

BODY WEIGHT REDUCTION PRACTICES OF FEMALE ATHLETES

Katarzyna Antosiak-Cyrak^{1(A-G)}, Małgorzata Habiera^{1(B)}, Elżbieta Rostkowska^{2,3(C-F)}

¹Department of Swimming and Water Rescue, University School of Physical Education, Poznan, Poland

²Clinic of Rheumatology and Rehabilitation, Poznan University of Medical Sciences, Poznan, Poland

³Chair of Human Motoricity, University of Computer Science and Skills, Łódź, Poland

Abstract

Objective: To examine relationships between self-assessment of one's slenderness, actual body shape, body weight reduction practices and coexisting menstrual irregularities in female athletes practicing various sports.

Methods: 345 female athletes of different sports, aged 13-18, participated in the study. The control group (N) comprised 140 non-training girls. Firstly, subjects' body height and weight were measured to determine the Body Mass Index (BMI). Next, the subjects had to fill in a questionnaire. The questionnaire items were related to three issues: self-assessment of one's own body weight, practices used to lose weight, and any menstrual irregularities.

Results: The research revealed that the athletes' decisions to reduce body weight were taken by the athletes themselves or were due to coach's pressure. Girls who seek information about rational weight control practices look for guidelines mainly in women's magazines. As a result they use drastic and irrational methods to lose weight, which are hazardous to their health.

Conclusions: The most drastic examples of weight reduction practices were revealed by female judo practitioners, for whom body weight is strongly associated with the sport result due of strict weight categories in this sports discipline. The data on artistic gymnasts who try to reduce their body weight before competitions are also worrying. Their main goal is to achieve a flat stomach, which may positively influence the referee's assessment.

Key words: *body image, sport, diet, menstrual irregularities*

Introduction

Practicing high-performance sports has many advantages but also poses some risks for young athletes, especially teenage girls. Research on health hazards across sports shows that early detection of specific hazards may protect against those adverse phenomena. Intervention by psychologists, medical doctors, coaches or parents, who notice any disturbed eating attitudes in young female athletes, should be aimed at help and prevention of specific hazards each sports discipline may trigger. Such risks are connected with high aspirations of young athletes, their family and peer groups [1]. Young athletes' self-image is influenced by the expectations of their community. This is often referred to as the first phase of self-ideal development. However, only in the second phase is one's self-image influenced by one's own expectations [2-4].

The research on adolescence seems to be particularly valuable in this respect because puberty, while highly advantageous to physical development, remains a very difficult time in our emotional life. This emotional crisis is caused by biological, psychological and social changes. As the young woman's body evolves, and as the woman becomes concerned with her body and its functioning, feelings of uncertainty and unattractiveness may be experienced [5-6]. Research shows that young people, in particular, are vulnerable to body weight problems [7-9].

The issue of eating disorders is often disregarded in the world of sports, most likely due to ignorance.

Obsession with losing weight seems to be something natural and characteristic of women, thus if a young female athlete does not display explicit disease symptoms, coaches remain calm about the issue.

Unfortunately, athletes are also affected by eating disorders. Literature abounds in studies of female athletes [10-12], bodybuilders [13,14], ice-skaters [15] and gymnasts [16] struggling with eating disorders. In 1994 American gymnast Christy Henrich died after a three-year fight against anorexia nervosa. As a result, in 1996, the Committee on Sports Medicine and Fitness appealed to coaches, parents and other people connected with young athletes to learn more on ways of body weight control.

In Poland, literature on the prevalence of this phenomenon in high-performance sports has not been extensive. Authors have pointed out that eating disorders may occur in sports which demand low body weight such as gymnastics, horse riding or ice-skating but their suppositions have not been confirmed by scientific research. Low self-assessment of one's body shape, struggle with one's body development with the use of new ways of weight reduction and a wish to adhere to canons of beauty may lead to anorexia nervosa, bulimia nervosa or binge eating disorder. Other conditions can also include menstrual disorders in girls practicing high-performance sports [17-20]. Early intervention and help provided to young people whose actions may be risky to their health will help prevent diseases known as eating disorders.

