAT-40		
I exercise a lot in order to burn calories	0.58 (0.22)	0.91 (0.43)**
I control myself at mealtimes	0.84 (0.62)	1.37 (1.11)**

the CIMEC-V and the EAT-40, and between the CIMEC-V and BMI).

The analysis of the various areas of influence measured by the CIMEC-V (considering $p < 0.01$) showed that for three of them (influence of ideal body model, concerns about being thin and the influence of social models) there was no significant correlation between CIMEC-V items and scores on the EAT-40. With respect to the influence of friends only one item (item 32: *Do you talk to your friends about slimming or slimming products?*) correlated significantly with the EAT-40 ($r = 0.128$). Regarding family influence, one item (item 10: *Do you talk to your relatives about slimming or slimming products?*) was again correlated positively with the EAT-40 ($r = 0.157$). In the area of interpersonal influences three of the items showed a significant correlation with the EAT-40 (item 40: *If you are invited to a restaurant or a meal with a group, do you worry about the amount of food you may feel obliged to eat?* $r = 0.240$; item 19: *Are you interested in conversations or comments related to weight, calories, figure, etc.?* $r = 0.158$; and item 34: *Do you think that young people are more popular if they are thin?* $r = 0.115$). Finally, in those areas related to weight-loss behaviour, body anxiety, the influence of advertising and concerns about being fat, all the items showed significant correlations with the EAT-40 ($r = 0.109$-0.274).

With respect to sport, participants spent an average of 1.63 hours a day (SD 1.30, range 0.49-2.47) over the last six months, with a mean intensity score during that period of 2.24 (SD 0.95). The mean length of time practising some kind of exercise (independently of the present amount of time spent and the intensity) was 6.37 (SD 4.20) years. Neither the amount of time spent per week on exercise, nor its intensity, nor the number of years engaged in exercise were significantly correlated with scores on the CIMEC-V or EAT-40. However, there was a positive and significant correlation ($p < 0.01$) between weekly exercise time and exercise intensity ($r = 0.126$), between weekly exercise time and years spent exercising ($r = 0.130$), and between exercise intensity and years spent exercising ($r = 0.330$). Correlations between the amount of time spent on different activities and scores on the CIMEC-V were only significant in the case of gym-based exercise ($r = 0.248$; $p < 0.01$). A total of 21 items were positively correlated with this form of exercise. These items belonged to all CIMEC-V areas except those relating to the influence of family and ideal body models.

The cluster analysis revealed a better solution when participants were grouped into two clusters. The first group included 898 individuals (94.52%) and the second 52 (5.47%). The characteristics of the two groups are shown in table II. The ANOVA confirmed the validity of these clusters, with significant differences in three of the four variables considered: BMI: $F = 13.59$, $p < 0.01$; EAT-40: $F = 446.50$, $p < 0.01$; and CIMEC-V: $F = 134.08$, $p < 0.01$. As the ANOVA results show, the CIMEC-V and EAT-40 account for the largest proportion of these differences. The number of hours spent exercising per week was not significantly different between the groups, even though the second group dedicated more time to physical activity.

The comparative study of data obtained in 1998 and 2008 revealed significant changes for some variables (tables III and IV). BMI was significantly higher in 2008 (24.26 ± 2.71) compared to 1998 (23.73 ± 3.25) ($F = 5.55$; $p < 0.05$). However, there were no significant differences between 1998 and 2008 in the overall scores on the EAT-40 (8.78 ± 4.67 and 8.94 ± 4.28, respectively) or CIMEC-V (11.40 ± 7.74 and 12.39 ± 7.69, respectively). As regards the amount of exercise, fewer hours were spent per day in 2008 (1.43 ± 1.19) than in 1998 (1.63 ± 1.30) ($F = 4.07$; $p < 0.05$). With respect to different forms of activity the number of hours spent per week on jogging was greater in 2008 than in 1998 (1.53 ± 1.26 *vs*. 1.22 ± 1.12; $F = 4.00$; $p < 0.05$). There was also a difference in the number of weekly hours spent on gym-based exercise (except for running), which was again greater in 2008 compared to 1998 (1.80 ± 1.70 *vs*. 0.85 ± 0.57; $F = 27.11$; $p < 0.01$). The only activity on which less time was spent in 2008 was soccer (2.17 ± 1.02 weekly hours in 1998 *vs*. 1.70 ± 0.97 in 2008; $F = 4.27$; $p < 0.05$). There were no significant differences for the other activities.

