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*THE EFFECTS OF AN INDIVIDUALIZED DIET AND EXERCISE
PROGRAM ON BODY FAT LEVELS IN TAIWANESE FEMALES
AGED 40-60*

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ABSTRACT

Obesity is increasingly common throughout the world and is associated with significant health problems. Middle-aged migrant women are one of the risk groups for obesity. Their body fat levels increase because of their age and menopause experiences. Besides, the change of lifestyle and eating habits after immigration also affects their body fat levels. Recent studies show the combination of diet and exercise may decrease body fat levels. This study is to observe the effects of a short-term diet and exercise intervention on body fat levels in middle-aged Taiwanese women in New Zealand. Thirty Taiwanese women aged between 40-60, who currently live in New Zealand were enrolled in this study. Body weight, height, skinfolds and circumferences were measured before and after the study. Subjects also completed a 24-hr diet recall, three-day diet record and answered a questionnaire to provide general information and an assessment of physical activity levels. Subjects were divided into an intervention group (n=17) and a control group (n=10). In the intervention group, subjects were given a personal diet and exercise program for 9 weeks according to their diet and physical activity levels; subjects in the control group stayed with their own previous diet and exercise habits without any modification. The results of this study showed no significant differences ($P>0.05$) in body weight between both groups. However, body fat levels in the intervention group decreased significantly ($p<0.001$) compared to the control group. It was also found that subjects who had higher initial body weight and BMI, lost more body weight during the intervention. Besides, subjects who were more active during the intervention lost more weight. It was concluded that a short-term diet and exercise interventions might decrease body fat levels in middle-aged Taiwanese women in New Zealand.

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Chapter 1

INTRODUCTION

The wave of Chinese migration to New Zealand peaked in 1995. Approximately 25,000 permanent residencies were granted to applicants from northern Asian countries in a single year. The majority were Chinese from Taiwan and Hong Kong (Abbott et al., 2000). Therefore, it is important to study the lifestyle of Taiwanese people in New Zealand.

Most migrants from these countries entered under the business category. Many were well-educated professionals and relatively wealthy business people who came with their families and did not have strong connections to already established communities (Ho and Farmer, 1994).

Besides, a large number of Chinese families have an absent spouse/parent, usually the husband/father, who works in his or her country of origin while the remainder of the family lives in New Zealand (Ho and Farmer, 1994). Ho and Farmer have observed that Chinese migrants frequently make visits to friends and relatives, especially at Chinese New Year and Christmas (Ho and Farmer, 1994).

Chapter 2

LITERATURE REVIEW

2.1 The Incidence of Obesity

2.11 Definition and Measurement of Obesity

The epidemiology of obesity has for many years been difficult to study because many countries had their own specific criteria for the classification of different degrees of overweight. Gradually during the 1990s, however, the body mass index (BMI; weight/height²) became a universally accepted measure of the degree of overweight and now identical cut-points are recommended. Table 1 below shows the classification of overweight in adults by the World Health Organization (WHO, 1998).

Table 1: WHO classification of overweight and obesity

<i>Classification</i>	<i>BMI (kg/m²)</i>	<i>Association Health Risks</i>
Underweight	Lower than 18.5	Low (but risk of other clinical problems increased)
Normal Range	18.5-24.9	Average
Overweight	25.0 or higher	
<i>Pre-obese</i>	25.0-29.9	Increased
<i>Obese Class I</i>	30.0-34.9	Moderately Increased
<i>Obese Class II</i>	35.0-39.9	Severely increased
<i>Obese Class III</i>	40 or higher	Very Severely Increased

Much research over the last decade has suggested that abdominal fat distribution is a useful indicator of health risks with respect to overweight and obesity. Traditionally it has been indicated by a high waist to hip circumference ratio (Waist/Hip ≥ 0.95 in men and ≥ 0.80 in women). Recently, it has been accepted that the waist circumference alone may be a better and simpler measure of abdominal fatness (Lean et al., 1998). Table 2 below gives some tentative cut-

points for the waist circumference. In the table, level 1-obesity was established to replace the classification of overweight ($BMI \geq 25 \text{ kg/m}^2$) but not combined with a high Waist/Hip ratio. Level 2-obesity was based on classification of obesity $BMI \geq 30$ and BMI between 25 and 30 kg/m^2 in combination with Waist/Hip ratio.

Table 2: Sex-specific cut-off points for waist circumference (Deurenberg, 1991).

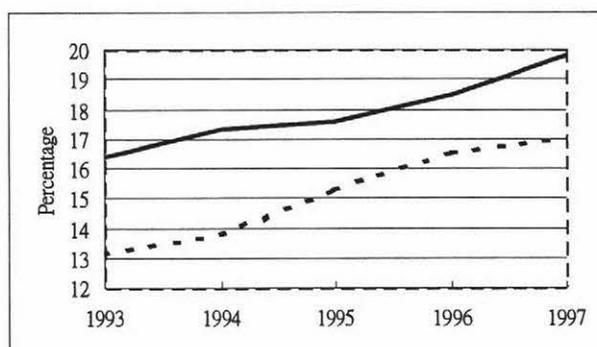
	Level 1-obesity	Prevalence	Level 2-obesity	Prevalence
Men	$\geq 94 \text{ cm}$	24.1%	$\geq 102 \text{ cm}$	18.0%
Women	$\geq 80 \text{ cm}$	24.4%	$\geq 88 \text{ cm}$	23.9%

2.12 World Trend

The incidence of obesity seems to have been increasing in recent years in many countries around the world. The prevalence in the USA overall is about 20% (Flegal et al., 1998). A major increase in obesity has been observed in the USA over the last decade. Some lower income and transitional countries have even higher obesity rates than those reported in the USA and other developed countries (Popkin and Doak, 1998).

In Europe, the prevalence of obesity is also high, and there is evidence for an increase in many countries. Figure 1 below shows the time trends from the Healthy Survey in England where obesity is now almost as prevalent as in the USA (Seidell, 2000).

Figure 1: Time trends in the prevalence of obesity ($BMI > 30 \text{ kg/m}^2$) in the health survey for England, 1993-1997 (Solid line, women; broke line, men)



The number of people worldwide with a BMI of 30 or above is currently thought to exceed 250 million, which is around 7% of the world's adult population. When individual countries are considered, the range of obesity prevalence covers almost the full spectrum, from below 5% in China, Japan and certain African nations to more than 75% in urban Samoa (Antipatis and Gill, 2001). Table 3 below summarized the world prevalence of obesity:

Table 3: Estimated world prevalence of obesity (Seidell, 1998)

	<i>Population over 15 years old (millions)</i>	<i>Prevalence of obesity (%)</i>
World	3616	
Established market economies	640	15-20
Former socialist economies	330	20-25
India	535	0.5-1.0
China	825	0.5-1.0
Other Asian countries and Islands	430	1-3
Sub-Saharan Africa	276	0.5-1.0
Latin America and Caribbean	280	5-10
Middle East	300	5-10

In general, in countries with established market economies, the prevalence of obesity is often 10-15% in men and 15-20% in women at age between 25 and 55 years old (Seidell, 1998). There is evidence that obesity is also increasing in countries where there was traditionally little obesity. The increase in obesity is most notable in countries undergoing rapid economic transition, as seen in many countries in Asia and Latin America (Seidell & Rissanen, 1998).

In 2000, another study also reported that obesity among women is a serious problem in Latin America and the Caribbean, the Middle East and North Africa. And it is less of concern in Sub-

Saharah Africa, China and South Asia. It indicated that rising national incomes in developing countries and increased “Westernisation” would most likely lead to increased levels of obesity in the future (Martorell et al., 2000).

2.13 *New Zealand*

In New Zealand, obesity is associated with significant health problems, appreciable health costs and increased risk of early death. If overseas trends of increasing obesity are mirrored in New Zealand, obesity levels should be considered a major public health issue (Wilson et al, 2001).

A report from the 1997 National Nutrition Survey (NNS97) shows the prevalence of overweight and obesity in New Zealand is increasing. Thirty-five percent of the New Zealand population (40.4% males, 30.1% females) was classified as overweight and a further 17% as obese (14.7% males, 19.2% females) in NNS97 compared to 32% overweight (43% males, 27% females) and 11% obese (10% males, 13% females) in the 1989 Life in New Zealand survey (LINZ89). Maori, compared to New Zealand European and others have approximately double the prevalence of obesity (27% males and 28% females) (Wilson et al, 2001; Russell and Wilson, 1991).

2.14 *Taiwan*

The prevalence of obesity in Taiwan is similar to that in New Zealand. When obesity is defined as BMI ≥ 25 , the prevalence in Taiwanese females (aged 45-64) was 44.6%, compared to 44.9% of New Zealand females (aged 35-64) (Simmons et al., 1996).

However, the mean body weight and BMI value of Taiwanese men and women from NAHSIT 1993-1996 (Nutrition and Health Survey in Taiwan) were higher than 7 years ago (NAHSIT 1986-1988). Body weight increased 2-5 kg in all age groups (Kao et al., 1998 and Kao et al., 1991). The prevalence of obesity in adult Taiwanese females between 1993-1996 was 23.4% when obesity was defined as body weight over 120% ideal body weight and 15.8% when obesity was defined as BMI over 26.4 (Kao et al., 1998).

Body weight of the Taiwanese population is increasing with increasing age. In Teh’s study, the BMI values for both males and females peaked at middle age (40-59) (Teh et al., 1996). The prevalence of obesity in 45-65 years old females in Taiwan was 41.6% when obesity was defined as body weight over 120% Ideal Body Weight and 29.5% when obesity was defined as BMI over

26.4. It was also found that there were more middle-aged obese women than men in Taiwan, with only 22.7% of men over 120% IBW and 18.4% with BMI over 26.4 (Kao et al., 1998).

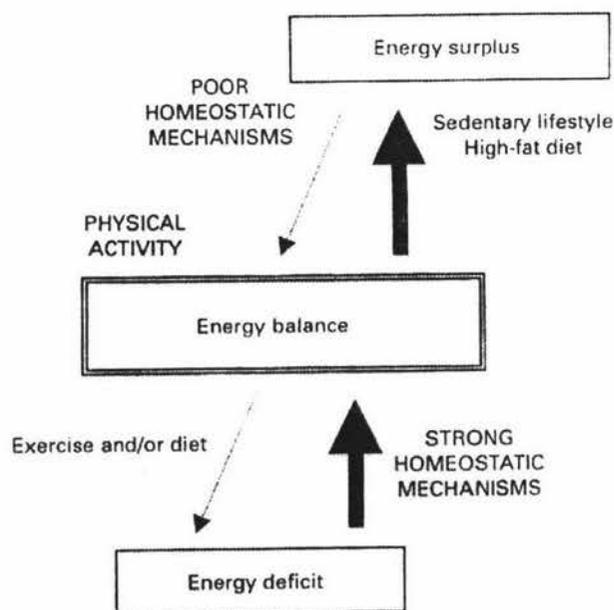
2.2 Cause of Obesity

2.21 Energy Imbalance

The role of diet and physical activity in the regulation of body weight is summarized in Figure 2. Homeostatic physiological mechanisms conspire to protect the body against energy deficits, and weight loss must usually be achieved through strong cognitive control. Successful weight loss usually involves dietary restriction, although it may also be achieved through increased exercise.

Conversely, energy deficits are difficult to attain, either through a restricted diet or increased exercise and, in contrast, there seem to be only very weak homeostatic mechanisms to restore energy balance in the face of an energy surplus. It is clear from the rising prevalence of obesity that it is relatively simple to slip into an energy surplus, through the passive over-consumption associated with high-fat diets and modern sedentary lifestyles (Moore, 2000).

Figure 2: Asymmetry of body weight regulation (Moore, 2000)



A reason for the increasing overweight and obesity is the imbalance between food energy intake and energy output in physical activity. There is an increase in the average energy supply *per capita* in the world. The World Health Report has estimated that the average energy supply *per capita* in the world was 2300 kcal in 1963, 2440 kcal in 1971 and 2720 kcal in 1992, and it is estimated that this will be 2900 kcal in 2010 (WHO, 1998). On the other hand, there are continuing changes in the physical demands of work and leisure time. Increasingly, people are at leisure during working hours and work out during leisure time (Seidell, 1998).

In New Zealand, the Auckland Hip Fracture Study showed that in Auckland, 48.7% of elderly New Zealanders did not undertake any leisure-time physical activities. Extrapolation of these data to the Auckland population indicated that 38.9% of older people do not participate in any leisure time activity (Galgali et al, 1998). In addition, it was also found that older women are less likely to participate in physical activities and participation in physical activity decreases with increasing age (Galgali et al, 1998).

These changes make people gain weight. With small changes in average body weight, the prevalence of obesity increases rapidly. For every unit increase in BMI, there is an increase in the prevalence of obesity of 5 percentage points (WHO, 1998). The WHO has estimated that about 300 million peoples will be obese in 2025.

2.22 *Hunger, Appetite and Satiation*

The determinations of food selection and food intake in humans are both physiological and psychological in origin (Castonguay and Stern, 1990). In all of these processes, the brain is the organiser and integrator of the signals, balancing expenditure and storage of energy with the intake of food (Anderson, 1996).

The recognition of the brain's function began with lesion studies that identified the roles of the ventromedial hypothalamus (VHM) and the lateral hypothalamus (LH). The VMH was identified as the satiety centre when lesions to this area caused hyperphagia and an increase in body weight in rats. The LH was identified as the hunger centre because lesions to this area caused aphagia and a loss of body weight in rats (Anderson, 1996).

In the past 20 years, the importance of neuropeptides to feeding behaviour has been recognized. These peptides, which include neuropeptide Y, galanin, opioids and growth hormone-releasing factor, affect feeding primarily through their action on the medial hypothalamus (Bray, 1992).

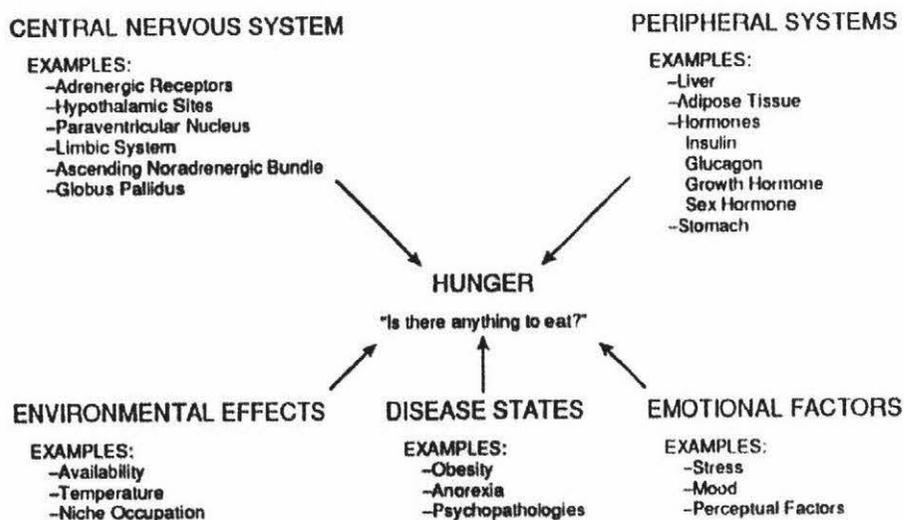
2.221 Hunger

Under strictly physiological circumstances, hunger initiates food-seeking behaviour. When the body needs food the characteristic sensations of hunger increase in intensity as long as the need is not satisfied. The sensation may be relatively weak if the person has eaten recently or relatively strong and unpleasant if the person has not eaten for some time (Anderson, 1996).

The term "hunger" refers specifically to internal signals that stimulate the acquisition and consumption of food. These signals may originate in the brain or in the periphery or may develop as habit. The signal set has many constituent parts that act in concert to initiate feeding (Castonguay and Stern, 1990).

Although the specific origins of hunger and meal initiation have not been determined, a number of events occur that results in the body asking the question, "Is there anything to eat?" Figure 3 shows a partial listing of the ever-growing number of factors that are known to influence the onset of hunger (Castonguay and Stern, 1990).

Figure 3: A partial list of the factors thought to affect hunger (Castonguay and Stern, 1990).

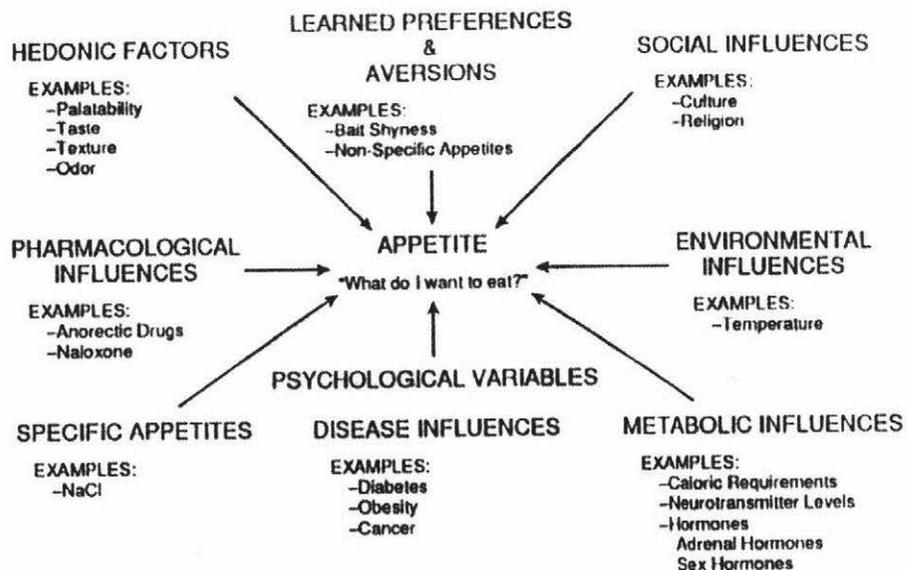


2.222 *Appetite*

Appetite is a desire for food, which may be accentuated by hunger and is generally associated with pleasurable aspects of food choice and ingestion. The term appetite is frequently used to discuss signals that guide selection and consumption of specific foods and nutrients (Castonguay and Stern, 1990). Thus, appetite can be expressed by different behaviours. It may lead to the specific intake of energy to satisfy body energy deficits, or to the selection of foods to meet the specific nutrient requirements of the organism, or to meet a hedonic desire for a specific taste (Anderson, 1996).

Unlike hunger signals, which are usually aversive in nature and are to be avoided, appetite signals are not necessarily aversive. Further, they can arise in the absence of hunger. The appetite signals associated with appetite usually work at a level secondary to those mediating caloric intakes and arise in response to the body asking, "What do I want to eat?" These signals promote feeding behaviours that are flexible and readily modifiable on the basis of experience, as well as subject to influences such as palatability and custom (Castonguay and Stern, 1990). Figure 4 shows some of the factors that determine appetite.

Figure 4: A partial list of the factors thought to affect appetite (Castonguay and Stern, 1990).



2.223 Satiation

With the initiation of food ingestion, a progression of psychological and physiological responses occurs, leading to satiation and the termination of food intake. If the hunger sensations are driven by an energy deficit, the sensation can be decreased and satisfied by the ingestion of food containing the macronutrients fat, carbohydrate or protein, which provide energy. The ingestion of these nutrients as well as many micronutrients also satisfies nutrient specific appetites (Anderson, 1996).

The amount of food ingested depends upon sensory and cognitive responses of the consumer as well as upon the energy and nutrient content of food. In humans, cultural and social conventions are significant modifiers of the signals arising from internal metabolic and physiological conditions. Psychological factors, such as the presence of others eating, social factors, such as occasion, culture and religious beliefs, and hedonic factors will all contribute to the relative state of satiation or the process of terminating hunger (Castonguay and Stern, 1990).

Following the satiety signals arising from sensory and cognitive factors, post-ingestive and post-absorptive satiation signals begin to arise from the food ingested (Anderson, 1994). Bulk, composition, rate of absorption and metabolic responses all affect the time frame in which satiety ultimately occurs. The duration of satiety and the interval to the next ingestion of food depend on a complex system of neuronal responses integrated in the central nervous system (Anderson, 1996).

2.23 Appetite Control

Early hypotheses describe single factors to explain the control of food intake, such as the glucostatic hypothesis and the lipostatic theory, but it is now evident that appetite involves the integrated response to many different factors (Moore, 2000).

