

A CASE STUDY OF A BODY WEIGHT CONTROL PROGRAMME FOR ELITE CHINESE FEMALE GYMNASTS IN PREPARATION FOR THE 2008 OLYMPIC GAMES

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Case report

Abstract

For top level female gymnasts, effective body fat reduction is a long-term process, often resulting in various issues; how to keep the physical fitness at an optimal level? How to control the amount of training to improve skill and performance? This report presents a case study of a successful weight-loss program used by the Chinese National Gymnastics Team when preparing for the 2008 Olympic Games.

Key words: *body weight control, Olympic Games, elite gymnastics*

INTRODUCTION

Olympic level female athletes experience a great deal of stress before competing (Pensgard, 1997), which can result in negative physical and psychological changes (Wegner, 2000) such as an irregular menstrual cycle (Dueck, Manore, & Matt, 1996); bodyweight increase; lack of motivation for training; lowered confidence and depression (Ardila, 2006).

This study reports the case of a 16-year-old female gymnast in the Chinese National Team who was involved in these circumstances prior to the 2008 Olympic Games. The balance of energy input (food intake) and energy output (physical activity) is key to body-weight management. In order to reduce body weight the study subject reduced their food intake while maintaining regular exercise for 2 weeks (period 1: June 13-23, 2008). During this period the energy input from food was 1,000 Kcal per day, and the volume of liquid was 800-1,000 ml each day. She ate a snack made from high fat and high-sodium, full flavor, low moisture content and the small quantity after the daily training short before sleep in the late evening. However, this led to an increase rather than desired decrease in body weight (520 grams);

of this 453 grams were fat (Table 3). After increasing her body weight she lost motivation for training and became depressed. At this point she sought professional assistance. A comprehensive program for losing body weight and improving her motivation was needed. Such a program should include both a physiological aspect and a psychological aspect (Rushall, 1989). For a successful bodyweight management program we had to deal with several factors such as losing body weight, finding the optimal bodyweight for the subject while maintaining skill and performance level, and regaining self-confidence. The aim of this article is to present a detailed approach to body weight management in elite gymnasts.

METHODS

The subject was a 16-year-old female gymnast in the Chinese National Gymnastics Team preparing for the 2008 Olympic Games. The body mass and body height of the subject was measured using weighing scales (Inco, Ambala, India, Model No. 4516 PXL) fitted with a height measuring stand.

BMI was calculated using the following formula: weight / the square of height. Body fat was measured using the GE Lunar Prodigy DF+301772 (GE Lunar, Madison, WI). The intervention program lasted for four weeks (June 23 – July 21, 2009) and consisted of 6 aspects that are explained in detail in Table 1.

Timing and quantity of food and liquid intake during the intervention period for the subject is presented in Table 2. The subject also took the following vitamins and minerals on a daily basis: vitamin A (780 mg), vitamin C (160 mg), thiamin (1.1 mg), riboflavin (1.6 mg), niacin (15.6 mg), calcium (900-1000 mg), and iron (15.8 mg) (note: all values are mean).