The main aim of the present study was to examine whether disturbing ways of body weight reduction occur more frequently in girls practicing high-performance sport as compared with their non-training counterparts. The study also examined relationships between assessment of one's slenderness, actual body shape, ways used to reduce body weight and any co-existing menstrual irregularities in females practicing various sports.

Methods

Participants

The sample consisted of 345 young female athletes practicing four sports: swimming (SW) - 98 girls (15.6 ± 1.33 years), rhythmic gymnastics (RG) - 83 girls (14.4 ± 1.51 years), synchronized swimming (SYN) 87 girls (15.3 ± 1.53 years) and judo (JU) - 77 girls (15.9 ± 1.76 years). All participants were training at an advanced level and had taken part in sport competitions on a regular basis.

Good results in swimming may be achieved thanks to hydrodynamic body shape and proper musculature, which remains in conflict with a wish to possess a slender body that is so typical for girls. Both in rhythmic gymnastics (RG) and synchronized swimming (SYN) the athlete's slender body influences the referee's subjective assessment of performance, and maintaining low body weight is an element of pre-competition preparation. In judo (JU) the division into weight categories also leads to tactical manipulations with practitioners' body weight.

The control group (N) comprised 140 girls who had not practiced any sports. The subjects were 13-18 year

old (15.1 ± 1.92 years), as individuals at this age are particularly vulnerable to reducing their body weight [21].

Procedure

Firstly, the subjects' body height and weight were measured to determine the Body Mass Index (Table 2). Next, the subjects were to fill in a questionnaire. Figures below present a shortened version of the questionnaire. The questionnaire items focused on three aspects: self-assessment of one's own weight, ways used to lose weight, and menstrual irregularities. Other items concerned the studied girls' behaviors over the last three months and dieting details.

Statistical analysis

The statistical analysis was made with the use of the Statistica software package (version 10, StatSoft). Basic characteristics of results were calculated. Since replies in questionnaire forms were qualitative results, relationships between answers and subjects' practiced sports were examined using the Fisher-Freeman-Halton test. The result is given as the Fisher's coefficient χ^2 .

Results

Body Mass Index (BMI)

None of the participants was characterized by the 3rd degree of overweight, and only few girls in the study featured either the 1st or 2nd degree of overweight (Fig. 1, Table 1). The actual weight status of the participants, conforming to proper body weight, contrasted with their self-assessment of their body weight (Fig. 2 and 3).

Table 1. Participants' average Body Mass Index (BMI) [kg/m^2] and body fat level

Group		min-max	SD	V (%)	BMI levels
SW	19.9	15.0-24.5	1.98	10.0	Norm
RG	16.5	12.7-22.7	1.86	11.3	2nd degree of underweight
SYN	19.1	13.4-26.3	2.23	11.7	Norm
JU	21.8	14.3-34.5	3.87	17.7	Norm
N	18.7	13.2-31.3	2.81	15.0	Norm

Groups: SW – swimming, RG – rhythmic gymnastics, SYN – synchronized swimming, JU – judo, N – control group, min-max – minimum-maximum, $\bar{x}$ – mean, V (%) – coefficient of variation, BMI levels – norm and 2nd degree of underweight by Gawęcki [22]

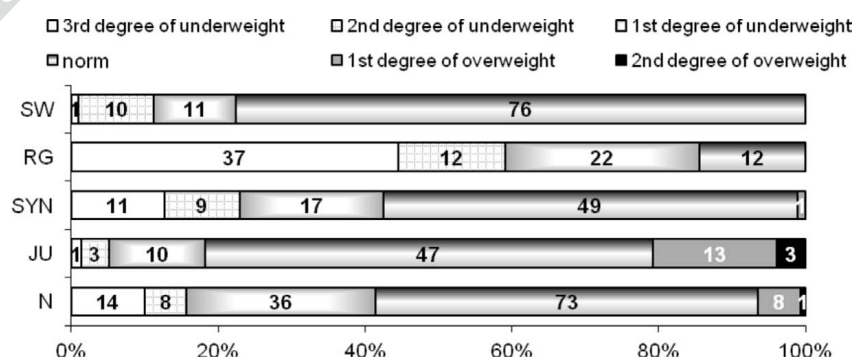


Fig. 1. The number of participants and their BMI levels (division into degrees of underweight and overweight by Gawęcki [22]). Groups: SW – swimming, RG – rhythmic gymnastics, SYN – synchronized swimming, JU – judo, N – control group