Schwartz et al. have recently updated their model of energy homeostasis, which involves the integration of long-term adiposity-related signals such as the hormones leptin and insulin with short-term meal-related signals such as gastrointestinal peptides (e.g. cholecystokinin) (Schwartz et al., 1999). It is believed that this system controls the initiation and termination of individual

meals and includes gastrointestinal peptides, glucose, behavioural and emotional influences, and effects of diet composition.

Besides, levels of the longer-acting hormones, which are determined by the size of adipose stores, may govern the sensitivity of the central nervous system to the shorter-acting mechanism; for example, insulin potentiates the action of cholecystokinin (Figlewicz et al., 1986).

2.3 Obesity as a Risk Factor in the Development of the Degenerative Disease

United States figures suggest that about 61% of non-insulin-dependent diabetes mellitus (NIDDM) and 17% of both coronary heart disease (CHD) and hypertension can be attributed to obesity (Antipatis and Gill, 2001). Indeed, as a person's BMI creeps up through overweight into the obese category beyond, the risk of developing a number of chronic non-communicable disease, such as NIDDM, CHD, gallbladder disease, and certain types of cancer increases rapidly. Table 4 below shows the relative risk of health problems associated with obesity (WHO, 1998):

Table 4: Relative risk of health problems associated with obesity.

<i>Greatly increased</i>	<i>Moderately increased</i>	<i>Slightly increased</i>
NIDDM	CDH	Certain cancer
Gallbladder disease	Hypertension	Reproductive hormone abnormalities
Dyslipidaemia	Osteoarthritis (knees)	Polycystic ovary syndrome
Insulin resistance	Hyperuricaemia and gout	Impaired fertility
Breathlessness		Low back pain due to obesity
Sleep apnoea		Increased anaesthetic risk
		Fetal defects arising from maternal obesity

In native and expatriate Asians, the complications of obesity, such as diabetes, hypertension, dyslipidaemias and CHD, are evident more frequently, even at BMI in the 22-27 kg/m² range (Beegom et al., 1995). These worrying complications have been described as Syndrome X and

linked with abdominal obesity (McKeigue et al, 1991). In Asians, the risks of excess visceral fat occur at lower body weights than in Caucasians (James and Ralph, 1999).

2.31 *New Zealand*

In New Zealand, it was estimated that diet is responsible, at a minimum for between 22% (1600 deaths) and 39% (2800 deaths) of the coronary disease mortality each year (Beaglehole et al., 1988).

It has been observed that there has been an increasing trend towards central obesity in New Zealand, which carries with it an increased health risk (Wilson et al, 2001). Another cross sectional survey was carried out among a multiracial workforce of 5677 staff aged 46-64 years at worksites in Auckland and Tokoroa. It was found that the relative risk (95% CI) of diabetes mellitus and impaired glucose tolerance (IGT) was significantly increased among Maori (3.63), Pacific Islanders (2.34) and Asians (5.97) compared with European (1.00) (Scragg, 1991).

2.32 *Taiwan*

Centralized adiposity is related to cardiovascular risk factors independent of general obesity. A study in Taiwan revealed significant associations of upper body adiposity (shoulder, mid-arm and waist girth) with cardiovascular risk factors among 40 to 59 year old subjects in all subgroups assessed (men, pre-menopausal women and post-menopausal women) (Lyu et al., 1994).

Also, hypertension prevalence is very high in Taiwan, especially in over 45 years old. According to the result of NAHSIT 1993-1996 (Nutrition and Health Survey in Taiwan), the prevalence of hypertension of Taiwanese females over 45 years old was 42% using the Joint National Committee on Detection, Evaluation and Treatment of High Blood Pressure criteria, of Systolic Blood Pressure (SBP)/ Diastolic Blood Pressure (DBP) $\geq 140/90$ mmHg and/or under treatment (Pan et al., 2001).

Besides, diabetes mellitus is also a major health problem in Taiwan. A study investigated in Tainan city based on subjects over 20 years old showed the crude prevalence of diabetes was 9.0% (10.3% men and 7.9% women), and the age-adjusted prevalence was 9.2% (10.4% men and 8.1% women) (Lu et al., 1998).

Wang et al demonstrated the relationship of not only BMI but also central obesity indices (such as subscapular and waist circumference) to the incidence of Non-Insulin-Dependent Diabetes Mellitus (NIDDM) among Taiwanese men and women and that this relationship was stronger in women than in men (Wang et al., 1997).

2.4 Factors Increasing the Risk of Obesity in Middle Aged Taiwanese Women Living in New Zealand

2.41 Menopause and Changes in Body Composition

2.411 Weight Gain

Obesity is often revealed by the tendency for gradual weight gain with increasing age. For example, the average American adult gains around 10kg between age 20 and 50 years old (Grundy, 1998). Moreover, the weight gain is obvious especially in middle-aged women. Wing et al's study in America reveals that 485 middle-aged women, aged between 42-50 years old, gained an average of 2.25 kg during a 3 years follow-up study and 20% of these women gained 4.5 kg or more (Wing et al., 1991). In Taiwan, middle-aged female are also reported to be at risk groups for obesity. (See 2.14)

2.412 Sarcopenia

In most cases, weight gain is not accompanied by more muscle mass (Kyle et al., 2001). In fact, it is suggested that muscle mass and skeletal mass decline with increasing age whereas there is a tendency towards an increase in fat mass (Cohn et al., 1976). Skeletal mass and muscle mass declines with age as a result of reduced mechanical stress from an increasingly sedentary lifestyle whereas fat mass increases as a result of the reduced energy expenditure (Aloia et al., 1991).

Besides, menopause is associated with an accelerated loss of fat-free mass. Poehlman et al found that women who experienced menopause lost more fat-free mass than women who remained pre-menopausal in their 6 years follow-up study with weight loss of 3.0 kg and 0.5 kg, respectively (Poehlman et al., 1995).

2.413 Total Body Fat

Significant age related increases in total body fat, percentage body fat and BMI have been found. A study reported that total body fat in women increased with age by an average 0.41 kg/year. It

also showed that post-menopausal women had significantly higher total body fat and percentage body fat than did pre-menopausal and peri-menopausal women (Guo et al., 1999). Poehlman et al also found that women who experienced menopause had greater increases in fat mass than women who remained pre-menopausal (2.5 kg and 1.0 kg, respectively) and waist-to-hip ratios (0.04 and 0.01) in a 6-year follow-up study (Poehlman et al., 1995). Besides, the longer the time since menopause the greater the increases in weight, BMI, total body fat and percentage fat (Guo et al., 1999).

2.414 Central Body Fat

Through the aging and menopausal effects, central body fat distribution increases. Compared with pre-menopausal women, postmenopausal women showed a significant increase in the proportion of android fat and the ratio trunk fat/leg fat. In postmenopausal women, there are early changes in body fat distribution with a shift of body fat towards a more central location (Tremollieres et al., 1996).

A Taiwanese study, with 2776 Chinese men and 3176 non-pregnant Chinese women, indicated that in the age over 50, a greater amount of fat tends to accumulate in the abdominal region compared to the younger age group (Teh et al., 1996). In a further study in Taiwan, 193 postmenopausal women showed a higher android fat percentage, centrality index, glycosylated hemoglobin A_{1c}, serum concentrations of total cholesterol, low-density lipoprotein (LDL) cholesterol and atherogenic indices than premenopausal women (Chang et al., 2000). Moreover, this change in fat distribution appears to be more related to menopause than to age (Tremollieres et al., 1996).

2.42 Energy Expenditure

2.421 Physical Activity

Physical activity generally declines with age. Many people become progressively more sedentary as they pass through adulthood. Adolescents and young adults commonly engage in sports and other physical activities while older people tend to give these up (Grundy, 1998).

A study reported that physical activity was associated with increases in fat free mass and decreases in total body fat and percentage body fat in women. The effects of physical activity

were more profound in post-menopausal than in pre-menopausal women, and estrogen use had beneficial effects on body composition (Guo et al., 1999). Decreased activity was related to weight gain in middle-aged women, and those who lived alone gained more weight than married women (Wing et al., 1991).

Natural menopause is associated with reduced energy expenditure during rest and physical activity. Poehlman's study found women who experienced menopause had greater decreases in resting metabolic rate (-431 kJ/day versus -33 kJ/day) and energy expenditure on physical activity during leisure time (-532 kJ/day versus 268 kJ/day) than women who remained pre-menopausal (Poehlman et al., 1995).

2.422 Decline in Resting Metabolic Rate (RMR)

Resting metabolic rate (RMR) is known to decrease with increasing age, mainly because of a change in body composition. The fat-free mass decreases with age and because this mass is metabolically active, the RMR is likely to decrease (Visser et al., 1995).

The major reason is probably an age-related reduction in muscle mass. Muscle metabolism contributes importantly to RMR and its decline with aging leads to a proportional decrease in RMR. If energy intake does not fall in parallel with loss of muscle mass, body fat will increase (Grundy, 1998). A lower physical activity level and hormonal changes might also contribute to a lower RMR in older subjects (Poehlman et al., 1992).

In Netherlands, the average RMR for elderly females is 3.33 kJ/min, which is significantly lower than young females with average RMR at 4.08 kJ/min (Visser et al., 1995).

2.43 Gender Difference

The study from Bates et al. of 1556 older people (aged 65 years old and over) in UK found gender differences in food choice, in energy and nutrient intakes. Women ate more butter, full-fat milk and certain beverages, cakes, apples, pears and bananas. They had higher fat intakes than men and higher plasma concentrations of total and non-HDL-cholesterol (Bates et al., 1999).

The dietary survey data from 28 countries around the world indicates a mean TEI (total energy intake) of 10476kJ/d for men and 7784 kJ/d for women (Zhang et al., 1999).

2.44 *Acculturation*

In recent years, the life habits of many Asians have changed. Their societies are becoming more urbanized and industrialized. The food supply is growing and physical activity is declining. The result is weight gain in the population (Grundy, 1998).

Changes in life habits and the prevalence of risk factors are particularly evident in Asians who migrate to various industrialized countries. In new countries, overeating and physical inactivity are becoming a way of life. As the migrating Asians lapses into these habits, their risk of obesity increases disproportionately (Grundy, 1998). Asian immigrants usually change their food intake and eating habits after they move to the Western country. For example, compared to Chinese students living in China, Chinese students living in America consumed more meat, dairy products, fat, sweets, snacks and fast foods, which contain more fat, saturated fat and cholesterol. In addition, they consumed less fruits vegetables and starch (Sun and Chen, 1994).

2.441 *Typical Taiwanese Meals in New Zealand*

According to Boyer's study of 50 Taiwanese families living in Auckland in 1995, the typical Taiwanese meals are summarised as follows (Boyer, 1995):

Breakfast- Western style breakfasts were strongly favoured over more traditional food by most of the Taiwanese immigrants, where 72% favoured toast or bread and only 4% preferred the traditional Taiwanese breakfast of rice porridge and Chinese pickles.

Lunch- The typical Taiwanese lunch in Auckland varies from wonton, rice and vegetables to meat pies and fast foods such as McDonalds. However, it was found that 26% preferred the traditional meal of noodles and 26% preferred sandwiches.

Dinner- Most Taiwanese families preferred a traditional Taiwanese dinner with noodles or rice, vegetables and meat. Only a few of them (3%) consumed any kind of Western food at dinnertime, and this was only on special occasions such as a child's birthday.

2.442 Reasons Taiwanese Immigrants to New Zealand Change Their Eating Habits

"Convenience" and "speed of preparation" are the most common reasons for Taiwanese immigrants eating Western style breakfasts. Besides, the families with children have been influenced by their children's preference for cereal, fruit, egg and toast (Boyer, 1995).

The choice of lunch menu is largely determined by pragmatism. For those who did not work, there was both the time and facilities available to prepare a traditional Taiwanese meal; for those working or studying, convenience dictated menu selection, and hence, Western foods were more often consumed. Besides, it was found that many families had Western lunches during the week, but reverted to traditional Taiwanese lunches in the weekend (Boyer, 1995).

The reason for eating a traditional Taiwanese dinner is the tastiness of the food, and the fact that they were used to it. Some of them also noted the health benefits of food prepared using traditional Chinese methods. A further group commented that they were unsure how to prepare a traditional Kiwi meal or what such a meal consisted of (Boyer, 1995).

These changes were also seen in other Chinese migrant communities. Among Chinese-American women, breakfast was usually the first meal to be Westernised, largely for reasons of convenience. Food quality, cost and availability were some of the most important predictors of dietary change after immigration to the United State. Based on their findings, dietary acculturation in Chinese-American women appears to be a largely passive, non-cognitive process driven primarily by daily life issues such as convenience and cost (Satia et al., 2000).

Asian immigrants retained certain traditional foods and adopted other non-traditional foods. In America, for example, they noted that rice continued to be an important staple, but other traditional foods were replaced by cereal, bread, sandwiches, milk and soft drinks. Dinner changed the least of the three meals and remained the most traditional meal. However, breakfast, lunch and snack items were replaced by foods more commonly consumed by Western society (Pan et al., 1999).

2.443 Taiwanese Food Shopping Patterns in New Zealand

Dietary behaviour also influences shopping patterns. While much of the shopping for food in Taiwan takes place in small stores or in the marketplace, the major location of food purchases in

New Zealand is the supermarket. Thus, the transition from small store to supermarket shopping could be seen as an example of assimilation among the Taiwanese community (Boyer, 1995).

Boyer's study found that majority of the Taiwanese did their shopping at the local supermarket and 29% of them did not even shop at specifically Asian food shops. It showed that the Taiwanese immigrants were consuming less Taiwanese food, and were more prepared to purchase Western brands of traditional Asian products such as noodles, rice and soy sauce (Boyer, 1995).

On arrival in New Zealand, Taiwanese families face a selection of foods that is often different from what they are accustomed to in their home country. The variety of foods consumed in the Chinese diet is also much greater than in the Western diet.

Chinese people in New Zealand consume many Western vegetables (e.g. carrots, tomatoes, beans), however, other Chinese vegetables have no Western equivalent (e.g. bamboos, Chinese mushrooms). On the other hand, dairy products and some cheaper Western vegetables are not traditionally consumed in the Chinese diet (e.g. cheese, lettuce) (Soh et al., 2000).

A study in Dunedin indicated that 65% of Chinese mothers experienced some food-related difficulties on arrival in NZ. The most common problem identified (73%) was a reduction in the varieties of vegetables, fish and meat available, and that many fruits and vegetables were unknown to them. The high cost of fruit and vegetables (9%), the poor flavour of pork and fish (18%) and the lack of freshness of foods (9%) were also identified as problems (Soh et al., 2000).

2.444 Length of Immigration

An Auckland University study on 51 Taiwanese families conducted in 1994 found that the longer Taiwanese immigrants had been in New Zealand, the stronger the desire for convenience was likely to be. Thus, the consumption of sandwiches and fast food was highest among those who had been in New Zealand for four years or more; while noodle and rice consumption was highest among those who had been in New Zealand no more than one year (Boyer, 1995).

Dietary changes were related to length of exposure to the new environment, ability of immigrants to speak or read the new language, social contact with people of the new culture and a greater involvement in extracurricular activities and educational programs (Pan et al., 1999).

2.445 Age of Immigrant

It is also observed that younger immigrants generally tended to change their food habits more readily than the older immigrants, and that men were more likely to change their food habits than women who had more experience preparing traditional cuisines (Pan et al., 1999).

2.5 Body Image and Behaviour Modification

2.51 Body Image

2.511 Healthy Body Weight

Healthy body weights were first defined as usual or normative weights in a population. People whose weights were average or between the 15th and 85th percentiles for a given age and sex group in the population, were considered to have healthy weights. Those whose weights were above these levels were considered to have unhealthy weights. The problem with such a definition is lack of evidence that the existing distribution of weights in the population is optimal for health (Dwyer, 1996).

Later definitions of healthy weight were based on ideal or desirable weights for minimal mortality, using data from large populations such as insured individuals. Healthy or desirable weights were defined as the range of weight-for-height for which mortality was lowest. However, ideal or desirable weights focus only on weights that minimize mortality, not morbidity, and ignore functional status or quality of life; as such they are incomplete (Dwyer, 1996).

The more satisfactory approach to defining healthy weight is that weight associated with measurably lower, or lesser morbidity. In most large, long-term, well-designed studies, the lowest morbidity and mortality rates occurred in adults at weights that yielded BMIs between 19 and 25 (Abemathy and Black, 1996). Normal body fat percentages are considered to be 12-20% body weight in male and 20-30% body weight in females (Abemathy and Black, 1996).

2.512 Healthy Weight Losses

Most obesity related conditions could be remedied or improved with weight losses of around 10% of body weight. Relatively small weight loss decreases morbidity, increases function and possibly decreases mortality (Dwyer, 1996).

Regardless of the amount of weight lost, maintaining the lost weight is vital. Most health benefits are lost and risks rise when weights is lost and then quickly regained. Therefore, small but permanent losses are the first priority. Greater losses may follow if small losses can be sustained. Therapeutic or curative measures for those with weight-related health problems must therefore emphasize long-term weight management (Dwyer, 1996).

2.513 History of Body Image

In Europe and America prior to 1900, plumpness was valued as insurance against consumptive illness. At the major transition point around the beginning of the twentieth century, public attitudes moved from valuing or accepting fatness to desiring or seeking thinness. Many types of diets and weight loss strategies began to be widely available and used after 1900 (Sobal, 2001).

During the second half of the twentieth century, social ideals have increasingly emphasized the value of slimness for women, as evidenced in the increasingly thinner body shape of idealized women's roles, such as beauty pageant winners and fashion models (Garner et al., 1980).

The rejection of fatness has worsened since the beginning of the twentieth century, but is grounded in a prior history of stigmatisation of obese individuals both in Europe and in Asia (Stunkard et al., 1998). A moral model was pervasive in developed societies for most of the twentieth century, treating fatness as badness rather than sickness (Sobal, 1995). However, since the 1950s there has been a medicalization of obesity that cast it as an illness rather than a consequence of moral failure of the individual (Sobal, 1995).

2.514 Weight Concern in Western Societies

Nowadays, the pressure exerted by society on its members to drive for "the body beautiful" is particularly strong in Western cultures, where an ever-increasing value is placed on the possession of a healthy slim body (Cuadrado et al., 2000).

Western society has been criticized for its emphasis on a slim physique and negative stereotyping of obese figures. It has been proposed that this has resulted in mass dissatisfaction with body shape and weight concerns among the female population. This dissatisfaction has been argued to lead to negative attitudes toward eating, a preoccupation with weight and dieting, and the pervasiveness of eating disorders in Western society (Lake et al., 2000).

2.5141 Commercial Consequences of Weight Concerns in Western Society

ADVERTISEMENTS AND BEAUTY ADVICE

Capitalism and patriarchy most often use the media to project the culturally desirable body to women. These images are everywhere; on TV, in the movies, on billboards and in print. The glossy pages of advertising and beauty advice in women's magazines hold up an especially devious mirror. They offer to help women while presenting a standard nearly impossible to attain (Hesse-Biber, 1996). In Arizona and California, 57% of the elementary school girls and 55% of the middle school girls tried to look like girls/women on TV and in magazines (Taylor et al., 1998).

THE DIET AND WEIGHT-LOSS INDUSTRY

Increasingly, women are told that they can have the right body if only they consume more and more products. It makes many women believe that in order to lose weight they need to buy something, for example, a pill, a food plan or membership in a self-help group. In October 1992, *Working Women* magazine reported that at any given time, 65 million Americans are dieting, and spending more than \$30 billion annually in the pursuit of losing weight (Hesse-Biber, 1996).

There are currently more than 17,000 different diet plans, products and programs from which to choose. Typically, these plans are geared to the female market. They are loaded with promises of quick weight loss and delicious low-calorie meals. In 1991, 7.9 million people enrolled in commercial weight-loss programs generating more than \$2 billion in revenue for these plans (Hesse-Biber, 1996).

THE RIGHT BODY WITH EXERCISE

Our culture mirror has undergone a massive transition from the 1950s, when the ideal female body had soft curves. In the late 1950s, the tiny waistline was in; clothing was tapered to fit,

emphasizing the shoulders, waist and hips. Women relied on girdles to achieve this look. During the 1960s fashion moved away from the hourglass shape to a more stick-like figure. The waistline disappeared. Girdles were becoming lighter and more flexible. Today, a woman's body is supposed to be in shape on its own, liberated from the girdle. Women are expected to be thin and firm with exercise and dieting. More recent advertisements for foundation garments promote the ease and freedom of wearing light, stretchy fabrics (Hesse-Biber, 1996).