Table IV
Differences in CIMEC-V scores, 1998-2008

	1998	*2008*
Influence of friends		
Item 2. Have any of your friends or schoolmates dieted in the past or are dieting now?	0.58 (0.12)	0.91 (0.23)*
Item 7. Is weight or body image a usual topic of conversation among your friends and schoolmates?	0.50 (0.32)	0.64 (0.42)*
Item 27. Are any of your friends or schoolmates worried or anxious about their weight or body shape?	0.40 (0.15)	0.60 (0.38)*
Item 30. Do any of your friends or schoolmates take physical exercise in order to slim?	0.58 (0.26)	0.78 (0.21)*
Item 32. Do you talk to your friends about slimming or slimming products?	0.10 (0.05)	0.28 (0.09)*
Influence of advertising		
Item 21. Do adverts about slimming make you anxious?	0.29 (0.12)	0.17 (0.07)*
Item 35. Do you remember any slogans, images or jingles from adverts for slimming products?	0.26 (0.19)	0.11 (0.09)*
Behaviours aimed at weight loss		
Item 13. Have you ever gone on a diet?	0.14 (0.11)	0.37 (0.16)*
Item 22. Have you ever done any physical exercise with the intention of losing weight?	0.26 (0.15)	0.48 (0.21)*

* $p < 0.01$.

The analysis of the different items on the EAT-40 and CIMEC-V also revealed some significant differences between the two time points. For example, the mean score on item 16 of the EAT-40 (*I exercise a lot in order to burn calories)* was 0.58 in 1998 and 0.91 in 2008 ($F = 45.88$; $p < 0.01$), while the scores on item 32 *(I control myself at mealtimes)* were 0.84 and 1.37 in 1998 and 2008, respectively ($F = 39.51$; $p < 0.01$). With respect to the CIMEC-V, significant differences were found for items 2, 7, 13, 21, 22, 27, 30, 32 and 35.

In relation to the usual cut-off points for the instruments used (EAT ≥ 30 and CIMEC-V > 23 or > 24) five positive cases were identified by the EAT in 1998 (0.74%), compared with only one case in 2008 (0.36%). In the case of the CIMEC-V for 1998 there were 53 cases above the cut-off point when this was situated at 23 (7.89%), and 44 cases if set at 24 (6.58%). The corresponding figures for 2008 were 24 cases scoring above 23 (8.63%) and 18 cases above 24 (6.47%).

Discussion

The previous study of reference that administered the CIMEC-V to Spanish males was that of Toro et al.[13] However, the results of this and the present study are difficult to compare due to differences in the age of the sample and one of the instruments used (the EAT-40 here and the EAT-26 in the study by Toro et al.). However, although this prevents statistical inferences from being made it is worthwhile noting a number of comparative aspects. All the mean CIMEC-V scores in the present research were lower than those obtained by Toro et al., except for those on items 30, 33 and 38 (item 30: *Do any of your friends or schoolmates take physical exercise in order to slim?*; item 33: *Have you ever taken physical exercise in order to build up your body and your muscles?*; item 38: *Do you have any friends or schoolmates who are currently taking physical activity to build up their body and their muscles, or any who have done so recently?)*.

