A CASE STUDY OF WEIGHT LOSS PROGRAM OF A UNIVERSITY AMATEUR CYCLIST

BY

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09005218

AN HONOURS PROJECT SUBMITTED IN PARTIAL FULFILMENT OF THE REQUIREMENTS FOR THE DEGREE OF

BACHELOR OF ARTS

IN

PHYSICAL EDUCATION AND RECREATION MANAGEMENT (HONOURS)

HONG KONG BAPTIST UNIVERSITY

APRIL 2012

HONG KONG BAPTIST UNIVERSITY

30th April, 2012

We hereby recommend that the Honors Project by Miss Lo Ka Yan entitled 'A case study of weight loss program of a university amateur cyclist' be accepted in partial fulfillment of the requirements for the Bachelor of Arts Honors Degree in Physical Education and Recreation Management.

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DECLARATION

I hereby declare that this honors project 'A case study of weight loss program of a university amateur cyclist' represents my own work and had not been previously submitted to this or other institution for a degree, diploma or other qualification. Citations from the other authors were listed in the references.

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30th April, 2012

ACKNOWLEDGEMENT

I would like to express my gratefulness to my chief adviser, Professor Chow Bik Chu, for her encouragement, patience, support, professional guidance and advice throughout the whole project. Special appreciation is given to Dr. Kim Seungmo as my second reader to review this project. In addition, I would like to give thanks to Mr. Quarch form Dr. Stephen Hui Center for Physical Recreational and Wellness, for guiding me in the use of the laboratory equipment.

Besides, I would like to have sincere thanks to my friend, Lam Yan Hang Eddie for his sincere participation. Without his participation, this project might not have been made possible and successful.

Finally, thanks should be given to my mother and my sister, for giving me lots of support and encouragement, especially in times of crises.

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ABSTRACT

Weight loss has been regarded as one of the most effective ways for athletes to improve performance by elevating the power-to-weight ratio. This study aimed to observe the intervention of a two-month exercise and diet induced weight loss program upon body composition on an amateur cyclist, a student at the Physical Education Department in Hong Kong Baptist University. The intent of this investigation is to provide an insight and reference to amateur cyclists and coaches in amateur cycling clubs who wish to enhance the power-to-weight ratio by a two-month weight loss program. The qualitative and quantitative approaches were used in analyzing the data. The intervention of a two-month exercise and diet induced weight loss program was successful. Study participant's measured body weight decreased from 74 kg to 72 kg. The Body Mass Index decreased from 26.22 to 25.51 and the percentage body fat decreased from 16.2% to 13.6%. The Waist-to-Hip Ratio changed from 0.86 to 0.83. The measured body weight change was mainly due to the increase in study

participant's energy expenditure and reduction in caloric intake. Study participant's measured body weight changed in a desirable manner continuously after the end of the two-month diet and exercise induced weight loss program. The body weight, Body Mass Index (BMI), percentage body fat and Waist-to-Hip Ratio (WHR) of study participant were also decreased in follow-up period.

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INTRODUCTION

Physically inactive and overweight are major health and clinical problems in modern societies (Lakka & Bouchard, 2005). Information regarding the absolute or relative amount of fat tissue, lean tissue and bone tissue can be provided by body composition assessment. A variety of techniques for assessing body composition have been employed in numerous studies (Matyk & Raschku, 2011; Karakaş et al., 2005; Vardar et al., 2007).

There are several techniques for assessing body composition. Methods of body composition assessment can be mainly divided into two types which are direct measurement and indirect measurement. Direct methods for measuring body composition are Isotopic dilution, Magnetic resonance imaging (MRI) and computed tomography (CT), dual-photon absorptiometry (DPA) and Dual-energy x-ray absorptiometry (DEXA), while indirect methods for measuring body composition are anthropometric measurements (skinfold measurement and

circumference measurement), hydrostatic weighting, Ultrasound and bioelectrical impedance analysis (BIA) (Heyward, 2006).

Exercise and sport influenced body composition by increasing fat free mass and reducing fat mass, hence helping individuals to restore higher metabolic rates (Evans et al., 1999). As mentioned by a lot of sources (Ballor & Poehlman, 1994; Garrow & Summerbell, 1995; Rivlin, 2007), in order to avoid excess fat and weight gain, individuals must increase their energy expenditure and reduce their caloric intake. Since adequate exercise and healthy diet are directly related to body composition, therefore, exercise and diet-induced weight loss program is one of the most effective ways to have a desirable body composition. Exercise and diet-induced weight loss program is referred to program that is notably designed for individuals to lose weight and lose fat by increasing their energy expenditure while reduce their caloric intake.

This study aimed to observe the intervention of a two-month exercise and diet induced weight loss program upon body composition on an amateur cyclist, a student at the Physical Education Department in Hong Kong Baptist University. The dependent variables include changes in body weight, body mass index (BMI), waist circumference, hip circumference, Waist-to-Hip Ratio (WHR) and percentage body fat. After the completion of two months of weight loss, study participant was under a follow-up observation for another 4 weeks.

Statement of problem

By looking at the situation in Hong Kong, weight loss is a blooming industry. Unfortunately, there is no weight loss program provided for amateur cyclists. The main purpose of this study was to observe the weight loss program of a university amateur cyclist for two months and with two weeks follow up observation. The secondary purpose was to investigate the measured body weight changes of the university

amateur cyclist before and after commencing the weight loss program.

Hypotheses

The hypotheses of this study were as follow:

1. There would be a significant loss of study participant's weight after the two months weight loss program.

Definition of terms

The following terms were operationally defined as:

University amateur cyclist

This was operationally defined as a Hong Kong University student representing his cycling team for local and oversea competitions.

Body composition

Maud and Foster (2006) stated that body composition was referred to the body's chemical composition. Referring to the

two-component model, body is divided into two parts which are fat mass and fat-free mass.

Fat mass

According to Heyward (2006), fat mass was referred to the body tissue which was composed of fat.

Percentage body fat

Heyward (2006) stated that percentage body fat was defined as the percentage of the total body mass that was composed of fat.

Body density

Body density, with regard to Siri (1961), could be calculated by body mass divided by body volume.

Anthropometry

Anthropometry was an indictor in assessing total and regional boy composition by measuring one’s body height and

body weight. Body height was measured to the nearest 1 mm using a wall-mounted stadiometer. Body weight (without shoes) was measured to the nearest 0.1 kg by the digital scale incorporated in the leg-to-leg BIA system (Lu, Quach, Tong & Lau, 2003).

BMI

Heyward (2006) stated that body mass index (BMI) was the ratio of body weight to height squared: BMI (in kg/m^2) = weight (in kilogram) / height^2 (in meter). BMI was commonly used to classify individuals as underweight, overweight, and obese (Class I, II and III). BMI also used to monitor changes in individual's body fatness, identifying individuals at risk for obesity-related diseases.

Waist-to-Hip Ratio

Waist-to-Hip Ratio (WHR) was an indirect measure of upper- and lower- body fat distribution (Haus, Hoerr, Mavis, Robison, 1994). It could be easily calculated by dividing waist

circumference (in cm) by hip circumference (in cm). WHR was a good indicator of upper-body obesity or central adiposity. The waist circumference was measured at the narrow part of the torso and the hip circumference was measured at the level of the maximum extension of the buttocks.

Leg to leg bioelectrical impedance analysis

According to Heyward (2006), leg-to-leg bioelectrical impedance analysis (BIA) was based on the principle that the amount of the fat-free mass (FFM) contained within the body was inversely related to the resistance to an applied electric current. The relationship existed as FFM has a greater water and electrolyte content, and thus greater conductivity, than bone and adipose tissue do. The larger the FFM, the greater the conductivity and the lower the electrical resistance. Relative body fat could be calculated from FFM by using this formula: percentage body fat = [(weight − FFM) / weight] 100.

Polar CS 500 cycling computer and power sensor

The polar power sensor and CS500 cycling computer were installed on the bike. The impulse causing heart contraction could be detected by the Polar heart rate sensor strap for measuring heart rate during exercise, the heart rate information would be recorded and transferred to the Polar CS 500 cycling computer for interpretation. The polar power sensor and CS500 cycling computer could measure the power (Watts) generated by the cyclist. The mechanism is simple, there was a magnet inside the magnetic sensor and there was a chain speed sensor, the magnetic force and the chain speed as a raw data, the cycling computer could calculate the tension of the bicycle chain, this tension was equal to the power output of the cyclist during cycling. This was the way to measure the power output of the rider.

Energy Expenditure (EE)

The total energy cost of maintaining constant conditions in the body was called Energy expenditure (also energy output).

According to Smith & Wardlaw (2011) EE was divided into three general categories: basal metabolism, physical activity, and digestion, absorption and processing of ingested nutrients.

Delimitations

The study would be implemented based on the following delimitations:

1. Study participant in this paper was a male student in the Hong Kong Baptist University, who has been a member of Vigor cycling team over five years.

2. The measurement of body height and weight, which were used to calculate the BMI, were carried out at the Dr. Stephen Hui Research Center for Physical Recreation and Wellness in Hong Kong Baptist University.

3. The measurement of waist circumference and hip circumference, which were used to calculate the

Waist-to-Hip Ratio, were carried out at the Dr. Stephen Hui Research Center for Physical Recreation and Wellness in Hong Kong Baptist University.

4. The leg-to-leg bioelectrical impedance analysis (BIA), which used to predict the percentage body fat, was carried at the Dr. Stephen Hui Research Center for Physical Recreation and Wellness in Hong Kong Baptist University.

5. In terms of training venue, two locations were used to have regular cycling training. They were Science Park and Tai Mo Shan.

6. Study participant was required to wear a Polar heart rate sensor strap during exercise.

7. Study participant was under the observation at least sixteen hours a day.

Limitations

The study would be implemented based on the following limitations:

1. The dietary intake of study participant might not be exactly estimated by Online Food Nutrient Calculator of the Centre of Food Safety.

2. There was an absence of control in the food intake which might affect weight loss program before or after the observation period.

3. BMI was an index of obesity (body fatness) as it did not account for the composition of body weight.

4. Waist circumference might not accurately reflect changes in visceral fat accumulation since both subcutaneous fat and visceral fat accumulation were measured.

15. As there was only one university amateur cyclist, the sample size was small and the research intervention time was limited.

