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Eating behavior and body image in athletes*

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ABSTRACT

The sports environment can enhance social and cultural pressure towards a lean body. The close relationship between corporal image and performance makes the female athletes a group particularly vulnerable to eating disorders and weight-control practices. The aim of the present work is to evaluate the presence of behaviors suggestive of eating disorders, shifts in body perception, and menstrual dysfunctions in female athletes of the Federal University of Rio de Janeiro School of Physical Education (EEFD-UFRJ). Twelve female athletes (20 ± 2 years), who had been training for 4.6 ± 2.3 years, a total of 13.8 ± 2.9 hours per week, were examined. The results of the athletes and of 32 young non-athletes (15 ± 1.4 years) were compared. The *Eating Attitudes Test* (EAT-26) was used to evaluate weight-control and eating attitudes and behaviors. The *Bulimic Investigatory Test Edimburgh* (BITE) was used to identify suggestive behaviors of bulimia nervosa, and also to obtain data about cognitive and behavioral aspects of this disorder. The *Body Shape Questionnaire* (BSQ) was used to verify dissatisfaction with body image. The three self-applied questionnaires were used in their Portuguese versions. The athletes presented body mass of 59 ± 7.3 kg, height of 1.65 ± 0.03 m, percentage of body fat (%F) of 23.1 ± 4.1% and body mass index (BMI) of 21.6 ± 2.3 kg/m^2. The entire sample had a %F compatible for age and sex, although 33% of the athletes presented some body image dissatisfaction. The BITE evidenced that 16.6% of the athletes presented a *non-usual* dietary pattern according to symptoms, but with no significance in terms of severity. These athletes are included among those who are not happy with their body. No athlete had a positive EAT-26 results. The findings of this study suggest the presence of symptoms that do not actually characterize bulimia or anorexia nervosa, but they point to the need of a careful surveillance and assessment of eating disorders and their precursors among athletes, as a way of prevention.

Key words: Eating disorders. Athletes. Amenorrhea. Body composition.

INTRODUCTION

The model of beauty society imposes a lean body, without considering health-related aspects and the different physical features of the population. Such distorted beauty standard makes an increasing number of women to go on weight-control diets, to over-practice physical exercises, and to a wide use of laxatives, diuretics and anorectic drugs[1]. These are considered precursory behaviors of eating disorders – which include anorexia and bulimia nervosa, and the so-called non-specific eating disorders, among which the periodic eating compulsion disorder stands out. The detection of *partial syndromes* of such diseases is of high importance for prevention, as they currently occur more often than the disease itself[2]. Young women, because they are more vulnerable to pressures of society, culture and economics on esthetic standards, are the group at higher risk for eating disorders[3]. Eating disorders are from multiple causes, including genetic, environmental and behavioral factors. People with anorexia nervosa or bulimia nervosa have, in common, an excessive concern with weight and diet, are dissatisfied and have a distorted perception of their body image, and typically are resistant to treatment. Lethality rate from anorexia nervosa ranges between 5% and 20%, which justifies the need for prevention.

Anorexia nervosa is characterized by a self-imposed dietary restriction, in order to achieve a marked weight loss. The goal of having a thin body is guided by behaviors that

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include a reduction of "fattening" food intake and/or the use of self-induced purgation methods, or the compulsive practice of physical activities. As the most common symptoms, the patients keep their body weight lower than 85% of what is considered suitable for their height and age, they present a morbid fear of getting fat, changes in their perception of their body, menstrual disorders, bone demineralization, loss of muscle mass and body fat, digestive disorders, cardiac arrhythmia, dehydration, intolerance to cold, thin and weak hair, among other problems[5].

A significant energy restriction, with a short-time loss of weight, lead to a decrease of the basal metabolic rate, and impairment of musculoskeletal, cardiovascular, endocrine, and thermoregulatory functions, and difficulties in attention and concentration[6,7].

Among the psychological symptoms, even though there is not a definite profile, the patient often presents anxiety, depression, low self-esteem, irritability, intolerance to frustrations, and mood unbalance, with an impact in his/her social, affective and professional life.