Table 1. *Description of the intervention program*

<i>Aspect</i>	Description
1. Cooperation with coach	Close communication was established between the program designers and the coach (Anthanasios, 2005). They met a couple of times each day (Cote, & Salmela, 1996). Therefore, the program designers had detailed information of the amount of daily training and daily activity and they precisely calculated daily energy consumed (Carta et al, 1998). Food intake was based on this energy consumed.
2. Diet regulation	To calculate precise energy intake (Bajerska, Jeszka, & Kostrzewa, 2003), a Personal Health Status Questionnaire* and a Daily Nutrient Intake Record** was used.
3. Adjust physical activity besides daily training	The athlete gained fat during period 1 (June 13-23, 2008) when she was in control of managing her her body weight. To help her lose weight some physical activities such as Pilates, Yoga, Dancing, and Meditation were added to the training program (La Forge, 2009). These activities were selected because of there effectiveness in burning calories, furthermore the participant enjoyed doing these activities (Berger, Pargman, & Weinberg, 2002). This non-training physical activity not only helped to achieve an ideal body weight, but also improved the athlete's self-confidence (Gallagher, Jakicic, Napolitano, & Marcus, 2006).
4. Use "true" body weight indicator to record the athlete's courage and encourage the athlete	The athlete did not fully understand the difference between body weight and body fat (Weier, 1997) and was therefore stressed when her body weight increased. Use the "true" body weight indicator to record the athlete's courage and encourage the athlete.
5. Combat the athlete's depressive condition	The athlete associated body weight control with feeling stressed. At the beginning of the program the athlete expressed her depression and disappointment (Barnes, Vogel, Beck, Schoenfeld, & Owen, 2008), she needed help to overcome these stressful feelings. Besides the additional physical activity mentioned above, the athlete took part in music therapy (Saalfeld, 2008) four times a week. Communicational psychological technique was conducted to improve the relationship between the coach and the athlete by helping each relate to the other more effectively, thus improving the atmosphere in training (Silverman, 2009).
6. Assessments and evaluations used to prevent the athlete from "overtraining"	Quantitative analysis of EEG and statistical mapping techniques were used in the system as early as possible in phase I in order to show the central effects of a new compound concluded in her body-weight control system (response relationships or time/efficacy potential, brain bioavailability, effects on vigilance, et.)

* Personal Health Status Questionnaire. This Questionnaire provided detailed information about personal medical history, family history, personal training history, personal life-style, including eating-habits.

** Daily Nutrient Intake Record. The athlete recorded a daily nutrient intake and submitted this record to a weight manager. The weight manager was a special coach whose responsibility was to analyze the record and to calculate a precise amount of daily nutrients intake for the athlete. The manager and the athlete kept close communication that made the athlete feel comfortable about the food intake (Filaire et al, 2002).

Table 2. *Nutrition and beverage intake per day in the intervention period*

TIME	FOOD (g)	Liquid (ml)
6 am	50.0	400.0
8 am	250.0	300.0
10 am	100.0	250.0
12 am	550.0	200.0
15 pm	250.0	350.0
18 pm	400.0	250.0
20 pm	0.0	300.0
Total	1600.0**	2050*

*Liquid intake: Stover et al, 2006)

** - of total 1600 Kcal 68% were carbohydrate, 20% were proteins and 12% were fats

RESULTS

Over 28 days the participant lost 840 grams of body weight, of this 356 grams were fat (Table 3). The participant achieved the optimal balance between fitness and body weight. She developed a desirable mental condition for competition and managed to achieve a respectable result at the 2008 Olympic Games.

DISCUSSION

This is a case report of a successful body weight management program for an elite woman gymnast in the Chinese national gymnastics team who achieved a top level result at the 2008 Olympic Games.

It is of crucial importance to achieve the optimal body weight and body composition to compete at the highest level in gymnastics, however this is difficult to achieve because of the unique characteristics required for this sport.

The gym-nastic performance at Olympic championships is influenced by physical factors (Stark, & In, 1991), such as body weight, body composition; and psychological factors, such as self-confidence, motivation, skill and event. Therefore, a body weight management program should be comprehensive. The following aspects were considered in our program.

1. Reduce body fat before the Olympic Games maintaining an optimal weight is an ongoing process for elite gymnasts. Although almost always lean, elite gymnasts aim to lose a little more body fat prior to the Olympic Games in order to gain even the slightest advantage.

Balance is important for gymnastic athlete because if their bodyweight is too high then their power, speed, agility, flexibility and balance may be compromised (Ackland, Elliott, & Richards, 2003), however, if their body weight is too low, they will not have enough muscle to produce muscular strength required for power, speed, agility, flexibility, and balance. Achieving this optimal condition can be difficult, particularly if the gymnast is left to achieve it themselves. Diet management (Schuit, 2006) is key to achieving this optimal condition. Gymnasts require a basic knowledge of nutrition. Establishing a suitable way of weight control for the elite gymnast, that includes physical condition balanced weight, injury prevention, enforcement of training program and performance, is an important aspect in competitive sport.