6. Interpretative research might be subjective when interpreting the study participant's diary.

7. The result might be limited to the honesty of study participant in reporting all the food intake and exercise record in the log book.

8. As this was a qualitative research conducted through interviews, findings of this study should not be used for producing generalization.

Assumptions

The assumptions of this study were as follow:

1. It was assumed that study participant strictly adhered to

the two months weight loss program.

2. It was assumed that the loss of weight was due to the effect of the weight loss program.

3. The hydration factor of the fat free mass was assumed to be constant in healthy and non-obese adults for the BIA method (Forbes, 1987).

4. Anthropometry was a good indictor in assessing total and regional body composition.

5. Leg-to-leg bioelectrical impedance analysis (BIA) was a good predictor in assessing body fat.

6. Polar CS 500 cycling computer was a good heart rate monitor.

7. Polar power sensor was a good energy output monitor.

Significance of the study

'Weight loss is a booming industry, with the topic selling magazines, foods, supplements, and gym memberships.' stated by Australian Institute of Sport (2010). In addition, weight loss has been regarded as one of the effective ways for athletes to improve performance by improving the power-to-weight ratio. High power-to-weight ratio is desirable for sprinting in cycling competitions. Unfortunately, there are no short term solutions and long term approach is required to lower body weight while maintaining muscle mass effectively.

It is necessary to have an initial cognition before weight loss programs for amateur athlete could be developed. Since there is seemingly a lack of local information, this study could serve as a pilot project. Moreover, as findings from previous researchers suggested that weight loss program towards amateur athletes might vary across sports; the inclusion of amateur cyclist weight loss program in this study provides a meritorious reference point.

Carmichael (2007) mentioned that ideal weight can be

achieved by changing the balance between daily energy intake and energy expenditure by employing a comprehensive and customized weight loss program for a cyclist. Through maintaining an ideal weight, losing body weight and body fat of a university amateur cyclist when conducting a two-month weight loss program, the study participant could have an opportunity to improve the power-to-weight ratio in a relatively short period of time. Therefore, the intent of this investigation is to provide an insight and reference to amateur cyclists and coaches in amateur cycling clubs who wish to enhance the power-to-weight ratio by a two-month weight loss program.

Chapter 2

REVIEW OF LITERATURE

The present study was to investigate the weight loss program of a university amateur cyclist. The review of literature for this study focused on six aspects: (a) an overview of weight loss program; (b) weight loss program for cyclists; (c) measurement tools of body composition; (d) approaches to qualitative research; and (e) Summary.

An Overview of Weight Loss Program

Weight loss program refers to the program that is designed for reducing the total body mass due to a mean loss of fluid, fat mass and/or fat free mass. According to the Australian Institute of Sport (2010), the Liver Cleansing Diet, the Self-help Diet, Grapefruit Diet, the Shape Up for Summer Bikini Diet and Eating in the Zone were the popular weight loss programs. Bray (1992) mentioned that intentional weight loss refers to the loss of total body mass in an effort to

improve health and fitness, and/or to change appearance. Meanwhile, therapeutic weight loss refers to loss of total body mass of individuals who are overweight or obese in an effort to decrease the likelihood of developing diseases such as high blood pressure, heart disease and certain type of cancers.

A number of researchers (Nagashima et al., 2010; Kreider et al., 2011) have investigated the effects of different weight loss programs in obese persons. Nagashima et al. (2010) indicated that the heart rate recovery could be improved in obese subjects by a three-month exercise and weight loss program included individual dietary instruction by a professional dietician per week and two hours of group exercise every week. Also, it is found that the change in heart rate recovery (HRR) was significantly correlated ($p<0.05$) with the change in hip circumference, waist circumference, body weight, percentage body fat and body mass index. Kreider et al. (2011) noted that more structured meal-plan-based diet

and supervised exercise program was more effective in weight loss. Kreider et al. (2011) and Kresta et al. (2010) conducted exercise and weight loss programs in women. Kresta et al. (2010) concluded that weight loss and fat loss could be promoted without associated reductions in resting energy expenditure (REE) by the short term weight loss program involved cycling between periods of higher caloric intake (2,200 kcals per day) and periods of moderate calorie restriction (1,200 to 1,500 kcals per day). Another study of effect of diet and exercise-induced weight loss programs in overweight persons was conducted by Wang, Chen & Chen (2011). In this study, the four-week diet and exercise weight loss program limited the amount of food given to the subjects for meeting their basal metabolic rate requirement. An average 2,000 kcal per day diet, including important nutrients such as minerals, vitamins, fiber, essential amino acids and polyunsaturated fatty acids, and an intense exercise program were prescribed for all subjects. By adopting the four-week diet and exercise weight loss program, subjects exhibited a significant decrease in

percentage body fat, body mass, body mass index and Waist-to-Hip Ratio (from 0.89±0.95 to 0.88± 0.10).

According to the U.S. Food and Drug Administration (FDA), healthy individuals should consume 2,000 calories per day in order to maintain their weight. Regarding to diet induced weight loss program, a wide variety of dietary programs have been designed to meet the needs of individuals seeking to lose excess body weight and body fat. Calorie-restriction programs were one of the most common dietary strategies in weight loss program. According to the HKSAR Department of Health (DH), gender, age and weight loss goals were factors affecting the daily calorie consumption for dietary purposes. For instance, nutritionists suggest that a minimum of 1,500 daily calories should be consumed by men in order to maintain health. The daily calorie consumption by women, on the other hand, could approach 1,200.

In addition to restricting calorie consumption, a balanced diet also regulated macronutrient consumption.

Anderson et al. (2011) mentioned that a low energy diet including five serving of fruits and vegetables and five meal replacements enabled obese persons to lose 13 kg over a 24 week period. As the World Health Organization noted, the recommended diet should come from 55-75% carbohydrates, 10-15% from protein, and 15-30% from fats within no more than 10% of total fat coming from saturated form and no more than 1% of total fat coming from trans forms. A nutrition program that included three weight loss eating principles, which are portion control, adding healthy fats back into diet and adding protein to diet, were effective in boosting one's metabolism and lose weight (Ramsdell, 2006).

According to Williams (2010), the most safety way to lose weight was to loss one to two pounds of body weight per week. Since one pound of fat equals to 3,500 kcal, therefore, individuals need to have negative 3,500 kcal per week or negative 500 kcal per day in order to loss one pound of body weight. After the desired body weight was reached, the amount

of calories consumed per day might be increased gradually but not to be exceeding 2,000 kcal net. Wang, Chen, and Chen (2011) stated that low-calorie diets combined with increased physical activity were more effective in long term. Physical activity could greatly enhance the efficiency of a diet-induced weight loss program. Thus, the healthiest weight loss program was one that consists of moderate physical activity and a balanced diet.

Weight Loss Program for Cyclists

According to Tsai, Sandretto, and Chung (2003), two types of weight loss programs were identified: exercise-induced weight loss programs and diet-induced weight loss programs.

Exercise-induced weight loss programs

According to Australian Institute of Sport (2009), road cyclists could be classified into elite level or recreational/amateur level by the training distances per week. Distances of 400 to 1,000 km in training per week are common for an elite road cyclist while distances of 300 km in training

per week are common for a recreational/amateur cyclist. In addition, for some cases, increasing exercise might not be an appropriate choice for the trained cyclists to increase the energy expenditure especially if that became pernicious to the overall training load. A famous cycling coach, Chris Carmichael, shared the same view with the Australian Institute of Sport (2009). The most effective way to lose body weight and body fat was to have a relative high intensity exercise for a longer duration (Carmichael, 2007).

Exercise was more effective in reducing fat during the early phase of weight loss program in healthy humans (Tsai, Sandretto & Chung, 2003). According to Australian Institute of Sport (2009), undertaking fast state of training sessions in the morning was relatively effective in promoting utilization and mobilization of body fat stores. There were a series of researches examined the effects of cycling in weight loss programs (Csatari, 1996; Carmichael, 2007). Csatari (1996) stated that gear, terrain and grade were greatly affecting the amount of weight loss while cycling.

Equation for measuring the amount of calories per minute burned during a cycling session in weight loss programs was shown in this study. The calories burned per minute of a cyclist could be calculated by finding his/her average speed in miles per hour (MPH) and multiply its coefficient by his/her body weight.

Apart from this, Chris Carmichael, a professional cyclist before he became cyclist Lance Armstrong's coach, detailed a weight loss program by improving his physical fitness (Carmichael, 2007). In this study, Chris Carmichael showed how he reclaimed his fitness and gave suggestions for the cyclists who want to be reclaimed their fitness. Carmichael (2007) mentioned that 'When I shifted gears, I lost fifteen pounds and regained the competitive zeal from my years as a pro cyclist. The key is not only to go faster, but also to go faster for longer.' Chris Carmichael stated a four-week cardiorespiratory program for cyclist to reduce body weight and body fat by achieving peak fitness. Exercise within specified intensity ranges for the notably amount of time for

each session was suggested in the guidelines (Carmichael, 2007).

Diet-induced weight loss programs

According to Australian Institute of Sport (2009), road cyclists could achieve an optimal power-to-weight ratio by minimizing the levels of fat mass, optimizing the levels of fat free mass. Most studies have shown that good diet is effective in lowering and maintaining body weight. Guidelines on dietary intake for cyclists have provided by different studies. According to the World Health Organization, The elite cyclists (400 to 1,000 km per week) were recommended to intake >60 calories/kg/day; 8 to 11 grams of carbohydrate/kg/day; 1.2 to 1.6 grams of protein/kg/day. The amateur cyclists (300 km per week) were recommended to intake 36 to 48 calories/kg/day; 5 to 8 grams of carbohydrate/kg/day; 1 to 1.6 grams of protein/kg/day. The total needs of calories intake of amateur cyclists were relatively lower than elite cyclists and vary according to the training intensities and

durations (Australian Institute of Sport, 2010). For the diet-induced weight loss program for cyclist, it was recommended that the total calories per day of cyclists should not be less than 2,000 kcal since it might have difficulty in meeting the nutritional needs for cyclists, especially in calcium and iron (Grandjean & Ruud, 1994).