2.515 Weight Concerns in the Chinese Female

Among Asian societies such as China, Hong Kong, India, Malaysia, Singapore and Taiwan, eating disorders had been reported to be very rare. This rarity is conjectured to be due to the Non-Western acceptance of plumpness as a sign of prestige and beauty, and hence the unpopularity of dieting behaviour (Lee, 1993).

For example, it was stated that because Chinese gods were almost always portrayed as being fat, modern Chinese women would accept obesity (Buhrich, 1981). Besides, some studies indicated that the people of Non-Western countries prefer heavier figure. Thus, it supports the idea that Western countries have thinner weight ideals (Altabe, 1996).

However, Asian countries are undergoing rapid socio-economic changes, which bring with them pervasive advertising pressures and adoption of Western attitudes and habits. For example, in the Chinese cultures increasing modernization and exposure to European American ideals have resulted in the devaluation of the once sought after fat body (Burich, 1981).

A current study found that more Chinese women than men reported dissatisfaction with a number of their body parts and desired to weigh less. Females desired a significantly lower ideal BMI, whereas males desired a significantly higher ideal BMI (Davis and Katzman, 1997). There is a pressure on Chinese women whose starting weight is below the ideals of European American women to diet (Lee, 1996). A study showed that the majority of Hong Kong female students who were underweight by western standard, and nearly all female students above a body mass index of 20.5 kg/m^2 were cognitively inclined to diet and weight loss, and many practised weight control behaviour (Lee, 1993).

2.516 *Effect of Immigration to Western Countries on Body Image*

The incidence of eating disorders has been shown to increase in Non-Western women entering Western society. A study revealed that Australian-born Chinese women have greater dissatisfaction in body shape perceptions than Hong Kong-born Chinese women (Lake et al., 2000).

Explanations come from two opposing viewpoints. The first attributes an increase in maladaptive eating patterns to a culture clash experienced by individuals who migrate to a new country, due to the pressure to adapt to a new culture. However, the alternative cultural assimilation suggests that the incidence of eating disorders increases in women from Non-Western cultures when they move to a Western society and assimilate the host society norms and values, including those relating to the ideal female body shape (Lake et al., 2000).

A study indicates that Chinese students in United States reported significantly less body and weight dissatisfaction, higher self-esteem, lower depression, less dieting and more exercise as compared to their cohorts in Hong Kong (Davis and Katzman, 1998).

2.52 *Behaviour Modification*

2.521 *Stages of Change Model*

The stages of change model, also known as the trans-theoretical model of behaviour change (TTM), includes five distinct stages in behaviour change (Ni Mhurchu et al., 1997):

Stage 1. Pre-contemplation- not intending to make behaviour changes in the foreseeable future.

Stage 2. Contemplation- considering behaviour change but not yet making a firm commitment to change.

Stage 3. Preparation- commitment to changing behaviour in the next 30 days but not yet changing behaviour.

Stage 4. Action- successfully changing behaviour.

Stage 5. Maintenance- behaviour changes sustained over 6 months.

The relationship between the stages-of-change model and dietary change were studied in recent years. McCann et al used the stages-of-change model to predict which types of subjects with hyperlipidemia were most likely to participate in a dietary intervention study to lower cholesterol. They found that those classified in the preparation stage were more likely to participate, than those in the pre-contemplation stage (McCann et al., 1996).

An association was found between stage of change and dietary fat intake. Persons in the pre-action stages (pre-contemplation, contemplation and preparation) had higher fat intakes than persons in the action and maintenance stages (Greene et al., 1994). Furthermore, a relatively orderly association was also found between stage and fat intake; with lower fat intakes in the more advanced stages (Steptoe et al., 1996).

Fruit and vegetable consumption were also found to be associated with stages-of-change. In Laforge's study, subjects were classified into stages of change based on intention to adopt the U.S. National Cancer Institute's Five-a-Day guidelines and consumption of fruit and vegetables. It was found that only 15% of respondents were in the action or maintenance stages, whereas 67% were in either pro-contemplation or contemplation and 19% were in preparation (Laforge et al., 1994). In conclusion, to be more effective, interventions to change dietary behavior may need to be more adapted according to the stage of change of the subject.

2.522 Exercise

Exercise appears to improve mood and psychological well being as well as enhancing self-concept and self-esteem. Plante and Rodin concluded that exercise leads to improved mood, self-concept, and work behaviour as well as improved cognitive functioning during and immediately following exercise. Their review suggested that exercise is likely to decrease mild anxiety, depression and stress, and may improve certain work-relevant behaviours (Plante and Rodin, 1990).

2.6 Weight Loss Programmes

It is clear that, excepting surgical removal, fat loss can result only from reduction of energy intake, from increasing energy expenditure, or from both changes simultaneously.

2.61 *Dietary Programs and Weight Loss*

2.611 *Fasting*

The most extreme form of dieting is fasting, which means that no food energy is consumed, whereas losses of water, electrolysis, vitamins and trace elements are compensated. Fasting has the disadvantage of leading to considerable loss of lean body mass. Most studies demonstrate that the long-term results of fasting programmes are not satisfactory. Rebound generally occurs and sustained weight loss is rare (Rossner, 2001).

2.612 *VLCD (Very-Low-Calorie Diets) and LCD (Low-Calorie Diets)*

VLCD are defined as hypo-energetic diets containing less than 3350 kJ/day. They were devised in the 1920s to provide larger and more rapid short-term weight loss than standard low-energy diets, whilst avoiding the dangers and adverse effects of total fasting (National Task Force on the Prevention and Treatment of Obesity, 1993).

During treatment with VLCD ketonaemia develops within a few days. Generally an anorectic effect is observed, and most patients on VLCD programmes do not complain of hunger as long as they adhere to the diet (Rossner, 2001). A study indicated that after use for the same period of time, VLCD produce average weight losses, which are two to three times greater than weight losses resulting from conventional low-energy reducing diets (Wadden, 1993).

However, there are a number of contraindications to the use of VLCD. These include cardiac abnormalities, cholelithiasis or cholecystitis, and renal dysfunction. Besides, VLCD are inappropriate for infants, children and pregnant and lactating women (Moloney, 2000).

Low calorie diets (LCD) generally consisting of 3350-5000 kJ/day are based on the same component as VLCDs. Whereas these seem to result in safe weight losses, they may not induce ketonaemia and so may be more difficult to adhere to comparing to VLCD (Rossner and Flaten, 1997).

2.613 Macronutrient Composition of Diets

The Role of Fat

Appetite studies have demonstrated that because fat is less satiating than carbohydrate and protein, high-fat diets promote passive over-consumption and are an important contributing factor to weight gain and obesity (Astrup and Raben, 1996).

Several dietary intervention trials have shown low-fat, high carbohydrate diets consumed at libitum cause spontaneous weight loss. Weight loss was correlated positively to the reduction in dietary fat content in a dose-dependent manner. Astrup et al. summarized the relation between dietary fat reduction and weight loss in six low-fat intervention trials. These suggested that a reduction in dietary fat content from 40% to 30% of energy produces an average weight loss of 5kg in obese patients (Astrup et al., 1997). Moreover, in a multivariate analysis of one study, weight loss was predicted best by the reduction in percentage of fat energy rather than by the change in total energy intake (Sheppard et al., 1991).

Another review of the results from 28 clinical trials showed that a reduction of 10% in the proportion of energy from fat was associated with a reduction in weight of 16g/d (Bray and Popkin, 1998).

Fat substitutes, which contain the fatty acids found in conventional fats and oils, may make it easier to prevent and treat obesity by making the diet palatable. Olestra, for example, is a mixture of long-chain fatty acid esters of sucrose, with the physical properties of triglycerides, but it is not digested by lipolytic enzymes or absorbed, making it non-energetic (Akoh, 1995). However, the efficacy of olestra remains to be determined.

The Role of Carbohydrate

Advice that produces a reduction in consumption of fatty foods without an absolute increase in consumption of carbohydrate-rich foods is unlikely to be effective in the long term amongst free-living individuals. There are three reasons. First, consumers are likely to develop resistance to prolonged exposure to negative advice, and are more likely to be motivated by positive advice in the long term (Meilson and Larson-Brown, 1990). Second, individuals in the free-living situation find advice to reduce consumption of foods high in fat particularly difficult to implement in practice (Van Assema et al., 1999). Third, low-fat diets in which absolute

carbohydrate intake is not increased are likely to provide only a low weight/volume of food. Diets that do not provide a reasonable quantity of food are unlikely to be satisfying for many individuals, and are unlikely to be adopted in the context of lifelong eating habits (Kirk, 2000).

Carbohydrate/Fat Ratio

There is considerable evidence to support the hypothesis that an increase in carbohydrate/fat ratio should help body weight control. There are two strands of physiological evidence. First, an increase in carbohydrate/fat ratio is thought to have a satiety-inducing effect, so that overeating is less likely to occur, possibly because carbohydrate exerts a more powerful metabolic effect than fat on satiety, through feedback mechanisms such as glucostatic mechanisms or mechanisms sensitive to the rate of hepatic glucose oxidation (Kirk, 2000). Current thinking is that an increase in carbohydrate/fat ratio induces satiety because it is associated with a reduction in the energy density of the diet, so that for a given energy intake a larger volume or weight of food has to be eaten (Kirk, 2000).

The second strand of physiological evidence is that if overfeeding occurs on a diet with a high carbohydrate/fat value, overfeeding substantially increase the rate of carbohydrate oxidation and slightly suppresses fat oxidation. Thus, the net storage of energy is smaller (Kirk, 2000).

Empirical evidence from dietary intervention trails shows that an increase in carbohydrate/fat ratio achieved by low-fat interventions is effective in producing spontaneous weight loss. Astrup et al conducted a meta-analysis of the results from 16 controlled low-fat ad libitum diets of 2-12 months duration involving 1728 subjects of both sexes. This analysis showed a spontaneous weight loss of 2.5kg more in the intervention group than in the control group (Astrup et al., 2000).

On the other hand, low carbohydrate, high protein (LCHP) diets, such as Atkin's diet, greatly reduces carbohydrates from food without restricting protein and fat intake. Deprived of carbohydrate, the body uses fat for fuel and a small part of metabolised fat is eliminated in the urine as ketone bodies (Hirschel, 1977). However, this carbohydrate free diet is high in fat, cholesterol and purines. The predictable hyperlipacidemia and ketosis are recognized health risks. Additionally, hypercholesterolemia is to be expected in many of the adherents to such a diet (Forster, 1978).

Glycaemic Index

Different foods containing an equal amount of carbohydrate vary considerably in their effects on hormonal and blood glucose response after a meal (Jenkins et al., 1988). The glycemic index (GI) is a direct measure of the glycaemic response to a food and thus reflects all the mechanisms that can influence the glycaemic response (Englyst et al., 1999).

Various studies have shown that meals characterized by low-GI foods prolong the duration of satiety (Holt et al., 1994). A study of obese subjects found that following the intake of a high-GI meal there was rapid absorption of glucose, which induced a sequence of hormonal and metabolic changes that subsequently promoted excessive food intake (Ludwig et al., 1999). In addition, reducing the GI of the diet may also have beneficial effects on blood lipids and cardiovascular disease (Moloney, 2000).

Dietary Fibre

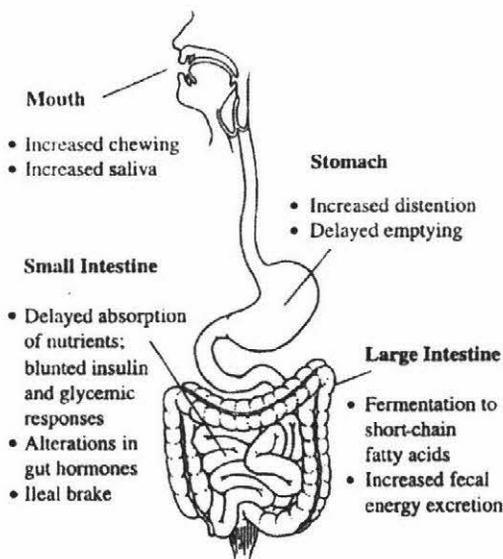
In 2001, Howarth et al. summarized published studies on the effects of dietary fibre on hunger, satiety, energy intake and body composition. They found the majority of the studies indicate that an increase in fibre intake increases postmeal satiety and decreases subsequent hunger under conditions of fixed energy intake. When energy intake is *ad libitum*, mean values for published studies indicate that consumption of an additional 14 grams fibre daily for more than two days is associated with a 10% decrease in energy intake and body weight loss of 1.9 kg over 3.8 months (Howarth et al., 2001).

Furthermore, they also found that obese individuals might exhibit a greater suppression of energy intake and body weight loss with higher fibre diets. Their energy intake reduced to 82% of control intake with weight loss of 2.4 kg compared to 94% and 0.8 kg in lean people. It was suggested that the ability of fibre to promote negative energy balance may be most pronounced in individuals who need to lose weight most (Howarth et al., 2001).

There are several physiologic effects of fiber that can influence energy regulation (Figure 5). Firstly, because only a proportion of dietary fiber will be fermented in the large intestine contributing to energy intake, it reduces energy density of total food consumed (Jeraci et al., 1993). The energy density of dietary fibre reported by FAO is 8kJ/g (FAO, 1998). Secondly, foods that are naturally rich in fiber require greater mastication and thus promote satiation by

reducing the rate of ingestion (Heaton, 1973). Thirdly, because some of the soluble fibers absorb large quantities of water and form gels, they may further increase stomach distension, and trigger afferent vagal signals of fullness and hence contribute to satiety during meals and satiation in the postmeal period (Bonfield, 1995). Fourthly, soluble fibers delay gastric emptying by forming a viscous gel matrix that traps nutrients and retards their exit from the stomach and retards digestion (Bonfield, 1995). Thus, nutrient absorption occurs over an extended period during consumption of diets higher in soluble fiber, which may reduce hunger and increase satiety.

Figure 5: The effects of fiber in the gastrointestinal tract on parameters related to energy regulation (Howarth et al, 2001)



In addition, glucagon-like peptide-1 (GLP-1) hormone secreted in response to glucose, fat, fermentable fibers and other stimuli, has been shown to slow gastric emptying, reduce hunger, and promote weight loss when provided exogenously (Gutzwiller et al., 1999). Therefore, dietary fiber may also influence energy intake and body weight through its effects on gut hormones.

Finally, higher fiber diets may directly reduce digestible energy intake and may contribute to long-term weight management. Some fibers, in particular the more soluble, fermentable fibers from fruits and vegetables, reduce the overall absorption of fat and protein (McBurney and Thompson, 1990).

2.614 Meal Replacement

Dietary interventions, which include the use of energy-controlled, nutrient-dense meal replacements remain a viable, practical safe and effective alternation to pharmacological intervention (Heber et al., 1994). A study found that patients who ate nutritionally balanced, pre-packaged meals received greater clinical benefits and nutritional completeness and showed better compliance than did those following a self-selected food plan (McCarron et al., 1997).

Another long-term study concluded that defined meal replacements can be used for successful, long-term weight control and improvements in certain biomarkers of disease risk (Ditschuneit et al., 1999).

2.615 Meal Pattern/Frequent Eating

Dietary treatment of obesity not only focuses on the total energy intake over the day, but also addresses the distribution of energy into meals. It is a common clinical experience that obese individuals tend to skip meals to reduce their total energy intake over the day (Hill and Rogers, 1998). However, this kind of eating behavior often results in overeating in the later part of the day when resistance to good intentions is weakened by increasing hunger sensations. Thus there is general agreement that obese persons should consume three main meals per day with two balanced snacks in between (Rossner, 2001).

In summary, there are four possible physiological advantage associated with frequent eating that may improve body weight control (Kirk, 2000). First, frequent eating may help to control hunger and improve the accuracy of energy compensation. Second, frequent eating may help to increase dietary carbohydrate: fat ratio (Kirk, 2000). Third, frequent eating is likely to shift the temporal distribution of energy intake away from the latter towards the earlier part of the day. Fourth, a pattern of eating little and often may be more compatible with a physically active lifestyle than a pattern of eating two or three large meals per day (Kirk, 2000).

The timing of the largest meal of the day may also affect body composition. A study comparing large evening meals to the ingestion of large morning meals resulted in slightly greater weight, but ingestion of larger evening meals resulted in better maintenance of fat-free mass. Thus,

incorporation of larger evening meals in a weight loss regimen may be important in minimizing the loss of fat-free mass (Keim and Van Loan et al., 1997).

2.62 *Exercise Programs and Weight Loss*

Studies have shown that a program of increased leisure-time physical activity with constant dietary intake can result in increased weight loss in women (Hill et al., 1989). In a 1-year randomized, controlled trial in 54 free-living, moderately overweight men aged 30-59, it was shown that a 1-year program of supervised exercise (without change in dietary intake) produced a similar reduction in percent body fat as did a program of moderate caloric reduction (without increase in exercise level) (Wood, et al., 1988).

2.621 *Mechanisms*

Theoretically, physical activity can affect both sides of the energy balance equation in adults (Wilmore, 1996):

$$\text{Energy Intake} - \text{Energy Excreted} = \text{RMR} + \text{TEF} + \text{TEA}$$

(While RMR = Resting Metabolic Rate, TEF = Thermic Effect of Feeding and TEA = Thermic Effect of Activity)

Generally, with exercise of low to moderate intensity and short duration, there is little or no change in energy intake. With exercise of higher intensity and longer duration, there is an increase in energy intake (Andersson et al., 1991).

RMR represents 60% to 70% of the total energy expended each day in an active individual who is not training. An increase in the RMR by only 1-2% could have a major effect on weight regulation over the long term (Broeder et al., 1992).

Increasing physical activity by formal exercise training can substantially increase the TEA. There is also the potential for a substantial expenditure of energy post-exercise, because metabolic rate can remain elevated above resting levels for several minutes up to over 24 hours after exercise (Poehlman et al., 1991). However, besides increasing energy expenditure, a formal exercise

program may result in a spontaneous reduction of normal daily activity throughout the remainder of the waking day (Wilmore, 1996).

2.622 Exercise Modalities

Resistance Exercise

Theoretically, resistance exercise should lessen the decline in RMR if it preserves FFM (Fat-Free Mass) by inducing hypertrophy of skeletal muscle (Walberg, 1989). For example, muscular men who weigh the same as obese men have a significantly higher RMR (Segal et al., 1985).

Two studies incorporating resistance exercise during dieting in obese women found contradictory results: one study found an increase in FFM (Ballor et al., 1988), but a second study found no effect of resistance exercise on FFM or RMR (Donnelly et al., 1991). The lack of effect on FFM in the second study may have been due to the relatively low energy intake overriding the potential effect of resistance exercise.

Aerobic Exercise

On the other hand, aerobic exercise, although it often does not significantly increase muscle mass, may have other advantages over resistance exercise. Aerobic exercise may be more effective in increasing peak oxygen consumption (VO_{2max}), an index of cardio respiratory capacity.

Aerobic exercise is generally recommended because it results in greater utilization of fat stores and greater energy expenditure in a typical exercise session than does anaerobic exercise (Geliebter, 1997).

2.623 Exercise Frequency

Pollock et al. researched the training frequency required to significantly change the body composition of individuals who walked or ran for over 30 mins. They found whilst training twice weekly was not instrumental in changing body weight, skinfolds or percentage body fat, exercising 3 and 4 days weekly was effective. Further, the 4 days weekly group lost significantly more weight and fat than the 3 days weekly group. Therefore, while exercising 3 days weekly will produce changes, training more frequently will be more effective (Pollock et al, 1975).

An extensive review of training studies found that changes in fitness are directly related to frequency of training when it is considered independent of the effects of intensity, duration, program length and initial level of fitness (Wenger and Bell, 1986).

2.624 Exercise Duration

The influence of exercise duration on weight loss in a group of previously sedentary men was investigated. The subjects were divided into a control group without any exercise and three exercise groups with 15, 30 or 45 minutes of exercise per session. They found whilst the three exercise groups decreased in body fat and waist girth significantly more than the control group, 45 minutes elicited significantly greater changes than 15 or 30 minutes of exercise (Milesis et al., 1976). In addition, more recent studies have shown that longer workouts (more than 35 minutes) produce greater fitness benefits, perhaps because the proportion of fat metabolised continues to rise for the first 30 minutes of exercise (Wenger and Bell, 1986).

