RELATIONSHIP BETWEEN NUTRITIONAL KNOWLEDGE, BODY COMPOSITION, DIETARY INTAKE, AND POWER IN FEMALE ATHELTES

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INTRODUCTION: A balance between dietary intake and physical activity level is essential to maintaining lean mass, immune, and reproductive function in female athletes. An optimal macronutrient distribution is required to support training adaptation, while inadequate energy intake negatively affects body composition and health. Moverover, eating disorders in female athletes have been associated with musculoskeletal injury (Rauh, Nichols, & Barrack, 2010). Female athletes engaged in resitance traning may require as high as 39 to 44 kcal/kg body weight to maintain lean body mass (Volek, Forsyth, & Kraemer, 2006).

Alaunyte, Perry, and Aubrey (2015) verified the relationship between nutritional knowledge and dietary habits in 21 professional rugby league players and concluded that athletes who scored higher in nutritional knowledge test were more likely to consume more fruits, vegetables and carbohydrate-rich foods than athletes who scored lower. In contrast, Folasire, Akomolafe, and Sanusi (2015) determined that good nutrition knowledge or practice did not directly determine handgrip strength in undergraduate athletes.

Despite well accepted knowledge that nutritional status is important to supporting body composition and performance, the relationship between nutritional knowledge, body composition, energy intake and macronutrient distribution, and power in female athletes is unkown. Thus, the objective of this study was to investigate the relantionship between nutritional knowledge, body composition, dietary intake, and power in female athletes.

METHODS: Twenty eight female Division I NCAA athletes were recruited from Coastal Carolina University during the off-season: basketball (n=17, age= 19.8±1.3 years) and softball players (n= 11, age= 19.9±1.5 years). All subjects read and signed informed consent documents approved by the University Institutional Review Board.

Nutritional knowledge was assessed via the Reilly and Maughan Sports Nutrition Questionnaire. The questionnaire was divided into seven testable sections including: hydration, weight control, dietary supplements, general nutrition, sports nutrition, protein, and strategies for training and food choices. A score of 1 was given for each correct answer and a score of 0 for each incorrect or “unsure” response allowing for a total possible score of 55.

Dietary Intake was measured via three-day food diaries that consisted of two weekdays and one weekend day. Total energy intake, protein, carbohydrates, and fats were analyzed using Diet Analysis Plus Version 10.

Body composition was determined by air displacement plethysmography (BodPod, Cosmed, USA). Total fat mass (FM), fat-free mass (FFM), in kilograms and percentage of fat mass (%FM), percentage of fat-free mass and body mass were used. During the test all participants wore compression shorts, swim cap, and did not exercise or consume food/drinks within two hours prior. All testing was performed with each subject at approximately the same time of day.

Jump height was determined by performance of a countermovement jump (CMJ) as assessed by Just Jump! Mat (Probotics Inc.: Huntsville, AL). Prior to testing, subjects engaged in a brief general warm-up consisting of several minutes of light cardiovascular exercise and then performed 6 submaximal jumps to heighten neural responses. Testing was carried out as follows: Vertical jumps were measured in inches on the Just Jump! mat. Subjects were instructed to perform a rapid lower body eccentric contraction followed immediately by a maximal intensity concentric contraction. The best of the three trials was recorded as vertical jump height.

Pearson correlations were used to analyze the relationships between nutritional knowledge, body composition, energy, carbohydrate, protein, and fat intake, and performance. Statistical significance was set at $p \leq 0.05$ and the data were analyzed using the Statistical Package for Social Sciences 17.0 (*SPSS* Inc. Chicago. IL.USA).

RESULTS: The mean of correct answers was 26.1±6.9 points. There were no significant ($p >$ .05) correlations between variables when analyzed by group or between sports (Table 1).

Table 1: Relationship between nutritional knowledge and body composition, dietary intakes, and performance in female athletes.

Variables	**Mean (n=28)**	**Overall (n=28)**	**Basketball (n=17)**	**Softball (n=11)**
	Nutritional knowledge points (*r*)			
Body mass (kg)	69.3±7.3	0.29	0.32	0.26
Fat mass (kg)	15.5±5.0	0.04	0.16	-0.07
Fat mass (%)	22.3±5.4	-0.25	0.06	-0.15
Fat free mass (kg)	53.5±5.4	0.25	0.27	0.27
Fat free mass (%)	77.7±5.4	0.25	-0.62	0.15
Energy intake (Kcal/kg)	32±12.3	-0.19	-0.11	-0.55
Protein (g/kg)	1.4±0.5	-0.09	0.04	-0.38
Carbohydrate (g/kg)	3.7±1.9	-0.19	-0.13	-0.44
Fats (g/kg)	1.2±0.5	-0.11	-0.07	-0.21
Jump height (cm)	20.5±3.1	-0.37	-0.30	-0.60

DISCUSSION: The main finding of the present study was that nutritional knowledge was not associated with body composition, dietary intakes, or power in offseason female basketball or softball players. Similar to our results, Valliant et al. (2012) reported a mean nutritional knowlege score of 2.47 in female volleyball players, and Folasire et al. (2015) reported no significant correlations between nutritional knowledge, good nutrition practices, and handgrip strength in male and female undergraduate athletes.

Subjects in this study were consuming inadequate energy and carbohydrate, comparated to the required 39-44 kcal/kg and 5-6 g/kg, respectively. Low energy availability due to dietary restriction and excessive exercise, rather than disordered eating alone, leads to menstrual dysfunction and low bone mass (Nattiv et al., 2007), and increases the risk of musculoskeletal injuries (Rauh et al., 2010). Suprisingly there was no relationship between sport nutrition knowledge and energy or any macronutrient intake. This may be the result of campus food availability, busy academic/athletic schedules, or lack of desire to eat optimally.

Given the low nutritional knowledge and inadequate nutritional status found in this and other studies, improving nutritional status via an education program may enhance body composition and performance. Valliant et al. (2012) reported improved nutritional status following an education intervention in female volleyball players, and we recently demonstrated improvements in off season body composition following an educational intervention (Cholewa et al., 2015). Future research should therefore investigate the longitudinal effect of nutritional knowledge on body composition, dietary intakes, and performance in a more diverse cohort of NCAA female athletes.

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