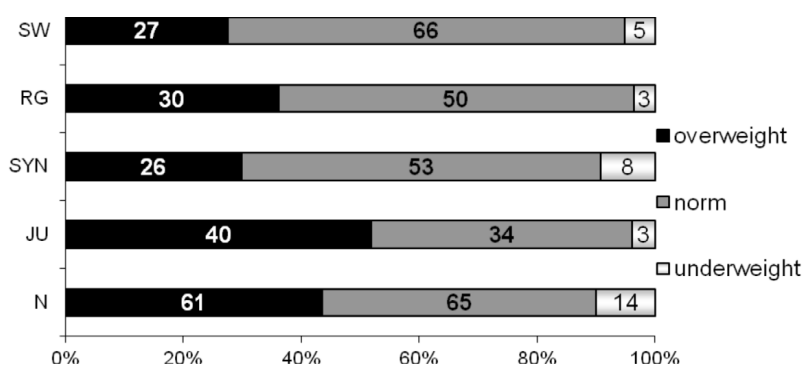


Fig. 2. Percentage of answers to item: "Do you consider your body mass overweight, norm or underweight?" Relationship between practiced sport and self-assessment of body weight $\chi^2 = 21.47$, $P < 0.01$, (answers "underweight, norm, overweight" are opinions of girls about their own body) Groups: SW – swimming, RG – rhythmic gymnastics, SYN – synchronized swimming, JU – judo, N – control group

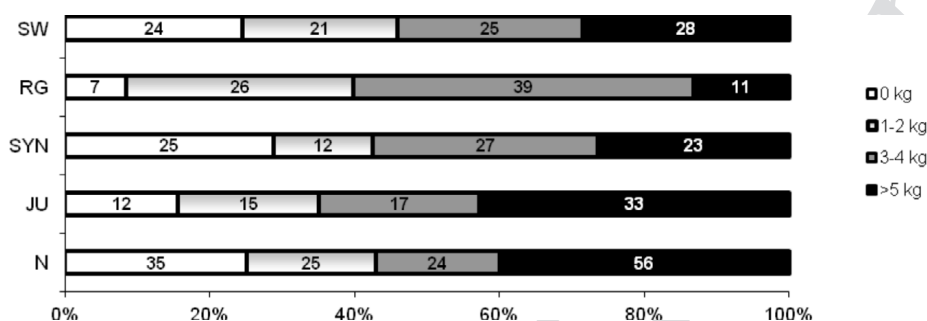


Fig. 3. Percentage of answers to item: "How many kilograms of body weight do you wish to lose?" Relationship between practiced sport and declared wish to lose weight (in kilos) $\chi^2 = 69.57$, $P < 0.001$. Groups: SW – swimming, RG – rhythmic gymnastics, SYN – synchronized swimming, JU – judo, N – control group

Self-assessment of body weight

Own opinions of examined girls on mass of their body were quite strict (Fig. 2) and stayed at variance with actual BMI (Fig. 1).

In their self-assessment, more girls (more than their BMI would indicate otherwise) considered themselves overweight. This was especially visible among the judo practitioners. Only 8% of the subjects ($n = 33$) believed they were underweight (Fig. 2). These results remain in contradiction to objective BMI measures. In the control group those who considered themselves overweight constituted the highest percentage (14 girls, i.e. 10% of the control group). The statistical analysis confirmed a correlation between subjects' group (experimental vs. control) and self-assessment of one's body weight (Fisher's $\chi^2 = 21.47$; $P < 0.01$). There were large differences in body weight self-assessment between the girls who practice various sports and controls who do not take up any sports activity. Statistically significant differences were found between their answers to the questionnaire items.