In addition, it was suggested that walking for at least 1 hour on most days represents the best exercise prescription for most obese individuals (Despres, 1994).

2.625 Exercise Intensity

The intensity of an exercise relates to fitness level. To attain high fitness, high intensity exercise must be performed. Intensity is of less importance in weight maintenance, where total amount of work done in a session and the number of sessions per week determine the overall caloric expenditure resulting from a specific program (Wood, 1996). A study has shown no effect of exercise intensity on body composition changes, either with or without dietary restriction, when total energy expended weekly is comparable. It was also concluded that fat loss is a function of energy expended rather than exercise intensity (Grediagin et al., 1995).

2.63 Diet and Exercise Combination Programs and Weight Loss

Theoretically, the addition of significantly increased energy expenditure to traditional “dieting” should enable the overweight person to achieve a given fat loss with less severe caloric restriction and so with less perception of deprivation and with less potential hazard to health (Wood, 1996).

For instance, one study showed that the addition of a supervised program of walking and jogging to a comprehensive course of instruction in low fat, energy reduced eating in men almost doubles the loss of body fat mass (Wood et al., 1991).

A similar result was found in obese women. A study designed with 16 weeks intervention for three groups (control group, diet only group and diet plus aerobic exercise group) found that although there were more changes in body mass in the diet only group (-7.2 kg) than the diet plus exercise group (-4.0 kg), the percentage of body fat decrease doubled in the diet and exercise group (-2.4%) compared to the diet only group (-1.2 %) (Evans et al., 1999).

Another study combined caloric restriction with a walking program in a group of obese women who were studied for 48 weeks. In these circumstances, a weight loss of 17-20% of body weight was accompanied by a reduction of resting metabolic rate for the lower body weight (Wadden et al., 1990).

2.631 Interactions Between Exercise and Diet

The influence of exercise on energy intake and energy balance has been investigated in short-term experimental studies in an attempt to elucidate some of the possible mechanisms involved. One study has shown that in the short-term exercise does not increase hunger and appetite (King et al., 1997). Another study also found that while exercise doesn't increase the drive to eat within 8 hours of the cessation of exercise, it raises the perceived pleasantness of foods in dietary restrained women (Lluch et al., 1998).

It was summarized in a recent review article, that contrary to popular belief that exercise would cause an automatic increase in appetite; most short-term experimental studies have shown there is no dietary compensation for added exercise (Moore, 2000). It has been suggested that appetite responses are more sensitive to carbohydrate balance than fat balance, due to the body's greater ability to store fat compared with carbohydrate (Flatt, 1987). Since the intensity and duration of exercise has the ability to alter macronutrient utilization, it may have the ability to alter appetite and hence energy intake.

One study found clear evidence of an interaction between the energy cost of the exercise and the macronutrient composition of diet, such that there had been a suppression of the high-fat

hyperphagia seen on the non-exercise day (Murgatroyd et al., 1999). Further evidence of an activity-macronutrient interaction was also found in Lissner's study. Data from their prospective study indicated that weight changes were only significantly dependent on dietary fat content in sedentary women (Lissner et al., 1997).

2.64 Long-term Maintenance

One of the major issues in the treatment of obesity is the long-term maintenance of weight loss. In a review of studies addressing long-term weight maintenance, it was reported that individuals who were most successful at maintaining weight loss had incorporated regular exercise into their lifestyle (Pronk and Wing, 1994).

A marked effect of exercise during the follow-up period when dietary control was relaxed has also been found. Subjects who continued to exercise or took up exercise in the follow-up period were much more likely to maintain their lower body weight than those who undertook no exercise (Pavlou et al., 1989).

In the long-term view, changing everyday lifestyle by increasing physical activity may also result in weight reduction. A study investigated the long-term outcomes of a cognitive-behavioural weight-control intervention with the first intensive 10-week psycho-educational approach focused on lifestyle change, followed by a less intensive 2-year phase focusing on relapse prevention and maintenance of lifestyle changes. The researchers found significant decreases in both body mass index and glucose level (Dornelas et al., 1998).

2.7 Objectives of the Study

The objectives of this study are:

- To design an individualized diet and exercise intervention program for Taiwanese females aged 40-60 who wish to lose body weight.
- To test the intervention program on 20 subjects to estimate its effectiveness. Ten additional subjects will act as controls and will take part in all aspects of the study except the intervention.

- To use the test results and experiences gained, to modify the intervention program to improve its effectiveness.

Chapter 3

METHODOLOGY

3.1 Ethical Approved

Ethical approved for this study was obtained from the Massey University Albany Campus Human Ethics Committee Reference MUAHEC 00/040. The ethics application and associated documentation are shown in Appendix 1.

3.2 Subjects

The subjects for this study were 40-60 years old migrant Taiwanese women living in New Zealand. Advertisements in Chinese were placed in local Taiwanese supermarkets, souvenir shops, golf clubs, pharmacies and churches (See Appendix 2). Women who were interested in taking part contacted the researcher by phone, by email or by post.

Then, the researcher sent those that enquired the participant information sheets to provide detailed information about the study (See Appendix 3). The potential volunteer phoned or emailed the researcher if they were interested and a suitable time and place for the first visit was arranged. This visit would be at a location chosen by the volunteer e.g. home, workplace etc. The signed consent form was collected at the first visit (See Appendix 4). Appointments were then made for the second home visit at a location and time convenient to the subject.

Thirty volunteers enrolled in the study; twenty subjects were in the intervention group and the other ten were in the control group. Three subjects from the intervention group withdrew from the study because of illness or travelling, yielding a responding rate of 90%.

3.3 Methods of Data Collection

3.31 Anthropometrics Measures

The following body measurements were taken before and after the intervention: body weight (kg), body height (cm), skinfolds (mm) at forearm, triceps, biceps, subscapular, abdominal, suprailiac, thigh and circumferences (cm) at waist, hip, abdomen, thigh and calf (See Appendix 5).

3.311 *Body Weight and Height*

Body weights were measured at least twice using the Wedderburn TANITA electronic digital scale accurate to 100g. The scales were calibrated using a standard weight. The scale was always placed on a hard surface or special board before the measurement was made. All subjects were asked to wear T-shirt and shorts for this measurement. They were also asked to look ahead and stand in the middle of scales during the measurement.

Body height was measured as follows: the subject stood with feet together stretching upwards to the fullest extent, aided by gentle traction by the measurer on the mastoid process. The subject's back was straight and their heels did not leave the ground.

3.312 *Skinfolds*

All skinfolds measurements were taken three times on the right side of the body. The mean values of the three readings were used in the data analysis. The skinfolds were measured using the techniques and instruction laid down by ISAK (International Society for the Advancement of Kinanthropometry) (See Appendix 6) A Holtain skinfold calliper was used, which was designed to exert a constant pressure of 10 gms/sq mm over its entire operating range. The standardized sites for skinfold measurement (measuring points) are listed below:

Forearm- The halfway point of the line drawn between the styloid process of radius and the medial epicondyle.

Triceps and Biceps- The arm hangs relaxed at the side. The mid-point between acromiale and olecranon process is marked. A flexible Lufkin tape is used to surround the upper arm horizontally from the middle point. The most anterior point is the measuring point for the biceps and the most posterior point is the measuring point for the triceps.

Subscapular- When the arm hangs relaxed by the side, mark the measuring point of the subscapular 2cm and 45° lateral from the scapular tip.

Abdominal- The measuring point of the abdominal is 5cm lateral from the umbilicus.

Suprailiac- The ilio-axilla line from the mid point of the armpit to the lateral superior edge of ilium is found. The cross point of a horizontal line from the umbilicus and the ilio-axilla line is the measuring point for the suprailiac skinfold.

Thigh- The subject was asked to sit on a chair with her right knee slightly flexed. The middle point between the inguinal crease and the anterior superior edge of the patella was marked as the measuring point of the thigh.

3.313 *Circumferences*

The circumferences were also measured using the techniques and instructions laid down by ISAK with a Lufkin tape. The tape was applied lightly to the skin surface so that the tape was taut but not tight. The circumferences measured were as follows:

Waist- The narrowest horizontal circumference between the mid point of the lower costal rib and the iliac crest.

Abdominal- The circumference at the greatest forward protuberance of the abdomen, usually at the umbilicus.

Hip- Horizontally around the maximum protrusion of the abdomen with the heels together.

Right Thigh- The subject was asked to sit on a chair with her right knee slightly flexed. The circumference of the middle point between the inguinal crease and the anterior superior edge patella was measured.

Right Calf- The subject was asked to stand with feet slightly apart and weight evenly distributed on both feet. The widest horizontal circumference between the ankle and knee was measured.

3.32 *Questionnaires*

Subjects were asked to fill out a General Questionnaire and Physical Activity Questionnaire-Part 1 before the study and Physical Activity Questionnaire-Part 2 after the study.

3.321 Questionnaire Development

Questionnaires in similar studies were studied and some questions adapted for use of this study. All questionnaires were translated into Chinese and modified to suit the subjects. A pilot test was conducted with 3 potential volunteers who were qualified for this study. The results of the pilot test were not included in the study but provided useful information on the questionnaire design, wording and measurement scales. For example, in the General Questionnaire, multiple-choice of previous weight-loss treatment experiences was limited to one single choice of the “most successful” treatment experienced. In the Physical Activity Questionnaire-Part 1 & -Part 2, the question regarding time spent on cycling each day was deleted, as it wasn’t popular among the subjects.

3.322 General Questionnaire

Subjects were asked to answer the 24 questions in the general questionnaire before the study (See Appendix 7). This questionnaire provided demographic data and information on the subjects’ experiences in previous weight loss programs. Questions related to age, numbers of children, education levels, health status (medication and menopause experience), lifestyle behaviour (smoking, coffee and alcohol consumption), weight history and previous weight loss programs followed.

3.323 Physical Activity Questionnaire

All subjects were asked to answer 27 questions on physical activity before and after the intervention (See Physical Activity Questionnaire-Part 1 and -Part 2, Appendix 8). The Physical Activity Questionnaire-Part 1 before the intervention provided information to help the researcher set up the individual exercise program for each subject in the intervention group, and the Physical Activity Questionnaire-Part 2 after the intervention provided the data for comparison of physical status of all subjects before and after the study. This questionnaire was designed to assess the physical activity levels of the subjects in kJ/kg/day by modification of the questionnaire in MOSPA (The MONICA Optional Study of Physical Activity) by WHO in 1998. This divides total physical activity into three parts: working activity, everyday activity and sports activity. Everyday activity includes transportation to and from work, school and shopping, walking during leisure time for pleasure and housework. Sports include the two most frequent

sports activities. In addition, there are a few questions regarding the “inactivity time” spent by the subjects; for example, sleeping, napping and lying down.

3.33 Dietary Assessment Methods

Two dietary assessment methods were used; the 24-hour recall and the 3-day dietary record. The 24-hour recall and 3-day dietary record before the intervention provided the information to help researcher set up the individual diet program for the subjects in the intervention group, and the 24-hour recall and 3-day dietary record after the intervention provided the data for comparison of nutrient intake of all subjects before and after the study.

3.331 24-Hour Record

The interviewer asked questions and recorded foods and drinks consumed by the subject during the day before interview, from midnight to midnight. The questions included name of foods/drinks, time of consumption, meal type, amount or volume of the foods/drinks and how they were prepared. The amount of foods was recalled by the interviewers with the assist of food models balls and beans. The 3-sweep method was used as follows (Quigley and Watts, 1997):

- The interviewer first asked the subject to recall what they had eaten in the previous 24 hours. This was recorded and formed the quick list.
- The interviewer then went back over the quick list and collected detailed information about each food and drink consumed, such as when it was eaten, how much was eaten, how was it cooked, and whether it was eaten in combination with other foods. The details of these latter foods were also recorded.
- The interviewer then checked the detailed food recorded with the subject for completeness, and added the details of any missing foods.

One 24-hour recall was carried out before and one after the study (See Appendix 9).

3.332 Diet Record

Subjects were asked to describe and record all foods and drinks consumed in 3-day dietary record books during two complete weekdays and one weekend day. The record included eating

time, meal type, food and beverage name, brand, description and preparation, and the amount or volume consumed as accurate as possible. The amounts consumed were weighed or measured with household measures, for examples, cups, spoons or teaspoons. Otherwise, the number of units eaten, for example, 6 slices of white bread, 2 apples etc was recorded. In addition, subjects could also use the weight or volume recorded on the container for bought foods. After a meal, the amount of any left over edible food was estimated and subtracted from the amount originally recorded. The record books were returned to the researcher by post once completed (See Appendix 10).

3.4 Interventions

An individualized diet and exercise program was given to each subject in the intervention group to follow over the nine week intervention period.

3.4.1 Diet Intervention

The general guidelines for the diet program are listed in Appendix 11. It included some tips on:

- How to cut down food amount;
- How to cut down energy intake from fat, carbohydrate and protein;
- Suggested carbohydrate/protein/fat ratio;
- How to increase dietary fiber intake;
- How to increase vitamins and minerals intake, and
- How to increase water intake.

However, each personalized diet program was modified from the general guidelines according to the different situations and eating habits of the different subjects. For example, subjects who had low intakes of certain vitamins, minerals or dietary fiber in their normal diet before study were given a list of food sources that were rich in these nutrients. In addition, if the subject didn't like certain foods, replacement foods were recommended.

For the subjects who had a habit of skipping meals or eating big dinners, regular meals or more frequent eating of smaller amount of foods was suggested. Also when the subjects had high fat/sugar intakes, tips to cut this down were provided to modify their daily eating habits.

Furthermore, when the subjects ate out often, a recommended list of dishes was given to choose when eating at Chinese restaurants, takeaways or fast food restaurants (See Appendix 12). Subjects, who usually prepared their own foods at home, were educated on how to choose the right foods and read food labels when shopping (See Appendix 13).

3.42 Exercise Intervention

The general guidelines for the exercise program are listed in Appendix 14. This includes how to set up the sports program for different subjects and tips to make their lifestyle more active.

At the second visit, the types of exercise for subjects to participate in were chosen according to their personal interest or convenience. If they didn't have any preference for a type of sport, walking or jogging would be suggested.

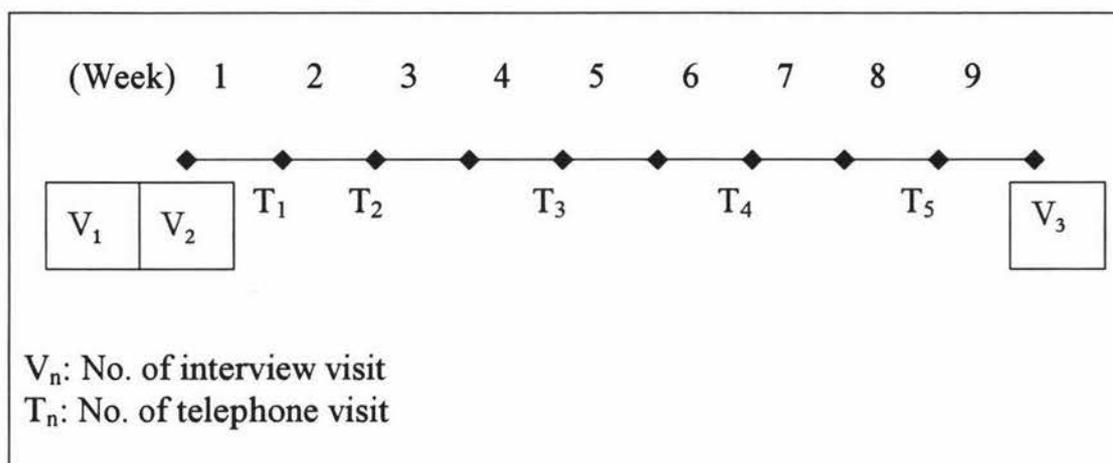
The sport program set up for subjects had to be safe, effective and easy to follow. It was suggested that at least two or three times per week subjects participated in one or two kinds of sporting activities. The duration of the sport varied; depending on the sport type chosen and the subject fitness level.

For example, for the subjects who never did any sport before the intervention; walking or jogging was suggested to start with 15-20 mins in the first week increasing gradually to at least 30-40 mins (See Appendix 15). Also, Appendix 16 shows some useful tips for effective walking.

In addition, resistance exercises were suggested for subjects to participate in at home on rainy or busy days. These exercises helped subjects to lose fat and gain muscle in certain areas. For example, "push-up" would work on pectoral muscles and "crunch" would work on upper fibers of the abdominal muscles. Different types of exercise were selected for different subjects depending on their preferences and fitness. The researcher demonstrated these exercises verbally and non-verbally by picture presentations and physical demonstrations (See Appendix 17).

To prevent tissue damages from these activities, stretching exercises designed by the New Zealand ACC (Accident Compensation Corporation) SportSmart organization, were recommended before and after the exercise to warm up and cool down, (See Appendix 18). At the second visit, the researcher demonstrated these exercises verbally and non-verbally by picture presentations and physical demonstrations.

3.5 Data Collection Program



There were three interviews for the intervention group (V_{1,3}) and two interviews for the control group (V₁ and V₃). For the both group, anthropometrics measurement, general questionnaire, physical questionnaire, 24-hour recall and 3-day dietary record were taken in the first (V_{1,2}) and the last interview (V₃) to collect the data for comparison. The 9-weeks individualized diet and exercise program for the intervention group were given after the first interview and followed by the regular telephone visits (T₁₋₅) to monitor and record the subjects' status (See Appendix 19).

Subjects in the intervention group were given diet and exercise program for 9 weeks. The intervention time started from the second visit after the individualized program and general guideline were given. The individualized diet and exercise programs were designed according to subjects' health status, eating habit and physical activity levels collected from the first visit.

3.6 Data Analysis

All data was coded and entered in an EXCEL spreadsheet. *Microsoft EXCEL 2000* and *MINITAB 13 for Windows* were used for all statistical analyses. *FoodWorks Version 2.01* (1998-2000)

was used to analyse the dietary data along with the Chinese foods database provided by Kai-Hong Tan (Tan, 2001). However, when foods were not available from the database, similar food ingredients were chosen as substitutes. For instance, “Taiwanese pork fibre”, which is dehydrated and flavoured pork were inputted as beef jerky and “fish ball” was inputted as fish meat with starch powder. In addition, the Taiwanese way of cooking rice is different from European’s; uncooked rice/water ratio is about 1:1. Therefore, uncooked rice and water were inputted separately, instead of the cooked rice value from the *FoodWorks* database.

Data in tables are given as mean (SD), minimum, first quartile, medium, third quartile and maximum. Regression analysis and 2-sample t-test were used to analyse the differences before and after the intervention between the two groups. 1-sample t-test was used to determine the significant differences of nutrient intake before and after the intervention. $P < 0.05$ was accepted as statistically significant.

3.7 Subject Feedback

At the end of the study, each subject received a summary of the study results as well as a brief analysis of her nutrient intake, body composition before and after the study, and general diet and exercise guidelines (See Appendix 20).

Chapter 4

RESULTS

4.1 Characteristics of the Subjects

4.11 Economic Status

The average age of the subjects was 47 and 45 years old in the intervention group and control group, respectively.

The majority of subjects defined themselves as housewives; 82% and 80% of them before the study and 71% and 80% after the study in the intervention group and control group respectively, when subjects were allowed to have more than one choice to describe their work status (Table 6). Most of the subjects were unemployed; 59% and 40% of them before the study and 65% and 70% after the study in the intervention group and control group respectively. The top three popular occupations among the subjects were clerks, service workers/shop sales worker and senior officials/managers; whereas IS0800 was used to clarify occupation status.

4.12 Educational Status

The education levels of the subjects were high, 65% and 70% had tertiary education in the intervention group and control group respectively. Furthermore, 18% of intervention group and 20% of control group had post-graduate education (Table 7).

4.13 Parity

More than half subjects have 2 children (59% of them in intervention group and 50% of them in control group) (Table 7).

4.14 Lifestyle Behaviours

All subjects were non-smokers, except one starter in the control group (Table 8). None of the subjects in this study were reported heavy or regular drinker. Most subjects were non-drinkers or drank small amount occasionally. Most of the subjects drank 1-3 cups of coffee a day (53% in the intervention group and 70% in the control group) and none of them drank over 3 cups a day.

