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EFFECT OF EDUCATIONAL TRAINING ON NUTRITION AND WEIGHT CONTROL KNOWLEDGE AND HABITS IN FEMALE COLLEGE VOLLEYBALL PLAYERS: A CASE STUDY

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ABSTRACT

The aim was to study the effect of a formative program about nutrition, weight control, and its risks in female college volleyball players. The sample was 13 female college volleyball players of a community college team. A case study quasi-experimental design with a pre-test and post-test was used. The dependent variable was the knowledge and habits related to nutrition, weight control, and its risks. The independent variable was the educational program (five 30-minute sessions which combined talks, videos, and tasks to be completed). The educational program was effective with regard to changing dietary habits and perceived knowledge, but not for increasing players' knowledge about nutrition and weight control. The paper discusses the effect of the intervention program, and the risks involved in being a student-athlete and playing volleyball.

Keywords: team sports, performance, health, prevention, knowledge, habits

INTRODUCTION

In team sports, such as volleyball, as the level of the team increases, the speed of the game is more pronounced (Garcia-Alcaraz, Valades, & Palao, 2017). Therefore, players practice and prepare to move and execute fast, powerful actions (Baker, 1996; Marques et al, 2008). As part of this process, athletes try to achieve a balance between their weight and their ability to apply force and power. In volleyball, the jump ability is critical to elevate part of the body over the net to spike or block (Vint & Hinrich, 2008). Therefore, athletes monitor their weight with the goal of preventing reduced performance and avoiding an increased risk of overload injuries (Jaric, & Markovic, 2013). In this process, athletes' nutrition and weight control behaviors play a significant role. However, this continual weight management, and the perception in sports that without pain there is no gain, means that volleyball players can be at risk to have problems related to weight control. This risk can be increased by the pressure that female players perceive in relation to the type of clothing typically used in volleyball (Steinfeldt et al., 2013). In this regard, education is considered the best way to provide tools and skills to the athletes to overcome or deal with these situations of risk. Different studies have shown that one of the moments in which this risk is highest is when athletes go to the university (Sepulveda, Carrobles, & Gandarillas, 2008). The reasons behind the increased risk are related to leaving the known environment, the stress of being student-athletes, being responsible for their diet for the first time, etc. (Berry, & Howe, 2000).

Previous studies have shown that college volleyball players have low nutrition knowledge, which is related to inadequate dietary habits (Danh et al., 2021; Holden et al., 2019; Torres-McGehee et al, 2012; Valliant, Emplaincourt, Wenzel, & Garner, 2012; Abreu de Almeida & Soares, 2003; Mielgo-Ayuso et al, 2015; Papadopoulou et al, 2010). Their knowledge and their dietary habits can be improved through educational training and individualized intervention programs supervised by a dietitian (Valliant et al, 2013). These problems with nutrition knowledge and dietary habits along with the perceived pressure that volleyball players have regarding their weight can result in unhealthy behaviors. Seven out of 10 professional volleyball players monitor their weight periodically and nine out of 10 players believe that there is a specific weight that they must maintain to play volleyball (Frideres & Palao, 2005). Among a sample of women's Division I college volleyball players, these dietary deficits did not provide the players with a sufficient caloric intake, which lead to menstrual dysfunction (Valliant et al, 2012). As a reference, the incidence of amenorrhea in elite adolescent volleyball players is around 17% (Beals et al, 2002). The combination of this inadequate knowledge, eating behaviors, and weight control behavior could result in suffering from an eating disorder.

Available information has shown that educational interventions are effective with regard to increasing college athletes' knowledge and self-efficacy (Abood et al, 2004; Tam et al., 2019) as well as improving the quality of the athletes' intakes (Valliant et al, 2013, Zawila et al, 2003; Wenzel et al., 2012). However, all teams and programs do not have the same resources, which affects their ability to provide educational training and resources to their athletes. The available resources, possibilities, etc. influence the environment that the different athletics programs create for their student-athletes. For student-athletes, the first years in college involve the need to adapt to new educational requirements, new training and competitive demands, a new lifestyle, etc. Experiences and training that provide information, tools, and

skills to the student-athletes can be helpful in their adaptation process to university life. The purpose of this study was to assess the effect of a formative program about nutrition, weight control, and its risks among female community college volleyball players.