The analysis of results revealed the relationship between one's practiced sport and declared wish to lose weight (Fisher's $\chi^2 = 69.57$; $P < 0.001$) (Figure 3). No statistical differences were noted between the swimmers and judo practitioners, whereas significant differences were observed between girls practicing

artistic sports and their non-training counterparts ($P < 0.001$ and $P < 0.01$).

Ways to reduce one's body weight

Girls who want to reduce their weight and do not know the rational ways to lose weight, use often detrimental to health methods for reducing body weight. The percentage of girls using such practices are presented in Table 2, while data on frequencies of application of these practices during the previous three months in the Table 3.

131 participants of the study had fasted to lose weight (Table 2). The synchronized swimmers and rhythmic gymnasts used this method statistically less often than controls. Judo practitioners fast most often and the difference between them and the other groups is statistically significant. The statistical analysis revealed relevant differences between practiced sport and fasting (Fisher's $\chi^2 = 35.02$; $P < 0.001$).

The investigation showed that during the past three months as many as 114 subjects tried fasting (in most cases two to four times throughout the studied period of time). However, fasting was most often practiced by non-training girls (9.3%, once a week). This difference was statistically significant (Fisher's $\chi^2 = 45.73$, $P < 0.001$) (Table 3).

Dehydrating medications to lose weight used 38 girls in the study (Table 2). A weak statistical

Table 2. *Percentage of answers to questionnaire items related to the uses of fasting, dehydrates, purgatives and vomiting induction*

	answer	SW %	RG %	SYN %	JU %	N %
Percentage of answers to item: "Have you ever fasted in order to reduce your body weight?" Relationship between practiced sport and fasting $\chi^2 = 35.02, P < 0.001$	yes	23.5	12	16.1	48.1	33.6
	no	76.5	88	83.9	51.9	66.4
Percentage of answers to item: "Have you ever received dehydrating medication to reduce your body weight?" Relationship between practiced sport and use of dehydrating medication $\chi^2 = 11.85, P < 0.05$	yes	2.1	4.8	6.9	14.3	10.7
	no	97.9	95.2	93.1	85.7	89.3
Percentage of answers to item: "Have you ever received purgatives to reduce your body weight?" Relationship between practiced sport and use of purgatives $\chi^2 = 17.74, P < 0.01$	yes	15.3	16.9	9.2	33.8	14.3
	no	84.7	83.1	90.8	66.2	85.7
Percentage of answers to item: "Have you ever induced vomiting to reduce your body weight?" Relationship between practiced sport and purging $\chi^2 = 12.85, P < 0.05$	yes	16.3	2.4	6.9	14.3	11.4
	no	83.7	97.6	93.1	85.7	88.6

Groups: SW – swimming, RG – rhythmic gymnastics, SYN – synchronized swimming, JU – judo, N – control group

Table 3. *Percentage of answers to questionnaire items related to the uses of fasting, dehydrates, purgatives and vomiting induction during the previous three months*

	Answer	SW %	RG %	SYN %	JU %	N %
Percentage of answers to item: "Have you fasted in order to reduce your body weight during the previous three months?" Relationship between practiced sport and fasting $\chi^2 = 45.73, P < 0.001$	>11/3m	1.0	1.2	1.2	2.6	9.3
	5-10/3m	5.1	1.2	0	2.6	4.3
	2-4/3m	10.2	3.6	3.4	20.8	10.7
	1/3m	5.1	3.6	6.9	11.7	8.6
	0	78.6	90.4	88.5	62.3	67.1
Percentage of answers to item: "Have you received dehydrating medication to reduce your body weight during the previous three months?" Relationship between practiced sport and use of dehydrating medication $\chi^2 = 14.5, P > 0.05$	>3/week	0	0	0	0	2.1
	1-2/week	0	0	0	1.3	2.1
	1-3/m	0	3.6	1.2	3.9	0.8
	< 1/m	0	1.2	5.7	0	2.9
	0	0	95.2	93.1	94.8	92.1
Percentage of answers to item: "Have you received purgatives to reduce your body weight during the previous three months?" Relationship between practiced sport and use of purgatives $\chi^2 = 25.76, P < 0.01$	>3/week	1.0	3.6	2.3	7.8	2.9
	1-2/week	8.2	4.8	1.2	2.6	7.1
	1-3/m	1.0	2.4	5.8	2.6	1.4
	< 1/m	4.1	6	0	3.9	0.7
	0	85.7	83.1	90.8	83.1	87.9
Percentage of answers to item: "Have you induced vomiting to reduce your body weight during the previous three months?" Relationship between practiced sport and purging $\chi^2 = 25.11, P < 0.05$	>3/week	1.1	1.2	1.2	9.1	3.5
	1-2/week	7.1	1.2	2.3	0	2.1
	1-3/m	3.1	0	2.3	0	2.9
	<1/m	2	0	3.4	2.6	3.6
	0	86.7	97.6	90.8	88.3	87.9

