

Research Article

Intervention Study of Women Wrestler on the Energy Consumption and Food Supplement in Weight Reduction Phase

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Abstract: The research aimed to explore the influence of energy consumption on wrestler in weight reduction phase and the intervention of food supplement on athletes. Twenty wrestlers were divided into intervention group and control group and went through weight reduction phase and food supplement by using the methods of slow weight training and weighing method to meet the entry requirements of the athlete's weight and improve exercise capacity at the same time.

Keywords: Dietary survey, food supplement, weight reduction phase, wrestling

INTRODUCTION

Wrestling sport is a sport event that plays a game according to the different weight level. Athletes in such projects tend to adopt traditional weight reduction measures to control weight before games in order to achieve the purpose of taking part in competitions in normal body weight level. Because of the long competition period, athletes need to keep their weight lower than normal in a few days. Match is often conducted under the dehydrated state. If the adjustment and arrangement are not good, competitive ability will decline with large difficulties. Therefore, all athletes and coaches consider how to control weight as a priority to catch before the competition.

Jing (2013) did a standardized and systematic design for the process of controlling weight of heavy sports athletes guided by the system theory, cybernetics and standardization theory and put forward the feasible opinion. Sun and Liu (2014) put forward methods and announcements of weight reduction before match, which aimed to make reasonable planning for the coaches and athletes in the future weight reduction and lower the effects of weight on performance. Wang *et al.* (2014) pointed out the change of training ways and methods for the problem of big weight, high body of Zhang Hong in preparation period, increased the proportion of the aerobic training, strengthened the training density of core strength by analyzing relationship between lipid-lowering and muscle-adding and sports level in view of the significance of lipid-lowering and muscle-adding.

This study discussed the research status of slow weight reduction method in detail by means of the weight reduction of wrestlers, then, summarized the related research and monitoring methods of nutrition and energy metabolism in weight reduction period and

pointed out the influences of food supplement for athletes, which explained food intervention method can maintain the muscle strength of athletes in slow weight reduction period that had positive influence on exercise capacity.

MATERIALS AND METHODS

Materials:

Research object: This study took 20 women wrestler in Sports College, in which 6 were master level, 8 were first grade sportsmen, 6 were second grade sportsmen. Basic situation for athletes: age (21.35 ± 1.87 year), training limit (7.10 ± 1.65 year), height (164.45 ± 5.13 cm), weight (60.48 ± 6.89 kg). Experiments randomly divided 20 athletes into two groups (intervention group and control group, 10 people in each group). Food supplement was implemented in intervention group; the athletes in control group had their own eating habits (Chen *et al.*, 2014).

Research method:

Slow weight reduction training: Monitor training process of women wrestlers in slow weight reduction period in the Sports College for a month. Determine weight and skin fold thickness 1 day before the control of weight; calculate percentage of body fat and monitor biochemical indicators.

Alimentary control method and water loss method in exercise: Alimentary control method: reduce the intake of water, sugar, protein; calculate the caloric intake and energy consumption by adopting nutrition survey method. Water loss method in exercise: run every afternoon with weight reduction, control heart rate at 130-140 times/cent in exercise for 1 to 2 h,

Table 1: The change of body composition (N = 10)

	Intervention group before test	Intervention group after test	Control group before test	Control group after test
Weight (kg)	63.84±6.57	59.57±8.45	62.46±7.51	57.98±4.32
Moisture content of body (kg)	36.53±8.32	37.31±3.94	37.73±4.33	38.46±3.64
Percentage of body fat (%)	15.73±4.75	11.89±8.45	15.23±4.32	12.76±3.11
Weight of skeleton (kg)	28.65±3.62	26.42±4.81	27.71±2.89	22.97±3.86
Weight of body fat (kg)	10.07±3.42	7.12±2.23	9.74±2.57	7.41±2.39

Table 2: Energy intake of food intervention before and after the test in slow weight reduction period (N = 10)

	Intervention group		Control group	
	Training day	Adjusting day	Training day	Adjusting day
Before test	2679.79±498.96	2499.45±413.26	2757.24±386.73	2478.32±331
After test	1724.87±431.16	1763.33±240.98	2057.13±324.75	2103.75±341.99

Table 3: Comparison of food intake and consumption before and after the period of slow weight reduction (N = 10)

	Intervention group		Control group	
	Training day	Adjusting day	Training day	Adjusting day
Total amount of intake	1724.87±431.16	1763.33±240.98	2057.13±324.75	2103.75±341.99
Total consumption	3070.56±342.36	2100.34±390.13	3045.72±297.54	2198.91±378.11

control weight when water lost in exercise (Huang *et al.*, 2013).

Weighing method: These method record types of food and weight of food of athletes for every meal per person a day for three consecutive days. It calculated daily energy intake and other data after the conversion of food composition table according to the ratio of unripe and ripe of variety of food. The advantage of this method lied in calculating the intake of various nutrients carefully and accurately. But this method was more complicated and had a high requirement for the operation proficiency of researchers.

Statistical method: Experimental data was analyzed by using statistical approach, EXCEL 2010 and SPSS 17.0 software. All data was expressed with the mean±standard deviation and retained two decimal points.