METHOD

The sample was composed of 13 players from a women's team at a Midwestern community college (2-year program). The characteristics of the sample were: 18.83 ± 0.83 years of age, 1.71 ± 0.11 meters of height, and 67.13 ± 1.41 kilograms of weight. No volleyball players on the team had been clinically diagnosed with an eating disorder. The study was pre-approved by a university ethics committee. Participation in the study was voluntary, and all participants were informed about the study. All participants signed an informed consent before the study began.

A quasi-experimental study utilizing a pre-test and a post-test was designed. The independent variable was the educational intervention, and the dependent variable was the athlete's knowledge of nutrition, weight control, and its risks. An ad-hoc questionnaire was utilized to measure the athletes' knowledge. The players' perceptions were registered using questionnaires as well as in the tasks and discussions of the intervention. The program consisted of five 30-minute sessions, combining talks, videos, and tasks to be completed. The pre-test was completed during the pre-season, while the post-test was completed at the end of the regular season.

Manuals about the topic were utilized to design the questionnaire and the training (Juzwiak & Ancona-López, 2004; Zawila, Steib & Hoogenboom, 2003). The questionnaire was an assessment of the basic knowledge of nutrition, weight control, and its risks. It consisted of 35 true-false questions (23 questions about nutrition knowledge and 12 questions about weight control and its risks). Experts validated the questionnaire and the training (content validity). Visiedo, Frideres, and Palao (2017) designed and validated the questionnaire, and they calculated its reliability.

The goal of the intervention program was to provide knowledge of nutrition, weight control, and its risks. The sessions were integrated into the team's regular pre-season training schedule. Each session consisted of two 15-minute blocks, the first of which was theoretical and the second of which was practical (tasks to be completed). The distribution of the sessions' contents is demonstrated in table 1. One of the researchers, a former volleyball coach, directed the sessions. Following each session, a survey of five closed questions was administered to the players to assess their acquisition of the knowledge as well as their opinion of the session. The questionnaire measuring knowledge was first completed before the intervention program, and the post-test took place at the end of the season.

Descriptive (average, standard deviation, percentages) and inferential analyses of the results were completed using SPSS software. Differences between the pre-test and post-test were assessed with the t-test for categorical questions and the ANOVA test for independent variables for continuous questions. Significance was set at $p<.05$. The magnitude of the effect size was calculate using the mean and standard deviation to calculate the Cohen's d. The following classification to measure the magnitude of ES was used (Ferguson, 2009): no effect ($d < 0.41$), minimum effect ($0.41 \leq d < 1.15$), moderate effect ($1.15 \leq d < 2.70$) and strong effect ($d \geq 2.70$).

Table 1. Content distribution in the educational intervention sessions.

Session	Time	Topic	Content	Task
1	30 min	Basic nutrition knowledge	Diet management, nutrition substrates, and hydration	Classification of food and organization of food plate
2-3	30 min	Weight control and eating habits	Diet planning and moments of the season	Diet evaluation and adaptations
4-5	30 min	Weight control risk	Poor diet, negative effect of weight control, myths	Problem solving (risky situations and solutions)

RESULTS

The educational training did not change these volleyball players' knowledge about nutrition or about weight control (Table 2). The players had less nutrition knowledge than weight control knowledge both before as well as after the intervention (scores of 64-66% vs. 75-73%, respectively).

After the intervention program, there were changes in the players' dietary habits (Table 3). Players increased their milk intake, increased their use of margarine and butter, reduced their egg intake, increased their meat intake, increased their legume intake, increased their vegetable intake, and increased their snack intake. However, none of these changes were significant. The intervention program significantly improved players' satisfaction with their weight and their nutrition and weight control knowledge (Table 4). These improvements had a large effect size for the perceived nutrition knowledge and weight control, and medium effect size for the degree of satisfaction with their weight. After the intervention, players reduced their ideal weight by more than two kilograms and they reduced how regularly they monitored their weight, although these were not significant changes. After the intervention, the proportion of players that ate five meals per day as well as those that ate three or fewer meals per day increased (Table 5).

Table 2. Players' knowledge of nutrition and weight control before and after the educational training.

	Pre-test				Post-test			
	Score		Percentage		Score		Percentage	
	M	SD	M	SD	M	SD	M	SD
Nutrition knowledge (scale 0 to 23)	15.35	2.35	64.01	9.71	15.90	2.07	66.28	8.63
Weight control knowledge (scale 0 to 18)	13.54	1.50	75.25	8.37	13.27	0.90	73.73	5.02

Legend: * $p<.05$.

