



EFFECT OF DIETARY NUTRITION INTERVENTION ON THE PHYSICAL STAMINA OF FEMALE WRESTLING ATHLETES

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ABSTRACT

As the material basis for athletes to satisfy their nutritional needs and gain exercise capacity, diet nutrition can improve the metabolism process of the body and regulate organ functions. In addition, dietary nutrition is contributive to the recovery of physical stamina after exercise and the prevention of certain injuries. Therefore, only when dietary nutrition is taken seriously can the athletes bring better performance. In recent years, more and more scholars have paid close attention to the effects of dietary nutrition on physical stamina of athletes. In this study, we performed an eight-day investigation on the dietary nutrition status of 30 female wrestling athletes from a physical education school, which contributed to the monitoring on the daily dietary nutrition of the female wrestling athletes who took training every day. Thus we put forward targeted guidelines and effective suggestions on the unscientific diet habits of the athletes. Through the investigation, this study provided some basic data and suggestions on the problems regarding dietary nutrition and the influence of dietary nutrition on the physical stamina of athletes of different regions and different competition events.

1. Introduction

Through ingestion, digestion and absorption of nutrients from food, the body can function normally in vital movements such as growing development and metabolism (Jensen et al., 2013; Lima et al., 2012). The requisite nutrients for wrestling athletes can be supplemented by means of dietary nutrition intervention so that the wrestling athletes can achieve better performance and their somatic functions can recover more quickly after exercise. As the main source of athletes' nutrition supply, diet has been one of the main research issues in recent years.

For instance, Ho et al. (2013) suggested that wrestling athletes needed to consider the influence of their weight-loss modes on their physical fitness; during the weight control phase, their dietary arrangement and nutritional supplements should accord with scientificity

and pertinence; for the tournaments, nutritional supplement of the wrestling athletes should be controlled according to their actual body weights; special nourishments were supposed to be supplemented according to the athletes' physical conditions and the specific problems emerging in the weight control phase. Based on the investigation on the diet structure, energy balance, body weights and body composition of teenager wrestling athletes and judokas as well as their ideal body weights and body fat percentages, Sled et al. (Sled et al. formulated an intervention recipe to improve the athletes' body composition. Eckner et al. (2011) stated that there was a gap between the physical function state of Chinese female wrestling athletes in the training period and that in pre-training period, which indicated that they needed to adjust their nutrition intake and resting schedules; they also found that

intervention with tea polysaccharide could promote the synthesis of red blood cells and hemoglobin during pre-match training period, protect skeletal muscle, cardiac muscle and liver from damage, improve the body's metabolic state and the rheological property of blood, and accelerate the recovery of body function. In this paper, we analyzed the influence of intervention of some dietary nutrients on the physical stamina of female wrestling athletes.

2. Subjects and methods

2.1. Subjects

In the study, we selected 30 female wrestling athletes (aged between 18 and 24 years old) from a school of competitive physical education. They were healthy without any medical history of acute or chronic diseases, including 15 top athletes, 8 first grade athletes and 7 second grade athletes; their average age was 21.24 ± 2.4 years old; their average training duration was 5.12 ± 1.29 years; their average height and weight were respectively (163.29 ± 5.03) cm and (58.23 ± 7.16) kg. They participated in the survey between March 21 and 28 in 2016.

2.2. Experimental instruments

The experimental instruments include an electronic balance, a weight scale, an energy monitor and a body composition analyzer.

2.2.1. Inquiry method

In a one-to-one manner, the athletes were inquired about their dietary structure and habits of the latest year. In addition, they needed to tell whether they took dietary supplements; if any, they would be inquired about the types and the dosage (Kitano *et al.*, 2010; Pereira *et al.*, 2014). By issuing dietary questionnaires, health conditions of the athletes were learned, including their dietary habits, food preference, whether they and their families had chronic diseases such as hypertension and hyperlipidemia.

2.2.2. Weighing and recording method

The investigators weighed and recorded the raw weight (before cooking) and cooked weight (before eating) of each meal of the wrestling athletes every day; moreover, they weighed the leftovers respectively. The common recording method of the weights is to record the dietary weights for three to four days, which is the most accurate and reliable method. However, it costs a lot of manpower and time, so it is not suitable for large-scale surveys.