As regards the EAT-40, and using the standard cut-off point for studies in community samples (≥ 30), the results of the present study are similar to previous findings. Previous research with males has reported prevalence rates for eating disorders of between 0.6 and 3.2% (24-26) in younger age samples (below 20 years old). With respect to total scores on the CIMEC-V we found 53 cases in 1998 and 24 cases in 2008 above the cut-off point when this was situated at 23 (7.89% and 8.63%, respectively), and 44 (1998) and 18 cases (2008) when the cut-off was set at 24 (6.58% and 6.47%, respectively). These figures are considerably lower than those reported by research with younger samples[27]

The present analysis only revealed three CIMEC-V items on which our sample scored higher than that of Toro et al., and all these items refer to present or past direct practice of physical exercise. Another significant finding is the fact that the prevalence of cases above the cut-off point of the EAT-40 is lower in the present sample than at younger ages. Age also seems to be a factor to take into account when considering the relationship between CIMEC-V scores and BMI. At younger ages this relationship appears not to exist (it was not reported by Toro et al. between the CIMEC-V and the EAT-26), and we can therefore conclude that body size seems not to mediate between social influences and eating behaviour. However, in the present study the relationship between the CIMEC-V and BMI was significant, so body size may well play a relevant role in mediating between social influences and eating behav-

iour. These influences were found in the family environment, relationships with friends and as regards advertising,[28-30] and they could modify eating behaviour through an effect on body shape. In fact, social pressure seems, to varying degrees, to have a negative influence on an individual's perception of body volume.[31,32] This mediation is clearly shown in the group of individuals that comprise cluster 2, whose mean BMI exceeds the upper limit for normality. This group scored higher on both the CIMEC-V and the EAT-40 than did the group forming cluster 1, so the former must be considered a higher risk. Individuals in cluster 2 also dedicated more time to physical activity.

Taking into account the correlations observed in males with the age and physical activity considered here, it does not seem that social and ideal body models or the desire to lose weight would lead to the emergence of eating disorders. It appears that the strongest influence (from family and friends) is centred on conversations about weight-loss products and activities, and that these behaviours are largely determined by practices geared toward weight loss, body-related anxiety, advertisements and concerns about being fat. Changes over the last ten years appear to indicate a progressively greater influence of friends, and slightly less influence of family and advertising. The other noteworthy finding concerns the rise in attitudes or behaviours whose aim is weight loss.

It should also be noted that gym-based exercise was the only sporting activity that was positively correlated with a greater influence of the body shape model. It may be that today's gym environments, more than any other place, gather together the risk factors previously mentioned by other authors[33] in relation to the practice of sport: social influence, performance anxiety, performance self-assessment and concern for the body (with an excessive concern for body volume). Alongside gym-based exercise there also appears to have been an increase in the frequency of jogging. This is relevant since gym-based exercise and jogging are among the most common activities (together with hyperactivity in everyday activities) engaged in by anorexic patients at the outset of their disorder, and constituent one of its determining factors.[34]

Another aspect of note in the CIMEC-V data is that concern about being thin was not shown to be a significant aspect, although concern about being fat was. In males of the age considered here, it seems that the influence of physical activity (one's own or others') or the concern about being fat become more determinant of eating behaviours than do other elements such as the desire to be thin or the influence of ideal body shape models. However, the data are somewhat contradictory, since conversations about weight-loss activities or products (with family or friends), along with an influence of advertisements, also seem to affect eating behaviour. As some authors have pointed out[16] there could be a different ideal body model in males and females, with certain contradictions in males who, although they are susceptible to messages about thinness, seem to pursue a more muscular body. At all events, recent studies have also shown a general rise in risk behaviours associated with eating disorders among males.[35]

Limitations

Given that the present sample comprised older males than those studied in previous research, and whose physical activity was specifically geared toward joining the army, it would be advisable to study a male sample of similar age but with the regular physical activity level of the general population.

Likewise, the degree of risk caused by an increase in male BMI needs to be determined in order to prevent those risk behaviours which are typical of eating disorders from happening as a result of greater social pressure on men of greater weight. However, it would be necessary to differentiate, at least among males, between the concepts of "greater weight" and "greater volume", given that the basis of male body dissatisfaction is often the desire for greater muscle mass.

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