4.15 *Health Status*

Most of the subjects had no health problems before the study, except one with joint pain, one with a sleeping disorder and one with lower back pain (Table 9). Fifty-three percent of subjects in the intervention group and 90% in the control group did not take any medication. In the intervention group, 18% were taking female hormone supplements, 12% were taking medicines for asthma and 12% were taking medicines for the digestion system. One subject in the intervention group experienced cancer a few years ago and was at the maintenance stage during the study.

The youngest child in the family was over ten years in 70% of the families in both group, so this means the subject's last pregnancy was ten or more years ago.

Twenty-nine percent of the subjects in the intervention group experienced menopause between 1 to 3 years ago, 18% over 5 years ago and 53% were pre-menopausal (Table 10). In the control group, 80% of the subjects were pre-menopausal with the other 20% experiencing menopause less than one year ago.

Eighteen percent of the subjects in the intervention group gained weight after the menopause; 12% gaining less than 5kg and 6% gaining more than 5kg. However, 24% of this group did not change their weight after the menopause, and only one subject lost weight (>5kg) after menopause.

4.16 *Experiences of Previous Weight Loss Program*

Ninety-four percent of the intervention subjects and 60% of the control subjects who attempted weight loss programs before this study found the program was successful (Table 11). All of them choose diet control to lose weight. The most popular diets were those found in newspapers, magazines or passed on by friends. Some subjects tried to lose weight by fasting or reducing food consumption, changing previous eating habits, consuming meal replacements or by following the menus and instructions given by dieticians in weight loss centres.

Exercise was also tried to lose weight by some (31% in the intervention group and 33% in the control group), and diet pills (19% in the intervention group and 17% in the control group).

Around half of the subjects who attempted weight loss previously gave up within one month (44% in the intervention group and 67% in the control group) (Table 12). Only 19% in the intervention group maintained the program for longer than 6 months. No one in the control group persevered longer than three months.

Most subjects in both groups lost weight in their past weight loss programs (88% in the intervention group and 84% in the control group). Furthermore, 38% in the intervention group and 17 % in the control group lost more than 5 kg body weight.

Table 6: Work status and occupation

	<i>Before</i>				<i>After</i>			
	Intervention Group		Control Group		Intervention Group		Control Group	
	(n)	(%)	(n)	(%)	(n)	(%)	(n)	(%)
Work Status*								
<i>Student</i>	1	6 %	1	10 %	1	6 %	1	10 %
<i>Housewife</i>	14	82 %	8	80 %	12	71 %	8	80 %
<i>Retired</i>	1	6 %	1	10 %	2	12 %	0	0 %
<i>Disabled</i>	0	0 %	0	0 %	0	0 %	0	0 %
<i>Unemployed</i>	0	0 %	0	0 %	0	0 %	0	0 %
<i>Employed</i>	5	29 %	4	40 %	5	29 %	2	20 %
<i>Others</i>	0	0 %	0	0 %	0	0 %	0	0 %
<i>Volunteer Worker</i>	3	18 %	3	30 %	2	12 %	2	20 %
Occupation								
<i>Senior officials/managers</i>	2	12 %	1	10 %	1	6 %	0	0 %
<i>Professionals</i>	0	0 %	0	0 %	0	0 %	0	0 %
<i>Technicians/associate professionals</i>	1	6 %	1	10 %	0	0 %	1	10 %
<i>Clerks</i>	3	18 %	1	10 %	2	12 %	1	10 %
<i>Service workers/shop sales workers</i>	1	6 %	3	30 %	2	12 %	1	10 %
<i>Plant/machine operators and assemblers</i>	0	0 %	0	0 %	1	6 %	0	0 %

*Subjects were allowed to have more than one choice to describe their work status.

Table 7: Education level and family size

		Intervention Group		Control Group	
		(n)	(%)	(n)	(%)
Education Level	<12 Years	0	0 %	1	10 %
	12 Years	3	18 %	0	0 %
	12-16 Years	11	65 %	7	70 %
	>16 Years	3	18 %	2	20 %
Number of Children	0	4	24 %	1	10 %
	1	2	12 %	1	10 %
	2	10	59 %	5	50 %
	≥3	1	6 %	3	30 %

Table 8: Lifestyle behaviors

		Intervention Group		Control Group	
		(n)	(%)	(n)	(%)
Smoking	Non-smoker	17	100 %	9	90 %
	Quitter	0	0 %	0	0 %
	Starter	0	0 %	1	10 %
	Current Smoker	0	0 %	0	0 %
Alcohol	None	5	29 %	6	60 %
	Occasionally	11	65 %	4	40 %
	Regularly or more	1	6 %	0	0 %
Coffee	None	8	47 %	3	30 %
	1-3 Cups	9	53 %	7	70 %
	>3 Cups	0	0 %	0	0 %

Table 9: Medical status table

	Intervention Group		Control Group	
	(n)	(%)	(n)	(%)
Health				
<i>Normal</i>	15	88 %	9	90 %
<i>Joint pain</i>	0	0 %	1	10 %
<i>Sleeping Disorder</i>	1	6 %	0	0 %
<i>Lower Back Pain</i>	1	6 %	0	0 %
Medication*				
<i>None</i>	9	53 %	9	90 %
<i>Thyroxin</i>	0	0 %	1	10 %
<i>Female Hormone</i>	3	18 %	0	0 %
<i>Antihypertensive</i>	1	6 %	0	0 %
<i>Asthma</i>	2	12 %	0	0 %
<i>Digestion System</i>	2	12 %	0	0 %
<i>Cancer</i>	1	6 %	0	0 %
Last Pregnant				
<i>No Children</i>	4	24 %	1	10 %
<i><5 Years ago</i>	0	0 %	0	0 %
<i>5-10 Years ago</i>	1	6 %	2	20 %
<i>10-20 Years ago</i>	6	35 %	6	60 %
<i>>20 Years ago</i>	6	35 %	1	10 %
Menopause Experience				
<i>Not Yet</i>	9	53 %	8	80 %
<i>>1 Year ago</i>	0	0 %	2	20 %
<i>1-3 Years ago</i>	5	29 %	0	0 %
<i>3-5 Years ago</i>	0	0 %	0	0 %
<i>>5 Years ago</i>	3	18 %	0	0 %

*Subjects may be under more than one medication

Table 10: Menopause

	Intervention Group		Control Group	
	(n)	(%)	(n)	(%)
Time After Menopause				
<i>Not Yet</i>	9	53 %	8	80 %
<i>>1 Year ago</i>	0	0 %	2	20 %
<i>1-3 Years ago</i>	5	29 %	0	0 %
<i>3-5 Years ago</i>	0	0 %	0	0 %
<i>>5 Years ago</i>	3	18 %		
Weight Change After Menopause				
<i>Not Yet</i>	9	53 %	8	80 %
<i>>5kg Weight Loss</i>	1	6 %	0	0 %
<i><5 kg Weight Loss</i>	0	0 %	0	0 %
<i>No Change</i>	4	24 %	0	0 %
<i><5 kg Weight Gain</i>	2	12 %	1	10 %
<i>>5kg Weight Gain</i>	1	6 %	1	10 %

Table 11: Previous Weight Loss Program Followed

		Intervention Group		Control Group	
		(n)	(%)	(n)	(%)
Weight Loss Attempted	Yes	6	35 %	2	20 %
	No	11	65 %	8	80 %
Type of Program*: (Exercise)	Yes	2	33 %	0	0 %
	No	4	67 %	2	100 %
(Diet Pills Taken)	Yes	0	0 %	0	0 %
	No	6	100 %	2	100 %
(Diet)	Special Diet	3	50 %	1	50 %
	Fasting/Reduced Eating	1	17 %	0	0 %
	Changing Eating Habits	1	17 %	0	0 %
	Meal Replacement	0	0 %	1	50 %
	Weight Loss Center/ Dietician	0	0 %	0	0 %
	None	1	17 %	0	0 %
Successful Weight Loss Program Found	Yes	16	94 %	6	60 %
	No	1	6 %	4	40 %
Type of Program*: (Exercise)	Yes	5	31 %	2	33 %
	No	11	69 %	4	67 %
(Diet Pills Taken)	Yes	3	19 %	1	17 %
	No	13	81 %	5	83 %
(Diet)	Special Diet	7	44 %	1	17 %
	Fasting/Reduced Eating	4	25 %	3	50 %
	Changing Eating Habits	4	25 %	2	33 %
	Meal Replacement	0	0 %	0	0 %
	Weight Loss Center/ Dietician	2	13 %	0	0 %
	None	1	6 %	0	0 %

*Some subjects may have tried a combination of diet, exercise and taking diet pills.

Table 12: Most Successful Weight Loss Program Previously Followed*

	Intervention Group		Control Group	
	(n)	(%)	(n)	(%)
Length of Time Program Followed:				
<i><1 month</i>	7	44 %	4	67 %
<i>1-3 months</i>	5	31 %	2	33 %
<i>3-6 months</i>	1	6 %	0	0 %
<i>>6 months</i>	3	19 %	0	0 %
Weight Lost in This Program:				
<i>Lost Weight, but doesn't know how much</i>	0	0 %	1	17 %
<i>>5kg Weight Loss</i>	6	38 %	1	17 %
<i><5 kg Weight Loss</i>	8	50 %	3	50 %
<i>No Change</i>	2	13 %	1	17 %
<i>Weight Gain</i>	0	0 %	0	0 %

*The figures are calculated from the subjects, who followed at least one previous weight loss program.

4.2 Anthropometrics

4.21 *Changes of Body Weight and Total Skinfolts*

The percentage of the changes was calculated by the following formulation:

$$\text{Percentage of the changes (\%)} = (M_A - M_B / M_B) \times 100\%$$

While M_A = the measurement after the intervention

M_B = the measurement before the intervention

The mean body weight of subjects in the intervention group decreased from 66.5kg to 65.6kg after the 9 weeks intervention (-1.3% of the original body weight) (Table 13 and 15). The mean sum of skinfolts decreased by 14.1mm, from 162.0mm to 147.9mm (-8.7% of the original sum of skinfolts). Thigh changed mostly among all skinfolts measurements, the mean value of thigh skinfolts was founded from 30.7mm to 26.1mm (-15.2% of the original measurement). For the measurements of circumferences, the highest change was found at waist with -1.8% decreases.

In the control group, mean body weight decreased slightly during the 9 weeks period, from 61.1kg before to 60.9kg after the study (-0.3% of the original body weight) (Table 14 and 15). The mean sum of skinfolts increased slightly from 137.7mm to 142.7mm (+3.6% of the original mean sum of skinfolts). Abdominal changed mostly in both skinfolts and circumferences measurements, with the percentage of increases +8.0% and +1.2% respectively.

4.22 *Changes of Skinfolts and Circumferences at Different Sites*

These figures show the distribution of measurement gains and losses as a percentage of the total measure before the intervention in the subjects (Figure 6 - 18). Changes in the skinfold measurements showed that the intervention subjects lost more fat in the triceps, biceps and thigh sites than the central body area sites (subscapular, abdominal and suprailiac). Changes in the circumference measurements showed that the intervention subjects lost most in abdominal area.

In the control group, most subjects increased their skinfolts measures at upper body (triceps, biceps, subscapular) and thigh. Changes in the circumference measurement showed these subjects increased mostly in the abdominal and thigh.

Table 13: Anthropometric measurements (intervention group)

	<i>Before</i>						<i>After</i>					
	<i>Mean (SD)</i>	<i>Min</i>	<i>1st Quartile</i>	<i>Median</i>	<i>3rd Quartile</i>	<i>Max</i>	<i>Mean (SD)</i>	<i>Min</i>	<i>1st Quartile</i>	<i>Median</i>	<i>3rd Quartile</i>	<i>Max</i>
Age (years)	47 (5.3)	40	43	47	51	56						
Body Weight (kg)	66.5 (10.1)	50.4	60.3	64.2	70.0	89.4	65.6 (8.6)	52.0	59.9	64.3	68.5	83.6
Body Height (cm)	157.1 (4.8)	149.3	152.9	157.5	161.4	165.0	157.2 (5.0)	149.5	152.7	157.2	161.1	165.0
Body Mass Index (kg/m ²)	26.9 (3.1)	21.2	24.5	27.3	28.4	34.0	26.5 (2.7)	22.1	24.9	27.3	28.5	31.9
Forearm Skinfol s (mm)	10.8 (3.8)	5.2	7.1	10.2	14.1	17.1	10.1 (2.3)	5.4	8.6	10.6	12.1	13.5
Triceps Skinfol s (mm)	27.0 (5.6)	18.6	22.9	26.7	31.8	35.7	24.0 (4.3)	15.6	22.5	24.0	26.7	32.7
Biceps Skinfol s (mm)	14.6 (6.3)	6.7	9.2	13.2	17.5	27.2	12.1 (4.0)	6.0	9.1	12.7	15.3	18.4
Subscapular Skinfol s (mm)	30.6 (5.1)	22.2	26.5	30.5	33.5	40.7	29.5 (4.6)	21.6	26.3	28.9	33.2	36.8
Abdominal Skinfol s (mm)	32.9 (4.5)	23.7	29.7	34.1	36.4	38.1	31.6 (5.1)	19.9	29.7	32.9	35	39.1
Superiliac Skinfol s (mm)	26.2 (6.6)	16.5	22.8	26.5	30.5	36.7	24.7 (6.1)	15.8	19.7	24.9	28.8	34.8
Thigh Skinfol s (mm)	30.7 (7.1)	15.1	25.8	30.5	36.6	41.0	26.1 (7.4)	12.1	22.7	25.1	30.5	38.5
Total Skinfol s (mm)	162.0 (29.7)	113.2	147.6	159.4	182.4	203.8	147.9 (26.2)	102.0	134.8	145.7	165.7	191.5
Waist Circumference (cm)	82.1 (9.0)	71.3	74.2	81.4	87.0	107.5	80.6 (8.3)	69.4	75.5	78.7	85.5	101.3
Abdominal Circumference (cm)	90.7 (8.6)	77.0	83.7	91.0	94.5	108.4	89.5 (10.4)	72.4	81.7	88.8	94.3	113.9
Hip Circumference (cm)	103.1 (6.8)	94.3	98.0	100.2	109.2	118.3	102.2 (6.0)	95.0	97.0	99.9	107.3	112.9
Thigh Circumference (cm)	49.5 (4.8)	39.2	47.3	49.9	50.8	60.0	48.7 (3.4)	41.8	46.6	49.0	51.4	52.8
Calf Circumference (cm)	37.1 (2.6)	32.2	35.2	37.3	39.4	40.5	36.7 (2.3)	32.8	34.9	37.0	38.6	40.1

Table 14: Anthropometric measurements (control group)

	<i>Before</i>						<i>After</i>					
	<i>Mean (SD)</i>	<i>Min</i>	<i>1st Quartile</i>	<i>Median</i>	<i>3rd Quartile</i>	<i>Max</i>	<i>Mean (SD)</i>	<i>Min</i>	<i>1st Quartile</i>	<i>Median</i>	<i>3rd Quartile</i>	<i>Max</i>
Age (years)	45 (4.5)	40	41	46	49	53						
Body Weight (kg)	61.1 (5.3)	53.5	56.8	60.9	64.8	70.2	60.9 (5.3)	53.4	57.3	61.0	64.2	69.0
Body Height (cm)	160.1 (6.6)	147.2	155.8	161.6	165.6	167.5	160.4 (6.6)	148.2	154.8	163.1	165.3	167.5
Body Mass Index (kg/m ²)	24.0 (3.6)	19.9	21.5	23.0	27.3	29.2	23.9 (3.5)	19.6	21.6	22.7	26.8	29.3
Forearm Skinfolds (mm)	9.2 (5.0)	2.4	6.3	9.0	11.2	18.5	9.3 (4.6)	2.6	6.1	9.4	11.5	18.5
Triceps Skinfolds (mm)	23.4 (6.8)	13.3	18.9	22.6	26.9	33.5	23.4 (5.8)	13.4	20.6	24.2	25.4	35.0
Biceps Skinfolds (mm)	12.4 (5.5)	5.1	7.5	12.8	17.4	18.3	12.6 (4.8)	5.0	8.6	14.1	16.5	18.1
Subscapular Skinfolds (mm)	26.6 (8.5)	14.7	19.9	26.4	33.7	37.6	27.3 (8.9)	14.1	20.1	26.7	33.8	39.3
Abdominal Skinfolds (mm)	27.2 (5.1)	14.6	26.5	28.1	29.9	33.3	29.3 (7.0)	14.5	27.2	29.5	33.3	38.1
Superiliac Skinfolds (mm)	20.3 (6.7)	8.9	15.7	21.6	24.8	30.9	21.2 (8.6)	8.8	13.4	23.0	25.0	33.1
Thigh Skinfolds (mm)	27.9 (7.3)	13.9	23.1	30.8	33.0	37.1	28.9 (8.7)	13.6	22.4	31.5	35.9	39.2
Total Skinfolds (mm)	137.7 (34.6)	80.0	108.5	143.9	167.7	180.5	142.7 (39.5)	76.8	112.4	141.5	169.4	193.4
Waist Circumference (cm)	77.3 (9.8)	65.7	69.6	75.3	84.2	92.9	76.1 (8.9)	65.7	68.9	75.1	82.1	91.2
Abdominal Circumference (cm)	83.3 (7.5)	73.8	78.0	82.2	85.2	97.6	84.2 (8.5)	73.2	77.6	82.1	90.4	99.2
Hip Circumference (cm)	98.5 (5.0)	90.3	94.6	98.8	102.3	105.4	96.9 (3.3)	92.6	94.7	96.6	98.6	103.4
Thigh Circumference (cm)	47.0 (3.0)	42.8	44.2	48.7	48.8	50.4	47.1 (3.7)	41.4	45.7	45.9	50.3	52.7
Calf Circumference (cm)	35.9 (1.5)	33.8	34.6	36.2	37.1	37.8	35.9 (1.3)	33.6	35.1	36.0	36.9	37.8

Table 15: Summary of measurement changes

		<i>Intervention Group</i>				<i>Control Group</i>			
		<i>Mean (SD) % Loss</i>	<i>Greatest % Loss</i>	<i>Median % Loss</i>	<i>p-value</i>	<i>Mean (SD) % Loss</i>	<i>Greatest % Loss</i>	<i>Median % Loss</i>	<i>p-value</i>
Body Weight	(kg)	-1.3 (0.034)	-6.7	-1.2	0.056	-0.3 (0.022)	-2.9	-0.6	0.229
Body Mass Index	(kg/m ²)	-1.4 (0.032)	-6.3	-1.6	0.052	-0.6 (0.022)	-3.9	+0.0	0.173
Forearm Skinfol s	(mm)	-6.1 (0.219)	-30.5	+4.0	0.318	+0.9 (0.156)	-17.6	+1.1	0.358
Triceps Skinfol s	(mm)	-11.2 (0.116)	-25.0	-8.4	0.000*	+0.0 (0.137)	-24.0	+2.6	0.247
Biceps Skinfol s	(mm)	-16.7 (0.197)	-45.0	-9.0	0.012*	+2.0 (0.192)	-25.7	+3.2	0.273
Subscapular Skinfol s	(mm)	-3.7 (0.065)	-12.4	-3.3	0.021*	+2.6 (0.039)	-4.1	+1.5	0.446
Abdominal Skinfol s	(mm)	-4.0 (0.093)	-16.0	-3.8	0.016*	+8.0 (0.113)	-11.2	+6.1	0.089
Superiliac Skinfol s	(mm)	-5.8 (0.108)	-22.2	-3.1	0.036*	+4.3 (0.200)	-24.5	-3.8	0.370
Thigh Skinfol s	(mm)	-15.2 (0.163)	-55.9	-10.1	0.000*	+3.5 (0.107)	-15.0	+4.6	0.466
Total Skinfol s	(mm)	-8.7 (0.068)	-18.1	-9.6	0.000*	+3.6 (0.075)	-7.5	+1.6	0.392
Waist Circumference	(cm)	-1.8 (0.024)	-5.8	-1.4	0.004*	-1.5 (0.029)	-5.5	-1.1	0.014*
Abdominal Circumference	(cm)	-1.3 (0.074)	-12.3	-1.3	0.204	+1.2 (0.054)	-9.9	+1.2	0.305
Hip Circumference	(cm)	-0.9 (0.021)	-7.2	-0.3	0.066	-1.6 (0.025)	-4.4	-1.4	0.020*
Thigh Circumference	(cm)	-1.5 (0.043)	-12.0	-1.1	0.102	+0.1 (0.043)	-6.4	+0.8	0.317
Calf Circumference	(cm)	-1.1 (0.019)	-4.5	-0.8	0.015*	+0.0 (0.016)	-2.1	-0.5	0.481