Groups: SW – swimming, RG – rhythmic gymnastics, SYN – synchronized swimming, JU – judo, N – control group, m – month

relationship was found between one's sport and the use of dehydrating medication (Fisher's $\chi^2 = 11.85$; $P < 0.05$). Judo practitioners, 14.3% of whom took diuretics, turned out to take such pharmaceuticals more frequently than the rest of the subjects, whereas swimmers used dehydrating medication least often during the previous three months (Table 3).

The analysis revealed the relationship between one's practiced sport activity and the use of purgatives (Fisher's $\chi^2 = 17.74$; $P < 0.01$). Again the largest group of athletes, which took purgatives, was the judo practitioners (33.8%) (Table 2). As many as 61 participants in the study admitted to using purgatives. Most often, they used these pharmaceuticals once or twice a week (25 subjects), with swimmers (8.2%) and controls (7.1%) as particularly distinctive groups. The judo practitioners were predominant in the group of girls who took purgatives more than twice a week (7.8%). A statistically significant relationship was found between the analyzed variables (Fisher's $\chi^2 = 25.76$; $P < 0.01$) (Table 3).

51 participants (11%) admitted they had induced vomiting to lose weight (Table 2). The swimmers were

the group, in which this practice of weight reduction was the most common ($n = 16$).

The statistical analysis confirmed a weak statistical relationship between the studied variables (Fisher's $\chi^2 = 12.85$; $P < 0.05$). In the three months before the study 44 girls used purging as a weight loss aid. Among them, the largest group (9.1%) were judo practitioners, who used this method of weight reduction more than twice a week. A statistically weak relationship was found between the analyzed variables (Fisher's $\chi^2 = 25.11$; $P < 0.05$) (Table 3).

It happens, that coaches encourage girls to reduce their body weight. However the knowledge, how to do this, girls draw from women's magazines. They do not receive professional advices. They reduce body weight particularly before competition. That's all results in menstrual disorders (Table 4).

A significant statistical relationship was found between the frequency of using any means of weight reduction before competition and one's practiced sport (Fisher's $\chi^2 = 99.83$; $P < 0.001$) (Table 3). The majority of rhythmic gymnasts reported trying to reduce weight

Table 4. Percentage of answers to questionnaire items related to weight reduction practices before competition, encouragement to reduce body weight and menstruation frequency

	answer	SW	RG	SYN	JU	N
Percentage of answers to item: "How often do you use any means of body weight reduction before competition?" Relationship between practiced sport and the frequency of use of any means of weight reduction before competition $\chi^2 = 99.83$, $P < 0.001$	each competition	7.1	63.9	14.9	28.6	–
	2-5 per year	22.4	3.5	17.3	22.1	–
	1/year	6.1	14.5	14.9	9.0	–
	not slimming	64.4	18.1	52.9	40.3	–
Percentage of answers to item: "Who encourages you to reduce body weight?" Relationship between practiced sport and the answer to the question: "Who encourages you to reduce body weight?" $\chi^2 = 117.60$, $P < 0.001$	Coach	18.4%	45.6	23	0.0	–
	parents	2.0	2.4	2.3	2.9	–
	friends	3.1	0.0	3.5	1.4	–
	herself	23.4	35.3	37.9	44.3	–
	not slimming	53.1	16.7	33.3	51.4	–
Percentage of answers to item: "Who advises you on means of body weight reduction?" Relationship between practiced sport and motivation to reduce body weight $\chi^2 = 118.20$, $P < 0.001$	physician	2.1%	0.0	0.0	2.6	0.0
	Coach	11.2	13.3	2.3	10.4	0.0
	parents	8.2	4.8	5.8	9.1	4.3
	friends	1.0	1.2	2.3	3.9	0.7
	herself	19.4	30.1	41.3	45.5	33.6
	papers	6.1	34.9	12.6	0.0	10.0
	not slimming	52.0	15.7	36.6	28.5	51.4
Percentage of answers to item: "Do you experience infrequent menstruation or absence of menstruation?" Practiced sport and the menstrual cycle $\chi^2 = 55.34$, $P < 0.001$	no menstr	7.1	42.2	13.9	28.6	11.4
	regularly	66.3	42.2	65.7	52.0	65.7
	menstruation every 2nd month	13.3	10.8	6.9	9.1	10.7
	menstruation every 3rd month	13.3	4.8	13.5	10.3	12.2