Table 3. *The body weight changes prior to intervention and following the intervention program*

	Prior to intervention			Following the intervention		
	June 13th 2008	June 28th 2008	Relative change in %	June 28th 2008	July 21st 2008	Relative change in %
Body weight (kg)	37.35	37.88	+1.4%	37.88	37.04	- 2.3 %
Body fat (g)	4065	4518	+10%	4518	4162	- 8.6 %

2. Help the athlete to understand the real meaning of body weight and body composition. Many methods have been used to measure body weight and body composition (McCardle, Katch, and Katch, 1994). Scales measure body weight only and provide no information regarding body composition. Body Mass Index provides information on body composition, but doesn't provide any information about body fat percentage (Houtkooper, Mullins, Going, Brown, & Lohman, 2001).

As discussed previously, weight of body fat is critically important to elite athlete's performance, particularly for gymnasts. GE Lunar Prodigy DF+301772 (from GE Healthcare) was used for giving the athlete a "true" indicator of body fat (Hetland, Haarbo, & Christiansen, 1998).

3. Combination of eating less and training more based on the results of this study the combination of "eating less" and "training more" can be effective in body weight control (Bogdanis, & Tsetsoni, 1999).

4. Does eating less or training more affect body weight effectively?

For a long time, elite athletes have expected for the answer about such questions seriously (Laquale, 2007). If above the competitive range and the athletes do more effort as they want to move faster, how can they get down closer to it? What is the best way to accomplish a lofty goal of dropping those last few pounds (Paul et al, 2006)? Unfortunately, studies on the best way for serious athletes to drop a few pounds are rare.

Based on our achievements the combination of "eat less" and "train more" perhaps can be much effective in the body weight control and better for athlete than only one choice. The optimal body weight for the training is very individually (Griffin, 1989). A functional program/system is required to answer this question and further study is needed.

5. Food content favoring reduced food intake prior to the Olympic Games, the content of food that is being eaten becomes more important (Rowlands, Thorp, Rossler, Graham, & Rockell, 2007). The food should provide enough energy for daily training and maintain an ideal body weight. Can protein be reduced? (Howarth, Moreau, Phillips, & Gibala, 2009). In this case, the athlete did not take milk and food that is rich in milk-protein as recommended, and she lost several grams of muscle, but it did not affect her performance.

6. When gymnasts eat less, what should be cut from their diet? A diet that is tailored to a training program is common for long term weight control, and keeping an energy-balanced diet (Gleeson, & Bishop, 2000) is key in this process. In this study the participant did not consume milk or other foods rich in milk-protein (Stroescu, Dragan, Simionescu, & Stroescu, 2001). Although the participant lost several grams of muscle, it did not influence her performance in competition. This brings about the question of how to reduce calorific intake and maintain muscle mass (Guest, 2005)? This is a difficult question to answer for athletes. Perhaps the bottom line is that when trying to lose those last few pounds of excess flab by cutting calories is more effective than increasing exercise volume and that a quality source of protein should be included in every meal.

7. Timing body weight lost in China, elite gymnasts spend most of their time in Beijing. There are four seasons in Beijing, winter is cold, summer is hot, spring and autumn are relatively dry. When an elite Gymnast needs to lose a few pounds we'd like to try to accomplish this in the early base period, because the mental and physical needs are not as intensive as in the process of preparing for competition. However, the challenge for most athletes is that time in the training season coincides with new year when a lot of food is typically consumed, this can prove a difficult time to lose weight. The best time in the season to lose weight is during the base period. The closer an athlete gets to the main competition the more detrimental calorie-cutting can be, as this this practice can be counterproductive in terms of recovery and performance. It is also difficult for the system provider to get about 10 to 12 weeks before the first competition in the year—then it's really too late and we need to accept whatever the athlete's body weight is and move on to the more challenging training.

CONCLUSION

In conclusion, the results of this study suggest that body weight control is an important aspect for elite gymnasts in preparation for competition. The regulation of food intake and energy balance contributes to the optimal body weight for performance. Further studies are needed for body weight

management of the top level gymnasts.

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