

# A CASE STUDY OF THE BODY WEIGHT MANAGEMENT OF AN ELITE GYMNAST DURING THE PREPARING PERIOD FOR 2012 OLYMPIC

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*A case study*

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## **Abstract**

*On the very first Science of Gymnastics Journal® in 2009, the authors have reported a successful weight-loss program in China National Gymnastics Team for preparing for 2008 Olympic Game, ever for an elite female gymnastic athlete (Chen, H., 2009).*

*So far as we know, to reduce body weight effectively is not an easy theme for everyone on the earth, even for elite gymnastics at the top level in the world, especially in the rush hour during the process of preparing for Olympic Games. Whenever these athletes need to lose a small amount (couple of pounds) of body weight, some issues are brought up. During the process in increased and decreased of body weight, how could the athlete keep their competition level and physical fitness stand at an optimal and high level? How to control the amount of daily training which should improve their skill and performance successfully?*

*Based on the needs of higher and higher competition level day by day in the world, more and more details gained from training practice should contribute more evidence to the development of gymnastic. This report would like to present another successful weight-loss case from a male elite athlete in China National Gymnastics Team who struggled with injury while prepared for 2012 Olympic Game.*

**Keywords:** *body weight management, Olympic Games, elite gymnastics.*

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## **INTRODUCTION**

Male gymnasts usually have a longer competition life span than that of the females. Some top level male gymnasts can extend their competition span into their 30's. At this age, however, a number of negative physical and psychological problems might happen to them due to the incredibly

stressful experience in preparation of a large number of games (Pensgard, 1997; Wegner, 2000), which include no motivation for training, less confidence for winning championship, and depression (Ardila, 2006). One possible cause of such problems is so-called overuse injury, which results

from many years' professional training. In such case, any weight gain during this period may significantly interfere with the rehabilitation of injury, as well as the competition level, which apparently reduce the competition life span.

Theoretically, the balance of energy input (food intake) and energy output (physical activity, and so on) was considered a key point of body weight management (D'Alessandro, C., et al. 2007; Filaire E., Lac G., 2002). Thus, alteration of the ingredient of food intake should be necessary and some fashionable snack, such as high density snack made from high fat and high-sodium, full flavor, rare moisture content and the light quantity that trigger too much body-weight change was forbidden from the menu (Chen, H., et al, 2009). Besides milk (Michopoulou, E. et al, 2011; Kawano, Y., et al, 2002), zero energy soda, as substitute for most of the beverage, should be added into the menu. Together with change of the ingredient of food intake, improvement of the gymnasts' motivation significantly contribute to an effective weight control. Such comprehensive program always puts equal emphasis on physiological aspect and psychological aspect (Anderson CM 2011;

Nora Klinkowski, et al. 2008; Rushall, 1989).

In the present study, the subject, a 28-year-old male gymnast of Chinese national gymnastic team, experienced such situations several months before the 2012 Olympic Game. We considered the management of body weight a crucial measure at that time and effort was put on the development of a personalized program for losing weight, balancing the targeted body weight and the optimal competition level, and rebuilding his confidence and self-belief in achieving world class results. Four months later, the subject lost 4000 gram body weight including 2330 gram fat. Consequently, he achieved world class results in 2012 Olympic Games.

## METHODS

Time: January 30 – June 01, 2012.

Program: In the beginning of the study, the subject suffered from injury. Based on his actual physiological and psychological condition, an intervention program composed of several aspects was designed as shown in Table 1.

Table 1 *Seven aspects of intervention program.*

<i>Aspect</i>	
1.	Cooperation with coach
2.	Diet regulation
3.	Adjust physical activity besides daily training
4.	Use "true" body weight indicator to record the gymnast's courage and encourage the gymnast
5.	Combat the gymnast's depressive condition
6.	Assessments and evaluations used as monitor to prevent the gymnast from "overtraining"
7.	Injury rehabilitation

### *Description of intervention program*

#### *1. Cooperation with coach*

A very close communication was established between the program designers and the coach group following the method described by Anthanasios and colleagues (Anthanasios, 2005). They met couple of times a day to ensure the program designers had detailed information about the amount of daily training and daily activities, as well as

the performance of the gymnast in order to calculate the daily energy consumption precisely (Cote, & Salmela, 1996; Carta et al, 1998; Chen, H., et al, 2009).