There were several researches investigated the diet-induced weight loss program for cyclists (e.g. Grandjean & Ruud, 1994 Bieler, 2004; Ramsdell, 2006). Grandjean and Ruud (1994) indicated that good dietary strategies were important to maintain the cyclist's body carbohydrate stores in order to enhance performance. It was necessary for the cyclists who had problems in body fat level to avoid overestimate the carbohydrate and energy requirements. Bieler (2004) found that choosing the appropriate foods, in the appropriate proportions, at the appropriate time was effective in losing weight; meanwhile, providing the cyclist's body adequate energy to cycle and live at an optimal level. Similarly, a study conducted by Ramsdell (2006), a nutrition program which

includes three weight loss eating principles, portion control, adding healthy fats and adding protein, was effective in boosting individuals' metabolism and losing weight.

According to Grandjean and Ruud (1994), a wide variety of dietary patterns could meet the nutritional needs of cyclists. No matter the cyclists were belonging to the elite level or recreational level, they should have a diet which could provide a variety of foods and adequate calories to meet the demand of energy expenditure. In other words, a balanced diet with a variety of nutrients dense foods could help sprint cyclists to meet their nutritional requirement while losing body weight. There was no doubt that reducing levels of body fat had impact to improve cycling performance in the flats or when sprinting and time-trialing. There was an estimation that a reduction of 5 kg would improve time-trailing in the flats by 1% (Australian Institute of Sport, 2010).

As mentioned before, good diet practices are important in weight loss program for cyclists. Bieler (2004) concluded that cyclists should match their nutritional intake to their

training demands. In this study, the researcher also noted the application of the principles of periodization to cyclist's diet with simple nutrient calculations. A similar study was conducted by Ryan (2006) examined that the caloric requirements of different training cycles for cyclists. The researcher investigated the principles and practices of periodization of nutrition. Diet-induced weight loss program. It was found that some level of tiredness from having an energy deficit could be reduced by adopting a balanced food intake to weight loss.

Measurement Tools of Body Composition

According to Heyward (2006), there were several techniques for assessing body composition. Methods of body composition assessment could be mainly divided into two types which were direct measurement and indirect measurement. Direct methods for measuring body composition were Isotopic dilution, Magnetic resonance imaging (MRI) and computed tomography (CT),

dual-photon absorptiometry (DPA) and Dual-energy x-ray absorptiometry (DEXA), while indirect methods for measuring body composition were anthropometric measurements (skinfold measurement and circumference measurement), hydrostatic weighting, Ultrasound and bioelectrical impedance analysis (BIA).

Concerning the instruments for measuring body composition, most studies have successfully shown that the common body composition assessments could measure the body composition. On the one hand, Lu et al. (2003) found that the leg-to-leg bioelectrical impedance analysis (BIA) system was a valid tool for assessing body composition in both genders by measuring their percentage body fat, fat free mass and fat mass. BIA was a valid instrument for measuring body composition based on one's body electrical conductivity and impedance properties (Mooney et al., 2011). BIA was an alternative method for assessing body composition which offered the advantages of cheapness, simplicity and ease of operation.

On the other hand, Rryan et al. (2011) found that body mass index (BMI) could be identified as an acceptable measurements in screening body composition. BIA could serve as an alternative assessment of skinfold thickness measurements in assessing body composition.

Apart from the studies of leg-to-leg bioelectrical impedance analysis (BIA) system and body mass index (BMI) for assessing body composition, in a recent study, the researchers suggested that the measurement of circumference of hips and waist could serve as valid instrument in assessing body composition. The researchers generated the data for showing the efficacy of several weight loss programs by measuring subjects' changes in body weight, centimeters of hips and waist (Kreider et al., 2011). Besides, Nagashima et al. (2010) employed body weight, hip circumference, waist circumference, body mass index (BMI) and percentage body fat measurements as body composition assessments to present the effectiveness of a 3-month exercise and weight loss program. Moreover, all

body shape indices (circumference of neck, waist, hip, thigh, calf, upper arm tense and upper arm relax) and Waist-to-Hip Ratio were used to presenting the effect on body composition of a diet and exercise-induced weight reduction intervention (Wang et al., 2011).

As mentioned above, comprehensive assessment of body composition included a variety of body composition measurements so as to ensure a relatively reliable and valid data on the study topic.

Approaches to Qualitative Research

According to Feagin, Orum and Sjoberg (1991), quantitative and qualitative approaches were generally used when formulating a research in the social science discipline. Quantitative approach referred to the collection of numeric data based on experiment and surveys, while qualitative approach tended to orient towards examining the life and/or social histories of a group of people, gathering information

from field researches. In this study, the qualitative approach would be mainly used to illustrate the issue ‘‘a case study of weight loss program of a university amateur cyclist’’. In addition, the quantitative approach would also be used to collect the numeric data based on measurements.

Qualitative researches had strong emphasis on observing, documenting, analyzing, interpreting the characteristics, attributes, meaning and patterns of contextual or specific or features of a phenomenon under study (Lenininger, 1995). According to Dewar & Horn (1992), the trend of writing qualitative researches was to use the heuristic approach. By using this method, researchers were required to be placed in a central position. It was important for the researcher to examine the subject’s experience as a whole while using a subjective viewpoint during the process (Cote, Russell, Barvia & Salmela, 1993). It was to ensure that the research could fully comprehend and interpret the subject’s world. Besides, according to Cote, Russell, Barvia & Salmela (1993), qualitative researches were flexible in nature. Since the

criteria set or structure set were used to increase the trustworthiness of researches, the researcher was required to provide a detailed description of the procedures, decision criteria and data manipulation when preparing a qualitative research so as to present the final results more comprehensively and readily.

According to Feagin, Orum & Sjoberg (1991), case study was defined as an in-depth, multi-faced investigation through the use of qualitative methods. Case study was one of the methods used in conducting qualitative researches (Easton, 1992). Case study allowed an investigation to maintain wholesome and meaningful characteristics of real-life issues or events which the investigator had little control of. Thus, this method was commonly applied for illustrating a phenomenon or making exploration to a particular issue.

Regarding to adaptation and flexibility, the procedures in case studies might be not as same as planned. Thus, it was essential for the investigator to keep their eyes opened for any possible changes. Nevertheless, if changes did occur, the

investigator must inform those involved in the study about the changes (Yin, 1994).

As mentioned above, case studies relied on a variety of evidence and information so as to guarantee a more comprehensive coverage on the study topic.

Summary

Weight loss program refers to the program that is designed for reducing the total body mass due to a mean loss of fluid, fat mass and/or fat free mass. According to Australian Institute of Sport (2010), weight loss has grown to be one of the more booming industries. In addition, weight loss has been regarded as one of the effective ways for athletes to improve performance by improving the power-to-weight ratio. High power-to-weight ratio is desirable for sprinting in cycling competitions. Road cyclists could achieve an optimal power-to-weight ratio by minimizing the levels of fat mass, optimizing the levels of fat free mass.

Information regarding the absolute or relative amount of fat mass and fat free mass could be provided by body composition assessment. A comprehensive assessment of body composition included the measurements of body weight, body mass index (BMI), waist circumference, and hip circumference, Waist-to-Hip Ratio (WHR) and percentage body fat so as to ensure a relatively reliable and valid data on the study topic. Based on the above information and knowledge, it was hoped that through this paper, a university amateur cyclist could lose body weight and body fat so as to improve the power-to-weight ratio by involving in a two-month weight loss program; providing an insight and reference to amateur cyclists and coaches in amateur cycling clubs who wish to loss body weight and body fat and enhance the power-to-weight ratio by a two-month weight loss program.

Chapter 3

METHOD

The primary purpose of this study was to observe the weight loss program of a university amateur cyclist for two months with four weeks follow up observation. The secondary purpose was to investigate the measured body weight changes of the university amateur cyclist before and after having the weight loss program. The study, using case study method, comprised the following organizational procedures:

A. Study Participant

B. Diet and Exercise Protocol

C. Measuring Instruments

D. Procedures of Data Collection

Study Participant

The aim of this paper was observing the weight loss program of a university amateur cyclist for two months with four weeks follow-up observation. This was achieved by conducting a

number of in-depth interviews, analyzing contents in log book and measuring the anthropometric changes that formed the ground for the case study.

A university amateur cyclist, Eddie, agreed to participate in this study. Eddie is a cyclist of Vigor Cycling Club who aged 23 years old and he studies at the Hong Kong Baptist University. Body weight of the study participant in this study was 74 kg and body height of the stud participant was 168cm. The BMI of the study participant was 26.22 and he was classified as overweight. This amateur cyclist practiced about 200 to 250 km per week and participated an average of 20 local competitions per year.

In addition, the study participant has participated in cycling over 11 years. He participated in different kind of competitive cycling competitions (e.g., downhill, cross-country and road cycling) and he was representing his cycling team, Vigor, for 5 years in local, national competitions and some of the international competitions. He was the Champion of the 13th Tour of South China Sea (Hong Kong

Challenge, Open). His best Tour de Qiandao Lake International Road Cycling Invitational Race ranking was eighth.

Assays and measurements of body weight, percentage body fat, waist and hip circumference were carried out while diary and log book were collected at baseline, 4 and 8 and 12 weeks. Refinements were made continuously throughout the program. Study participant signed informed consents and the protocol was approved by the study participant. The two-month weight loss program notably designed for the study participant was a diet and exercise-induced program. Diet and exercise-induced weight loss program referred to program that notably designed for individuals to lose weight and lose fat by reducing their caloric intake while increasing their energy expenditure (Wang et al., 2011). Study participant agreed to set a target that loses two pounds per week. Half of the targeted weight loss was induced by reducing study participant's caloric intake and the other half of targeted weight loss was induced by increasing study participant's energy expenditure.

Diet and Exercise Protocol

Based on the dietary recommendations of Australian Institute of Sport (AIS), the amateur cyclists (300 km per week) were recommended to intake 36 to 48 calories/kg/day; 5 to 8 grams of carbohydrate/kg/day; 1 to 1.6 grams of protein/kg/day. The most effective way to lose weight was to loss one to two bounds of body weight per week. Since one bound of fat was equal to 3,500 kcal, therefore, individuals need to have negative 3,500 kcal per week or negative 500 kcal per day in order to loss one bound of body weight per week(Williams, 2010).