Groups: SW – swimming, RG – rhythmic gymnastics, SYN – synchronized swimming, JU – judo, N – control group

before each tournament. Additionally, a relationship was found between practiced sport and dietary restraints (Fisher's $\chi^2 = 81.23$; $P < 0.001$). Swimmers most often (17.4%) limit the number of calories to 1200 kcal a day, while rhythmic gymnasts mostly limit dietary fat, sweets and white bread (32.5%). Synchronized swimmers and judo practitioners simply "eat less" than before. The subjects also used vegetarian diets or fasting, whereas controls most often did not try to reduce weight at all (50%). Also, the girls who intended to slim down tried eating less (26.4%), or eliminate all fat, sweets or white bread from their meals (16.4%). As far as low calorie diet (up to 1200 kcal) is concerned, statistically relevant differences were found between swimmers, rhythmic gymnasts, judo practitioners and non-training controls. Girls, training high-performance sports than their non-training counterparts were more often followed by low calorie diet.

Losing weight by athletes before competition or dieting by non-training individuals may be caused by an internal need to lose a number of kilograms or by social pressure. It is interesting to examine whether athletes who are losing weight are helped by people who encourage them to do so, or are left to experiment on their own in this matter. A correlation was noted between a subject's practiced sport and her motivation to slim down (Fisher's $\chi^2 = 117.60$, $P < 0.001$).

Artistic gymnasts who attempt to lose weight diet statistically more often than other training and non-training subjects take their advice from women's magazines. Very frequently athletes utilize their own ways to lose weight. Only four girls in the study: two swimmers and two judo practitioners, consulted a doctor about their weight control plans. The subjects from the control group mostly reduce their weight without any external advice or consultation. The relationship with the analyzed variable was highly significant (Fisher's $\chi^2 = 118.20$; $P < 0.001$).

Prevalence of menstrual disturbances

Literature includes many reports on menstrual disturbances in women practicing high-performance sports [17-21,23]. It is difficult, however, to clearly state why girls practicing high intensity sports suffer from amenorrhoea or oligomenorrhoea more frequently than non-training girls (Table 3). Intense physical effort, critical fat, dietary styles and eating disorders may be all listed as sources of these irregularities.

A relationship was found between sports practiced by subjects and menstrual regularity both in the last three months (Fisher's $\chi^2 = 55.34$; $P < 0.001$) and recently (Fisher's $\chi^2 = 66.11$; $P < 0.001$). Additionally, the differences between the training and non-training girls were especially significant in the three month period before the study.

Discussion

Irrational actions connected with slimming are inseparably linked with self-assessment of one's body weight. It is the low self-assessment of one's own looks, and inadequate body image (its shape and proportions) which makes one act irrationally and, as a result, make use of fasting, dietary regimes, dehydrating medication, purgatives or purging [8,24]. Additionally, as the study shows, decisions to reduce body weight are taken by athletes on their own or due to coach's pressure. Girls who seek information about rational ways of body mass regulation look for guidelines mainly in women's magazines. As a result they use drastic and irrational methods to lose weight which are hazardous to their health. This is particularly the case with judo practitioners for whom body weight is strictly connected with the result because of division into weight categories in judo. The data on artistic gymnasts who try to reduce their body weight before competitions are also worrying. Their main goal is to achieve a flat stomach, which may positively influence referee's evaluation. The same phenomenon, although to a lesser degree, is also characteristic of another artistic sport discipline - synchronized swimming. However, a synchronized swimmer is constantly changing her body positions and performing figures while in the water so the surface of her stomach remains hidden. Above all, menstrual irregularities in judo practitioners pose a special problem. In the case of rhythmic gymnasts irregular periods may be caused by their young age.

