

## The Association between Body Shape, Body Mass Index, and Eating disorders among Athletic and Non-athletic Female Students

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### Abstract:

**Background:** Owing to high prevalence and potentially harmful physical and psychosocial consequences, eating disorders are considered as significant harm to adolescents in public health. Many factors increase the risk for developing eating disorders such as social pressure, cultural factors, economic status, and the media programs' focus on weight loss. **Objectives:** The study aimed to detect if there are any differences between athletic female students and non-athletic ones in perceiving body shape, body mass index, and eating disorders. **Methods:** This is a comparative cross-sectional study comparing between athletic female students from Faculty of Physical Education for Girls and non-athletic female students from another college using a self-administrated questionnaire consisting of a demographic section, an Arabic version of the Eating Attitude Test 26, the Body Shape Questionnaire, and the Body Figure Rating Scale. **Results:** 118 female students participated in the current study and completed the questionnaires. Athletic female students got higher scores in the Eating Attitude Test 26, showing moderate to severe body shape dissatisfaction. There was a statistically significant difference ( $p < 0.05$ ) between athletic and non-athletic female students in terms of actual body size and perceived body image. **Conclusion:** The study results demonstrated that athletic female students were more prone to the risk of eating disorders than non-athletic ones along with dissatisfaction of their body image. It is advised that the athletic departments examine their students for eating disorders with the purpose of early detection. Further studies are needed to assess the relationship between the risk of developing eating disorders and athletic female students to overcome this problem in an early stage.

**Keywords:** Athletics, Body image, Eating disorders, Female students, Non-athletics.

### Introduction:

Adolescence is the time of development between childhood and adulthood. During this stage, many dramatic changes and growth of physical, emotional, and cognitive functions take place. Nutritional requirements are one of the most critical factors in this period relative to all life spans as the most important phases of growth and development takes place in adolescence.<sup>(1)</sup>

A balanced diet helps adolescents to complete growth, improves health and well-being, and reduces the risk of chronic diseases in older ages.<sup>(2)</sup> Many health problems can affect adolescents like obesity

and eating disorders due to their lifestyle which affects their eating habits.<sup>(3)</sup>

Eating disorders are significant public health threats for young people because of their high prevalence and potentially severe physical and psychosocial consequences.<sup>(4)</sup> Many factors increase the risk for developing eating disorders such as social pressure, cultural factors, economic status, and the media programs' focus on weight loss.<sup>(5)</sup>

Similar to depression and anxiety disorders, eating disorders are considered as one of the most common mental health problems<sup>(6)</sup> characterized by body image

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dissatisfaction. Sedentary lifestyle and shifts in eating habits along with other social and cultural aspects prove how these factors are rising across the world.<sup>(7)</sup>

Athletes are considered as one of the high risk groups for the development of body image issues and eating disorders (EDs) as they are prone to many pressures, either general expectations of social attractiveness or weight, nutrition, or performance stresses specific to the sports environment.<sup>(8)</sup>

Also, there are sport-specific stresses which include specific judging requirements, sport weight limits, coach/teammate specifications, and specific uniforms. Frequently, these pressures have been more common among female athletes.<sup>(9)</sup> Many studies proved this idea such as Black et al.<sup>(10)</sup> study who reported that athletic university students are two to three times more liable than non-athletic ones to suffer from the symptoms of eating disorders.

There are three types of eating behavioral disorders: anorexia nervosa (AN), bulimia nervosa (BN), and eating disorders not otherwise specified (EDNOS). Anorexia nervosa (AN) is characterized by self-hunger whereby people consume very little food willingly and, even though being emaciated, they have a pathological fear of gaining weight as they think they are overweight.<sup>(11)</sup>

On the other side, bulimia nervosa is characterized by frequent binge eating, followed by lengthy weight-control habits such as prolonged fasting, vomiting, in addition to laxative and diuretic abuse.<sup>(12)</sup>

The present study aimed to detect if there are any differences between athletic and non-athletic female students in perceiving body shape, body mass index, and eating disorders.

### **Methods:**

#### **Design and setting of the study:**

A comparative cross-sectional study was performed in Zagazig University, Sharkia Governorate, Egypt, from March 2019 to June 2019.