#### *2. Diet plan adjustment (table 2)*

To make a precise energy intake plan, a Personal Health Status Questionnaire\* and a Daily Nutrient Intake Record \* \* were used (Bajerska, Jeszka, & Kostrzewa, 2003; Ziegler, P. J., 2005; Chen, H., et al, 2009; Antonio Paoli, et al, 2012).

Based on the actual needs for training and recovery, his consumption of 70% or even more food energy was from carbohydrate during the 4-month study period, the intake of carbohydrate referred from Foster-Powell and Brand-Miller (Foster-Powell, K. & Brand-Miller, J., 1955). The gymnast took low GI (Glycemic Index) food every 2-3 hours to keep an optimal body and mental condition. Following this way, the subject did not feel tired and hungry during the training class, and good recovery was made before the next day's training.

By comparison, his daily diet plan before the study period included 2 or 3 meals, which were rich in salt and fat, and about 70% of the food energy was consumed after the last training class in the late afternoon, which made him feel tired and hungry. As a result, it was hard for him to get a good recovery before the next day's

training, which always put him in a bad mood.

### 3. Adjustment of non-training physical activities

To help him in weight loss, a number of physical activities such as pilates, yoga, dancing, and meditation, and meditation were added to the training program, as done by others ("Finally in control: 'as I became slimmer, my self-confidence grew, and I tried new activities like dancing, yoga, weight training and Pilates.'", 2003; La Forge, 2009). As suggested by a number of studies, such physical activities could consume calories additionally and effectively in support of weight control, improve the mood, and build self-confidence (Berger, Pargman, & Weinberg, 2002; Gallagher, Jakicic, Napolitano, & Marcus, 2006).

Table 2. *Difference in food and beverage intake between the original and interventional diet plans.*

	<i>Original diet plan</i>	<i>Interventional diet plan</i>
Carbohydrate intake (the percentage of total energy intake)	30%	70%
Protein intake (the percentage of total energy intake)	20%	20-23%
Fat intake (the percentage of total energy intake)	50%	10%
Beverage intake (ml)	1300-1700	3000-3500

### 4. Use "true" body weight indicator to record the gymnast's courage and encourage the athlete

It was found that there were so many athletes who did not fully understand the difference between body weight and body fat (P Klentrou, M Plyley, 2003; Weier, 1997), which also happened to the subject in the present study. For example, he was very stressed out when there was a change in his body weight. Therefore, the "true" body weight indicator was applied in the present study for recording athlete's courage and encourage the athlete, as we did previously (Chen, H., et al, 2009; Weier, 1997). With the aid of a dual-energy X-ray absorptiometry (DXA) (GE Lunar Prodigy DF+301772, GE Healthcare), the subject

was able to understand the real meaning of body weight and body composition.

### 5. Solution to the gymnast's depressive condition

A desire for the championship, perfect body weight control, or successful rehabilitation means nothing but stress to the athlete (Chen, H., et al, 2009; Neoklis A. 2011). At the beginning of the study, the subject expressed his need for help in relieving stress caused by his depression and disappointment to his competition level.

Besides the non-training physical activities described above, the athlete underwent music therapy several times a week, since music therapy might soften depression symptoms (Saalfeld, 2008). As suggested by Silverman and colleagues

(Coaches need to 'Walk the Talk.', 2009; Silverman, 2009), communicational psychological technique was also applied in this study to make the relationship between the coaches and the gymnast more friendly, both of them understood each other much more, and the atmosphere in the daily training was much more harmony.

#### 6. *Assessments and evaluations used in preventing the gymnast from overtraining*

Quantitative analysis of EEG and statistical mapping technique were used in the system to show the central effects of a new compound concluded in his body-weight control system (response relationships or time/efficacy potential, brain bioavailability, effects on vigilance, etc.), as described by us and others (Chen, H., et al, 2009; Zhou, W., Chen, H., et al, 2010).

In addition to Encephalofluctograph Technology (ET), other assessments and evaluations were used to prevent the athlete from "over-trained" following the methods described by Berglund and Safstrom (1994).