The main characteristic of bulimia nervosa is a compulsive overeating, followed by some sort of purgation. In this disease, the patient eats an amount of food much higher than typically would be eaten by most people over the same period of time and in similar conditions, associated to a loss-of-control sensation. This sensation leads the patient to extreme attitudes, such as self-inducing vomiting, or laxative and/or diuretic abuse, excessive workout, extreme diets or even fasting, to prevent consequences of the over-intake of food. The main effects from such practices are loss of fluids and electrolytes during purgation (dehydration), acid-base unbalance, electrolyte unbalance, cardiac arrhythmias, decrease of serum potassium levels (the main cation accountable for muscle contraction), gastrointestinal disorders, increase of the parotid gland, erosion and loss of teeth enamel[1,8]. Bulimia nervosa is also related with an excessive concern about weight and body shape, and the patient tends to judge him/herself from these variables. It is the excessive fear of getting fat that differentiates the bulimic from anyone who may eventually overeat. Differently from the anorectic individual, whose extreme leanness makes the problem evident, the bulimic person has normal weight or is slightly overweight, and because of that the disease may be hidden for many years[9,10]. The prevalence of bulimia nervosa ranges between 1% and 4% in the adolescent and young adult female population[2].

The compulsive-eating disorder is characterize by the *binge eating*, by which the patient intakes huge amounts of food over a short period of time, until he/she feels uncomfortable. The patient typically eats alone, and afterward feels guilty and depressed[11].

In athletes, even though the prevalence of anorexia nervosa and bulimia nervosa is not really known, particularly in Brazil, studies have found an increased frequency (from 15 to 62%), particularly in some sports[5,12]. The close relationship between corporal image and physical performance makes athletes a group particularly vulnerable for such disorders, considering the importance given to weight control[13-15]. Recent studies mention the influence of coaches, sponsors and families, through their comments on the athletes' weight and shape, as a powerful element for triggering abnormal eating disorders. It is also known that the adoption of a restrictive diet at an early age, particularly if without professional supervision, may trigger an eating disorder, causing major health hazards and thus, impairing athletic performance[16,17].

Sports that require low body weight and overestimate aesthetics, using it as a criterion for obtaining good results in competitions – such as in artistic gymnastics, synchronized swimming, running, and dance – have been pointed out by investigations carried out in this area as presenting the highest incidence of eating disorders and of precursory eating disorder behaviors[18-23]. West[24], investigating 42 university gymnastics athletes, found that 62% of them used, at least, one type of inappropriate dietary practice. Dietary restriction, which is not recommended to non-athlete young people, is extremely dangerous to athletes, as it may lead to a caloric deficit and electrolytic unbalancing, causing malnutrition and compromising physical fitness. A low-calorie diet is also associated to low pulse and frequency of the luteinizing hormone and triiodothyronine[25-28]. These hormones act on the menstrual cycle control, and, if altered, they cause secondary amenorrhea and oligomenorrhea, typical eating-disorder symptoms.

The interrelationship and, in many cases, coexistence of eating disorders, amenorrhea and osteoporosis form the female athlete triad[29,30]. The development of abnormal eating patterns may lead to menstrual dysfunction and to osteoporosis; therefore, the symptom control from such abnormalities is mandatory. Each component of this triad may interfere in physical performance, and be a morbidity or mortality cause.

The general population, and particularly the population focused in our study (athletes and their coaches), must be informed about risk behaviors that preceded the development of eating disorders, for an early diagnosis and control to prevent severe eating disorder cases.

The scope of this investigation was to assess the occurrence of behaviors suggestive of eating disorders, changes in body image, and presence of menstrual dysfunctions in female athletes of the Federal University of Rio de Janeiro School of Physical Education (EEFD-UFRJ).

MATERIAL AND METHODS

A cross-sectional study was carried out with a target-population considered to be of higher risk for eating disorders: female young athletes.

The sample included 12 young women (20 ± 2 years) at childbearing age (age at menarche: 12.2 ± 1.5 years), affiliated to clubs of different sports modalities in Rio de Janeiro, and students of EEFD-UFRJ. The assessed group of athletes included six from collective sports (handball, soccer, volleyball), three from individual sports (triathlon, swimming, dance), and three from fighting sports (karate, jiu-jitsu and kick-boxing), who reported and average training period of 4.6 ± 2.3 years, and a total of 13.8 ± 2.9 hours of practice a week. A control group of 32 non-athlete post-menarche adolescents (15.0 ± 1.4 years) was evaluated according to the same protocol of the athletes.