#### **Sample size:**

The sample size was estimated by the computer software Epi- Info version 6 using the following parameters: mean  $\pm$ S.D for eating disorders in the athletic ( $6.89 \pm 7.94$ ) and non-athletic groups ( $10.58 \pm 6.18$ )<sup>(13)</sup> at a confidence interval of 95 % and power of 80 percent.

So, the sample size was 59 female students from the Faculty of Physical Education for Girls and 59 female students from the Faculty of Commerce. Accordingly, the total sample size was 118 female students.

#### **Technique of sample selection:**

The study samples were classified into 2 groups; the first group consisted of athletic

female students who were chosen from the Faculty of Physical Education for Girls and the second group consisted of non-athletic female students who were chosen from Faculty of Commerce which was chosen randomly from other Zagazig University faculties. The selection of participants was done by the stratified sample technique where the 1st stage included 2 academic years from each college which were chosen by simple random technique; 1<sup>st</sup> and 2<sup>nd</sup> academic year were chosen from Faculty of Physical Education for Girls College and 1<sup>st</sup> and 3<sup>rd</sup> academic year were chosen from Faculty of Commerce. In the second stage, simple random samples were chosen from the students' list of the selected academic years.

#### **Inclusion criteria:**

For the 1<sup>st</sup> group, the included participants were female students from the Faculty of Physical Education who were involved in various types of sports in the study period such as handball, soccer, swimming sports, power games, or other college sports and accepted to be involved in the study.

The 2<sup>nd</sup> group included students in the Faculty of Commerce who do not play any kind of sport even walking as type of exercise: it is an aerobic sport of brisk, rhythmic, vigorous walking or going to the gym. This information were obtained by

asking the girls at the beginning of the interview.

#### **Exclusion criteria:**

The excluded students from this study are the females having any chronic diseases or those who refused to participate in the study.

#### **The tool of the study:**

Self-administered questionnaire was developed and adapted from a validated and applicable study. The questionnaire was divided into 4 sections:

The first section was concerned with demographic and anthropometric data of participants, age, and type of college. Weights and heights of participants were assessed in light clothes and without shoes using a digital scale and a portable stadiometer.

Calculation of the body mass index was done by dividing the weight (kg) by height square (m<sup>2</sup>) then classified into 6 classes according to the BMI classification of the World Health Organization (WHO); thinness (BMI: 16–18.5), normal weight (BMI: 18.5–25), overweight (BMI: 25–30), obesity grade I (BMI: 30–35), obesity grade II (BMI: 35–40), and obesity grade III (BMI > 40).<sup>(14)</sup>

The second section was concerned with the assessment of eating disorders attitudes using an Arabic version of the Eating Attitude Test 26 (EAT-26), a widely used

standardized measure of self-reported eating disorders symptoms. It consists of 26 items with four sub-scales namely dietary items, bulimia items, items for food preoccupation, and items for oral control.

The answers in each item were arranged in a Likert scale with 6 points to choose from where the chosen scale "always," "usually", and "often" were scored as 3, 2, and 1, respectively to measure the total score of items from 1 to 25, while the other 3 scales (never, rarely, and sometimes) were given a zero score.

With the exception of question number 26 (Enjoy trying new rich foods) where the scores of "never," "rarely," and "sometimes" were given scores of 3, 2, and 1, respectively and the other three scales were scored as nil. The maximum score range was 0-78. A maximum score of 20 or more has been graded as at risk of eating disorders (positive EAT-26).<sup>(15)</sup>

The third section: The Body Shape Questionnaire (BSQ) is a 34 item self-report questionnaire that measures low self-esteem, weight loss, and body dissatisfaction feelings.

Its score was classified into 3 classes; the score < 81 indicates slight dissatisfaction with the body shape (BSD), score of 81-110 indicates moderate BSD, and the score 111-140 indicates extreme BSD.<sup>(16)</sup>

The fourth section: The Body Figure Rating Scale (BFR) was used to assess the Desired Body Image (DBI) and the Perceived Body Image (PBI) of participants compared to their Actual Body Size (ABS).

The BFR consisted of 9 separate women body pictures; each figure in proportion to a specific category of BMI. Participants were asked to pick a picture representing their perceived body image and another one representing their desired body image.

