

# **NUTRITION, WEIGHT CONTROL, AND WEIGHT CONTROL RISK KNOWLEDGE, AND DIETARY AND WEIGHT REGULATION PRACTICE IN ELITE GYMNAST OF DIFFERENT LEVELS OF COMPETITION**

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## **ABSTRACT**

The purpose of this study was to assess the level of nutrition, weight control, and weight control risk knowledge, and dietary and weight regulation practice of female gymnast of different levels of competition (regional, national, and international). The sample was 39 female rhythmic and aesthetic gymnastics athletes from the different levels of competition (15 gymnasts from regional level, 12 gymnasts from national level, and 12 gymnasts from international level). A self-administered questionnaire was used to measure the knowledge nutrition, weight control, and weight control risk knowledge and dietary practice. National and international gymnast had higher nutrition and weight control knowledge than regional gymnast. National and international gymnast skip more meals and have a significantly reduce intake of fruit, vegetables, and meat than regional gymnast. Gymnast of regional, national and international level do not have a proper perception about their knowledge and their risk of weight control on their bodies. This lack of adequate perception made recommended monitor the perception of these populations and provide them specific educational training.

**Keywords:** aesthetic sport, performance, prevention, health

## **NUTRICIÓN, CONTROL DE PESO Y CONOCIMIENTO DEL RIESGO DEL CONTROL DE PESO, Y PRÁCTICA DE REGULACIÓN DE DIETA Y PESO, EN GIMNASTAS DE ELITE DE DIFERENTES NIVELES DE COMPETICION**

### **RESUMEN**

El propósito de este estudio fue evaluar el nivel de nutrición, control de peso y conocimiento de riesgo de control de peso, y la práctica de regulación dietética y de peso de gimnasta femenina de diferentes niveles de competencia (regional, nacional e internacional). La muestra fue de 39 atletas femeninas de gimnasia rítmica y estética de los diferentes niveles de competencia (15 gimnastas de nivel regional, 12 gimnastas de nivel nacional y 12 gimnastas de nivel internacional). Se utilizó un cuestionario autoadministrado para medir el conocimiento de la nutrición, el control de peso y el conocimiento del riesgo de control de peso y la práctica dietética. La gimnasta nacional e internacional tenía un mayor conocimiento de nutrición y control de peso que la gimnasta regional. Las gimnastas nacionales e internacionales se saltan más comidas y reducen significativamente la ingesta de frutas, verduras y carne que las gimnastas regionales. Los gimnastas de nivel regional, nacional e internacional no tienen una percepción adecuada sobre sus conocimientos y su riesgo de controlar el peso en sus cuerpos. Esta falta de percepción adecuada hizo que se recomendara monitorear la percepción de estas poblaciones y brindarles capacitación educativa específica.

**Palabras clave:** deporte estético, rendimiento, prevención, salud

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## INTRODUCTION

The goal of training is to increase performance in competition. In the aesthetics sports, performance is measured by the physical appearance of the athletes' executions (Palao & Morante, 2013). The sport rules establish the standards to measure the athlete's actions at level of rhythm, amplitude, harmony, expression, etc. (International Gymnastics Federation, 2016). In these type of sport, it is easy to identify a specific somatotype in these athletes at performance levels (Douda, Laparidis & Tokmakidis, 2002; Marina & Rodriguez, 2014; Miletic, Katic & Males, 2004; Souza-Menzes, Novaes, & Fernandes-Filho, 2014). This stereotype is established by a select and reduce number of elite athletes that reach the national or international championships in the best moment of their competitive lives. Previous research have shown the occurrence of inadequate unhealthy behaviours for these population in the attempt to reach this somatotype (Boros, 2009; Klentrou & Plyley, 2003; Lagowska, Kapczuk, Friebe & Bajerska, 2014; Sundgot-Borgen, 1996). The use of this body image as reference for your athletes can increase the risk of unhealthy behaviours and eating disorders. Level of competition can affect the stress perceived by the athletes regarding their body weight. At higher level of competition, the stress and demands that athletes have are also higher; however, the athletes are mature, have more experience and training (Koivula, Hassmen & Fallby, 2002; Nordin, Harris & Lumming, 2003; Picard, 1999; Roupas, Neoklis & Georgopoulos, 2011).