Sixty-four percent of the athletes reported that they have tried to reduce their weight to compete. No changes were reported in the methods that athletes used to control their weight: 87.5% control their weight by eating less, 50% do so by reducing carbohydrates, 50% by reducing fat intake, 22.5% by skipping meals, and 75% by increasing exercise. No player reported the use of vomiting, laxatives, or diuretics to lose weight. Most of the players do not think that there is a problem of eating disorders in volleyball. However, two players expressed their concerns about this issue: "In our sport we wear spandex and tight jerseys, and with that, girls believe that they need to be really skinny and will do anything they need to lose weight" [Player #10]. During the intervention, at least half of the players reported that when they lose weight, their performance, health, and appearance improve. At the end of the intervention, and when the players filled out the post-test questionnaire, two players reported that although they had increased their knowledge, they still had problems adapting to life as a student-athlete and losing weight without losing muscle.

Table 3. Dietary habits before and after the educational training (values expressed in percentages).

	Pre-test						**Post-test**						
	+1 day	Daily	3-5 per wk	1-2 per wk	Month	Never	+1 day	Daily	3-5 per wk	1-2 per wk	Month	Never	Sig.
Milk	0.0	18.2	9.1	9.1	18.2	45.5	25	37.5	12.5	6.3	6.3	12.5	n.s.
Yogurt	36.4	27.3	27.3	9.1	0.0	0.0	6.3	18.8	12.5	18.8	6.3	37.5	n.s.
Cheese	27.3	36.4	18.2	9.1	0.0	9.1	18.8	25.0	43.8	12.5	0.0	0.0	n.s.
Butter / Margarine	0.0	0.0	100	0.0	0.0	0.0	6.3	31.3	31.3	18.8	6.3	6.3	n.s.
Meat	18.2	0.0	36.4	36.4	0.0	9.1	50.0	25.0	18.8	0.0	0.0	6.3	n.s.
Cold meat (sausage)	0.0	0.0	9.1	36.4	27.3	18.2	6.7	0.0	26.7	20.0	26.7	20	n.s.
Hamburgers or hotdogs	0.0	0.0	9.1	18.2	9.1	63.6	0.0	6.3	31.3	37.5	12.5	12.5	n.s.
Fish	0.0	36.4	0.0	18.2	18.2	27.3	0.0	0.0	25	18.8	25.0	31.3	n.s.
Eggs	54.5	36.4	0.0	9.1	0.0	0.0	0.0	6.3	37.5	25.0	12.5	0.0	n.s.
Fruit	36.4	9.1	45.5	9.1	0.0	0.0	50.0	31.3	6.3	12.5	0.0	0.0	n.s.
Vegetables	0.0	0.0	0.0	9.1	9.1	81.8	43.8	37.5	12.5	12.5	6.3	0.0	n.s.
Legumes	18.2	27.3	27.3	27.3	0.0	0.0	25.0	62.5	0.0	6.3	0.0	6.3	n.s.
Grains	63.5	0.0	27.3	0.0	0.0	9.1	0.0	25	37.5	25.0	18.8	12.5	n.s.
Bread	27.3	0.0	18.2	36.4	9.1	9.1	6.3	12.5	25	31.3	12.5	12.5	n.s.
Cookies, cakes, pastries…	0.0	9.1	18.2	18.2	27.3	27.3	0.0	6.3	37.5	25	18.8	12.5	n.s.
Precooked (fast food)	0.0	0.0	36.4	18.2	9.1	36.4	6.3	12.5	25	31	12.5	12.5	n.s.
Nuts	0.0	9.1	9.1	27.3	18.2	36.4	0.0	18.8	12.5	6.3	31.3	31.3	n.s.
Bagged snacks, chips….	9.1	27.3	18.3	9.1	9.1	27.3	0.0	43.8	6.3	12.5	12.5	25.0	n.s.
Candy	0.0	0.0	10.0	0.0	0.0	90	0.0	9.1	18.2	0.0	9.1	63.6	n.s.

Legend: Sig. = Significance; n.s. = Not significant.

Table 4. Degree of satisfaction with themselves and knowledge perception before and after the educational intervention.

	Pre-test		Post-test			Effect
	M	SD	M	SD	Sig.	size
Degree of satisfaction with your body (scale 0-10)	5.4	2.6	6.8	1.8	n.s.	0.53
Degree of satisfaction with your weight (scale 0-10)	4.9	2.4	6.5	2.0	.025	0.75
Ideal weight (kg)	64.9	10.9	62.1	10.5	n.s.	0.25
Perceived nutrition knowledge (scale 0-10)	4.2	2.4	7.3	1.5	.006	1.61
Perceived knowledge of weight control (scale 0-10)	4.3	2.9	7.4	1.9	.019	1.32
Perceived knowledge of risks of weight control (scale 0-10)	6.7	3.1	8.1	1.5	n.s.	0.45

Legend: Sig. = Significance; n.s. = Not significant.