The pilot study: Firstly, the content validity of the questionnaire was assessed by 3 Egyptian experts in the field of epidemiology and research. In the view of experts' conclusion, the validity of questionnaires were calculated and found to be 94%.

Then, the questionnaire was distributed to 15 female students from each group who were not involved in the sample of the study to test the study tool's validity, simplicity, and applicability.

After that, slight changes were made to the questionnaires to facilitate collecting information to make the questions easy to understand in Arabic language and be answered quickly.

The Cronbach's alpha coefficient of Arabic version was 0.78 for Eating Attitude Test 26 (EAT-26) and 0.78 for The Body Shape Questionnaire (BSQ), indicating acceptable internal consistency.

### **Administrative design and ethical aspects:**

Data were collected after obtaining the approval from IRB of the Faculty of Medicine, Zagazig University (IRB#5323) and written administrative permission from the authority of Zagazig University.

Female students' written consents to participate in this study were obtained. Participants have been ensured that any information obtained are strictly confidential and that the study results will only be used for research purposes.

### **Statistical analyses:**

All the statistical analyses were done by using Statistical Package for Social Sciences (SPSS Inc, Chicago, Illinois, USA) version 20.0. Chi-square, t-test, and correlation coefficient were measured. The statistical significance level was set at  $p < 0.05$ .

### **Results:**

A total of 118 female students participated in the present study and completed the questionnaires. The first group included 118 female students from the Faculty of Physical Education for Girls and the second group included 118 female students from other colleges in Zagazig University with average age of  $18.4 \pm 1.07$  in the first group and  $18.5 \pm 1.08$  in the second group. The age difference between the two groups was not significant as shown in Figure (1).

The prevalence of EAT26+ve was high among athletic female students compared to that of non-athletic female ones with a significant difference ( $p < 0.05$ ).

The satisfaction of females students about their body shape was examined using Body Shape Questionnaire Figure (1) and it was found that the prevalence of severe and moderate BSD was high in athletic female students (20.3% and 61%, respectively), while the percentages of severe and moderate BSD were 0% and 47.3%, respectively in non-athletic female students.

On the contrary, slight BSD was high in non-athletic females (39%) in comparison to athletic ones (32.2%) with a statistically significant difference.

An increase in the mean BMI was found in non-athletic females ( $24.6 \pm 2.4$ ) compared to athletic ones ( $19.6 \pm 1.7$ ) with a significant difference as shown in (Table 1), while the mean EAT 26+ and BSQ were higher in athletic females ( $26.6 \pm 9.1$  and  $93.3 \pm 14.8$ , respectively) compared to non-athletic ones with a significant difference ( $20.1 \pm 5.7$  and  $87.9 \pm 10.3$ , respectively)

A statistically significant difference was found ( $p < 0.05$ ) between athletic and non-athletic female students in terms of actual body size (BMI) and perceived body image ( $p < 0.05$ ) (Table 2), while there was no statistically significant difference between both groups in terms of desired body image.

The relationship between perceived body image and actual body size was examined in the athletic and non-athletic groups (Table 3) and a statistically significant difference was found ( $X^2$  11.9, p value \*0.01 and  $X^2$  14.6 p value \*0.00, respectively).

Also, a statistically significant difference was found between perceived body image and desired body image in the athletic group and non-athletic groups ( $X^2$  6.8, p value \*0.033 and  $X^2$  18.9, p value 0.00\*, respectively).

Table 4 represents the correlation between BMI, EAT26, and BSD in the studied groups. In the non-athletic group, BMI and EAT26 were positively correlated (p-value is 0.01) where the observed correlation coefficient (r) is 0.31. Furthermore, BMI and BSQ were positively correlated (p-value 0.00) where the observed correlation coefficient (r) is 0.47.

Also, the BSQ and EAT26 were positively correlated in the non-athletic group (p value 0.00) where the observed coefficient is 0.48.