## RESULTS

Table 3. *Body weight changes in following the program in these 4 months.*

	Jan. 30, 2012	June 01, 2012	Difference in the 4 months	Relative Change in %
Body weight (kg)	62.20	58.20	4.00	-6.87%
Body fat (gram)	5845	3515	2330	-66.3%

In 4 months this male athlete lost 4000 gram of body weight, among them 2330 gram was fat (Table.3). He achieved the optimal balance between body fitness and body weight for his intense training. He gained an optimal mental condition for the champion. His rehabilitation program would be carried out successfully in these 4 months. He achieved world class results in 2012 Olympic Games.

## DISCUSSION

The Olympic Games are held every four years, it is impossible to have a group of Olympic medalists as the subjects in a study; therefore, any case report of Olympic

Since the training intensity is always very high and over-training might be triggered during the preparation for world level sports and competitive events (Halson, & Jeukendrup, 2004), such assessments and evaluations about his body and mental condition were necessary.

#### 7. *Rehabilitation of injury*

Had been taking part in gymnastic training for more than 20 years, the subject suffered from meniscus strain and achilles tendinitis at the beginning of this study.

The rehabilitation protocols was designed based on the authors' experience in injury rehabilitation (Chen, H., et al, 2009; Chen, H., et al, 2010; Chen, H., et al, 2011), as well as in training the top gymnasts in the world (Li, J., Chen, H., 2010). However, to admire the will of the Chinese Olympic Committee and Chinese national gymnastics Association, the rehabilitation protocol of the subject, who is still an active member of Chinese national gymnastics team, will be reported separately.

medalist is valuable beyond all question. As we know, it is very important for the top level athletes to maintain ideal body weight and body composition. Such athletes, especially those who undergo rehabilitation of injury during the preparation period for the Olympic Games, always possess unique physical and psychological aspects. Accordingly, personalized program are designed for each individual elite athlete, which also make it impossible to conduct group study.

This case study reports a successful management of body weight of a 2012 Olympic medalist of male gymnastics, who suffered from injury and underwent rehabilitation during the preparation for the

2012 Olympic Games. As we know the gymnastic performance of the elite gymnasts is generally influenced by a number of physical factors such as body condition, body weight, and body composition, as well as many psychological factors such as self-confidence and motivation (Stark, & In, 1991). Apparently, a comprehensive program for body weight management is of significant importance in helping the gymnast to achieve optimal condition in the preparation for the games. Therefore, the following aspects should be included into such program.

*1. Lose fat as many as possible before the gymnastic competition in the Olympic Games.*

Weight loss means a life-term process for the world's top level gymnasts (P. Klentrou, M. Plyley, 2003). To lose fat as more as possible is very important to the elite gymnasts since even a couple of pounds of fat loss could be of help in improving their relative strength, speed and flexibility. There is an optimal point or named balance-point for each individual especially for the elite gymnasts, which is important for them to trace and keep. For example, if the bodyweight of a gymnast increases, the balance between his/her feelings for the instrument and his/her action, power, speed, agility, and flexibility, almost everything concerning performance, could be damaged (Ackland, Elliott, & Richards, 2003). By contrast, if the body weight is too low, the athlete might not have enough muscle to produce muscular strength for required power, speed, agility, flexibility and balance. Although such optimal situation is not easy to reach and maintain, many gymnasts are able to maintain this balance point through many years of practice. For example, the balance point for the subject in the present study is about 57 kilogram of the body weight with 6% of total body fat. Diet management (Schuit, 2006) is one key factor for reaching and maintaining the balance point, which is always influenced by character of the games, as well as the gymnasts' personal traits and individual life

habits. Therefore, it is necessary for the gymnasts to have the basic knowledge in nutrition, which helps them to find out a proper way in balancing the body weight, injury prevention, enforcement of training program, and performance.

*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, & Katch, 1994). Weight scale can only measure the body weight without telling the body composition, and body mass index (BMI) may only provide information about body composition without determining the percent body fat (Houtkooper, Mullins, Going, Brown, & Lohman, 2001). As discussed early, the weight of body fat is critical to elite gymnast's performance, which is associated with the achievement and performance.