The presence of menstrual dysfunctions, diagnosis of osteoporosis, and recent bone injuries, and the training routine were self-reported in a questionnaire supervised by the authors of this study. This questionnaire was especially developed for this investigation, being previously validated by eight UFRJ experts. The four adopted questionnaires were applied at EEFD-UFRJ's Exercise Physiology Lab.

After responding to the four questionnaires, the athletes were submitted to anthropometrical evaluation[31] for assessment of body composition, and the following measurements were made: *skinfold* (chest, triceps, biceps, subscapular, suprailiac, abdominal, medium axillary, thigh and leg – CESCORF, 0,1 mm); *body girth* (relaxed and contracted biceps, thigh, leg, abdomen and hip – flexible metallic tape – CARDIOMED, 1 cm); *bone breadth* (wrist, knee and elbow – caliper, 1 mm); *height* (stadiometer, 1 mm) and *total body mass* (electronic scale, 50 g). From the measures found, the different parameters were calculated, and the present analysis includes the proportion of body fat (%F)[32], obtained from body density estimates[33], lean body mass [total body mass – fat body mass, kg], and the body mass index [BMI = total body mass/height^2, kg/m^2][34]. Body fat estimate for the control group was made from body density estimates calculated from Jackson *et al*. model[35].

To assess typical attitudes and behaviors of patients with anorexia nervosa and to rank the severity of the eating disorders, the *Eating Attitudes Test* (EAT-26)[36] was adopted. EAT-26 is a self-report questionnaire internationally used to identify and assess abnormal eating standards, and is also useful to follow up progression of medical cases. The questionnaire includes 26 questions, with six response options: *always*, *very often*, *often*, *sometimes*, *seldom*, and *never*, and three aspects are analyzed:

Aspect 1: Diet – the first three items address pathologic high-calorie food refusal and concerns about fitness;

Aspect 2: Bulimia nervosa – the six questions that follow are to reflect respondent's thoughts on food and bulimic attitudes;

Aspect 3: Oral control – the last seven items address self-control regarding food and acknowledge social pressure in the environment towards weight gaining.

The evaluation of EAT-26 responses is done by rating three to the most extreme responses ("always" or "never"), two to the second most extreme responses, and one to the third most extreme responses; the other responses are not scored. The scores from each EAT-26 question are added and computed for each person assessed. If the total score is higher than 21, EAT-26 is considered to be positive (EAT-26$^+$), thus confirming the presence of abnormal dietary attitudes, and risk for the development of eating disorders.

The authors who developed EAT-26 used a 20-score cut-off point. In our study we used a cut-off of 21 points, as its sensitivity and specificity are highly satisfactory[37,38], and it is being used by other Brazilian authors[4,39], allowing results to be compared.

To assess the presence and intensity of bulimic behaviors, the *Bulimic Investigatory Test Edinburgh – BITE*[40] was used. It is a self-response questionnaire with 33 questions and two sub-scales, one for SYMPTOMS and the other for their SEVERITY. These scales are described below, according to Cordás[41].

There are three scoring groups for the SYMPTOM scale:

- High (a score of 20 or higher): this is considered a high scoring, with presence of compulsive eating behavior and likely to meet diagnostic criteria for bulimia nervosa according to DSM-III-R[2].
- Medium (scores between 10 and 19): suggests a non-usual eating pattern, and not all bulimia criteria are typically present. People with scores ranging from 15 to 19 may be a subclinical group of compulsive eaters, early-stage bulimics, or bulimics in remission – they should undergo a diagnostic interview with specialists.
- Low (a score below 10): within normal range.

BITE's SEVERITY scale includes questions 6, 7 and 27 of the questionnaire, and measures the severity of the compulsive behavior according to the frequency of attitudes; it is to be analyzed in the cases that score 10 or higher in the symptom scale, and presents three stages:

- High (a score ≥ 10): high degree of severity, and may point to the presence of psychogenic vomiting or laxative abuse without a compulsive behavior, and the patient should be referred to a diagnostic interview with specialists.
- Moderate (a score between 5 and 9): are considered clinically significant, and patients should be referred to a diagnostic interview with specialists.

➢ Low (score up to 5): a clinically non-significant result.