### **Discussion:**

There is an increase in the needs for nutritional requirements in the adolescence due to rapid growth and increased metabolic rates. <sup>(17)</sup>

In this age range, the adolescents chose their food by themselves. Also, the pressure

from their friends affects their dietary attitude. <sup>(18)</sup>

Female adolescents are more prone to eating disorders as they are highly aware of their weight where they want to be thin and socially acceptable; they will try to skip the meals that would expose them to many health hazards such as deficiencies in minerals, hair and skin problems, and finally eating disorders. <sup>(17)</sup>

Dissatisfaction with body weight and body shape has been shown to play a major role in eating disorders. <sup>(19)</sup>

The aim of the current study was to detect if there are any differences between athletic and non-athletic female students in perceiving body shape, body mass index, and eating disorders.

In the present research conducted among university female students in Sharkia Governorate, Egypt, the prevalence of eating disorders was higher in the athletic group than in the non-athletic one with a statistical significant difference (Figure 1) (Table 1).

This result agrees with the research <sup>(20)</sup> which reported that athletes show more eating disorders symptoms and are at higher risk for disordered eating than non-athletes. Moreover, Hausenblas and McNally <sup>(21)</sup> reported that athletes with high rates of activity had higher prevalence of eating disorders than lower active non-athletes and this agrees with our results.

On the contrary to these results, McLester et al<sup>(22)</sup> reported that the risk of developing eating disorders was low in female student athletes.

In the present study, body shape dissatisfaction was studied (Figure 1, Table 1) and our results were in contrary with a previous study by “Mention the author’s name here better”<sup>(20)</sup> who reported that athletes had less reported BSD than non-athletes as they are more physically active, so their body was fitting with their societal needs.

The discrepancy in results may be related to cultural expectations as the athletic culture sets unrealistic standards and focuses intensively on weight, appearance, leanness, and muscularity.

As reported by “Mention author’s name here better”,<sup>(23)</sup> when athletes internalize these sporting environmental cues about body size and shape, they can experience increased body discomfort, higher dietary restriction rates, and more disorderly eating symptoms. College students are particularly susceptible to social expectations based on physical appearance. The college stage is the period where the individual creates his own identity and builds his self-worth including physical self-perception.<sup>(24)</sup>

Thus, body image dissatisfaction, weight issues, and physical attraction among

college students are important where up to 90% of college students worry about body image.<sup>(25)</sup>

This could be noticed in the analysis of our results as shown in (Table 2); our results are in agreement with the results of “mention author’s name here”<sup>(26)</sup> who recorded that the female students who took part in sports were dissatisfied with their body image and perceived themselves as more obese and less attractive than those who did not take part or practice any sports.

On the contrary, Mention author’s name here<sup>(27)</sup> reported in his study that the athletic group was more satisfied with their shape than the non-athletic group.

Self-perceived body image is an important indicator for psychological wellbeing and nutritional status in the form of BMI. The present study results shown in (Table 3) are in contrary with Mäkinen et al., 2015<sup>(28)</sup> results who studied the relation between body image perception and actual body weight and reported that 59% of the study group underestimated and 27% overestimated their perceived body image.

In choosing the desired body image, most of the athletic group participants (27 students) chose the normal weight body image and 15 students chose desired body image as underweight although they perceived themselves as overweight.

This agrees with the study of Kabir et al<sup>(29)</sup> who reported that 61% of their sample had desired body image to be thinner.

In the non-athletic group, BMI was significantly correlated with EAT26 and BSQ. This could be because the excessive weight gain may trigger the development of eating disorders and body shape dissatisfaction in the non-athletic group.

#### **Limitation of the study:**

There were many limitations in the study. Firstly, there were some concerns if the athletic group participants were regularly participating in an organized sport with personnel trainer or not.

The use of BMI scale to detect the healthy body weight is another limitation as it has many drawbacks in estimating the percent of body fat or lean body mass.

**Conclusion and Recommendation:** The present study results demonstrate that the athletic female students are more prone to the risk of eating disorders than the non-athletic ones along with the dissatisfaction with the body image.

A significant positive correlation was found between BMI and eating disorders tests as well as between BMI and body shape dissatisfaction. These results are due to the nature of studying in college and its requirements to achieve good score. that it is advised for the athletic depart. to examine for eating disorders for early detection.

So, no need to add though. Further studies are needed to assess the relationship between the risk of developing eating disorders and athletic female students to overcome the problem in early stage.