Table 5. Weight control habits and risk of eating disorders in volleyball players (values expressed in percentages).

Variables	Pre-test	Post-test	Significance
Regularly control one's weight (daily or weekly)	33.3	23.1	n.s.
Average meals per day (%)			
3 meals or fewer	45.4	61.5	n.s.
Four meals	36.3	0.0	n.s.
Five meals or more	18.2	38.4	n.s.
Clinically diagnosed with an eating disorder	0.0	0.0	n.s.

Legend: n.s. = Not significant.

DISCUSSION

The purpose of this study was to assess the effect of a short-term educational intervention and provide athletes with resources about nutrition and weight control during their sport season. At the end of the season, and after the intervention, the players did not increase their knowledge about nutrition and weight control. However, players increased their perceived knowledge of nutrition and weight control, and they improved several aspects of their intake, such as reducing their egg intake, increasing their meat intake, increasing their vegetable and legume intake, increasing their nut intake, and increasing their snack intake. Additionally, the team went from more than 90% of players eating one or more eggs daily to less than 10% of players eating eggs daily. The protein intake changed through an increase in meat and nuts.

The results show that although the intervention did not increase players' knowledge, these players did modify their eating patterns. These results are similar to those found in previous studies. However, in previous studies, a follow-up of the diet was done by a dietician. In our study, we tested whether an educational intervention that provides educational resources could be used by volleyball teams that do not have the resources to have the support of a dietician. Not all the results were positive, as some players reported that the information did not help them to handle the stress involved in being a student-athlete regarding following a proper diet or how to eat and exercise to control their weight without reducing muscle mass. Also, players made some inadequate choices, such as, for example, increasing their use of butter and margarine.

From a general perspective, players' knowledge was lower than that of other athlete populations, such as gymnasts and combat sport athletes (Danh et al., 2021; Karabudak et al, 2016; Ubeda et al, 2010). This difference could be related to the greater importance placed on weight control in these sports due to either the aesthetic evaluation of these sports or the fact that these athletes compete in weight categories. This aspect, combined with the volleyball players' low perceived knowledge, the stress that they report in relation to being a student-athlete, and their sport's characteristics, result in a recommendation of formal and informal educational training for volleyball players when they start to play at the college level. If possible, this training must be supervised and individualized by specialists.

The intervention program about weight control affected these athletes' perceptions and references. In this regard, players reduced their ideal weight and reduced the frequency with which they monitored their weight. During the intervention, myths were detected among at least half of the players. In one of the tasks, they reported that their performance, health, and appearance improved when they lost weight. During the discussions, players mixed recommendations about obesity, eating disorders, sport traditions, and images and stereotypes provided by the media, etc. These misleading ideas show the need to provide information and evidence adapted to the requirements of being a student-athlete and the sport they practice. Six out of 10 players reported that they had tried to control their weight to compete. Although no unhealthy methods were reported, the combination of practicing a sport, reducing their meals, being away from home for the first time, possibly being responsible for shopping for and preparing meals, adapting to their first years of college, etc. can increase the risk that this population has for suffering disordered eating and eating disorders. Volleyball is not considered a risky sport; however, as one of the players reported, the fact that they are wearing spandex and tight jerseys make some players want to reduce their weight at any cost. Several authors previously reported that volleyball players have similar risks to athletes of other sports, such as swimming (Steinfeldt et al., 2013). However, it is not clear whether higher risks involve a higher incidence of eating disorders. Nonetheless, prevention though educational training can be useful to provide evidence and skills to athletes, which can help them manage the risks and stresses involved in being a student-athlete and playing volleyball at the community college level.

CONCLUSIONS

The intervention program improved the volleyball players' habits and perceptions, although it did not increase their knowledge of nutrition or weight control and its risks. The results show that providing educational training and resources about this topic can help female volleyball players of community college programs to improve dietary habits. Several players indicated that they try to reduce their weight to play volleyball and they reported misleading ideas about the effect of weight control and its risks. Although volleyball is not considered a sport in which its players are at risk for developing problems related to weight control and disordered eating, it must be considered that the combination of being a college student-athlete and playing with tight clothing can increase the risk that this population has with regard to problems related to their health. The use of formal and informal training can help reduce this risk.

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