Study participant received individualized dietary recommendations for the two-month intervention. The prescribed diet represented an average 2,600 kcal per day in order to have negative 500 kcal per day or negative 3,500 kcal per week. Furthermore, study participant was required to increase exercise duration other than regular trainings in order to increase the energy expenditure by 500 kcal per day or 3,500 kcal per week. Study participant could perform any

type of physical activities provided that extra 3,500 kcal energy expenditure was recorded by the Polar CS 500 cycling computer and power sensor.

Measuring Instruments

In this study, there were three main components that used to assess the study participant's change of body weight and body fat which were Body Mass Index (BMI), Waist-to-hip ratio (WHR) and percentage body fat. There were five parts of measurements, (1) body height, (2) body weight, (3) waist circumference, (4) hip circumference and (5) percentage body fat. The study participant was consented to undertake the above assays and measurements orderly in the morning at the baseline, 4 and 8 and 12 weeks.

Anthropometry

Anthropometry is a good indictor in assessing total and regional body composition. Body height was measured to the nearest 1 mm using the stretch stature method on a wall-mounted

stadiometer (Novel, Rockton, IL, US). Height was measured twice, with accepted values within 3 mm. Further measures were taken if measurements were outside the acceptable range. The average of the two acceptable measures will be recorded. Body weight was measured in light clothing and without shoes on a digital scale incorporated in the leg-to-leg BIA body fat analyzer to the nearest 0.1 kg (Tanita, TBF-410, Tanita Corp., Tokyo, Japan). Weight was measured twice, with accepted values within 0.1 kg. Further measures were taken if measurements were outside the acceptable range. The average of the two acceptable measures will be recorded. Body Mass Index (BMI) was calculated as the ratio of body weight (kg) to body height (m) square.

Waist-to-Hip Ratio (WHR)

Waist-to-Hip Ratio (WHR) is an indicator of upper-body obesity or central adiposity. WHR can be calculated by dividing waist circumference (cm) by hip circumference (cm). Study participant was asked to take off his clothe prior to

the measurements. Waist circumference was measured to the nearest 0.1 cm using a qulick measuring tape (M-22C, Creative Health Products, Inc., Michigan, USA). Waist circumference was measured at the narrowest part of the torso and measured at end of normal expiration (Callaway et al., 1988). Waist circumference was measured twice, with accepted values within 0.5 cm. A third measure was taken if measurements were outside the acceptable range. The average of the two acceptable measures will be recorded. Hip circumference was measured to the nearest 0.1 cm using a gulick measuring tape (M-22C, Creative Health Products, Inc., Michigan, USA). Hip circumference was measured at the level of the maximum extension of the buttocks. Hip circumference was measured twice, with accepted values within 0.5 cm. A third measure was taken if measurements were outside the acceptable range. The average of the two acceptable measures will be recorded.

Leg-to-leg bioelectrical impedance analysis (BIA)

Leg-to-leg bioelectrical impedance analysis (BIA) is a

good predictor in assessing body fat. BIA assessment was undertaken at least two hours after breakfast. Study participant was measured in light sport wear and without shoes and socks. Leg-to-leg bioelectrical impedance assessment was performed with a leg-to-leg BIA body fat analyzer with the software comprised in it (Tanita, TBF-410, Tanita Corp., Tokyo, Japan). Study participant was required to stand barefoot on the metal sole platform of the impedance machine, with eyes looking forward. Gender, age and height details were inputted into the impedance machine manually. Body weight and percentage body fat were predicted by using the standard built-in prediction equations for general public. The result was showed on the impedance machine and printed out for data analysis.

Online Food Nutrient Calculator

The online food nutrient calculator is powered by the nutrient data from the Food Research Laboratory of the Centre for Food Safety. The food nutrient calculator includes

nutrient data that belong to the Nutrient Data Laboratory, US Department of Agriculture; the Institute of Nutrition and Food Safety, Chinese Center for Disease Control and Prevention; Food Standards Australia New Zealand; the Institute of Nutrition, Mahido University, Thailand. Nutrient Information Tables used in the Food Nutrient Calculator contain nutrient data that is an average of nutrients in a particular sample of foods and ingredients, determined at a particular time such as breakfast, lunch, dinner, snack and other occasions. The online food nutrient calculator calculated the nutrient values and total kcal of dietary intake of study participant by entering serving size of foods and ingredients. The nutrient values are rounded up to 2 decimal places in calculation.

Polar CS 500 cycling computer and power sensor

The number of kcal expended during trainings and physical activities was objectively displayed by Polar CS 500 cycling computer and power sensor (Polar CS 500; Polar Electro Oy,

Professorinitie 5, FI-90440 Kempele, Finland). Study participant was asked to attach the Polar CS 500 heart rate sensor strap only when doing exercise. The Polar OwnCal system calculated the number of kcal expended during exercise which allowed study participant to follow the kcal expend during single training session and cumulative kcal expended during several training sessions. In addition, the effect of the ambient air pressure was taken into account in the calorie expenditure calculations. Study participant was required to record the number of kcal expended during exercise in the log book. The number of kcal expended showed to the nearest 1 kcal using Polar CS 500 cycling computer and power sensor.

Procedures of Data Collection

As mentioned above, case studies relied on a variety of evidence and information so as to guarantee a more comprehensive coverage on the study topic. Thus, the data collected would be analyzed by two approaches which were qualitative approach and quantitative approach.

Qualitative Approach

The study was conducted with a university amateur cyclist, and it took place during the academic semester. Study participant was asked to write down his feelings, feedbacks and comments in the dairy. Study participant was required to submit his dairy weekly. As one of the mediums of research was diary, this study was a qualitative research and was set in a case study format. Accordingly, there would be considerably quoted dialogues reported.

The in-depth interviews were another research medium for this paper; the extra data could be generated by the interactive interviews. The regular in-depth interview was scheduled in every weekend after the start of two-month weight loss program. Supplementary interview could be scheduled if it was needed during the investigation period. Interviews were created in attempt of looking at the study participant in more subjective way, for instance, how he experienced changes from the start of the two-month weight loss program; how he feel when he need to reduce energy intake while increase energy

expenditure; and how the performance affected by the weight loss program. During the interviews, study participant was encouraged to give detailed feedbacks, comments and insights when illustrating their feelings and ideas. Refinement might be made according to the progress of weight loss program.

Under the interpretational analysis, the case study format was chosen to form the base of the observations and interviews. This method was often used to illustrate a circumstance or make investigation to a particular issue. The significance to this approach was to propose and process the data from observations, interactions and interviews. As mentioned above, case studies relied on a variety of evidence and information so as to ensure a more inclusive coverage on the study topic.

Quantitative Approach

In this study, study participant was asked to record his dietary intake and energy expenditure according to the data shown by the Polar CS 500 cycling computer and power sensor in the log book every day. Study participant was required to

submit his log book weekly. The dietary intake records were entered into the online food nutrient calculator for calculating the total kcal of dietary intake of study participant at the baseline, 4 and 8 and 12 weeks.

In this study, there were three main components that used to assess the study participant's change of body weight and body fat which were Body Mass Index (BMI), Waist-to-hip ratio (WHR) and percentage body fat. There were five parts of measurements, (1) body height, (2) body weight, (3) waist circumference, (4) hip circumference and (5) percentage body fat. All measurements were conducted at Dr. Stephen Hui Research Center of Physical Recreation and Wellness in Hong Kong Baptist University. The study participant was consented to undertake the above assays and measurements orderly in the morning at the baseline, 4 and 8 and 12 weeks.

Chapter 4

ANALYSIS OF DATA

Results

A university amateur cyclist, Eddie, was invited to participate in this study. Eddie was classified as overweight individual as his BMI was 26.22. The primary purpose of this study was to observe the weight loss program of a university amateur cyclist for two months with two weeks follow up observation. The secondary purpose was to investigate the measured body weight changes of the university amateur cyclist before and after having the weight loss program.

Physiological Variables of the Study Participant

After having the two month diet and exercise induced weight loss program, the study participant's measured body weight decreased from 74 kg to 72 kg. In other words, there was the measured body weight change of the university amateur cyclist before and after the weight loss program. The Body Mass Index decreased from 26.22 to 25.51 and the percentage body fat decreased from 16.2% to 13.6%. The Waist-to-Hip Ratio changed

from 0.86 to 0.83. The above information was shown in Table 1.

Table 1

Physiological Variables of the Study Participant

	Baseline	Week 4	Week 8	Week 12
Weight (kg)	74	72.6	72	71.5
BMI (kg/m^2)	26.22	25.72	25.51	25.33
WHR Waist(cm)/Hip(cm)	0.86	0.84	0.83	0.82
% Body Fat (%)	16.2	14.5	13.6	12.3