#### **Declaration:**

#### **Ethics approval and consent to participate:**

Data were collected after obtaining the approval from IRB of the Faculty of Medicine, Zagazig University, Zagazig (IRB#5323) and written administrative permission from the authority of Zagazig University. Female students' written consent to participate in this study was obtained and they have been ensured that any information obtained are strictly confidential and that the study results will only be used for research purposes.

#### **Availability of the data:**

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

**Competing of interest:** The authors declare that they have no conflict of interest.

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**Author contributions:** All authors were responsible for the present study. All authors contributed to the study conception and design. Material preparation and collection



of the data were performed by two authors. Data management was performed by [G. M. S.].

Discussion was performed by [M. B. A]. The manuscript's first draft was written by all authors. Two authors read and approved the final manuscript.

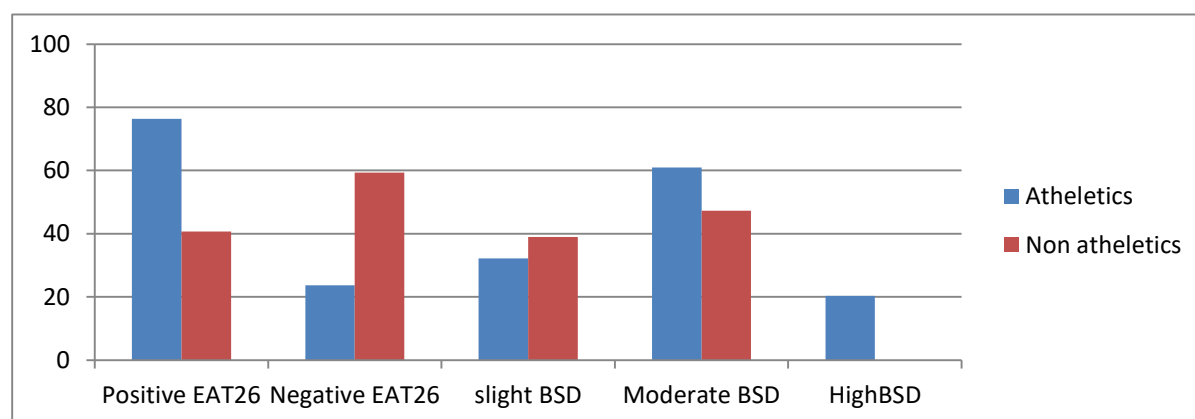
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**Figure (1): Prevalence of the eating attitude test 26 and different degrees of body shape dissatisfaction among the studied groups**

**Table (1): Body mass index, EAT26, and body shape questionnaire between athletes and non-athletes**

Items	Athletes Mean± S.D	Non-athletes Mean± S.D	t-test	P-value
<b>BMI</b>	19.6±1.7	24.6±2.4	18.4	0.00*
<b>EAT26</b>	26.6± 9.1	20.1±5.7	6.5	0.00*
<b>BSQ</b>	93.3±14.8	87.9±10.3	3.27	0.00*

\*significant test p &lt;0.05

**Table (2): Comparison between the actual body size, perceived body image, and desired body image between athletic and non-athletic female students**

Items	Athletes (No.=59)	Non-athletes (No.=59)	X <sup>2</sup>	P-value
<b>Actual body size</b>				
▪ Under weight	18(30.5)	12(20.3)	27.95	0.00*
▪ Normal weight	33(55.9)	12(20.3)		
▪ Overweight	8(13.6)	35(59.4)		
<b>Perceived body image</b>				
▪ Under weight	12(20.3)	8(13.6)	6.4	0.04*
▪ Normal body weight	17(28.8)	8(13.6)		
▪ Overweight	30(50.9)	43(72.8)		
<b>Desired body image</b>				
▪ Under weight	19(32.2)	16(27.1)	1.2	0.5
▪ Normal weight	29(49.1)	35(59.3)		
▪ Overweight	11(18.7)	8(13.6)		