Education and healthy environment are considered as key elements to avoid the realization of unhealthy behaviours. Knowledge about the require nutrition to grown, training and performance, the risk of weight control, and adequate body images reference are critical in these prevention (Arends, Cheung, Barrack, & Nattiv, 2012; Nattiv et al., 2007; Temme & Hoch, 2013;). In review of the literature, it is possible to find studies that shown gymnasts have good nutritional intake (D'alessandro et al., 2007) and also studies that show gymnast have proteins or lipids and calcium intake deficits (Gomez- Campos et al., 2013; Michopoulou et al., 2011). The nutritional habits of the gymnast are better as higher is their level (Gomez- Campos et al., 2013). However, independently of the level, gymnasts have caloric deficit due to the intensity and duration of their training (D'alessandro et al., 2007; Deutz, Benardot, Martin, & Cody, 2000). It had been also reported that during the competitive season, their diet habits change and they are not adequate (Michopoulou et al., 2011). Compare with no-athletes, gymnasts have a higher nutrition knowledge, higher carbohydrate intake, avoid more unhealthy intakes (food with high collectors and saturate and Trans fats), and do not reach the normal caloric intake (Cupisti et al., 2000; Karabudak et al., 2016). These studies that compare gymnast with no athletes show that gymnast had higher knowledge that allow

them to modify their diet and get their goals better than no-athletes. These higher knowledge did not involve that their dietary habits were adequate (e.g., amount of meals, eat candies, percentage of the macronutrients) and they have enough caloric intake (Boros, 2009). In elite gymnast, no differences have been found in different age groups (under-18 and senior) regarding their intake; that was low in both age groups (Jonnalagadda, Benardot, and Nelson, 1998). Less is known about the differences knowledge and habits in young gymnast of different levels of competition. Regarding the realization of unhealthy behaviours, previous studies show gymnast control weight control reduce their intake (low caloric intake) and the realization of exercise and training (D'alessandro et al., 2007; Deutz et al., 2000; Gomez-Campos et al., 2013; Michopoulou et al., 2011; Nova et al., 2001). These behaviours increase their risk to physical debility (Coppola, Vastola, Scatigna and Fabiani, 2014), immunosuppression (Lopez- Varela et al., 2000), and eating disorders (Sundgot-Borgen & Torstveit, 2004).

At different levels of competition, lot aspects change in the practice environment; such as training characteristics, human resources, coaches, external and internal pressure, etc. To provide healthy sport environment to the athletes of aesthetics sport, knowing what knowledge, stress, or behaviours they have and how they change in the different levels of competition is critical. This information will allow to the different stakeholder adapt, maintain or study more deeply the environments where these athletes practice and compete. The different stakeholders must have active roles to avoid the practice of gymnastic have negative impacts on athlete's life (Sundgot-Borgen, 1996; O'Connor, Lewis, Kirchner, and Cook, 1996). The purpose of this study was to assess the level of nutrition, weight control, and weight control risk knowledge, and dietary and weight regulation practice of Spanish female gymnast of different level of competition (regional, national, and international).

## METHOD

### *Design*

A selective retrospective design with three groups of study (regional level gymnasts, national level gymnast, and international level) was carried out. An original, self-report was used to collect the data.

### *Participants*

A total of 39 female rhythmic and aesthetic gymnastics athletes fill-out the questionnaire. The sample was composed by 15 gymnasts from regional level, 12 gymnasts from national level, and 12 gymnasts from international level. Table 1 describe the characteristics of the sample. Regional gymnasts were considered as those gymnast that have never attended to a Spanish national

championship. National gymnasts were considered as those gymnast that have attended to a Spanish national championship. International gymnasts were considered as those gymnast that have never attended to a continental or world championship. Ethical approval was obtained from the ethics committee. A signed informed consent was obtained from their parent/guardian and participants. Before fill-out the survey the gymnasts were informed that the realization of the survey was voluntary, the survey was anonymous, and the data collected will be confidential.

### *Variables*

The gymnasts were divided in three according to their competitive experience (regional, national, and international). The studied variables were divided in five in five groups, that correspond with the questionnaire used: athletes' characteristics (10 questions), nutrition knowledge (23 questions), nutrition habits (2 chart questions), weight control and its risk knowledge (12 questions), and weight control and its risk habits and perceptions (19 questions). A self-administered questionnaire was used to measure the knowledge nutrition, weight control, and weight control risk knowledge and dietary practice. The questionnaire had a total 66 questions.

### *Procedure*

The questionnaire was validated by experts (content validity), and the reliability was calculated with a test-retest in gymnast of similar characteristics (Visiedo, Frideres, & Palao, 2017). The lower value of the intra-class correlation coefficient of the questions of the questionnaire was 0.609. Data collection was carry-out in the pre-season. The presentation and explanation of the questionnaire was done by one of the researcher before or after practice. All data collection was done in time frame of two weeks. The questionnaire were transcript to a spreadsheet by one of the researcher. Quality of data was controlled by reviewing all the data collection.