Summing up, one should note that the group of judo practitioners examined in the study not only had the highest BMI levels but were also characterized by the highest percentage of individuals using dehydrating medication and purgatives. Judo practitioners also frequently induce vomiting, however, to a lesser degree than the swimmers. Moreover, except for rhythmic gymnasts who are much younger, the highest percentage of judo practitioners experience irregular menstruation. They decide to undertake such slimming actions themselves and do not use information from any reliable sources. After gymnasts, judo practitioners also come second on the list of athletes who start slimming down directly before competition.

Gymnasts, who are girls of 14 years on the average, are most commonly encouraged by their coaches to reduce weight. Furthermore, doctors never give them advice on how to achieve this goal, so they do it on their own or use information from women's magazines. Most commonly they attempt to lose weight before competition and come second on the list of athletes who most frequently use laxatives. None of them is overweight but nearly one half believe they are. Because of their young age, and also perhaps due to their excessive attention to possessing a slim figure, their menstrual cycle is not yet regular. Also, none of the

swimmers is overweight but nearly a half of them think they suffer from this problem and more than a half of them want to lose 3 to 5 kilos. They also most often induce vomiting. However, their behavior is the least disturbing considering other groups of sports players.

Taking all the results into consideration, one should consider the fact that girls judge their figure more severely than their BMI levels might suggest. Many of them want to lose weight and, either by their own initiative or at their coach's instigation, use slimming methods which are hazardous to health. The majority of them are left to themselves to choose methods of body weight reduction or get their advice from women's magazines. When a sports competition is coming up the girls intensify their weight reduction activities. Nearly a half of them report menstrual irregularities, which can be caused by various means of losing body weight hazardous to health. The results of the present study confirm that such disturbing weight control practices as those described by Petrie et al. [25] are still present in high-performance sport, and that the only way to limit these tendencies is their constant monitoring and informing coaches and parents about all the health hazards they involve.

Yet, the comparison of the results of training and non-training girls indicates that the athletes remain in jeopardy of eating disorders. The girls who are sports players should be offered assistance in evaluation and regulation of their body mass, and their parents and coaches should be informed about risks of eating disorders in sports and methods of their prevention.

Declaration of interest

The authors report no conflicts of interest.