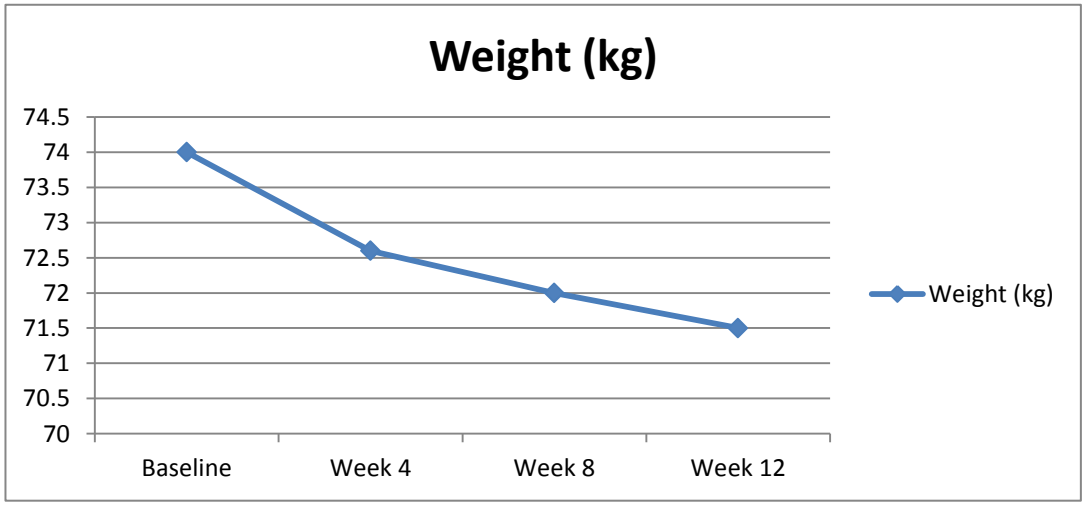

Fig. 1 *Weight Changes of the Study Participant*

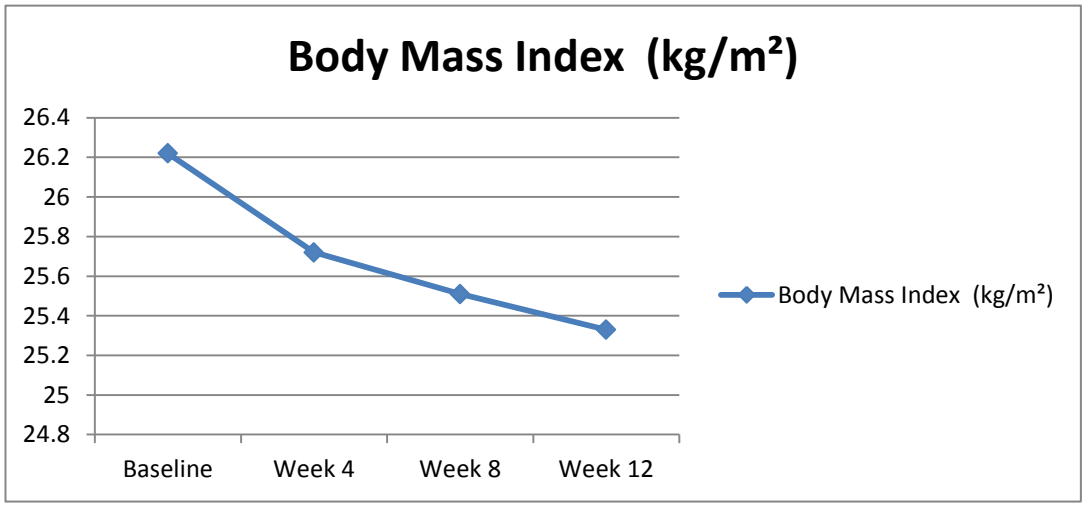

Fig. 2 *Body Mass Index Changes of the Study Participant*

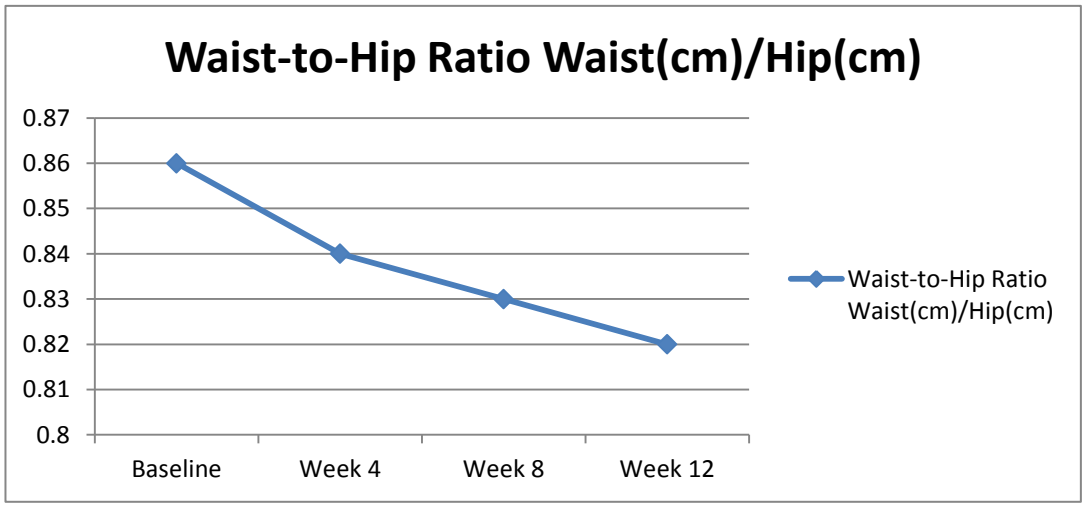

Fig. 3 *Waist-to-Hip Ratio Changes of the Study Particpant*

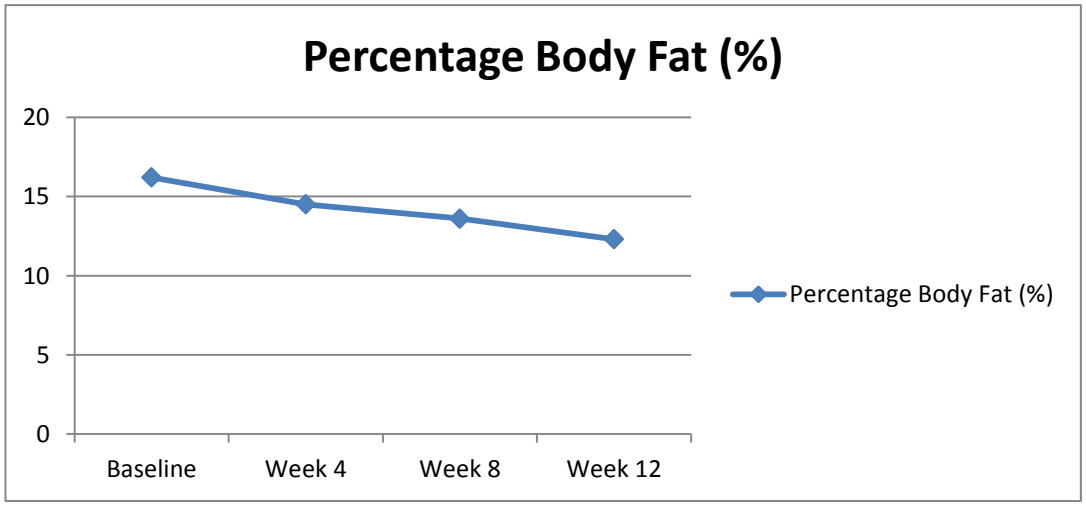

Fig. 4 *Percentage Body Fat Changes of the Study Particpant*

Summary of Dietary Intake per Day Averaged Over a Week

After showing the figures of the study participant's physiological variables, the information of (i) Dietary intake, (ii) Energy expenditure and (iii) Net calories intake would be shown as follow.

First of all, the descriptive statistics of the dietary intake as computed by the Online Food Nutrient Calculator of the Centre of Food Safety at the baseline, 4 and 8 and 12 weeks were shown in Table 2.

Table2

Summary of Dietary Intake per Day Averaged Over a Week

	Minimum	Maximum	Mean	±SD
Baseline	3393	4397	3920.2	419.67
Week 4	3026	3854	3533.5	320.53
Week 8	2732	3979.5	2983.6	444.43
Week 12	2599	2961	2750.4	127.11

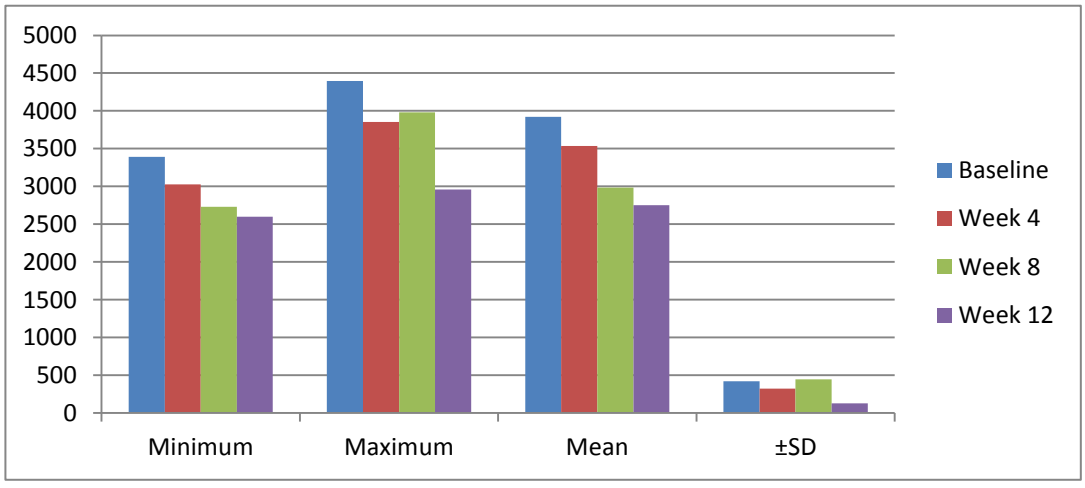

Fig. 5 *Summary of Dietary Intake per Day Averaged Over a Week*

Summary of Energy Expenditure per Day Averaged Over a Week

Moreover, the descriptive statistics of the energy expenditure as measured by Polar CS 500 cycling computer and power sensor at the baseline, 4 and 8 and 12 weeks were shown in Table 3.

Table3

Summary of Energy Expenditure per Day Averaged Over a Week

	Minimum	Maximum	Mean	±SD
Baseline	506	1980	969.3	604.75
Week 4	1021	2390	1455.0	558.02
Week 8	501	2960	973.2	920.73
Week 12	502	1920	941.4	570.71

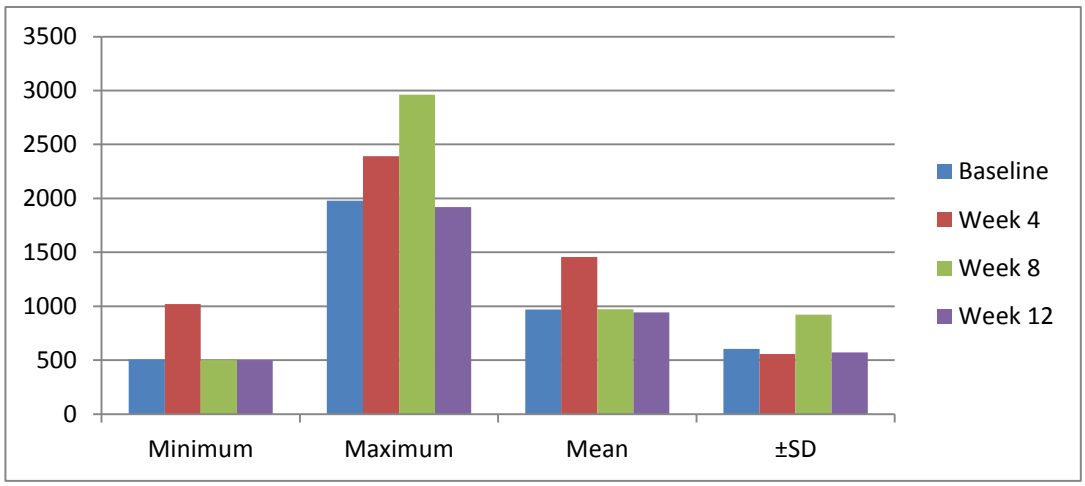

Fig. 6 *Summary of Energy Expenditure per Day Averaged Over a Week*

Summary of Net Calories Intake per Day Averaged Over a Week

Nevertheless, the descriptive statistics of the net calories intake at the baseline, 4 and 8 and 12 weeks were

shown in Table 4.