### *Statistical analysis*

A descriptive (average, standard deviation, percentages) and inferential analyses of the results was done using SPSS software. The difference between the age groups were assessed using the t-test for evidence of relationship for categorical questions, and ANOVA test for independent variable for evidence of relationship for continuous questions. The level of significance was set at  $p < .05$ .

## RESULTS

Table 1 show the characteristics of the gymnasts of different levels of competition studied (regional, national, and international). As higher level, the gymnasts are significantly older, are taller, started at younger age, have more year of training, and have more hours training per week ( $p < .05$ ). Regarding the gymnasts' knowledge about nutrition and weight control (Figure 1), national and international gymnasts had significant higher nutrition knowledge than regional gymnasts. International gymnasts had a higher knowledge about weight control than regional gymnast.

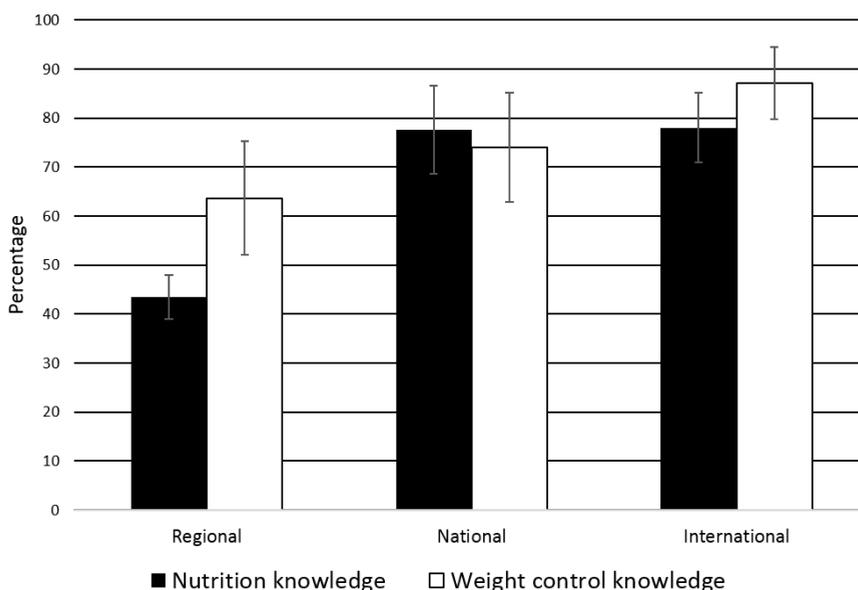


FIGURE 1: Nutrition knowledge of regional, national and international gymnastics level (values expressed in percentages).

Regarding the dietary habits (table 2), national gymnasts have a significant higher intake of fish and nuts than international gymnasts, and regional gymnasts had a significant higher intake of meat than national and international gymnasts. Comparing the gymnasts of different levels of competition with the recommendations of the literature, results show that more than 40% of the national and international gymnasts eat cookies and cakes every day, regional gymnasts eat more vegetables than international gymnasts, that do not eat vegetables daily (more than 80%). Regarding the averages meals per day, the result show that more than 60% of the regional gymnast do five meals per day, 83% of the national gymnast do five meals per day, and 8.3% of international gymnast.

Regarding the gymnasts' degree of satisfaction with their bodies (Table 3), international gymnasts have a significantly lower satisfaction than regional and national gymnasts ( $p < .05$ ). Although, their ideal weight differ in similar values percentage than for regional and national gymnasts. National gymnasts controlled significantly more their body weight daily or weekly than regional gymnasts ( $p < .05$ ). Regarding the impact of losing weight on their performance and health (Table 4), regional gymnasts indicated that the weight loss do not affect their performance or health, national gymnasts think that improves their performance and health or do not vary them, and international gymnasts thinks their performance and health is worse when they lose weight. Significant differences were found between international gymnasts with regional and national gymnasts ( $p < .05$ ). Regarding the impact of losing weight on their appearance, national and international gymnast think significantly more than regional gymnast that their appearance improves. Comparing gymnast knowledge with their perception about their knowledge, regional gymnasts perceive similar values in both. National and international gymnast have a perception that their knowledge was lower than they have. Between 70-90% of the gymnast reported they had received information about nutrition. Less than 15% of the gymnast reported they had received information about weight control and their risk of weight control. Forty percent of the international gymnast think that they are a problem in gymnastics with weight control, and 25% of national and international gymnast think that there is a problem in gymnastics with eating disorders. No studied wrestlers indicated that they have been clinically diagnosed with an eating disorder.