Previously the authors applied the bioelectric-impedance analysis for obtaining fat-free mass and body-cellular mass with a low-cost portable device. However, data measured by this device were not suitable for continuous analysis and comparison.

By contrast, dual-energy X-ray absorptiometry (DXA) is helpful in providing a "true" and "clear" indicator of body weight (Hetland, Haarbo, & Christiansen, 1998). Such indicator is easy for the athlete to understand the real meaning of body weight and body composition, it may help the athlete to trace in the training.

*3. Does "eating less" or "training more" or the combination of "eating less and training more" affect the body weight effectively?*

For a long time, the elite gymnasts have seriously expected the answers to such questions (Laquale, 2007), and dropping off excessive body fat is always their lofty goal (Paul J. A., et al, 2006). Unfortunately, so far the affirmative answers have not come into being. In fact, the optimal body weight for the competition is very personalized (Griffin,

1989), and it turns out that the combination of “eating less” and “training more” might be an effective strategy in the weight control (Bogdanis, & Tsetsoni, 1999).

#### 4. *Content of food.*

The content of food is very important in building up the body (Rowlands, Thorp, Rossler, Graham, & Rockell, 2007). It provides energy for daily training and the maintenance of an ideal body weight. Michopoulou (2011) and Kawano (2002) suggested that the ingredient of food intake of the athletes could be varied before the Olympic Games, and Howarth and colleagues questioned if the protein content of food could be reduced (Howarth, Moreau, Phillips, & Gibala, 2009).

In our previous case study of a female gymnast (Chen, H., et al 2009), we recommended her not to take milk as well as food that is rich in milk protein. Consequently she lost several grams of muscle as result without influencing her performance in the competition. In the present study, we added zero energy soda in the menu as substitute for beverage that is rich in sugar. He also changed his diet habit during the study period and ate more rice and needle than before. Therefore, the switch of calorie source from beverage to rice and needle significantly contributed to a stable blood glucose level and a stable mood, which were beneficial to his performance in daily training. In the meanwhile, the new diet plan for the subject increased the intake of protein, which is of help in building up his body and injury rehabilitation.

#### 5. *When they eat less, what should be cut in the diet?*

Michopoulou et al (2011) and Soric et al (2008) found that gymnasts were accustomed to higher carbohydrate intake; however, Paoli (2012) suggested that very low carbohydrate ketogenic diets (VLCKD) for a relatively short time period (i.e. 30 days) could decrease body weight and body fat without negative effects on strength performance in high level athletes. In fact, a suitable diet plan that matches the character

of the training program would be a common choice for long term weight control (Gleeson, & Bishop, 2000). The method suggested by Stroescu and colleagues (Stroescu, Dragan, Simionescu, & Stroescu, 2001) was followed in the present study, and the subject increased his daily protein intake by drinking milk beverage and taking protein-rich foods. As result, he lost several pounds of fat (relative change: 66.3%) and was satisfied with the program and his achievement.

There remains significant concern about the influence of long term weight control in gymnast's condition and performance. Such influence was suggested to be associated with the contents of training. Results from the present study as well as our previous study demonstrated that long term weight control might not influence the condition and performance of the gymnasts since both of them achieved top class results in the Olympic Games.

Another concern is how to maintain muscle mass in the event of reducing calories (Guest, 2005). Although some reports about sedentary people are available, it remains a puzzle if the conditions of the sedentary people are similar to those of the gymnasts.

Perhaps cutting calories is more effective than increasing the amount of exercise in losing the excessive body fat (*200 best muscle building foods*, 2008).

## CONCLUSION

In conclusion, results of the present study suggest that body weight control is an important issue for the elite gymnasts. Adjustment of food intake and energy balance is equally influenced by energy consumed. The balance between body condition and mental condition contribute to the optimal body weight and performance. Beyond body weight control, significant attention should be paid on the other factors which influence the performance of the gymnasts. The “true” indicator for the body weight control plays an important role in directing the gymnasts to understand the

optimal body weight and to reach the balance between body condition and body weight. Further study is needed to help the top gymnasts to better achieve their career goals.

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