Table4

Summary of Net Calories Intake per Day Averaged Over a Week

	Minimum	Maximum	Mean	±SD
Baseline	2064	3874	2938.1	757.69
Week 4	1251	2833	2078.5	634.54
Week 8	-44	2705.5	2010.5	920.32
Week 12	746	2315	1818.9	606.43

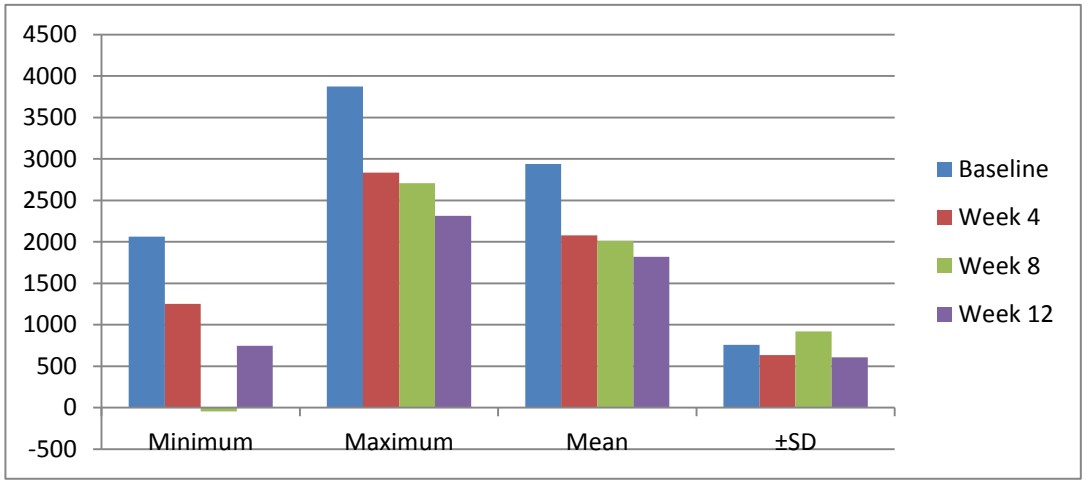

Fig. 7 *Summary of Net Calories Intake per Day Averaged Over a Week*

CHAPTER 5

DISCUSSIONS AND CONCLUSIONS

Discussions

Baseline

Based on the data computed by the Online Food Nutrient Calculator of the Centre of Food Safety, the average dietary intake of Eddie was 3920.22 kcal ±419.67 kcal per day throughout the week at baseline. According to the dietary recommendations of Australian Institute of Sport (AIS), amateur cyclists (300 km per week) were recommended to consume 36 to 48 calories/kg/day. In other words, Eddie was recommended to intake 2664 to 3552 kcal per day. However, the average dietary intake of Eddie at baseline was 812.21 kcal per day higher than the AIS recommendation. As the AIS (2009) stated, many cyclists fell into the habit of consuming huge quantities of foods when in heavy training then fail to cut back when they were less active. Club cyclists could overestimate their carbohydrate needs, consuming too many energy dense products such as bars, gels, powders sports

drinks. Eddie might fall into the situation as mentioned by the AIS (2009).

According to the log book, Eddie consumed proportionally high in meat, but low in carbohydrate. Meanwhile, Eddie had an irregular intake time. Bieler (2004) suggested that the percentage of carbohydrates in a male cyclist's diet should be 60% to 70% of his daily calories intake. Based on the dietary recommendations of AIS, the amateur cyclists (300 km per week) were recommended to intake 5 to 8 grams of carbohydrate/kg/day; 1 to 1.6 grams of protein/kg/day. Based on the data computed by the Online Food Nutrient Calculator of the Centre of Food Safety, Eddie's average daily intake of protein was 1715 kcal per day throughout the week at the baseline which was approximately 44% of his daily calories intake. Eddie's average daily intake of carbohydrate was 1532 kcal per day throughout the week at baseline which was approximately 39% of his daily calories intake. As observed, Eddie loves snacks very much, especially in training days. He had extra energy consumption due to the excess calories from sources such as

fat and non-nutritious carbohydrate (chocolate, power gel, power bar, etc.) during training. Eddie's diet was found to be often high in sugar but low in dietary fiber and water. He rarely drank water. He consumed high sugary drinks such as chocolate milk, coffee and milk tea as his regular fluid replenishment. Eddie easily consumed in large amount as 5 cups of milk tea per day. Although these drinks are low in fat content, but these drinks are still energy- dense and contribute to excessive energy intake. Besides, the intake time of Eddie was fluctuated, for instance, the dinner time of Eddie could be sometime between ranged from 18:00 to 02:00. Bieler (2004) mentioned that choosing the appropriate foods, in the appropriate proportions, at the appropriate time was effective in losing weight. As observed, Eddie failed to have a desirable nutritional balancing intake and regular intake time.

Based on the observation and the energy expenditure recorded by the Polar CS 500 cycling computer and power sensor, the summary of Eddie's regular cycling training at baseline

was shown by the table as follow:

Tuesday	20:30-21:30	Team training for 40km in Science Park (700-800 kcal)
	21:30-21:50	Recovery period with food consumption (Power gels, Power Bars, Chocolates)
Thursday	20:30-21:30	Compete with local cycling teams for 40Km in Science Park (750-850 kcal)
	21:30-21:50	Recovery period with food consumption (Power gels, Power Bars, Chocolates)
Sunday	0600-0930	Long Ride with local cycling teams for 120 km from Fanling → Tai Po → Shatin → Lai Chi Kok → Tsuen Wan → Sham Tseng → Golden Coast → Tuem Mun → Yuen Long → San Tin → Sheung Shui → Sha Tau Kok → Bride's Pool → Tai Mei Tuk → Tai Po → Fanling (2000-2500 kcal)

AIS (2009) mentioned that serious recreational cyclists tended to compete 1-2 times weekly. In Eddie's case, he raced 1 time weekly. Normally, the races were scheduled to be held in the Sunday morning. The distance covered in the races was normally the same as the distance covered in the regular long

ride. If there was race in the Sunday morning, the regular long ride for 120 km would be cancelled.

For the trainings on Tuesday and Thursday, Eddie regularly consumed energy dense food and drinks during the recovery period in 21:30-21:50. Since Eddie's normal intake is already as high as approximately 3900 kcal per day, these energy dense foods were excessive to Eddie's diet. There was no doubt that Eddie's cycling exercises required Adenosine Triphosphate (ATP) which was a high energy phosphate compound for repetitive muscular contraction. According to Powers and Howley (2007), storing energy by ATP formation from other chemical sources was a process called Phosphorylation. Both fat and carbohydrates are substrates for Phosphorylation, but there are factors determining whether fat or carbohydrates as the major substrate source during exercise. The first factor is exercise intensity. When exercise intensity increases, the recruitment of fast twitch muscle fibers increases. Since fast twitch fibers contain more glycolytic enzymes and less lipolytic enzymes compared with slow fibers,

carbohydrates will be the major sources of fuels for fast twitch fibers contraction which in turns decreased the portion of fat metabolism. Moreover, exercise duration is another major factor governing the selection of fuel. During low intensity and prolonged exercise, blood epinephrine hormone levels increases; this will increase lipase enzyme activities and thus promotes fat metabolism (Power and Howley, 2007). Therefore, low intensity, long duration exercise relatively utilizes more fat than high intensity, short duration exercise. However, the duration of Eddie's Training was relatively short on Tuesday and Thursday. Although the total training time was close to 2 hours on Tuesday and Thursday, there was a clear and significant recovery period between two training sessions which allowed Eddie to restore his phosphagen and glycogen content in muscles. This resting session contributed to the switch of the usage of fuel back to carbohydrates instead of fat. Therefore, if the resting session could be eliminated or modified into low intensity exercises, the proportion of combustion of fat could be largely increased. The AIS (2009)

stated that, in order to create an energy deficit to achieve weight loss, while fueling desired training adaptations and assist recovery, it was important to the cyclists to be strategic with carbohydrate around training sessions. Eddie was required to reduce his consumption in energy dense food and drinks during the recovery period.

In this study, there were three main components that used to assess the study participant's change of body weight and body fat which are Body Mass Index (BMI), Waist-to-hip ratio (WHR) and percentage body fat. BMI is commonly used to classify individuals as underweight, overweight, and obese (Class I, II and III). BMI is used to monitor changes in individual's body fatness, identifying individuals at risk for obesity-related diseases. At the baseline, the body weight OF Eddie was measured as 74kg. Eddie's BMI was 26.22 and he was classified as overweight. Waist-to-Hip Ratio (WHR) was an indirect measure of upper- and lower- body fat distribution (Haus, Hoerr, Mavis & Robison, 1994). Waist-to-Hip Ratio (WHR) could be easily calculated by dividing waist circumference

(in cm) by hip circumference (in cm). WHR is another good indicator of upper-body obesity or central adiposity. At the baseline, Eddie's Waist-to-Hip Ratio (WHR) was 0.86 and which represented that Eddie was at moderate risk for adverse health consequences. Heyward (2006) stated that percentage body fat was defined as the percentage of the total body mass that was composed of fat. At the baseline, the percentage body fat of Eddie was 16.2% computed by the Tanita Body Composition Analyzer TBF-410. In the present study, body weight, Body Mass Index (BMI) Waist-to-hip ratio (WHR) and percentage body fat measurements were used as body composition assessments to reflect the effectiveness of the two-month exercise and weight loss program by the present investigation.