\*significant test p &lt;0.05

**Table (3): The relationship between perceived body image, actual body size, and desired body image for each group**

Items		Perceived body image					
		Athletes			Non-athletes		
		Under weight No.=11(%)	Normal weight No.=15(%)	Over weight No.=33(%)	Under weight No.=9(%)	Normal weight No.=9(%)	Over weight No.=41(%)
<b>Actual body size</b>	Under weight	4(36.4)	6(40.0)	3(9.1)	5(55.6)	4(44.5)	7(14.3)
	Normal weight	5(45.4)	6(40.0)	27(81.8)	2(22.2)	3(33.3)	7(15.5)
	Overweight	3(27.2)	3(20.0)	3(9.1)	2(22.2)	2(22.2)	27(70.2)
<b>X<sup>2</sup> &amp; P-value</b>		11.27	*0.02		10.72	*0.02	
<b>Desired body image</b>	Under weight	3(27.2)	7(46.7)	7(21.2)	5(55.6)	3(33.3)	9(22.0)
	Normal weight	2(18.3)	5(33.3)	20(60.6)	2(22.2)	3(33.3)	30(73.2)
	Overweight	6(54.5)	3(20.0)	6(18.2)	2(22.2)	3(33.4)	2(4.8)
<b>X<sup>2</sup> &amp; P-value</b>		6.8	*0.02		13.4	0.00*	

\*significant test p &lt;0.05

**Table (4): Pearson's correlation matrix between the two study groups in terms of body mass index, eating attitude test 26, and body shape questionnaire**

	Body mass index		EAT26		BSD	
	Athletes r (p value)	Non-athletes r (p value)	Athletes r (p value)	Non-athletes r (p value)	Athletes r (p value)	Non-athletes r (p value)
<b>Body mass index</b>	1	1	0.093(0.48)	0.31(0.01)*	-0.15(0.24)	0.47(0.00)**
<b>EAT26</b>	0.093(0.48)	0.31(0.01)*	1	1	0.193(0.14)	0.48(0.00)**
<b>BSD</b>	-0.155(0.24)	0.47(0.00)**	0.19(0.14)	0.48(0.00)**	1	1

\*correlation is significant at the level 0.05

\*\*correlation is significant at the level 0.01

### الملخص العربي

الارتباط بين شكل الجسم ومؤشر كتلة الجسم واضطرابات الأكل بين طالبات الألعاب الرياضية وغير الرياضيات

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**الخلفية:** بسبب الانتشار الواسع والعواقب الجسدية والنفسية والاجتماعية الضارة المحتملة، تعتبر اضطرابات الأكل أضراراً جسيمة للمراهقين في مجال الصحة العامة. هناك العديد من العوامل التي تزيد من خطر الإصابة باضطرابات الأكل مثل العوامل الاجتماعية والثقافية والوضع الاقتصادي وتأثير فقدان الوزن من البرامج الإعلامية والضغط الاجتماعي. **الأهداف:** هدفت الدراسة إلى الكشف عما إذا كان هناك فرق بين طالبات ألعاب القوى والطالبات من غير الرياضيات في إدراك شكل الجسم ومؤشر كتلة الجسم واضطرابات الأكل. **طرق البحث:** كانت هذه دراسة مقطعية مقارنة بين طالبات رياضيات من كلية التربية البدنية للبنات وطالبات غير رياضيات من كلية أخرى، باستخدام استبيان ذاتي الإدارة يتكون من قسم ديموغرافي، نسخة عربية من اختبار موقف الأكل 26، استبيان شكل الجسم ومقياس تقييم شكل الجسم. **النتيجة:** مشاركة 236 طالبة في الدراسة واستكمال الاستبيانات. كانت طالبات كلية التربية البدنية عالية في EAT26 وتظهر عدم الرضا عن شكل الجسم بدرجة متوسطة إلى شديدة. كان هناك فرق ذو دلالة إحصائية ( $P < 0.05$ ) بين طالبات الألعاب الرياضية وغير الرياضيات من حيث الحجم الفعلي للجسم وصورة الجسم المتصورة. **الخلاصة والأستنتاجات:** تولي الدراسة الحالية الانتباه إلى أهمية فحص اضطرابات الأكل بين المراهقين لاكتشاف من لديهم اضطراب في سلوك الأكل والمعرضين لخطر الإصابة باضطرابات الأكل.