2.2.3. Chemical analysis method

Chemical analysis method is applied by analyzing the subjects' daily food intake in a laboratory. It takes multiple procedures and the accuracy of measurement has to be guaranteed. In general, chemical analysis method is user-friendly without costing much manpower. It is suitable for long-term researches on diets; however, it is not as accurate as the weighing and recording method, which makes it unsuitable for in-depth studies on nutritional problems (Sun *et al.*, 2011; Lee *et al.*, 2015).

In summary, inquiry method is the most convenient and adaptable method for individuals; it is featured by high accuracy, while there might be great errors. Weighing method is accurate and suitable for the collective units, individuals and families with special requirements or for demanding researches. However, as it consumes a lot of time and efforts, it is unsuitable in the cases with large investigation scope and scale. Chemical analysis is a good choice when it is necessary to perform accurate measurement; however, it is disadvantageous in complex procedures and high cost.

2.2.4 Statistical analysis

Statistical software SPSS 17.0 was used for calculational analysis of the data. All the data were expressed as mean \pm standard deviation.

Table 1. Basic information of the female wrestling athletes (N = 20)

Age (years old)	Training duration (years)	Weight (kg)	Height (cm)
21.24±2.4	5.12±1.29	58.23±7.16	163.29±5.03

Table 2. Body composition of the athletes in intervention group and control group before and after the experiment

	Before experiment (intervention group)	After experiment (intervention group)	Before experiment (control group)	After experiment (control group)
Body weight (kg)	63.75±6.27	58.93±8.31	61.94±7.26	57.81 ± 4.16
Water content in the body (kg)	36.61±8.38	37.59±4.04	38.12±4.19	38.55 ± 3.46
Percentage of body fat (%)	15.82±4.29	12.03±3.12	15.02±4.19	13.16 ± 3.19
Weight of skeletal muscle (kg)	29.01±3.77	26.11±4.16	27.88±2.91	23.02 ± 3.54
Weight of body fat (kg)	10.11±3.26	7.29 ± 2.44	10.02 ± 2.16	7.24±2.15

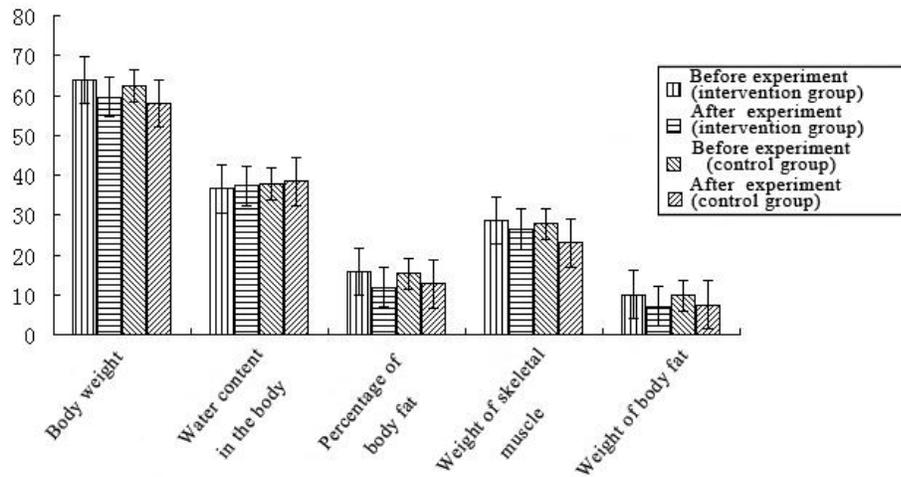


Figure 1. Body composition of the athletes the intervention group and control group before and after the experiment

Paired sample t test was used for the comparison between groups of the same type (including the intervention group and control group), while independent sample t test was used for the comparison between different types of groups (namely, the intervention group and control group); $p \leq 0.05$ means there is significant difference; $p \leq 0.01$ means there is insignificant difference.

3. Results and discussions

3.1. Body composition test

Table 2 shows the body composition of intervention group and control group before and after the experiment. Figure 1 shows the differences of data more distinctly.