Eddie received individualized dietary recommendations during the two-month intervention. The prescribed diet represented an average 2,600 kcal per day in order to have negative 500 kcal per day or negative 3,500 kcal per week. According to Bieler (2004), a competitive cyclist was recommended to intake 3,000 kcal or more per day during the

off-season. However, after the observation at the baseline and discussion with Eddie's coach, the prescribed diet represented an average 2,600 kcal per day was agreed to be changed to 3,500 kcal in order to avoid drastic reduction of energy input, minimizing the effect on cycling performance and maximize the effect on safety weight loss program. The proportion of dietary intake was told to be changed from high in meat and low in carbohydrate to high in carbohydrate and dietary fiber (70%) and low in meat (20%). To achieve the goal that reducing Eddie's excessive energy intake, replacing sugary drinks by water or low-energy drinks is vital. Eddie was also asked to intake water regularly and he was not allowed to eat on or after 21:00.

Furthermore, the AIS (2010) stated that if carbohydrate was consumed before training, the athletes might be possible to train harder for a longer period. Generally, this would result in greater energy expenditure and a more desirable contribution to the negative energy balance which was needed to lose weight. Apart from this, Chris Carmichael, a

professional cyclist before he became cyclist Lance Armstrong's coach, highlighted suggestions for the cyclists who want to be reclaimed their fitness. Carmichael (2007) mentioned that the key of successful weight loss was not only to go faster but also to go faster for longer. In addition, the AIS (2009) claimed that increasing exercise might not be an appropriate mean to lose weight for cyclists who train more than twice a day. Eddie was required to increase exercise duration other than regular trainings in order to increase the energy expenditure by 500 kcal per day or 3,500 kcal per week. As observed, Eddie had regular cycling training three times a week. He was required to increase training duration. The frequency of exercise was increased from three times a week to six times a week. Since the weight loss program intervened during the academic semester, it was difficult for Eddie to have cycling training every day. Therefore, Eddie was allowed to perform any type of physical activities provided that extra 3,500 kcal energy expenditure was recorded by the Polar CS 500 cycling computer and power sensor.

Week 1 to Week 4

Eddie went to McDonald to have lunch and he was allowed to order any one of the set in the menu broad on weekend in week 2. Parts of conversations in McDonald were shown as following:

Interviewer: *'You can order either one of the sets shown in the menu broad.'*

Eddie: *'Only one set? Can I order more?'*

Interviewer: *'More? Before you start the weight loss program, how much you usually order?'*

Eddie: *'I usually order a Sausage McMuffin and Egg set plus nine pieces of Chicken McNuggests and a piece of Apple Pie.'*

Based on the conversation recorded, it was found that Eddie's dietary intake was relatively high before the start of weight loss program. This high energy-dense diet habit contributed to the excessive consumption of dietary calories intake of Eddie. Carmichael, a former competitive cyclist and

an Olympic trainer, highlighted that 'Diet and training are so closely intertwined, they can't be separated.' (Bieler, 2004). Ryan (2006) explained the importance of following a diet that match with the needs of cyclist who was participated in periodize training. Eddie was required to match his nutritional intake with the demands of his physical activity level in order to achieve peak performance. By matching his demand of training and other exercises, Eddie's was required to intake 3,500 kcal per day on average in the early stage of the two-month diet and exercise induced weight loss program. Carmichael also mentioned that portion of nutrients was linked to the performance of cyclist (Bieler, 2004).

At the very beginning of weight loss program, Eddie was required to lengthen his intake time from 15 minutes to at least 45 minutes. Individuals might intake excessive calories because they ate too quickly, failing to recognize the 'full' signals. Reducing the energy density of each mouthful and spend a certain amount of time for every meal could reduce in calories intake (Australian Institute of Sport, 2010).

Eddie did well in avoiding excessive size of some meals by lengthening his intake time with relatively low energy density of each mouthful.

According to the Australian Institute of Sport (2009), it was difficult to assess the adequacy of carbohydrate intake. However, unnecessary fatigue and poor training performance might be indirect markers that the cyclist's carbohydrate intake was inadequate. However, Eddie overestimated his energy needs during exercises, consuming too many energy-dense products, therefore, it was important to change Eddie's habit that consuming large quantities of foods when in heavy training was appropriate for cyclists. After the discussion, Eddie was required to limit his intake of energy-dense foods and fluid, especially the intake during recovery period. Besides, as daily recovery between heavy training sessions required not only high total carbohydrate intake but also good timing of snacks and meals so as to enhance muscle glycogen restoration (Australian Institute of Sport, 2009), thus, Eddie rescheduled his training sessions,

ameliorating the need for recovery snacks in order to reduce his intake of energy-dense foods.

Some of Eddie's training sessions were changed to be undertaken in the morning since it could help to promote utilization of stored fat and greater mobilization. The Australian Institute of Sport (2009) also suggested that cyclists should ensure their protein intake in at most meals and snacks were adequate in order to minimize the extent of lean muscle mass loss associated with energy deficit periods. In this study, Eddie did not care about this suggestion since his intake of protein should be excessive according to the data computed by the Online Food Nutrient Calculator of the Centre of Food Safety.

Surprisingly, Eddie had a laudable change of eating preference starting from the 2nd week of the diet and exercise induced weight loss program. Eddie loved to eat animals' skin products, such as, chicken legs, pig hands and legs. These high fat content foods always included in Eddie's diet before the weight loss program start. After the start of weight loss

program, Eddie once went to a Chinese restaurant and ordered a set diner of Hainanese chicken rice. As observed, Eddie ate none of the chicken skins. Investigation was needed in order to find out the reason for this circumstance.

'I don't want to eat the chicken skins anymore. Once I think of the hardness of burning extra calories during exercises by looking at the data shown by Polar CS 500 cycling computer and power sensor, I don't want to eat chicken skins anymore since I know they are high in fat with high calories.'

Indeed, this behavior was an unexpected, commendable changed during the two-month diet and exercise program that resulted in weight loss program.

As Eddie was asked to increase his intake of carbohydrate and dietary fiber and decrease his intake of meat, Eddie found difficulties in practicing this change of intake portion in the first week after the start of weight loss program. He loved to eat high protein products such as beef, hating to eat vegetables and fruits. In order to know more about

Eddie's feeling of having a new diet, the feedbacks and comments in the dairy were investigated. As examined, it took time for him to be used to have the prescribed, healthy and balanced diet. Eddie stated that in week 3:

> *'Rice was unsavory, veggies were unpalatable. The size of beef was too small; I want to have a bigger one. There is no doubt that this is a healthy, but dry meal.'*

Based on the data collected by assays and measurements at baseline and week 4, the body weight of Eddie was found to be reduced from 74 kg to 72.6 kg. According to Williams (2010), the most safety way to lose weight was to loss one to two pounds of body weight per week. In the early stage of this study, Eddie lost 3.08 pounds of body weight within four weeks by the diet and exercise induced weight loss program. As the body weight of Eddie was reduced after the intervention of weight loss program, the Body Mass Index (BMI) decreased to 25.72. Besides, measurements of waist and hip were useful to depict a picture of body fat loss (Australian Institute of Sport, 2010). Eddie's lower- and upper- body fat distribution also

had a desirable change as Eddie had a reduction of 0.02 in Waist-to-Hip Ratio (WHR). Moreover, the percentage body fat of Eddie decreased due to the diet and exercise induced weight loss program, it decreased from 16.2% at baseline to 14.5% at week 4 based on the data computed by the Tanita Body Composition Analyzer TBF-410. The average dietary intake of Eddie was 3533.5 kcal ± 320.53 kcal per day throughout the week 4 which was 386.7 kcal per day less throughout the baseline based on the data computed by the Online Food Nutrient Calculator of the Centre of Food Safety. In this case, Eddie had an obvious change in daily calories consumed per day at week 4 by comparing with the daily calories consumed per day at the baseline. However, the pleasing change in body weight (-1.4 kg) might not be from the loss of fat. Since carbohydrates had strong affinity for water, these unique properties made the solvated water-carbohydrate complex large and heavy. After heavy-sustained exercise, the solvated water-carbohydrate complex was broken down as fuel for phosphorylation. The breakdown of carbohydrates molecules

brought to water loss which in turns resulted in an observable weight loss after heavy-sustained exercise exercises. Therefore, the remarkable change in body weight (-1.4 kg) in the early stage of the weight loss program might be partially due to the fluid loss. In addition, by comparing the daily energy expenditure at baseline and week 4 based on the energy expenditure record in the Polar CS 500 cycling computer and power sensor, it was found that the average energy expenditure of Eddie was increased after the weight loss program started. The average energy expenditure of Eddie was 1455.0 kcal ± 558.02 kcal per day throughout the week 4 which was 485.7 kcal per day more throughout the baseline. This was due to the lengthening of duration of Eddie's physical activities. Since Eddie lengthened the training duration by eliminating the resting session on Tuesday and Thursday's training, the resting session was modified into low intensity cycling with no food replenishment allowed. Besides, regular day training with riding on direct-drive indoor bike trainer for approximately 500 kcal expenditure was added on Monday,

Wednesday, Friday and Saturday according to Eddie's preference. Therefore, the average energy expenditure of Eddie was increased after the start of the weight loss program.

Week 5 to Week 8

As observed in week 5, Eddie did not realize that he would like to eat when he was not hungry. Reasons for this situation were examined and the related conversation was recorded as follow:

Interviewer: *'Why you eat chocolate frequently? Is it because you are hungry?'*

Eddie: *'No, I eat those chocolates simply because there are chocolates here. Also, I predicted that I will be hungry soon, so that I eat some chocolates before I get hungry.'*

The reasons for Eddie to eat when he was not hungry were ridiculous. Due to the above reasons, Eddie was not allowed to buy and eat sugary snacks never again, until the end of the weight loss program.

As observed in week 5, Eddie tended to eat most of food served at a meal, especially when eating out. Eddie explained that:

'I eat most of food served simply because I don't want to waste the food. I will order less food in the next time.'

Ramsdell (2006) highlighted that normally, individuals would not be compensated for their clean-plate-club habits by consuming less later on. Eddie then was told that it was not necessary for him to finish all at a meal. Also, Eddie was reminded once again for the importance of portion control. As overeating was an unconscious eating habit, therefore, Eddie was required to avoid overeating by reduce serving size in every meal. It was believed that appropriate serving size could help Eddie to limit intake automatically.

Furthermore, Eddie was asked to limit and reduce the amount of dressings and sauces in meals. In the early stage of weight loss program, he employed dilatory approach and refused to follow the instruction. After the explanation and encouragement, Eddie was willing to try to do so. Starting

from week 6, Eddie got used to limit and reduce the amount of dressings and sauces in meals.