References

1. Scoffier S, Maiano Ch, d'Arripe-Longueville F. The effects of social relationships and acceptance on disturbed eating attitudes in elite adolescent female athletes: The mediating role of physical self-perceptions. *Int J Eat Disord* 2010; 43(1): 65-71. DOI: 10.1002/eat.20597
2. Richardson SM, Paxton SJ. An Evaluation of A body image intervention based risk factors for body dissatisfaction: A controlled study with adolescent girls. *Int J Eat Disord* 2010; 43(2): 112-22. DOI: 10.1002/eat.20682
3. Gutierrez-Maldonado J, Ferrer-Garcia M, Caqueo-Urizar A, et al. Body image in eating disorders: The influence of exposure to virtual-reality environments. *Cyberpsychol Behav Soc Netw* 2010; 13(5): 521-33. DOI: 10.1089/cyber.2009.0301
4. Schneider N, Frieler K, Pfeiffer E, et al. Comparison of body size estimation in adolescents with different types of eating disorders. *Eur Eat Disord Rev* 2009; 17(6): 468-75. DOI: 10.1002/erv.956
5. Augustad LB, Flanders WD. Eating disorder behavior in physically active Norwegian women. *Scand J Med Sci Sports* 2002; 12(4): 248-55.
6. Glauert R, Rhodes G, Byrne S, et al. Body dissatisfaction and the effects of perceptual exposure on body norms and ideals. *Int J Eat Disord* 2009; 42(5): 443-52. DOI: 10.1002/eat.20640
7. McKnight Investigators. Risk factors for the onset of eating disorders in adolescent girls: Results of the McKnight longitudinal risk factor study. *Am J Psychiatry* 2003; 160(2): 248-54.
8. Putyński L, Zarzycki J. Characteristics of the body image and self-assessments at girls with the anorexia nervosa and the simple obesity. *Pediatr Pol* 1994; 6: 415-20 [in Polish].
9. Chen EY, McCloskey MS, Keenan KE. Subtyping dietary restraint and negative affect in a longitudinal community sample of girls. *Int J Eat Disord* 2009; 42(3): 275-83. DOI: 10.1002/eat.20661
10. Bale P, Doust J, Dawson D. Gymnasts, distance runners, anorexics body composition and menstrual status. *J Sports Med Phys Fitness* 1996; 36(1): 49-53.
11. Prussin RA, Harvey PD. Depression, dietary restraint, and binge eating in female runners. *Addict Behav* 1991; 16(5): 295-301.
12. American Academy of Pediatrics. Committee on Sports Medicine and Fitness. Promotion of healthy weight-control practices in young athletes. *Pediatrics* 1996; 97(5): 752-3.
13. Guthrie SR, Ferguson C, Grimmer D. Elite women body-builders: ironing out nutritional misconceptions. *Sport Psychol* 1994; 8(3): 271-86.
14. Long Anderson S, Zanger K, Hetzler RK. Comparison of eating Disorder Inventory (EDI-2) Scores of male bodybuilders to the male college student subgroup. *Int J Sport Nutr* 1996; 6(3): 255-62.
15. Ziegler P, Hensley S, Roepke J, et al. Eating attitudes and energy intakes of female skaters. *Med Sci Sports Exerc* 1998; 30(4): 583-6.
16. Sundgot-Borgen J. Eating disorders, energy intake, training volume, and menstrual function in high-level modern rhythmic gymnasts. *Int J Sport Nutr* 1996; 6(2): 100-9.
17. Sinning WE, Little KD. Body composition and menstrual function in athletes. *Sports Med* 1987; 4(1): 34-45.
18. Rosetta L, Williams C, Brooke-Wavell KSF, et al. Diet and body composition of female recreational runners of differing menstrual status. *J Sports Sci* 1998; 16(7): 629-37.
19. Ramsay R, Wolman R. Are synchronised swimmers at risk of amenorrhoea? *Br J Sports Med* 2001; 35(4): 242-4.
20. West RV. The female athlete: the triad of disordered eating, amenorrhoea and osteoporosis. *Sports Med* 1998; 26(2): 63-71.
21. Skierska E, Socha T, Gajewski AK. The menstrual dysfunctions in female judo competitors. *Wych Fiz Sport* 1995; 39(3): 47-53 [in Polish].
22. Gawęcki J. Żywnienie człowieka. Podstawy nauki o żywieniu. Warszawa: Wydawnictwo Naukowe PWN, 2010: 234-5.
23. Raczynska B, Raczynski G, Malczewska J, et al. Bone mineral content (BMC) and bone mineral density (BMD) in postmenopausal women formerly practicing kayaking and fencing. *Biol Sport* 2003; 20(2): 147-58.
24. Kaschack E. *The new psychology of women*. Gdańsk: Gdańskie Wydawnictwo Psychologiczne, 1996 [in Polish].
25. Petrie T, Greenleaf C. Eating disorders in sport: from theory to research to intervention. In: G. Tenebaum & R. C. Eklund (Ed.). *Handbook of sport psychology*. 2007: 352-78.

Accepted: December 10, 2014

Published: December 23, 2014

Address for correspondence:

Katarzyna Antosiak-Cyrak, PhD

Department of Swimming and Water Rescue

University School of Physical Education

61-555 Poznań, Poland

ul. Droga Dębińska 10c

mobile: +48 600 42 42 32

e-mail: kcyrak@poczta.fm

Małgorzata Habiera: habiera94@poczta.onet.pl

Elżbieta Rostkowska: jaroe8@wp.pl