TEST RESULTS

Body composition tests (Yu, 2011): In order to show significant difference between the data clearly, we analyzed the change data of body composition of intervention group and control group before and after test. The athletes (intervention group) who accepted food supplement had weight loss and statistical significance after the period of weight reduction. Percentage of body fat declined, which showed very significant difference. Weight of body fat decreased and had statistical significance. The change of body moisture content and weight of skeletal muscle had no obvious difference.

Percentage of body weight and body fat of athletes in control group who had no food intervention declined after the experiment and had significant difference. Weight of skeletal muscle decreased and there was statistical significance. After weight control period, weight of body fat had significant difference compared

with the control group and intervention group and the weight did not have statistical significance (Table 1).

The influence of food intervention on the consumption and intake of athletes: Energy intake of athletes was monitored through dietary investigation for three days; food intervention was conducted before and after the experiment in slow weight reduction period. We can see from the statistic data that energy intake of training day, adjusting day in intervention group and training day, adjusting day in control group had significant differences before and after the experiment. The intake energy of body reduced greatly after the experiment. Compared with the intervention group after the experiment, the energy intake of training day in control group after experiment had significant difference. Compared with the energy intake of training day in intervention group after experiment, the energy intake of adjusting day in control group had obvious difference.

Energy intake can be determined according to the daily energy consumption of player before the period of slow weight reduction after statistical analysis of energy intake and consumption data of people in the each group. After the weight reduction period began, the energy intake of athletes was controlled so as to realize the negative balance of energy and achieve the effect of weight reduction (Table 2 and 3).

DISCUSSION

In general, the wrestlers participate in training need around 45-50 kcal calories every day for per kg weight, a 70 kg athlete need about 3000-3500 kcal every day. Calorie should keep the negative balance in weight reduction period; when consumption is greater than the intake, method of decreasing daily diet and increasing exercise should be taken. But the daily calorie supply should be not less than 1000-2000 kcal in order to maintain lean body mass. Athletes tend to need about 3500 kcal daily. During the weight reduction, calorie

Table 4: Metabolism of human skeletal muscle during exercise

Coefficient of energy	Base number	Reserve volume	Synthesized ATP	Max. movement time	Substances and metabolites of ATP
Phosphagen system	ATP CP	4~6 15~17	100	6~8 (sec) <10 (sec)	CP CP+ADP→ATP+C
Lactic acid energy system	Muscle glycogen	365	250	2~3 (min)	Muscle glycogen →lactic acid sugar→CO ₂ +H ₂ O
Aerobic oxidation system	Fat	49	13000	>3~5 (min)	Fat→CO ₂ +H ₂ O
			Unlimited	1~2 (h)	Protein→CO ₂ +H ₂ O+urea

intake of daily food can reduce 1000 kcal: reduce meals that contain fat and starch, increase the various intake of protein; limit water supply in training and without snacks.

This study was given priority to reduce fat content in body (Yi *et al.*, 2012) and decrease the moisture appropriately. Because the method of increasing time of aerobic exercise was adopted, fat supply increased through increasing the amount of fat oxidation in body and the aerobic exercise of small and medium intensity for a long time. At the same time the discharge of water increased. Results showed that as a result of adopting the reasonable methods of chronic weight control, physical ability of athletes had no significant decline. The energy consumption of athletes in the motion of human body will produce anaerobic and aerobic metabolism, in which ATP was the most direct power supply in human (Liu, 2014; Su, 2013). It was mainly determined by the relationship between the oxygen demand and the oxygen uptake in movement, the latter related to exercise intensity and exercise time. ATP stored with limitation in the human body, for example, muscle cell contained ATP of only 4~6 mmol/L. Hence, the body also needed to constantly synthesize ATP when the ATP decomposed so as to meet the needs of muscular activity. Resynthesis of ATP also needed to have a certain energy source, which mainly included: decomposition of Creatine Phosphate (CP), glycolysis and aerobic oxidation of sugar, fat and protein, which were corresponding to three functional systems of the phosphagen system, lactic acid energy system and aerobic oxidation system (Table 4).

Slow weight reduction method heavily depends on method of energy negative balanced. The loss of body is mainly the fat. Weight reduction method usually has dehydration phenomenon, the losses of body mainly are inorganic salt, glycogen and constitutive protein, which influence physical fitness heavily. Dehydration phenomenon will appear in the most rapid weight reduction method, the degree is different. The survey results found that athletes usually adopt some scientific way to lose weight, including strict limits of energy intake, the strict control of water intake, etc. and even some extreme weight control measures (Wang, 2011), such as eating laxatives or vomit. These phenomena will seriously affect the athlete's sports ability, even good health. As we all know, most of the fast weight reduction method is mainly caused by the loss of moisture and the damage of body, fat reduction is small, which will cause the drain of liquid inside and outside the cell and reduce endurance and power of muscle.