After the two-month diet and exercise induced weight loss program intervention, Eddie had anthropometric changes. Based on the assays and measurements on week 8, the body weight of Eddie was reduced to 72 kg in week 8. In other words, Eddie lost 4 kg after the intervention of two-month weight loss program. At week 8, the Body Mass Index (BMI) decreased to 25.51 and the Waist-to-Hip Ratio (WHR) decreased to 0.83. Besides, the percentage body fat of Eddie was 13.6% computed by the Tanita Body Composition Analyzer TBF-410 at week 8. As the AIS (2010) stated, preserving muscle mass while losing body fat was the mean to achieve successful long-term weight loss. It was grateful for Eddie to have a decrease in percentage body fat (fat mass) associated with the loss of body weight. According to the data computed by the Online Food Nutrient Calculator of the Centre of Food Safety, the average dietary intake of Eddie was only 2983.6 kcal ± 444.143 kcal per day throughout the week 8. The average dietary intake of Eddie

at week 8 was closer to the ideal prescribed diet which was an average 2,600 kcal per day comparing with that at baseline. These desirable anthropometric changes were due to the net energy deficit to the whole body system. Besides, the decrease in percentage body fat was due to the effectiveness of lengthening the exercise duration which in turns switching the fuel for phosphorylation from carbohydrates to fat. However, the reduction of body weight in week 5-8 was much lower than the reduction in week 1-4 might mainly due to the reduction of resting metabolic rate. Metabolic rate would be decreased after the intervention of kcal-restricted diet. The reduction of metabolic rate made individual had difficulties in creating an energy deficit to the whole body system. The more the restriction of intake, the less the requirement of energy and which increased the difficulty to lose weight. (Australian Institute of Sport, 2010).

In addition, based on the energy expenditure record in the Polar CS 500 cycling computer and power sensor, the average energy expenditure of Eddie was 973.2 kcal ± 920.73 kcal per

day throughout the week 8. By comparing the daily energy expenditure at week 4 and week 8, it was found that the average energy expenditure per day of Eddie was reduced. However, the average energy expenditure at the end of weight loss program was 973.2 kcal ± 920.73 kcal per day. After the desired body weight was reached, the amount of calories consumed per day might be increased gradually but not to be exceeding 2,000 kcal net (Williams, 2010). At the end of the two-month weight loss program, the net calories intake of Eddie was computed as 2010.5 kcal ± 920.32 kcal per day throughout week 8 and which was quite close to 2,000 kcal net. Since Eddie's diet was changed to be healthier after the two-month weight loss program intervention, the balanced diet that contained a wide range of nutrient dense carbohydrate, vegetables and fruits was believed to be helpful to Eddie for meeting his nutritional requirements with optimal calories intake and manage weight in a comfortable manner continuously.

Week 12 (Follow-up)

The Australian Institute of Sport (2009) stated that losing weight was not a competition, it needed to be approached consistently from time to time. Successful weight loss program should be a long-term, comfortable and sustainable change in lifestyle. Wang, Chen, and Chen (2011) stated that low-calorie diets combined with increased physical activity were more effective in long term. Beside, in a recent study, a weight loss program which focused on behavioral changes (improving physical activity and eating habits), not only focused on weight loss could help to sustain weight maintenance even after the program was over. Fortunately, Eddie had desirable behavioral changes with improved eating habits and physical activity level by participating in the two-month weight loss program. For instance, Eddie practiced a desirable portion control and serving sizes, regular intake time and diminished sugary snacks. Other than the changes in eating habits, Eddie also had changes in the mode of physical activity. For instance, Eddie rescheduled some of training sessions from night to

morning. He also lengthened each of his training duration from an hour to one and two hours. In addition, Eddie practiced to participate in different mode of physical activities, such as, basketball, badminton and tennis, every day.

Based on the assays and measurements on week 12, Eddie still had anthropometric changes after the program was ended. The body weight of Eddie was reduced to 71.5 kg in week 12. In other words, Eddie lost 0.5 kg within two weeks after the end of the two-month weight loss program. At week 12, the Body Mass Index (BMI) decreased to 25.33 and the Waist-to-Hip Ratio (WHR) decreased to 0.82. Besides, the percentage body fat of Eddie was 12.3% computed by the Tanita Body Composition Analyzer TBF-410 at week 12. According to the data computed by the Online Food Nutrient Calculator of the Centre of Food Safety, the average dietary intake of Eddie was 2750.4 kcal ± 127.11 kcal per day throughout the week 12 (follow-up). The average dietary intake of Eddie at week 12 (follow-up) was much closer to the ideal prescribed diet which was an average 2,600 kcal per day. These desirable changes might due to the

improvement of Eddie's eating habit. In addition, based on the energy expenditure record in the Polar CS 500 cycling computer and power sensor, the average energy expenditure of Eddie was 941.4 kcal ± 570.71 kcal per day throughout the week 12 (follow-up). By comparing the daily energy expenditure at week 8 and week 12 (follow-up), it was found that the average energy expenditure of Eddie was reduced after the end of the two-month weight loss program. However, the reduction of average energy expenditure after the end of weight loss program was only 31.8 kcal per day. After the desired body weight was reached, the amount of calories consumed per day might be increased gradually but not to be exceeding 2,000 kcal net (Williams, 2010). In this study, the net calories intake of Eddie was 2010.5 kcal ± 920.32 kcal per day throughout week 8 (the end of program) and calories intake of Eddie was 1818.9 kcal ± 606.43 kcal per day throughout week 12 (follow-up). Since the amount of calories consumed by Eddie per day was not excess 2,000 kcal net and Eddie already had desirable behavioral changes with physical activity level by

participating in the two-month weight loss program, therefore, the mile reduction in the average energy expenditure throughout the follow-up week was still praised.

Based on the data collected by assays and measurements at baseline and week 12 (follow-up), the body weight of Eddie was found to be reduced from 74 kg to 71.5kg. According to Williams (2010), the most safety way to lose weight was to loss one to two pounds of body weight per week. In this study, Eddie lost 5.5 pounds of body weight within ten weeks by the diet and exercise induced weight loss program. As the body weight of Eddie was reduced after the two-month weight loss program, the Body Mass Index (BMI) decreased to 25.33. Besides, Eddie's lower- and upper- body fat distribution also had a desirable change as Eddie had a reduction of 0.04 in Waist-to-Hip Ratio (WHR). Eddie's Waist-to-Hip Ratio (WHR) was 0.82 at week 12 (follow-up) and which represented that Eddie's risk for adverse health consequences was charged from moderate to low after intervention of the weight loss program. Moreover, the percentage body fat of Eddie decreased

continuously, it decreased from 16.2% at baseline to 13.6% at week 8 and 12.3% at week 12 (follow-up) based on the data computed by the Tanita Body Composition Analyzer TBF-410. The average dietary intake of Eddie was 2750.4 kcal ± 127.11 kcal per day throughout the week 12 (follow-up) which was 1169.8 kcal per day less throughout the baseline based on the data computed by the Online Food Nutrient Calculator of the Centre of Food Safety. According to the Australian Institute of Sport (2009), sprint cyclists required a carefully balanced intake in order to minimize body fat levels and optimize fat free mass, achieving an optimal power-to-weight ratio. In this case, Eddie's obvious change in daily calories consumed from the baseline to follow-up was due to the habit of regular diet, regular portion and regular intake time. In addition, by comparing the daily energy expenditure at baseline and week 12 (follow-up) based on the energy expenditure record in the Polar CS 500 cycling computer and power sensor, it was found that the average energy expenditure of Eddie was almost the same before and after the two-month weight loss program

intervention. It might be due to the change of mode of Eddie's physical activities. Since Eddie lengthened the training duration and the combustion of fat energy increased dramatically compared with activities at baseline, therefore, the portion of energy expenditure from fat was comparatively increased with the similar amount of energy expenditure. Hongu, Kataura and Block (2011) suggested that self-management and self-efficacy strategies could be incorporated into weight loss program, helping to maintain the healthy habits even after the end of a program. Although behavior change strategies were not intervened in present study, the healthy eating and exercise habits seemed to be maintained after the two-month diet and exercise induced weight loss program ended.

Conclusions

The intervention of a two-month exercise and diet induced weight loss program upon body composition on an amateur cyclist, a student at the Physical Education Department in Hong Kong Baptist University was successful. Study participant's measured body weight decreased from 74 kg to

72 kg. In other words, there was measured body weight change of the university amateur cyclist before and after having the weight loss program. The Body Mass Index decreased from 26.22 to 25.51 and the percentage body fat decreased from 16.2% to 13.6%. The waist-to-hip ratio was changed from 0.86 to 0.83 after having the 2-months weight loss program. The measured body weight change was mainly due to the increase in study participant's energy expenditure and reduction in caloric intake. Fortunately, study participant's measured body weight changed in a desirable manner continuously after the end of the two-month diet and exercise induced weight loss program. The body weight, Body Mass Index (BMI), Waist-to-Hip Ratio (WHR) and percentage body fat of study participant were also decreased in follow-up period. This remarkable anthropometric change was due to behavioral changes of Eddie. The increase in Eddie's energy expenditure was due to the change of mode of Eddie's physical activities, for instance, he participated frequently in low intensity, long duration exercises instead of high-intensity, and short duration exercises so as to

promote fat utilization. Moreover, the reduction in Eddie's calories intake was due to the habit of regular diet, regular portion and regular intake time. Overall, there was no measured body weight rebound was found after the two-month diet and exercise weight loss program in this present study. In addition, the loss of body weight due to the weight loss program might improve study participant's sprinting performance in cycling competitions by improving the power-to-weight ratio. Although the study participant felt overload in training in the second month of the program, the study participant still strictly adhered to the weight loss program after the refinements were made. Therefore, the effect of the 2 month exercise and diet induced weight loss program was clearly observed.

Recommendations of Further Study

Based on the present study, the following recommendations are presented for further studies:

1. Underwater weighting or Dual-energy x-ray absorptiometry (DEXA) should be used in order to obtain more accurate data.

2. The duration of program should be longer in order to increase the research intervention time of weight loss program.

3. To enrich the study findings, further studies should include the psychological and social effect from the weight loss program.

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