TABLE 1  
Gymnastics' characteristics (regional, national, and international level).

Variables	Regional (n=15)		National (n=12)		International (n=12)		Significant
	M	SD	M	SD	M	SD	
Age (yr)	12.8	2.13	13.7	2.12	16.39	1.20	Reg<Nat<Int
Height (m)	1.59	0.08	1.59	0.07	1.68	0.05	Reg & Nat<Int
Age start to wrestling (yr)	10.9	3.4	7.08	1.73	6.1	1.6	-
Age start to compete in wrestling (yr)	11.2	2.6	8.77	1.97	8.16	1.26	-
Years of experience (yr)	1.6	0.8	6.3	3.47	8.3	1.32	Reg<Nat<Int
Weight in pre-season (Kg)	46.5	9.7	45.5	8.8	53.2	5.01	-
Weight in competitive season (Kg)	45.5	8	46.7	7.02	53.08	5.07	-
Weight in off-season (Kg)	48	8.5	46.4	9.48	54.25	5.39	-
Weekly training hours (hr)	2.5	0.7	7.4	2.1	12.5	0.0	Reg<Nat<Int
Sessions training per week (session)	2.0	0.25	3.5	1.73	5.0	0.0	-

\* $p < .05$  (ANOVA Test)

TABLE 2  
 Dietary habits of the regional, national and international gymnastics level (values expressed in percentages).

	Regional (n=15)						National (n=12)						Intercontinental (n=12)						p
	+1 day	Daily	3-5 wk	1-2 wk	Month	Never	+1 day	Daily	3-5 wk	1-2 wk	Month	Never	+1 day	Daily	3-5 wk	1-2 wk	Month	Never	
Milk	53.3	13.3	0.0	13.3	0.0	20.0	66.7	16.7	8.3	0.0	0.0	8.3	50.0	41.7	0.0	0.0	8.3	0.0	
Yogurt	13.3	26.7	26.7	13.3	20.0	0.0	8.3	66.7	8.3	0.0	0.0	16.7	16.7	25.0	33.3	16.7	0.0	8.3	-
Cheese	20.0	26.7	13.3	26.7	6.7	6.7	0.0	45.5	9.1	9.1	27.3	9.1	25.0	25.0	16.7	0.0	8.3		-
Butter and/or margarine	0.0	28.5	21.4	21.4	28.6	0.0	0.0	8.3	25.0	25.0	8.3	33.3	0	8.3	25.0	16.7	16.7	33.3	-
Meat	20.0	33.3	33.3	0.0	13.3	0.0	8.3	0.0	66.7	8.3	0.0	16.7	16.7	16.7	25	53.3	0.0	8.3	-
Cold meat (sausage)	21.4	7.1	21.4	28.6	7.1	14.3	0.0	0.0	36.4	36.4	9.1	18.2	0.0	25.0	16.7	41.7	8.3	8.3	-
Hamburgers or hotdogs	0.0	6.7	20.0	40.0	13.3	20.0	0.0	0.0	9.1	45.5	36.4	9.1	0.0	0.0	16.7	16.7	50.0	16.7	-
Fish	6.7	0.0	46.7	6.7	26.7	13.3	0.0	0.0	66.7	16.7	8.3	8.3	0.0	0.0	16.7	50.0	16.7	16.7	Int<Reg
Eggs	0.0	13.3	20	66.7	0.0	0.0	8.3	0.0	50.0	25.0	8.3	8.3	0.0	0.0	41.7	50.0	8.3	0.0	-
Fruit	42.9	35.7	14.3	7.1	0.0	0.0	27.3	45.5	18.2	9.1	0.0	0.0	50.0	33.3	0.0	8.3	8.3	0.0	-
Vegetables	28.6	21.4	21.4	7.1	7.1	14.3	18.2	36.4	9.1	27.3	0.0	9.1	8.3	8.3	33.3	33.3	16.7	0.0	-
Legumes	13.3	6.7	20.0	53.3	0.0	6.7	0.0	0.0	58.3	33.3	0.0	8.3	0.0	9.1	36.4	54.5	0.0	0.0	-
Grains	20.0	26.7	26.7	13.3	6.7	6.7	9.1	36.4	18.2	36.4	0.0	0.0	16.7	25.0	41.7	16.7	0.0	0.0	-
Bread	57.1	21.4	7.1	7.1	7.1	0.0	18.2	63.6	18.2	0.0	0.0	0.0	41.7	58.3	0.0	0.0	0.0	0.0	-
Cookies, cakes, pastries...	6.7	26.7	33.3	26.7	6.7	0.0	8.3	33.3	33.3	8.3	16.7	0.0	8.3	50.0	0.0	16.7	16.7	8.3	-
Precooked (fast food)	0.0	6.7	20.0	13.3	26.7	33.3	0.0	18.2	18.2	18.2	18.2	27.3	0.0	0.0	16.7	25.0	41.7	16.7	-
Nuts	6.7	13.3	13.3	33.3	20	13.3	0.0	16.7	8.3	16.3	33.3	25	0.0	0.0	0.0	16.7	58.3	25.0	Int<Reg
Bagged snacks, chips....	0.0	7.1	35.7	21.4	14.3	21.4	8.3	0.0	8.3	33.3	41.7	8.3	0.0	0.0	9.1	9.1	72.7	9.1	-
Candy	0.0	6.7	26.7	6.7	40.0	20.0	8.3	0.0	16.7	33.3	25.0	16.7	0.0	0.0	0.0	0.0	41.7	33.3	