*With significant difference $p < 0.05$

Figure 6: Changes of body weight

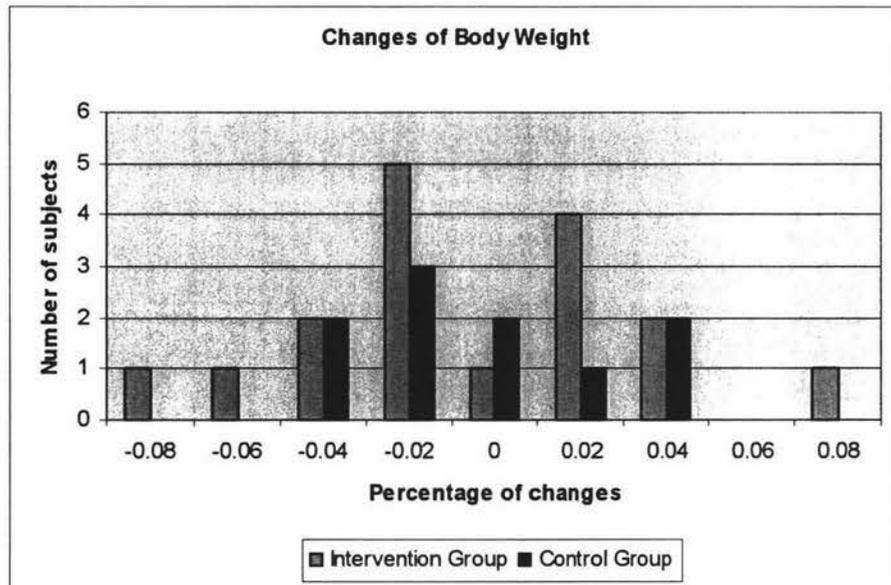


Figure 7: Changes of BMI

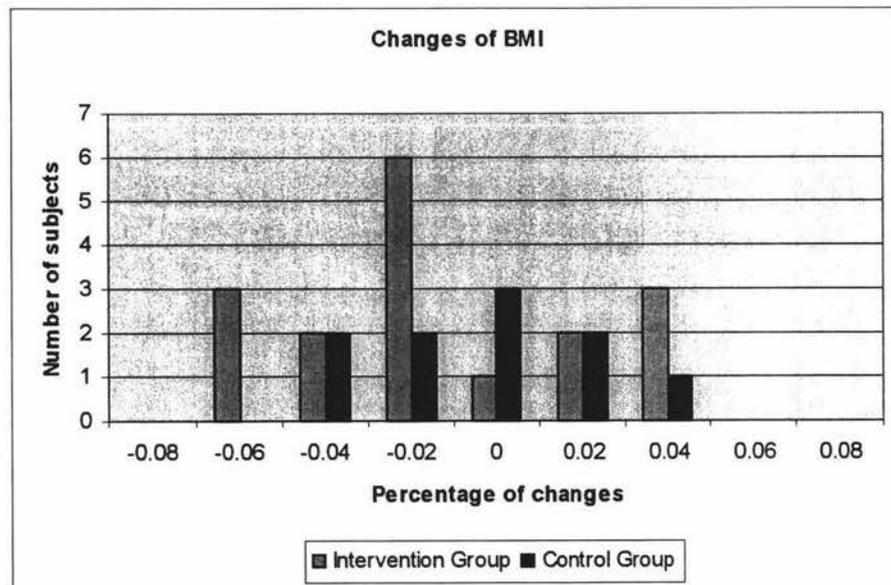


Figure 8: Changes of skinfolds in triceps

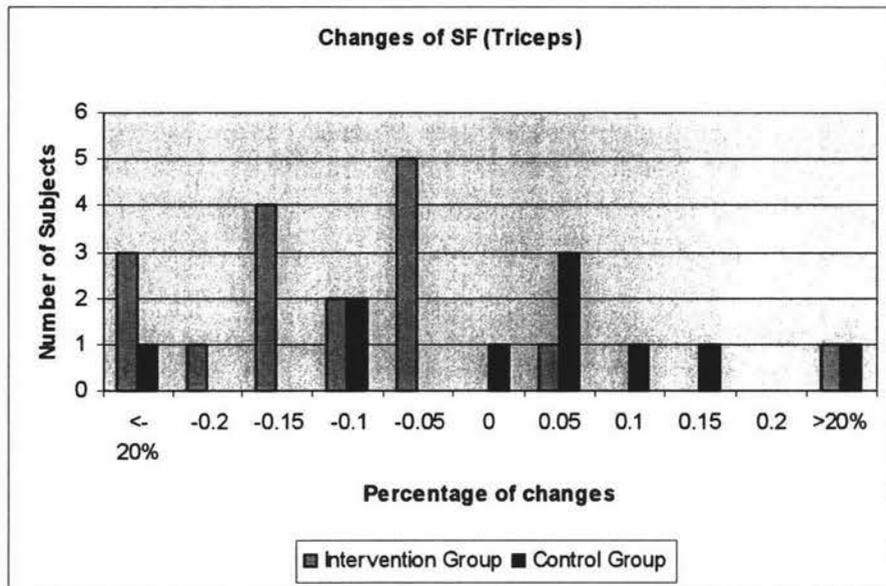


Figure 9: Changes of skinfolds in biceps

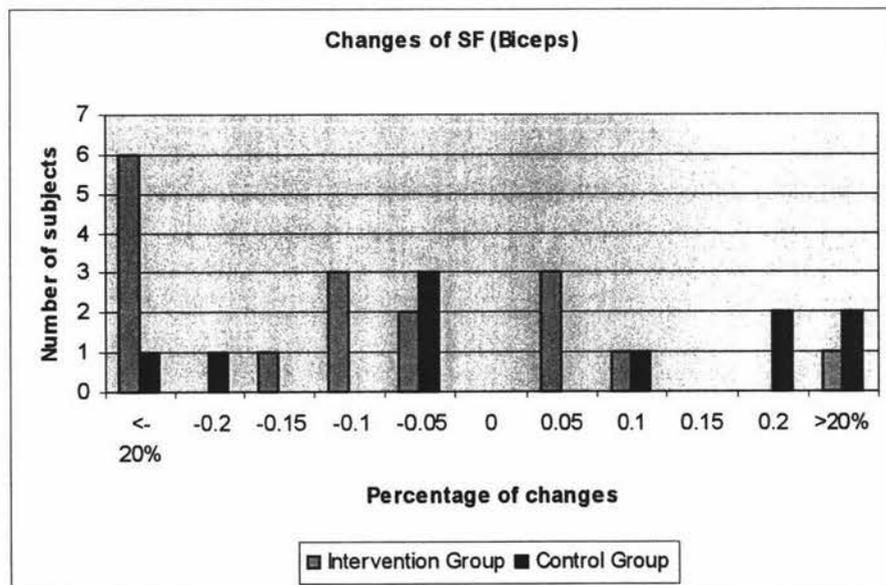


Figure 10: Changes of skinfolds in subscapular

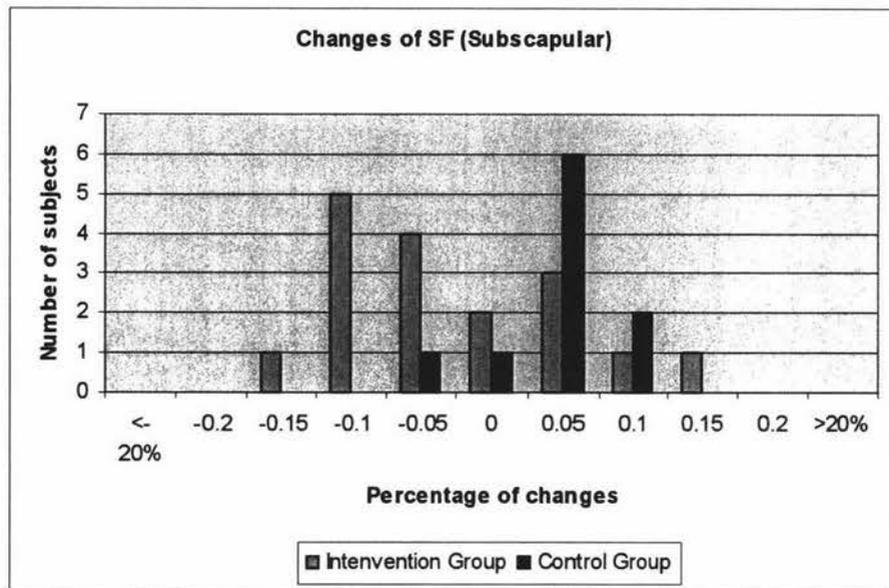


Figure 11: Changes of skinfolds in abdominal

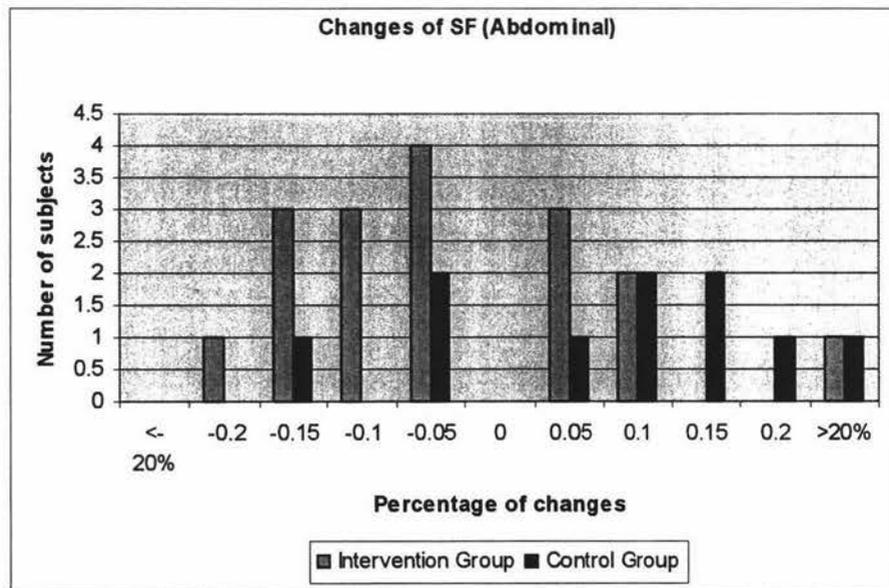


Figure 12: Changes of skinfolds in superiliac

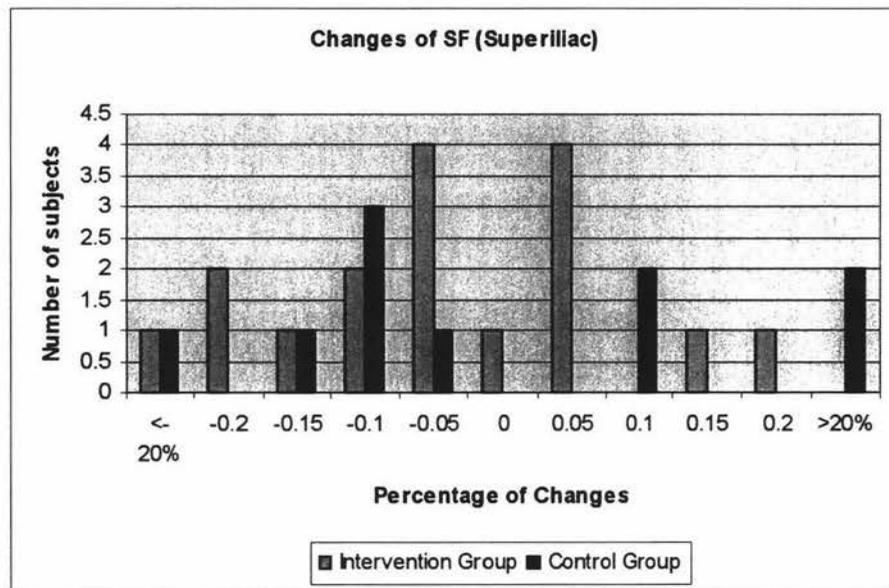


Figure 13: Changes of skinfolds in thigh

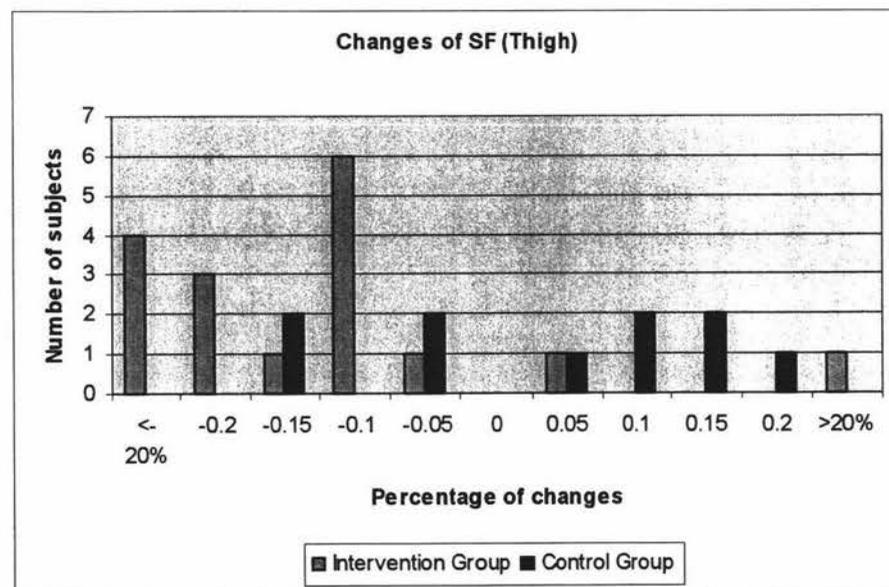


Figure 14: Changes of circumferences in waist

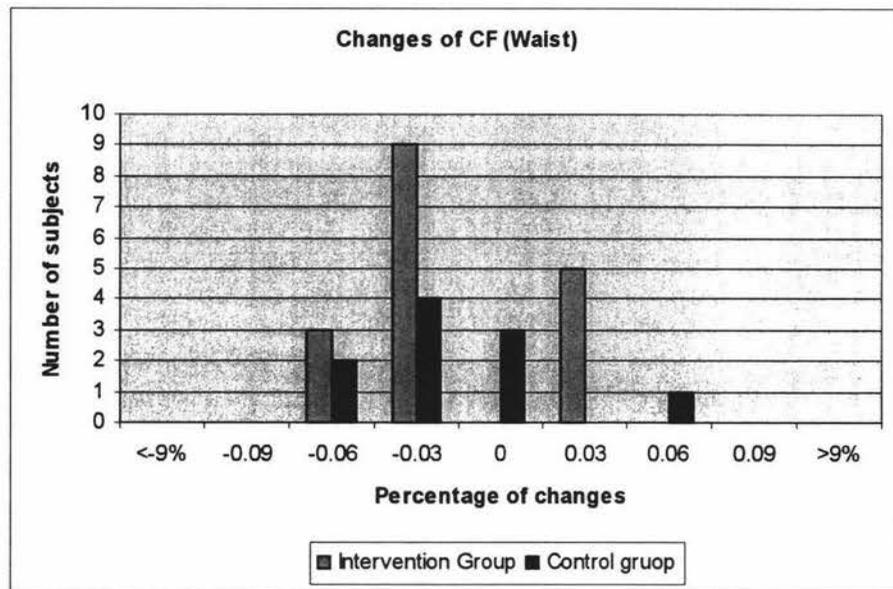


Figure 15: Changes of circumferences in abdominal

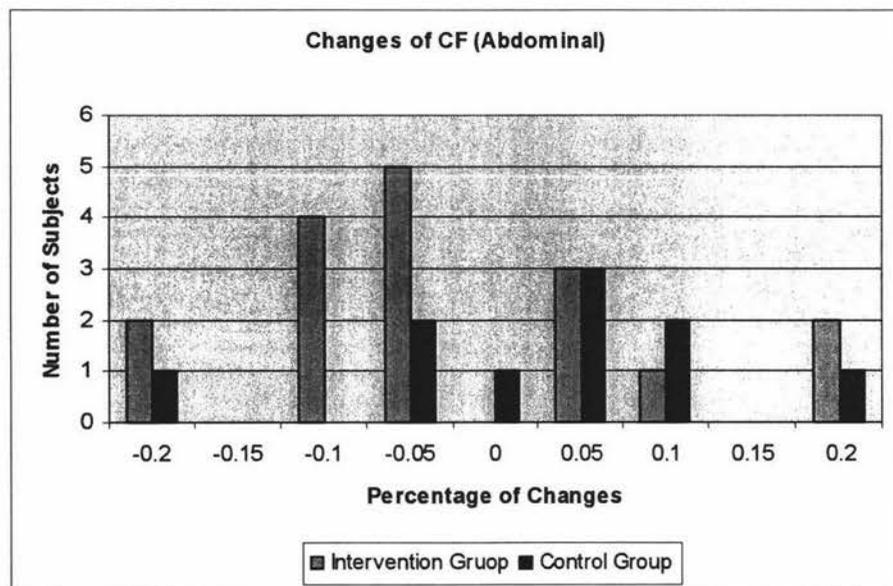


Figure 16: Changes of circumferences in hip

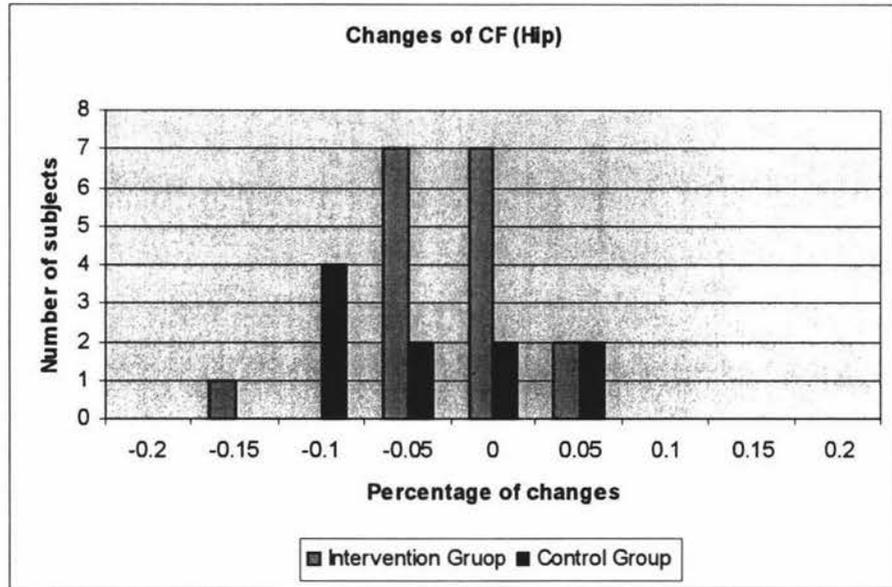


Figure 17: Changes of circumferences in thigh

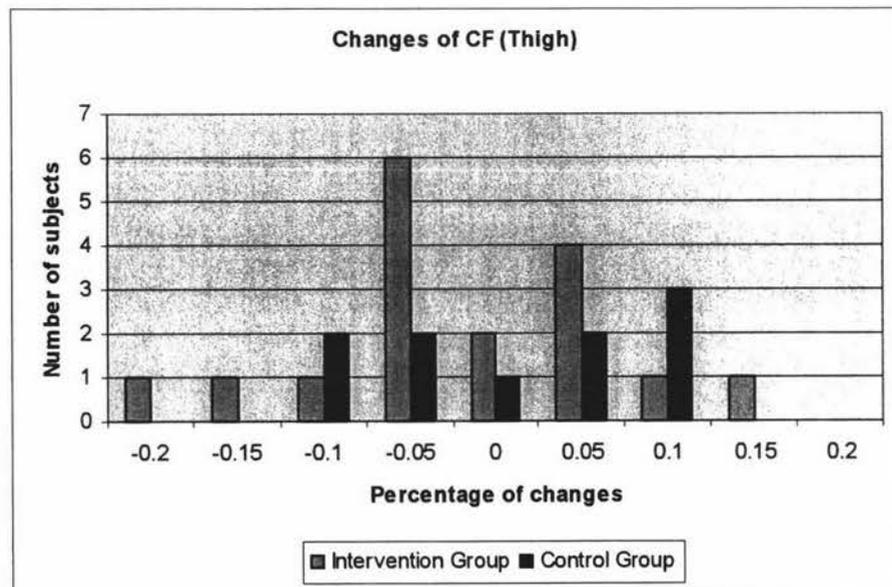
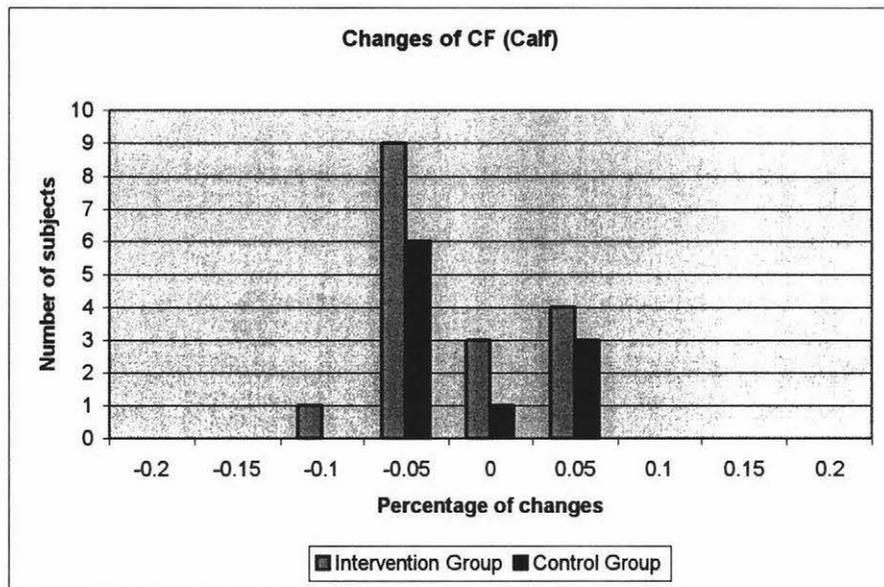


Figure 18: Changes of circumferences in calf



4.3 Physical Activity Assessment

Sport activities include the two most frequent sports activities (sport 1 and sport 2). In the intervention group, subjects mostly increased their sporting activity during the intervention, from 8.0 to 19.5 kJ/kg/day (Table 16). Working activities were calculated by the sum of slight, moderate and heavy activities during working. The mean working activity in the intervention group was increased only slightly from 8.5 to 10.5 kJ/kg/day. Everyday activity, such as housework, walking for transportation, and leisure time walking, was even lower during the intervention than before; it decreased by 1.4 kJ/kg/day (Table 17).