In the aspect of food intervention, compared with intervention group before and after experiment, the intake of mineral substance calcium, zinc increased significantly, which had significant differences. Food intervention required athletes must consume a certain amount of dairy products every day to meet the need of calcium. Because women were more likely to come up iron-deficiency anemia, athletes should eat many agaric, lean meat, liver, etc., in the food intervention. Iron intake had a rising trend before and after the experiment, but there was no significant difference. For insufficient zinc intake, it was recommended that the athletes should eat many seafood, lean meat, pork liver, fish, yolk, beans, peanuts, millet, turnip, Chinese cabbage, etc., (Zhang *et al.*, 2013). Zinc intake rose significantly after the intervention period. In the maximal strength test for the athletes, bench press, deep squat, high turnover, front squat in each group had no significant difference (Chen and Zhan, 2014), which explained that food intervention had small effects on maximum power of athletes in weight reduction period and there was no obvious growth on the biggest strength of athletes in slow weight reduction period, that is to say the muscle strength of athletes in this weight reduction period had no significant increase and decrease. Therefore, the diet intervention method in this study maintained the muscle strength of athletes in period of slow weight reduction and the influence of exercise capacity was positive.

As the unceasing enhancement of wrestling sports level, more comprehensive factors such as good special quality and psychological quality will play a key role in the competition (Di, 2014). An athlete should not only have good technological and tactical level and good psychological quality, but also guarantee normal body function in the game. In the process of training, it is necessary to combine two aspects of energy consumption and energy intake for the implementation of the training plan and feedback process and interfere diet according to the energy consumption which can accurately control, quantize daily energy intake of athletes, in order to realize the weight of athletes after the end of weight control period, meet the entry requirements and at the same time maintain the moisture content of the body and movement ability. And through monitoring the athletes' competitive ability and functional status, reasonable weight and abundant energy should be maintained in the slow weight reduction process, which can improve the athletes' performance effectively.

CONCLUSION

In conclusion, energy intake and consumption of athletes are balanced before weight reduction period, athletes are able to preliminarily understand high-energy food and allocate nutrition intake reasonably under the action of food intervention. From food intervention in this study, the athletes can maintain their weight; reduce the percentage of body fat greatly. And there is no dehydration in the slow weight reduction period. Furthermore, there is no adverse effect on the exercise ability and sleep time for athletes. Exercise ability test found that food intervention for athletes can better control dietary intake and optimize the structure of food intake. The intake ratio and the recommended value of 3 major nutrients are closer. Training arrangement of slow weight reduction period in the study has positive influence on athletes' anaerobic ability. The implementation of food intervention on athlete helps their maintaining and improvement of anaerobic and aerobic ability. At the same time, the maximum muscle strength does not have significant decline after the weight reduction period.

REFERENCES

- Chen, X.Q. and X.G. Zhan, 2014. Analysis of prediction method maximum strength. *Contemp. Sports Technol.*, 4(2): 10-12.
- Chen, Y.L., Y. Sun, C.Y. Bian, X.F. Li, L.G. Wang and Y.Z. Yu, 2014. Behavioral risk factors associated with overweight and obesity among middle school students in Wuhan. *Chinese J. School Health*, 1: 83-85.
- Di, L., 2014. The influence factors and cultivation of athletes performance of Wushu routine. *Liaoning Sport Sci. Technol.*, 5: 121-122.
- Huang, Y.R., H. Ji, X.C. Ge, Y. Hu and X.Y. Mao, 2013. Effects of 4-weeks exercise and diet intervention on body composition, serum lipid and the regulatory mechanisms in overweight adolescents. *China Sport Sci. Technol.*, 1: 46-51.
- Jing, R., 2013. Analysis of weight control of heavy athletics event-group in military sports. *J. Mil. Phys. Educ. Sport.*, 32(4): 126-128.
- Liu, Q., 2014. On the computing method of non-protein material consumption by anaerobic metabolism under high intensity movement. *J. Ankang Univ.*, 264: 109-113.
- Su, Z., 2013. Experimental research on aerobic capacity of man sanda athletes. *Sport Sci. Technol.*, 5: 81-83.
- Sun, L. and J.J. Liu, 2014. Methods and announcements of losing weight for wrestlers before match. *Liaoning Sport Sci. Technol.*, 36(1): 93-94.
- Wang, C.J., 2011. The research progress of obesity and weight loss. *Neijiang Sci. Technol.*, 6: 33-47.
- Wang, L.N., X.B. Fan and Z.W. Li, 2014. Lowering fat and gaining muscles training exploration of Zhanghong preparing for winter Olympics in Sochi. *China Winter Sports*, 2: 1-5.
- Yi, B., Z.Y. Wen, Y.L. Sun and Y.L. Cai, 2012. The effect of fat distribution on bone mineral density in normal subjects. *Chinese J. Osteoporosis*, 7: 610-617.
- Yu, N., 2011. Influence research on test methods of body composition and sports training for body composition. *New West*, 9: 257.
- Zhang, J.G., B. Zhang, H.J. Wang, Z.H. Wang, J. Zhang and F.Y. Zhai, 2013. Nutrients intake trend of Chinese population in nine provinces from 1991 to 2009 (X) zinc intake trend of Chinese children aged 7-17 years. *Acta Nutrimenta Sinica*, 35(2): 131-133.