To assess the degree of dissatisfaction with body image, the *Body Shape Questionnaire – BSQ* (validated by Cooper *et al*.)[42] was used, which measures the concern one has with the shape of the body, self-depreciation due to physical aspect and to the feeling of being fat. According to Cordás[43], the questionnaire differentiates two aspects of body image: the accuracy of body size estimates, and the feelings towards the body (dissatisfaction or depreciation of one's fitness). The questionnaire includes 34 questions, with six response alternatives: *1) never*, *2) seldom*, *3) sometimes*, *4) often*, *5) very often*, *6) always*. According to the response marked, the considered score for the question is the number of that response (for instance*:* the score for *never* is 1). The scores are summed and the total is considered for each individual. The rating of results is according to the total number of points, and reflects the level of concern for body image. A total score lower or equal to 80 is considered normal, i.e., **no** distortion of body image. A score between 81 and 110 means **mild** body image distortion; between 111 and 140, **moderate** distortion; and over 140, **severe** body image distortion.

EAT-26, BITE and BSQ were used in their Portuguese versions[43]. These are self-report tools used in internal medicine for triage and identification of eating disorders and other psychiatric co-morbidities, and study participants did not go to a diagnostic interview (APA)[2].

The Ethics Committee of the Collective Health Study Center, Clementino Fraga Filho Hospital, approved this study and all participants signed an informed consent from agreeing to the procedures to be adopted and authorizing the scientific use of the study results. Participants' anonymity and privacy were kept in the study.

Calculation of parameters, descriptive data statistics and comparison (non-paired Student's *t* test) of the variables and eating disorder questionnaire responses between the groups were performed with the use of software *Statistica for Windows* (5.1, 1998), with a significance level of $p \leq 0.05$.

RESULTS

Menstrual dysfunction

Primary amenorrhea, which is the absence of menarche at age 16, may be related to the practice of exhaustible physical exercises[12]. The athletes of our investigation, even though they did not present primary amenorrhea, had their menarche at a significantly older age then the control group, and both groups were within the average menarche standard of Brazilian women[44] (table 1).

There were a significant number of athletes (50%) and controls (25%) with dysmenorrhea (menstruation accompanied by severe colic). The relationship between physical exercises and dysmenorrhea is not well established in the literature. In some athletes, dysmenorrhea symptoms remain with training, in others, the symptoms fade[45,46].

In our investigation, 75% of the athletes mentioned a change in performance when they compete at the menstrual period. This figure includes all athletes with dysmenorrhea and others without it. There is no consensus among investigators as to the possibility of performance impairment of athletes at competitions during the menstrual period. Some authors[45,46] did not find effects from menses on motor performance, while others report that performance improves in the post-menstrual phase and worsens during menses or on the three previous days[37-49].

Only one athlete (soccer, 8.3% of the sample) informed having had secondary amenorrhea (interruption of menses for three or more months)[11] over the last two years of training. In the control group, a case of secondary amenorrhea (3.0% of the sample) was also identified. In the literature,

TABLE 1
Physical features of the sample

Variables	Athletes (n = 12)	Controls (n = 32)	P value
Age (years)	20.2 ± 2.0	14.6 ± 1.7	0.000001 *
Height (cm)	1.65 ± 0.03	1.62 ± 0.07	0.03*
Age at menarche (years)	12.2 ± 1.1	11.6 ± 1.9	0.02*
Total body mass (kg)	59.0 ± 7.3	56.9 ± 9.9	0.16
Percentage of body fat (%)	23.1 ± 4.1	26.1 ± 7.5	0.04*
Body lean mass (kg)	45.3 ± 3.7	41.4 ± 3.6	0.01*
Body mass index (kg/m²)	21.6 ± 2.3	21.8 ± 3.6	0.47

* Statistical difference for $p \leq 0.05$.

a prevalence of 2 to 5% of sedentary women with amenorrhea has been registered, whereas for athletes, depending on their sports, it may range from 10 to 66%[50].

Osteoporosis: The athletes stated in the questionnaire that they did not have a recent diagnosis of osteoporosis, nor suffered bone injuries (over the past two years). These statements *may* indicate absence of osteoporosis in this sample. We stress, however, that for a definite diagnosis a bone densitometry test is required. To overcome this limitation of our investigation, the clinic of orthopedics of UFRJ's University Hospital was involved in the study and is preparing the necessary equipment for the test and diagnosis, which will be done in further investigations with athletes of national teams.