On the other hand, both working and everyday activity decreased respectively by 16.5 and 17.9 kJ/kg/day, while sporting activity stayed almost the same.

Inactivity time was defined as the time spent sleeping, napping and lying down when watching television or reading. During the intervention, subjects decreased their daily inactive time by 27 minutes, whilst the control group slightly increased this time by 8 minutes (Table 18).

Table 16: Physical activity (kJ/kg/day)

		<i>Intervention Group</i>			<i>Control Group</i>		
		<i>Mean (SD)</i>	<i>Median</i>	<i>p-value</i>	<i>Mean (SD)</i>	<i>Median</i>	<i>p-value</i>
Working Activity	<i>Before</i>	8.48 (14.34)	N/A	0.295	30.27 (47.43)	4.16	0.075
	<i>After</i>	10.48 (17.73)	N/A		13.73 (27.74)	N/A	
Everyday Activity	<i>Before</i>	48.93 (34.63)	38.84	0.448	55.56 (23.73)	48.65	0.016*
	<i>After</i>	47.48 (34.32)	36.59		37.72 (19.51)	32.66	
<i>(Transportation)</i>	<i>Before</i>	5.28 (4.79)	4.14	0.341	6.84 (8.41)	3.11	0.365
	<i>After</i>	5.77 (5.15)	4.14		6.22 (6.84)	4.14	
<i>(Leisure Time Walking)</i>	<i>Before</i>	13.59 (11.02)	12.92	0.128	15.50 (11.19)	13.40	0.349
	<i>After</i>	20.57 (18.03)	15.79		13.87 (10.54)	3.83	
<i>(Housework)</i>	<i>Before</i>	30.05 (27.19)	27.13	0.108	33.23 (15.48)	27.13	0.002*
	<i>After</i>	21.14 (19.31)	13.56		17.63 (14.72)	13.56	
Sport Activity	<i>Before</i>	7.97 (6.59)	7.97	0.256	4.55 (7.57)	0.67	0.413
	<i>After</i>	19.44 (23.94)	14.35		8.27 (6.82)	4.84	
<i>(Sport 1)</i>	<i>Before</i>	5.49 (5.43)	4.58	0.045*	3.53 (5.23)	0.67	0.043*
	<i>After</i>	16.32 (23.53)	10.76		3.70 (2.99)	1.15	
<i>(Sport 2)</i>	<i>Before</i>	2.48 (3.49)	0.89	0.042*	1.02 (2.73)	N/A	0.280
	<i>After</i>	3.13 (4.70)	N/A		0.43 (1.36)	N/A	

N/A: Not Applicable

*With significant difference $p < 0.05$

Table 17: The changes of physical activity before and after intervention (kJ/kg/day)

	<i>Intervention Group</i>				<i>Control Group</i>			
	<i>Mean (SD)</i>	<i>1st Quartile</i>	<i>Medium</i>	<i>3rd Quartile</i>	<i>Mean (SD)</i>	<i>1st Quartile</i>	<i>Medium</i>	<i>3rd Quartile</i>
Working Activity	+2.00 (14.99)	-0.45	N/A	N/A	-16.54 (33.17)	-30.13	-0.09	N/A
Everyday Activity	-1.44 (44.76)	-12.92	-1.97	+14.09	-17.85 (22.39)	-17.79	-17.51	-7.14
Sport Activity	+11.48 (25.71)	-0.53	+3.42	+11.33	-0.41 (3.57)	-1.01	N/A	+1.08

Table 18: Inactivity table (minutes/day)

		<i>Intervention Group</i>			<i>Control Group</i>		
		<i>Mean (SD)</i>	<i>Medium</i>	<i>p-value</i>	<i>Mean (SD)</i>	<i>Medium</i>	<i>p-value</i>
Sleeping	<i>Before</i>	461 (84.8)	420	0.099	455 (34.4)	480	0.149
	<i>After</i>	434 (54.2)	420		440 (49.0)	460	
Napping	<i>Before</i>	17 (24.5)	0	0.287	13 (20.6)	0	0.500
	<i>After</i>	24 (32.4)	10		13 (20.0)	0	
Lying Down	<i>Before</i>	173 (79.0)	180	0.387	129 (67.0)	165	0.252
	<i>After</i>	166 (77.3)	180		152 (126.9)	120	
Total Inactive Time	<i>Before</i>	651 (107.8)	630	0.164	597 (80.8)	615	0.414
	<i>After</i>	624 (96.2)	600		605 (158.3)	600	

4.4 Nutrient Intake from the Diet

4.41 Energy Sources

The average energy intake in the intervention group before the study was 6337 kJ/day dropping down to 4628 kJ/day after the intervention (Table 19). Fat intake decreased most dramatically from 57.9 g/day to 33.6 g/day ($p < 0.01$). Also, the intakes of saturated fatty acids, monounsaturated fatty acids and polyunsaturated fatty acids decreased significantly by 7.7 g/day, 11.2 g/day and 6.9 g/day respectively (Table 20). All these differences were statistically significant at the $p < 0.01$ level. Besides, total carbohydrate and total sugar intakes decreased from 179.4 g/day to 143.2 g/day ($p < 0.01$) and from 67.7 g/day to 64.0 g/day ($P = 0.5$) respectively. However, the fibre intake decreased significantly ($p < 0.05$) by 4.7g/day (Table 21).

The percentage of total energy from fat also decreased from 32.9% to 26.9% ($p < 0.001$), while protein and carbohydrate increased, respectively, from 18.8% to 21.8% ($p = 0.09$) and from 45.9% to 49.3% ($p < 0.01$).

In the control group, the average energy intake was slightly dropping from 6411 kJ/day to 5777 kJ/day ($p = 0.2$). Energy intakes from protein, fat and carbohydrate were all slightly dropping by 11 g/day, 6 g/day and 15 g/day respectively without significant differences. Compared to the intervention group, the intakes of saturated fatty acids, monounsaturated fatty acids and polyunsaturated fatty acids in the control group decreased slightly by 1.7 g/day, 0.4 g/day and 1.1 g/day respectively with no significant differences. As for the fibre intake, it decreased significantly ($p < 0.05$) by 2.7 g/day.

4.42 Vitamins and Minerals Intakes

Vitamins intake during the intervention dropped dramatically compared to the control group (Table 22). The intake of thiamine, vitamin E and iron decreased significantly ($p < 0.05$) by 1.0mg, 11.3mg and 4.0mg, respectively. In addition, the average intake of riboflavin, folate, vitamins C, B₆, B₁₂, calcium, zinc and selenium also decreased without significant differences during the intervention.

Table 19: Energy sources in the diet

		<i>Intervention Group</i>						<i>Control Group</i>					
		<i>Mean</i>	<i>(SD)</i>	<i>1st Quartile</i>	<i>Medium</i>	<i>3rd Quartile</i>	<i>p-value</i>	<i>Mean</i>	<i>(SD)</i>	<i>1st Quartile</i>	<i>Medium</i>	<i>3rd Quartile</i>	<i>p-value</i>
Energy (kJ)	<i>Before</i>	6337	(1407)	5316	5969	7328	0.000*	6411	(797)	6117	6444	6968	0.209
	<i>After</i>	4628	(1174)	3503	4442	5022		5777	(1738)	4341	5727	6361	
Protein (g)	<i>Before</i>	69	(16.7)	57	67	75	0.088	77	(21.3)	72	77	90	0.203
	<i>After</i>	59	(15.6)	49	58	70		66	(24.0)	52	64	81	
Fat (g)	<i>Before</i>	58	(23.3)	47	49	69	0.000*	52	(12.9)	46	47	64	0.297
	<i>After</i>	34	(10.5)	24	31	42		46	(21.2)	29	39	60	
Available Carbohydrate (g)	<i>Before</i>	179	(39.6)	151	180	198	0.009*	186	(31.1)	163	191	211	0.446
	<i>After</i>	143	(43.1)	115	129	164		171	(51.2)	139	160	197	
Alcohol (g)	<i>Before</i>	1.4	(2.5)	0.0	0.3	1.7	0.074	2.3	(4.7)	0.0	0.0	0.8	0.166
	<i>After</i>	0.3	(0.7)	0.0	0.0	0.1		0.0	(0.1)	0.0	0.0	0.0	
% Total Energy from Protein	<i>Before</i>	18.8	(3.8)	16.3	17.6	20.4	-	20.1	(4.8)	17.8	19.7	22.9	-
	<i>After</i>	21.8	(3.7)	19.3	21.1	24.0		19.2	(3.5)	17.3	20.0	21.2	
% Total Energy from Fat	<i>Before</i>	32.9	(8.1)	27	34.9	38.2	-	30.1	(6.6)	25.0	30.5	35.9	-
	<i>After</i>	26.9	(5.1)	23.8	25.3	31.3		28.9	(6.9)	25.2	26.8	34.3	
% Total Energy from Carbohydrate	<i>Before</i>	45.9	(8.1)	40.8	44.9	50.5	-	46.4	(5.8)	42.3	45.4	50.3	-
	<i>After</i>	49.3	(5.1)	45.3	49.6	53.3		48.4	(9.1)	43.6	51.3	52.6	
% Alcohol	<i>Before</i>	0.6	(1.1)	0.0	0.1	0.5	-	1.0	(2.0)	0.0	0.0	0.4	-
	<i>After</i>	0.2	(0.5)	0.0	0.0	0.0		0.0	(0.0)	0.0	0.0	0.0	

*With significant difference $p < 0.05$

Table 20: Further analysis of dietary lipid intake

		<i>Intervention Group</i>						<i>Control Group</i>					
		<i>Mean</i>	<i>(SD)</i>	<i>1st Quartile</i>	<i>Medium</i>	<i>3rd Quartile</i>	<i>p-value</i>	<i>Mean</i>	<i>(SD)</i>	<i>1st Quartile</i>	<i>Medium</i>	<i>3rd Quartile</i>	<i>p-value</i>
Saturated fatty acid (g)	<i>Before</i>	20.3	(8.0)	15.0	17.7	26.8	0.000*	23.6	(7.5)	21.4	22.6	27.5	0.482
	<i>After</i>	12.6	(4.8)	8.9	11.8	15.3		21.9	(9.0)	16.6	19.4	24.7	
Monounsaturated fatty acid (g)	<i>Before</i>	23.7	(10.9)	16.8	22.2	28.8	0.000*	22.0	(5.5)	17.2	23.0	27.0	0.900
	<i>After</i>	12.5	(4.9)	8.9	10.5	15.7		21.6	(10.1)	14.3	18.1	25.4	
Polyunsaturated fatty acid (g)	<i>Before</i>	14.0	(7.2)	9.6	12.7	16.7	0.000*	13.4	(3.5)	11.9	13.0	15.0	0.609
	<i>After</i>	7.1	(3.4)	4.4	6.2	9.6		12.3	(5.2)	8.6	11.7	13.5	
Cholesterol (mg)	<i>Before</i>	223.3	(93.4)	143.6	271.5	298.9	0.567	296.2	(77.4)	280.6	310.3	336.6	0.212
	<i>After</i>	207.0	(89.8)	135.8	181.6	245.1		246.7	(119)	141.0	222.5	340.8	
% of total Energy from Saturated fatty acid	<i>Before</i>	36.0	(7.1)	29.7	35.8	43.2	-	39.7	(6.5)	34.9	39.5	44.1	-
	<i>After</i>	39.4	(6.5)	34.6	38.1	43.5		39.6	(4.6)	36.1	41.2	42.8	
% of total Energy from Monounsaturated fatty acid	<i>Before</i>	40.5	(4.0)	38.4	40.2	44.0	-	37.3	(3.0)	36.7	36.9	39.8	-
	<i>After</i>	39.0	(4.0)	37.1	38.9	41.6		38.3	(4.4)	35.5	37.7	39.4	
% of total Energy from Polyunsaturated fatty acid	<i>Before</i>	23.5	(5.0)	20.6	22.3	27.0	-	23.0	(5.0)	18.6	21.8	27.1	-
	<i>After</i>	21.6	(4.1)	20.9	21.5	25.0		22.2	(4.5)	19.1	21.3	24.8	

*With significant difference $p < 0.05$

Table 21: Further analysis of dietary carbohydrate intake

		<i>Intervention Group</i>						<i>Control Group</i>					
		<i>Mean</i>	<i>(SD)</i>	<i>1st Quartile</i>	<i>Medium</i>	<i>3rd Quartile</i>	<i>P-value</i>	<i>Mean</i>	<i>(SD)</i>	<i>1st Quartile</i>	<i>Medium</i>	<i>3rd Quartile</i>	<i>p-value</i>
Total Sugar (g)	<i>Before</i>	67.7	(16.1)	56.3	69.8	76.9	0.498	60.6	(12.6)	52.3	60.0	68.9	0.486
	<i>After</i>	64.0	(24.4)	48.0	59.0	77.0		54.4	(29.0)	39.0	43.8	51.8	
Total Starch (g)	<i>Before</i>	78.7	(25.9)	56.5	86.4	94.2	0.058	71.0	(16.2)	64.0	71.0	83.1	0.375
	<i>After</i>	62.5	(14.1)	51.8	60.0	68.7		60.8	(28.4)	47.7	56.4	64.2	
Fibre (g)	<i>Before</i>	16.5	(6.8)	12.8	15.3	19.1	0.026*	13.6	(3.3)	11.6	12.5	14.6	0.049*
	<i>After</i>	11.8	(4.7)	9.2	11.2	12.7		10.9	(4.0)	8.2	10.0	12.8	
Sucrose (g)	<i>Before</i>	24.2	(7.8)	19.9	23.6	27.8	0.808	25.6	(10.2)	23.4	25.0	27.6	0.464
	<i>After</i>	25.2	(16.6)	17.9	20.9	28.8		22.6	(11.6)	15.6	21.3	30.3	
% of Total Energy from Sugar	<i>Before</i>	18.3	(5.3)	14.0	17.8	21.1	-	15.8	(2.6)	13.6	16.0	16.7	-
	<i>After</i>	22.9	(5.8)	17.9	23.0	27.0		15.6	(5.2)	11.5	13.6	19.5	

*With significant difference $p < 0.05$

Table 22: Vitamins and minerals intake

		<i>Intervention Group</i>				<i>Control Group</i>			
		<i>Mean</i>	<i>(SD)</i>	<i>Median</i>	<i>p-Value</i>	<i>Mean</i>	<i>(SD)</i>	<i>Median</i>	<i>p-value</i>
Thiamine (mg)	<i>Before</i>	1.9	(2.0)	1.0	0.032*	0.9	(0.2)	0.9	0.405
	<i>After</i>	0.9	(0.5)	0.8		0.8	(0.3)	0.8	
Riboflavin (mg)	<i>Before</i>	1.6	(1.2)	1.3	0.077	1.2	(0.3)	1.2	0.519
	<i>After</i>	1.0	(0.4)	0.9		1.1	(0.5)	1.0	
Niacin Eq (mg)	<i>Before</i>	27.7	(9.5)	25.6	0.090	24.9	(6.0)	25.4	0.413
	<i>After</i>	22.9	(5.0)	21.3		22.6	(9.0)	21.4	
Vit. C (mg)	<i>Before</i>	131	(68)	123	0.057	128	(44)	117	0.118
	<i>After</i>	96	(63)	77		96	(59)	101	
Vit. E (mg)	<i>Before</i>	16.2	(20.6)	8.8	0.032*	7.4	(3.1)	7.3	0.565
	<i>After</i>	4.9	(1.5)	4.7		6.6	(4.0)	5.7	
Vit. B6 (mg)	<i>Before</i>	2.1	(3.5)	1.1	0.199	1.0	(0.3)	1.0	0.343
	<i>After</i>	0.9	(0.3)	1.0		0.9	(0.5)	1.0	
Vit. B12 (ug)	<i>Before</i>	3.9	(3.4)	2.8	0.365	3.3	(2.1)	3.2	0.482
	<i>After</i>	3.2	(1.6)	2.8		4.1	(3.5)	3.4	
Folate (ug)	<i>Before</i>	206	(141)	166	0.094	166	(40)	154	0.525
	<i>After</i>	140	(61)	132		147	(79)	141	
B. Carotene (ug)	<i>Before</i>	2754	(2070)	2292	0.800	2733	(1053)	2493	0.791
	<i>After</i>	2613	(1938)	2190		2528	(2148)	2094	
Total Vit. A Eq (ug)	<i>Before</i>	791	(488)	627	0.105	617	(287)	567	0.699
	<i>After</i>	617	(319)	526		560	(435)	451	
Sodium (mg)	<i>Before</i>	1914	(965)	1736	0.050	2122	(924)	2089	0.590
	<i>After</i>	1368	(536)	1476		1946	(812)	1661	
Calcium (mg)	<i>Before</i>	633	(227)	599	0.237	595	(185)	598	0.482
	<i>After</i>	554	(304)	422		537	(338)	515	
Iron (mg)	<i>Before</i>	15.1	(6.5)	13.1	0.010*	15.7	(3.7)	15.1	0.400
	<i>After</i>	11.1	(6.0)	8.7		13.8	(4.4)	11.4	
Zinc (mg)	<i>Before</i>	9.6	(3.6)	8.2	0.067	10.4	(2.7)	10.8	0.073
	<i>After</i>	7.5	(2.2)	7.1		8.5	(2.8)	8.6	
Selenium (ug)	<i>Before</i>	55.2	(24.8)	52.0	0.724	53.3	(20.5)	53.3	0.486
	<i>After</i>	52.2	(30.7)	47.0		47.4	(27.5)	41.3	

*With significant difference $p < 0.05$

Chapter 5

DISCUSSION OF RESULTS

5.1 Subjects

5.11 Social Economic Status

Most of the Taiwanese immigrants in New Zealand are well educated compared to the normal Taiwanese population (Table 23). Eighty-six percent of the subjects had tertiary qualification while only 9.7% of the residents in Taiwan enrolled in colleges and universities in 2000 (EIU, 2002). This could demonstrate the symptoms of “brain drain” from Taiwan; highly skilled workers moving overseas to seek employment.