\* No significant difference were found in the dietary habits between the different age groups (T-students).

Legend: +1 day - Several time per day; Daily - Once per day; 3-5 wk - 3-5 times per week; 1-2 wk - 1-2 times per week; Month - Several times per month; Never - Rarely or never.

TABLE 3  
Weight control practice and aspect related in regional, national and international gymnastics level.

	Regional (n=15)		National (n=12)		International (n=12)		Significant
	M	SD	M	SD	M	SD	
Degree of satisfaction with your body (scale 0-10)	7.85	2.34	8.08	1.08	6.41	2.57	-
Degree of satisfaction with your weight (scale 0-10)	7.92	2.46	8	1.41	6	2.41	Int<Reg
Ideal weight (kg)	44.55	5.8	45.41	5.69	51.66	5.86	Nat<Int
Self-perception about nutrition knowledge (scale 0-10)	5.93	2.6	6.83	1.94	5.5	1.24	Reg<Nat
Self-perception about weight control knowledge (scale 0-10)	5.92	2.4	7.09	1.92	5.72	1.34	-
Self-perception risk weight control knowledge (scale 0-10)	4.14	3.8	6.4	3.68	6.54	2.25	Nat<Reg

\* $p<.05$ ; \*\* $p<.01$  (ANOVA Test).

TABLE 4  
Weight control habits and risk of eating disorders in regional, national and international gymnastics level (values expressed in percentages).

Questions	Regional (n=15)	National (n=12)	International (n=12)	Significant
When you lose weight, your performance...				
Worsens	0.0	8.3	50.0	Int<Reg
Does not vary	73.3	41.7	33.3	-
Improves	26.7	50.0	16.7	-
When you lose weight, your health...				
Worsens	0.0	8.3	50.0	Nat<Int<Reg
Does not vary	66.7	33.3	41.7	-
Improves	33.3	58.3	8.3	-
When you lose weight, your appearance...				
Worsens	15.3	0.0	16.7	Int<Reg
Does not vary	53.3	33.3	8.3	-
Improves	33.3	66.7	75.0	Reg & Nat < Int
Regularly control you weight (daily or weekly)	26.6	58.3	33.3	Nat>Reg
Averages meals per day (%)				
3 meals or less	20	0.0	66.6	Int<Reg
Four meals	20	16.6	25	Int<Reg
Five meal or more	60	83.3	8.3	Int<Reg
Clinically diagnosed with an eating disorder	0.0	0.0	0.0	-
Problem related to weight control in gymnastic	6.6	16.6	41.6	-
Problem related to eating disorder in gymnastic	13.3	25.0	25	-
Received information about nutrition and diet	73.3	91.6	83.3	-
Received information about weight control	13.3	0.0	0.0	-
Received information about risks of weight control	0.0	0.0	0.0	-

\* $p<.05$  (T-students or ANOVA Test)