Body composition

The mean total body mass of the athletes, in kg, was higher than of controls, but this was not statistically significant (table 1). This means that the control group, in spite of being younger, had a body mass similar to athletes'. The difference between the groups was evident when the analysis of the total body mass was broke down in its different components. Athletes presented lower body fat (%F) and higher lean mass compared to non-athletes (table 1). These results were expected as response to the training athletes are submitted to.

Some athletes had body fat proportion (%F) higher than expected for athletes of their category, but below the proportion of non-athlete women (25.5%)[5,51]. This may be due to the fact that the sample, in spite of not including high-level athletes, comprised young women who have been training for 4.6 ± 2.3 years, and thus have their organic response from energy lipid metabolism adapted to training. Such adjustment has a strong impact on the athletes' body composition, and might have determined a significantly lower %F for the group of athletes from the school of physical education EEFD compared to the control group, which includes sedentary young women[52] (table 1).

EAT-26 results

Table 2 presents the mean results and standard deviation of both athlete and control groups for the EAT-26, BITE and BSQ, and a comparison among them. One sees from the mean results of both groups on the three tools evaluated, that they are within normal standards for eating disorders. In spite of athletes presenting mean values a little higher than controls, the difference was not statistically significant.

The analysis of individual EAT-26 results showed lack of pathological or at-risk attitudes for the development of anorexia nervosa among the investigated athletes, differently of what the literature points out to athletes[11-12,53,54]. Such good result for anorexia nervosa was not replicated in the control group, which presented 15.6% positive results for EAT-26 (table 3). Nunes *et al*.[55] found similar results for *non-athlete* adolescents from Rio Grande do Sul (positive EAT-26 in 13.7%).

TABLE 2
Results (mean and standard deviation) from EAT-26, BITE and BSQ

Tools	Athletes (n = 12)	Controls (n = 32)	p value
EAT-26	11.7 ± 6.2	7.8 ± 5.4	P = 0.08
BITE	7.2 ± 4.4	5.8 ± 3.2	P = 0.28
BSQ	77.8 ± 28.7	69.8 ± 26.5	P = 0.40

BITE results

In our study, 16.7% of athletes and 21.8% of non-athlete adolescents scored between 10 and 19 on the BITE symptom scale. These results express a non-typical eating pattern, showing an at-risk eating behavior (table 3). The BITE severity scale showed that, in spite of athletes presenting a non-typical eating pattern, the result is not clinically significant for bulimia. Among the controls who presented non-typical eating standard on the BITE symptom scale, 42.8% had clinically significant results for bulimia nervosa (table 3).

BSQ results

The analysis of BSQ showed a mean average result higher for athletes compared to controls, but it was not statistically significant (table 2). In a relative analysis, distortion of body image is more worrisome in non-athletes than in athletes (table 3).

Our investigation revealed also an important practice of abnormal eating behaviors in both groups. Such habits may reflect the development of partial eating disorder syndromes, and are characterized as overtly abnormal eating and at-risk behaviors[4]. Table 4 presents some of BITE questions where one can see the concern with weight control and practice of dietary restrictions, particularly fasting, which are conflicting with physical activities.

DISCUSSION

According to the literature, the prevalence of the female athlete triad ranges from 10 to 66% among elite athletes, particularly those whose sports modalities require low body mass (runners, gymnasts, dancers)[11,30,56]. In the sample of

TABLE 3
Results from EAT-26, BITE and BSQ

Tools	Athletes (n = 12)	Controls (n = 32)
EAT-26		
Positive	0%	**15.6%**
Within **normal** ranges	**100%**	**84.4%**
BITE		
Symptom scale		
HIGH	0%	0%
MEDIUM	**16.7%**	**21.8%**
LOW (or within **normal ranges**)	83.3%	78.2%
Severity scale		
Applied when changes in the symptom scale were found		
HIGH degree of severity	0%	0%
MODERATE clinically significant	0%	**42.8%**
LOW clinically **non** significant	100%	57.2%
BSQ		
SEVERE body image distortion	0%	0%
MODERATE body image distortion	0%	**12.5%**
MILD body image distortion	**33.3%**	**37.5%**
ABSENCE body image distortion	66.7%	50%