Table 3. Recommended intakes of calories for the daily meals of the athletes and their actual intake

Daily meals	Recommended intake (%)	Actual intake (%)
Breakfast	25~30	27.1
Lunch	40	35.9
Dinner	30~35	36.3

3.2. Recommended intake of calories for the daily meals of the athletes and their actual intake

According to the recommended caloric intake proportions for daily meals shown in Table 3, it can be seen that the wrestling athletes' caloric intake for breakfast basically accorded with the recommended values; however, their caloric intake for lunch was insufficient compared with the recommended values, while their caloric intake for dinner was slightly beyond the recommended values. From the perspective of training, insufficient caloric

intake of lunch could affect the wrestling athletes' performance for the whole afternoon, thus affecting the overall training effect.

3.3. Dietary nutrition intake of the athletes

Based on the data in Table 4, we found that an athlete's actual intake of calories was about 1361 Kcal higher than the recommended value; as for the protein intake, an athlete's intake was about 250 g more than the recommended value; moreover, fat intake of an athlete was nearly seven times the recommended value.

Table 4. Dietary nutrition intake of the athletes

Category	Calories (kcal)	Protein (g)	Fat (g)	Sugar (g)
Actual intake (A)	3950.23±578.92	331.24±100.69	574.29±234.39	602.29±133.78
Recommended value (B)	2589.12±148.29	80	80	550
Difference value (A-B)	1361.11±430.63	251.24.2±100.69	494.29±234.39	52.29±133.78
T value	11.791	12.823	10.927	2.103
P value	0.000	0.000	0.000	0.049

3.4. Changes of energy balance before and after intervention

Observing the data in Table 5, we found that after dietary nutrition intervention on the intervention group, energy intake and energy

expenditure were basically in a balanced state, which showed remarkable effect in comparison with the unbalanced state in control group before dietary nutrition intervention ($p < 0.05$).

Table 5: Energy balance conditions of the wrestling athletes before and after dietary nutrition intervention

	Sample size (people)	Energy balance before intervention (Energy intake-energy consumption)	Energy balance after intervention (Energy intake- energy consumption)
Intervention group	15	-165.8±153.15	-19.1±91.25
Control group	15	-161.2±133.96	-165.9±122.91

4. Conclusions

Comparing the body fat percentages, skeletal muscle weights and body fat weights before and after the experiment, we found that there were decreases in the body weight, average body fat percentage and body fat weight in intervention group after the experiment and the differences were significant; there was no significant difference in water content of the body and skeletal muscle weight. The results suggested that through dietary intervention, the lean body mass of athletes was maintained well, while their body fat percentages were reduced significantly. In the low-speed weight control phase, there was no dehydration (Peterson et al., 2011; Mettler et al., 2010; Leblanc et al., 2011; Bann et al., 2014). As for the athletes in control group, their body weights, body fat percentages and body fat weights decreased obviously after the experiment, and the differences were significant. The athletes without systematic dietary intervention could reduce their body weight and body fat content; however, their skeletal muscle weights decreased greatly after the experiment, which caused the loss of lean body mass (Liu et al., 2014; Yoo et al., 2015; Saleh et al., 2014). In addition, some adverse conditions should also be taken seriously, such as dehydration and inorganic salt loss which might bring serious damage to the athletes' physical stamina.

In the process of investigation, we found that some wrestling athletes had unhealthy eating habits—they chose their favorite food over the food they disliked, which could result in nutrition imbalance. For a lot of athletes, meat consumption accounted for the majority of their diet structure while their intake of vegetables and fruit fell far behind. The reason why meat was their favorite was probably that they were affected by the custom of their families or hometowns or they misunderstood nutritional intake theory and considered that meat and other fatty food were more nutritional (Manabe et al., 2015; Lees et al., 2013). It indirectly indicated that the wrestling athletes,

coaches and restaurant staff were lack of scientific knowledge of dietary nutrition, or perhaps they were unaware of the importance of dietary nutrition to athletes' physical stamina (Kim et al., 2012; Ganio et al., 2010). After the investigation, it was suggested that the staff should lay emphasis on dietary nutrition intake, thus to avoid extremely unhealthy diet structure which would affect the training effect in future.

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