## DISCUSSION

The nutrition knowledge of the gymnasts is higher at national and international level than regional level. These results are may be related to the years of experience training gymnast. Regional gymnasts have on average less two years of experience and national and international gymnasts more than six year of experience. The increase of knowledge must be related to the nutrition information received and seek of information of the gymnast. Gymnasts of all level have the perception that their knowledge about nutrition is low. The perception that they have enough information to solve the problem of being thin and training can be behind the increase of the knowledge found at higher level. National and international gymnast present a high score in the questionnaire (over 75%). These results are similar to the one found in the literature, that show that elite athlete of different age groups have good knowledge about nutrition (D'alessandro et al., 2007). Despite their higher knowledge, result show that national and international risk have a higher risk to present inadequate nutrition (D'alessandro et al., 2007; Deutz et al., 2000; Gomez-Campos et al., 2013; Michopoulou et al., 2011; Nova et al., 2001). At higher level, the hours of training significantly increase, but there is a reduction of the number of meal per day. This could indicate that the gymnasts skip meal as way to control their weight. Also, it was found that international does not eat a lot meat, and vegetables. However, international gymnasts organize their diet in such a way they eat cookies and cakes every day. These results agree with the findings in the review. These population use their nutrition knowledge to control their weight and try to balance an insufficient intake (D'alessandro et al., 2007; Deutz et al., 2000; Gomez-Campos et al., 2013; Michopoulou et al., 2011; Nova et al., 2001).

The international gymnast had an elevated level of knowledge regarding weight control, and national gymnast has adequate levels. However, gymnasts of the three levels perceived that their knowledge about this aspect was low and they reported that they have not received information about this topic. Besides, four out ten international gymnasts show concern about the existence of problem about weight control in gymnastics. The results show the need of educational training about weight control and their risk.

At higher level, the perception of satisfaction with their body and weight is lower by the gymnast, International gymnast have lower perception, although, at percentage level, the differences between their weight and ideal weight are similar. These differences between level could be related to the reference that gymnast of each group have or tried to achieve. These findings show the stress of the gymnasts to achieve a specific physical stereotype is similar to previous studies (Douda, Laparidis & Tokmakidis, 2002; Marina & Rodriguez, 2014; Miletic, Katic & Males, 2004; Souza-Menzes, Novaes, & Fernandes-Filho, 2014).

The combination of stress, seek for perfection, reference model, etc. make the gymnasts of higher level be less satisfy and have the perception that they do not know enough to manage this situation properly. This hypothesis can be supported by the result about the gymnast perception of the impact of weight loss on the performance, health, and appearance. Regional gymnast think that weight loss does not change their performance, health or appearance. National gymnasts tend to think that a weight loss improves or does not varies their performance, health or appearance. However, international gymnast think that a weight loss makes worsen or do not vary their performance or health, but increase their appearance, due they will be closer to the ideal body stereotype of their sport (Douda, Laparidis & Tokmakidis, 2002; Marina & Rodriguez, 2014; Miletic, Katic & Males, 2004; Souza-Menzes, Novaes, & Fernandes-Filho, 2014).

Although any gymnasts reported clinical diagnosed with eating disorder, the results show the need to monitor these population due to the realization of some inadequate nutrient habits and their high-intensity training in age of development. It must be considered that to develop properly our body needs a minimal amount of caloric intake and fat in our body is required (Plowman, & Smith, 2013). Previous studies have reported that gymnasts were smaller than the adolescent non-gymnast (Boros, 2009; Cupisti et al., 2000; Karabudak et al., 2016). Another aspect to consider is that during the adolescent is the moment when the habit is acquire, and the reference criteria are set (Franchini et al., 2012). For that, educational interventions are required to provide objective evidence of the risk of the realization of unhealthy behaviours. The approach of this educational training with national and international population must have in consideration that they have an elevated level of knowledge, inadequate habits, and low perception about their knowledge to solve the situation that the sport creates them. These athletes may require the realization of specific, applicable intervention when the data of the behaviour information of each gymnast and specific reference model are used to provide objective evidence that can contribute their formation and help them to deal with these issues.

#### CONCLUSIONS

As higher level of the gymnast, higher is the knowledge about nutrition and weight control. However, the results seem to show how elite gymnast use this knowledge to control their weight and adjust it to the stereotype of the sport. National and international skip meals and have a significantly reduce intake of fruit, vegetables, and meat. The perception about their nutrition knowledge and knowledge about weight control and their risk is low. These results could indicate in national and international gymnasts that they perceive not having enough information and skills to manage the situations this sport create for them. Regional and national gymnast did not have a proper perception of the

risk of weight control on their bodies. It is recommended to monitoring the gymnast perception about these topics and provide educational training about nutrition and weight control, having in consideration that the knowledge of the gymnasts about these topic is high.

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