TABLE 4
Responses suggestive of typical bulimia behaviors

Questions	Athletes %	Controls %
Fear (panic) of getting fat	58.3	81.2
Rapid intake of high amounts of food	41.6	53.2
Fasting for a whole day	**25.0**	18.7
Eating when no one is watching	16.6	37.5
Concern with lack of food control	8.3	37.5
Feeling guilty for eating	33.3	53.1
Obsessive thoughts about eating	33.3	31.2

Questions from BITE portraying dietary practices and emotional attitudes.

our investigation, we found only one case of amenorrhea (without a diagnosis of osteoporosis). This result may be due to the fact that athletes did not practice sport modalities where prevalence of this syndrome is higher, and our subjects were not elite athletes. Considering that recent studies have reported a strong correlation between amenorrhea and eating disorders and with low bone density[7,16,23], it is to be stressed the need for more detailed clinical investigations on the presence of amenorrhea in athletes, particularly elite ones.

The presence of eating disorders and inadequate weight-loss practices (impact diets, vomiting induction, fasting, use of laxatives, compulsive exercising, etc.) combined to dissatisfaction of body image has been pointed out in the literature. Studies have found that, even with body mass within normal population standards, it is significant the number of young women unhappy with their weight, and that do inappropriate practices to reduce body mass[57]. In Porto Alegre, Nunes *et al.*[58], in a populational study with young women aged 12 to 19, found that perception of body weight (feeling fat) was determinant for abnormal eating behaviors, even among those whose with normal BMI. Our investigation confirms these findings, as, in spite of the healthy standards for total body mass, %F and BMI[5,51] in both the athlete and control groups, the presence of at-risk behaviors for eating disorders was found in EAT-26 (for non-athletes only), BITE, and dissatisfaction with body image in the BSQ (table 3). BITE scores of athletes and controls, even being of moderate intensity and severity, are worrisome, serving as a warning about the possibility of progression for severe behaviors and the development of eating disorders[59-61].

Estimates of eating disorder among athletes range between 15 and 62%, being more marked in esthetic sports, such as dance, bodybuilding, artistic skating and gymnastics[52,53]. Sundgot-Borgen[53] observed a higher prevalence of eating disorder in athletes (18%) than in non-athletes (5%). Assessing such prevalence among different sports modalities, the author found that the presence of eating disorders

and the use of inadequate weight control was significantly higher among bodybuilders (34%) and those who practice sports that require low body mass (27%). For technical (13%) or team (11%) sports, the prevalence found was lower, closer to the controls' (7%).

The results from our study showed that the frequency of at-risk eating behaviors pointed out at BITE and EAT-26 was more significant among controls than in EEFD's athlete students. Literature[2] points out that anorectic behaviors begin at age 15, and bulimic at age 19. Thus, not-surprisingly the control group, in spite of being younger, presents a higher proportion of abnormal results than the athletes group. From our point of view, these results are supported by the fact that the athletes under assessment practiced sports considered to be of lower risks for eating disorders. The fact that they are **not** elite athletes (members of national teams) may also add to the result, as they have less training and less stress level, factors that could be related to the presence of eating disorders. However, Weight and Noakes[64] did not find higher prevalence of eating disorders in athletes compared to controls either, in spite of having analyzed endurance runners, a sports modality where other authors did find a high prevalence of eating disorders. Thus, we believe it is necessary to epidemiological studies to be carried out, considering the different sports modalities, training levels, and including males, for one to have an overall perspective of the eating behavior impact among Brazilian athletes.

CONCLUSION

Even though, at the moment, there is no sign of anorexia or bulimia nervosa among the investigated athletes, the results from our study show the presence of worriment about body weight, combined with a mild distortion of body image and the practice of dietary restrictions. Such practices are called partial eating disorder syndromes, and when associated to systematic and exhaustible physical exercises, they become risk factors, and their early detection may prevent progression to severe eating disorders.

This was the first of a series of multidisciplinary investigations to be carried out at the Federal University of Rio de Janeiro-UFRJ, which will unfold to include other sports modalities and populations, with the purpose of understanding and guiding an issue of complex biological, psychological, epidemiological, anthropological, sociological, economic and historical aspects – thus requiring an interdisciplinary focus to integrate these different dimensions.

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