However, due to the language problem, the employment rate of the subjects in New Zealand was relatively low (33%) compared to the employment rate in Taiwan of women with similar qualifications (65% with tertiary qualifications) and in a similar age group (50.5% aged 45-54) in 1997 (DGBAS, 1997).

The most common occupations for the subjects in New Zealand were clerks or service workers/shop sales workers (62.5% of employed subjects), while only 25% of female labour force in Taiwan came under this occupation category in 2001 (DGBAS, 2002). Furthermore, 81% of our subjects defined themselves as housewives, which is also the main reason for women not working in Taiwan (57.3%), the rest 22% as volunteer workers, 7% as students and 7% as retired.

Table 23: Demographics table of all subjects before study

	ALL 27 SUBJECTS	
	(n)	(%)
Work Status*		
<i>Student</i>	2	7
<i>Housewife</i>	22	81
<i>Retired</i>	2	7
<i>Disabled</i>	0	0
<i>Unemployed</i>	0	0
<i>Employed</i>	9	33
<i>Volunteer Workers</i>	6	22
Occupation		
<i>Senior officials/managers</i>	3	11
<i>Professionals</i>	0	0
<i>Technicians/associate professionals</i>	2	7
<i>Clerks</i>	4	15
<i>Service workers/shop sales workers</i>	4	15
<i>Plant/machine operators and assemblers</i>	0	0
Education Levels		
<i><12 Years</i>	1	4
<i>12 Years</i>	3	11
<i>12-16 Years</i>	18	67
<i>>16 Years</i>	5	19

* Subjects were allowed to have more than one choice, which can describe their work status.

In the Chinese culture, social economic status is a very private issue. Most subjects refused to answer questions on their economic status or husband's occupation. They also thought these questions were not directly relevant to the study. However, all subjects were willing to give information about their own occupation, as they understood it would help the researcher to analyse their activity levels.

Also in some cases, the subjects did not want to supply information about their husbands. This may also explain why the response rate was low (20-30%) to the questions related to the husband's occupation. Besides, 30% of the subjects were single or divorced, while one subject was single and seven were divorced. This compares to government statistical data in Taiwan, where among women aged between 40-49, 7% were single, 79.9% were married and 8.8% were divorced (DGBAS, 2002). The reason for the high divorced rate in New Zealand Taiwanese women could be the environment effect or distance relationship between husband and wife.

5.12 Household Composition

Fifteen percent of subjects had three or more children, 56% had two, 11% had one and 19% had no children (Table 24). In Taiwan, the average number children per family in the age group 40-49 and 50-64 are 2.5 and 3.3 respectively (DGBAS, 2002). Furthermore, 44% subjects youngest children were in the age range between 10-20 and 26% of the subjects' youngest children were over 20 years old.

TABLE 24: Household Composition Table of ALL Subjects Before Study

	<i>ALL 27 SUBJECTS</i>	
	<i>(n)</i>	<i>(%)</i>
Number of Children		
0	5	19
1	4	11
2	15	56
≥3	4	15

5.13 Health Status

Most subjects didn't have any health problems that affected their daily physical activities, except one subject who had mild joint pain, one who had mild lower back pain and one who had a slight sleeping disorder.

More than half the subjects (67%) took no medication. However, three subjects were under female hormone replacement therapy for menopause discomfort; two subjects had medication for asthma and digestion system disorders and one took thyroxin, one antihypertensives and one cancer medicine (Tamoxifen®).

In this study, subjects aged between 40-60 years old were chosen as this is the common age for Taiwanese women to experience menopause. Sixty-three percent of the subjects had not experienced menopause, Menopause started in 7% of the subjects less than one year ago, in 19% of subjects between 1-3 years ago, and in the remaining 11% of subjects more than 3 years ago.

One of the common side effects of menopause is weight gain due to hormone unbalance. In this study, 50% of subjects gained weight, 40% experienced no weight change and only one subject lost weight after the menopause.

Alcohol consumption by the subjects in this study was lower than women in the New Zealand population. Here, 41% of subjects were non-drinkers, 55% were light drinkers and only 4% were frequent drinkers. This compares to a New Zealand survey in 1988, where 38% of women were classified as light drinkers and further 30% of women as frequent drinkers (Wyllie and Casswell, 1989). In the 1996/97 New Zealand Health Survey, it was found that 21.2% of females aged between 45-64 years old were non-drinkers, 75.3% were light/frequent drinkers and the further 3.5% were defined as "hazardous drinkers" with an AUDIT (Alcohol Use Disorders Identification Test) score of over eight (Ministry of Health, 1999).

In addition, the prevalence of smoking in the subjects was also much lower than that in New Zealanders. In 1999, 20.2% of females in New Zealand aged 45-64 were current smokers, 27.2% were ex-smokers and the rest (52.6%) never smoked, Most of the subjects in this study (96%) were non-smokers and never smoked.

None of the subjects were heavy coffee drinkers (over 3 cups per day); 59% of the subjects drank 1-3 cups per day or occasionally, and 41% didn't drink coffee at all.

5.2 Anthropometrics

5.2.1 Overweight/Obesity Prevalence of Taiwanese Women in New Zealand

Compared to middle aged women in Taiwan (Kao et al., 1998), Taiwanese women in New Zealand had higher mean body weights, heights and BMI. Although waist and hip circumferences were higher in Taiwanese women living in New Zealand, their mean W/H ratios were slightly lower than women in Taiwan. As for the skinfolds measurement, both triceps and subscapular skinfolds were higher in women in New Zealand (Table 25).

Table 25: Anthropometrics Comparison

	<i>All Subjects (aged: 40-60)</i>			<i>Women in Taiwan (aged: 45-64) (NAHSIT1993-1996)</i>		
	<i>Mean</i>	<i>(SD)</i>	<i>Median</i>	<i>Mean</i>	<i>(SD)</i>	<i>Median</i>
Height (cm)	158.2	(5.6)	158.1	153.6	(4.9)	153.4
Weight (kg)	64.5	(8.9)	64.7	58.0	(8.8)	57.2
BMI (kg/m²)	25.8	(3.5)	25.9	24.6	(3.5)	24.4
Waist Circumference (cm)	80.3	(9.4)	79.3	77.2	(8.6)	76.0
Hip Circumference (cm)	101.4	(6.5)	100.2	95.6	(6.5)	95.2
W/H Ratio	0.79	(0.07)	0.78	0.81	(0.06)	0.80
Triceps Skinfolts (mm)	25.7	(6.2)	25.8	21.3	(5.9)	20.6
Subscapular Skinfolts (mm)	29.1	(6.7)	30.5	19.9	(6.8)	19.5

A formula for calculating ideal body weight in Taiwanese women was proposed by Huang et al, based on the data collected in NASIT 1980-1982 (Huang et al., 1992).

This is: $\text{Weight (kg)} = (\text{Height (cm)} - 158) * 0.5 + 52$

Table 26 shows the overweight and obesity prevalence when body weight was more than 10%, 20% and 30% over the ideal body weight. The prevalence of obesity among Taiwanese women in New Zealand was much higher than that in women in Taiwan.

According to the Department of Health in Taiwan in 1995, the ideal BMI for the Taiwanese people is 22 (kg/m²) (Kao et al., 1998). Overweight and obesity prevalence defined as being over the ideal BMI value by 10% (24.2), 20% (26.4) and 30% (28.6) is shown in Table 26. Compared to women in Taiwan, more Taiwanese women in New Zealand were in the BMI range of 26.4-28.6 (kg/m²) and over 28.6 (kg/m²).

Table 26: Overweight/obesity prevalence by ideal body weight (IBW) and BMI

<u>Standard by Ideal Body Weight</u> * $IBW (kg) = 52 + (Height (cm) - 158) * 0.5$			
Body Weight	110% IBW ~ 120% IBW	120% IBW ~ 130% IBW	Over 130% IBW
All Subjects	18.5%	18.5%	37.0%
Women in Taiwan (NAHSIT 1993-1996)	21.4%	20.7%	20.9%
<u>Standard by BMI</u> * $BMI (kg/m^2) = Weight (kg) / Height^2 (m^2)$			
BMI	24.2 ~ 26.4	26.4 ~ 28.6	Over 28.6
All Subjects	22.2%	22.2%	22.2%
Women in Taiwan (NAHSIT 1993-1996)	22.2%	17.6%	11.9%

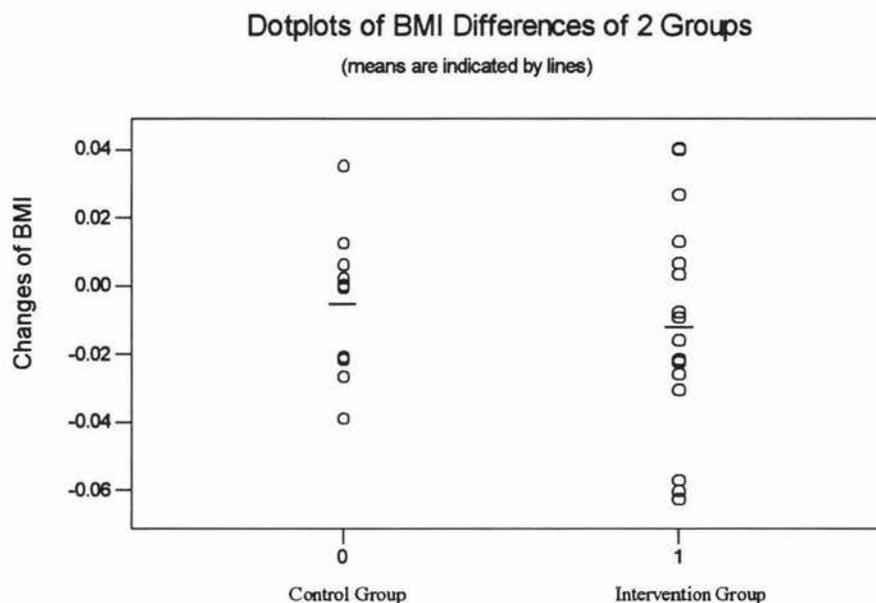
Table 27: Overweight/obesity prevalence by W/H ratio and triceps skinfolds

	W/H Ratio ≥ 0.85	Triceps Skinfolds $\geq 28mm$
All Subjects	25.9%	33%
Women in Taiwan (NAHSIT 1993-1996)	21.3%	14%

The rate of obesity indicated by measurements in the central region (W/H ratio) and the upper arm (triceps skinfolds) were both higher in the subjects than in women in Taiwan. Table 27 shows that when obesity is defined by W/H ratio ≥ 0.85 and a triceps skinfolds $\geq 28mm$, the prevalence of obesity in the subjects was 25.9% and 33% compared to the women in Taiwan with 21.3% and 14% respectively (Kao et al., 1998).

5.22 Changes in BW/BMI and Skinfolds

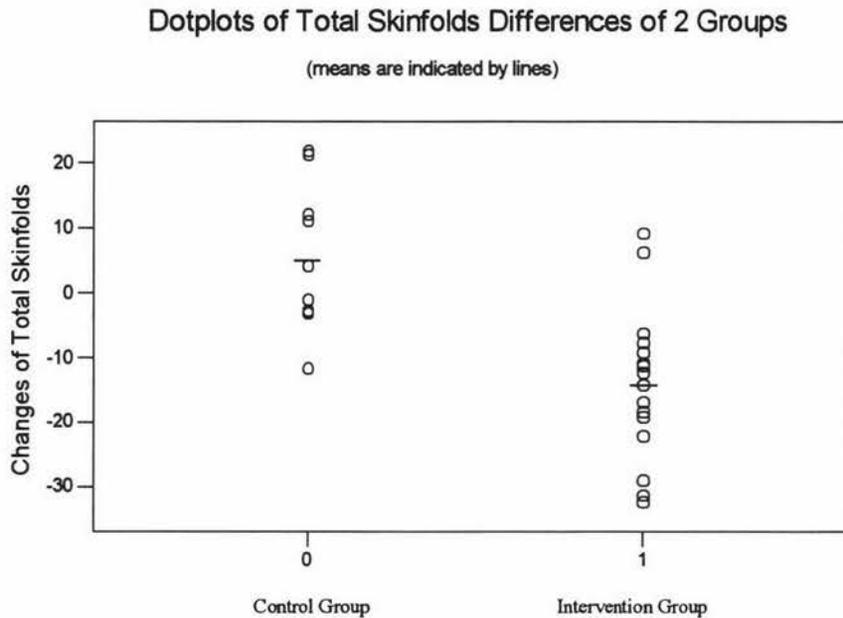
Figure 19: Dotplots of BMI differences in both groups



The dotplots in Figure 19 above shows the distribution of BMI changes in both the control and intervention group. Although, the mean body weight and BMI seem to decrease more after the study in the intervention group (-0.9kg) than the control group (-0.7kg), there were no significant differences ($p > 0.05$) in body weight and BMI between the two groups.

However, a significant difference ($p < 0.001$) was seen in total skinfolds, which decreased more in the intervention group than the control group. This is shown in Figure 20 below. These results demonstrate that the short-term diet and exercise intervention might decrease total body fat (density 0.9) rather than body weight as the exercise increased lean body mass (density 1.1) and in some cases weight, after the intervention.

Figure 20: Dotplots of total skinfolds differences in both groups



5.23 Changes in Body Fat Percentages

Body fat percentage can be estimated by anthropometric prediction equations for different population groups. There are generally based on an accurate measure of body fat like body density and its relationship to various body measures in specific groups, e.g. body circumferences in European females aged 26-54 (McArdle et al., 1996). The five equations listed below are either in popular use or are more suitable to estimate fat levels in our subjects (Taiwanese women aged 40-60) than others (Table 28).

Table 28: Five different formulas for body fat (%) estimation

1 <i>Deurenberg et al., 1991</i>	% Body Fat = $1.20 \times \text{BMI} + 0.23 \times \text{age} - 10.8 \times \text{sex} - 5.4$ (Males = 1, Females = 0)
2 <i>Durnin & Womersley, 1974</i>	Body Density = $1.1333 - 0.0612 \times \log \text{ skinfolds sum}^*$ (aged 40-49) Body Density = $1.1339 - 0.0645 \times \log \text{ skinfolds sum}^*$ (aged over 50) (skinfolds sum* = triceps + biceps + subscapular + suprailiac) % Body Fat (<i>Siri, 1961</i>) = $(4.95 / \text{Body Density} - 4.50) \times 100$
3 <i>Jackson et al., 1980</i>	Body Density = $1.0960950 - 0.0006952 \times \text{skinfolds sum}^{**} + 0.0000011 \times (\text{skinfolds sum}^{**})^2 - 0.0000714 \times \text{age}$ (skinfolds sum** = triceps + abdominal + thigh + suprailiac) % Body Fat (<i>Siri, 1961</i>) = $(4.95 / \text{Body Density} - 4.50) \times 100$
4 <i>Fu and Fung, 1995</i>	% Body Fat = $13.547 + 0.445 (\text{subscapular skinfold}) + 0.406 (\text{forearm skinfold})$
5 <i>McArdle, Katch & Katch, 1996</i>	% Body Fat = Constant A + Constant B – Constant C – 18.4 (Constant A, B and C are converted by the circumference of abdominal, thigh and calf)

All the above equations were based on data derived from European populations except for Fu and Fung's equation, which was especially designed for estimating body fat for Chinese women. This used the forearm skinfold. In one case in this study, the forearm skinfold was hard to take as the subject had too little fat on her forearm to measure. Other subjects also had very little fat on their forearms, which may have caused errors during measurement.

The mean calculated fat percentages from the different equations are showed in Table 29 below. The changed percentage of initial body fat was calculated by the formulation:

$$\text{Changed Percentage of Initial BF (\%)} = (M_A - M_B / M_B) \times 100\%$$

While M_A = the mean value of body fat after the intervention

M_B = the mean value of body fat before the intervention

In general, subjects in the intervention group lost more body fat than those in the control group, in all five equations.

Table 29: Mean values of body fat (%) in two groups

	Intervention Group				Control Group			
	<i>Before</i>		<i>After</i>		<i>Before</i>		<i>After</i>	
	Mean (%)	(SD)	Mean (%)	(SD)	Mean (%)	(SD)	Mean (%)	(SD)
1 <i>Deurenberg et al., 1991</i>	37.7	(4.0)	37.3	(3.7)	33.8	(5.1)	33.6	(4.9)
	<i>-1.1% of initial BF%</i>				<i>-0.6% of initial BF%</i>			
2 <i>Durnin & Womersley, 1974</i>	40.5	(2.7)	39.5	(2.8)	36.9	(4.7)	37.2	(4.9)
	<i>-2.5% of initial BF%</i>				<i>+0.8% of initial BF%</i>			
3 <i>Jackson et al., 1980</i>	32.0	(4.3)	29.8	(4.2)	28.1	(5.1)	28.9	(6.1)
	<i>-6.9% of initial BF%</i>				<i>+2.8% of initial BF%</i>			
4 <i>Fu and Fung, 1995</i>	31.5	(3.1)	30.6	(2.5)	29.1	(5.5)	29.4	(5.6)
	<i>-2.9% of initial BF%</i>				<i>+1.0% of initial BF%</i>			
5 <i>McArdle, Katch & Katch, 1996</i>	26.9	(4.6)	26.3	(4.9)	23.0	(4.0)	23.5	(4.6)
	<i>-2.2% of initial BF%</i>				<i>+2.2% of initial BF%</i>			
Mean Value of ALL 5 Equations	28.1	(2.6)	27.2	(2.4)	25.2	(3.8)	25.4	(4.2)
	<i>-3.2% of initial BF%</i>				<i>+0.8% of initial BF%</i>			

From these results, it was found that Jackson et al's equation gave the most similar result to Fu & Fung's equation, which was specifically designed for Chinese people. If Fu and Fung's equation did indeed give the most accurate results for Chinese then Deurenberg et al's equation and Durnin & Womersley's equation seems to over-estimate; and the McArdle, Katch & Katch's equation seems to under-estimate body fat in our subjects. Fu and Fung's equation was based on measurements in 40 subjects, and was validated in a separate sample of 20 subjects aged 40-50.

5.24 *Factors that Affect Body Weight*

Hormone secretion may affect body weight, especially female hormones. One subjects reported that her body weight was lower than normal during menstruation and went up after menstruation ceased. Another subject's appetite and energy expenditure dropped dramatically due to depression during the menopause. The similar result was also found in the study of Andersson and Seidell et al., they suggested that obesity treatment by implementation of a negative calorie balance might be more successful in postmenopausal than in younger women (Andersson and Seidell et al., 1990).

Travelling is another factor that may have affected body weight/fat during the intervention. In some cases, subjects had their Christmas and New Years holidays during the intervention. As Asian immigrates, several travelled back to their home country, Taiwan, to visit friends and relatives during the holidays. During this time they had totally different lifestyles and ate different foods.

Body composition may also change with the season. A study on women in the USA found that in healthy postmenopausal women, fat tissue increased from winter to summer, and decreased from summer to winter. On the other hand, lean tissue mass decreased from winter to summer, and was increased from summer to winter (Dawson-Hughes and Harris, 1992). In our study, most subjects had their intervention period from winter to spring, which may have affected their body composition negatively, by increasing body fat and decreasing muscle mass.

There is a very important event in February- the Chinese New Year. In Chinese culture, it is important to gather with family members during these days. Special "New Year's Foods" are eaten. New Year's foods usually include many varieties of meat, vegetables and mixed dishes. The quantities of all these foods need to be large enough to feed all the family members. Quantities prepared are too much for one meal and usually last from a few days to a whole week. Furthermore, "New Years" desserts and snacks, such as rice cake and candies, are also high-energy content foods.

Subjects who included "Chinese New Year" during their intervention period seemed to find it hard to control their diet at this time compared to the normal days. Also they were very busy

cleaning the house before Chinese New Year and visiting all their friends and relatives. This may also have affected their body weight/fat status.

Changes of lifestyle may also affect body composition. Some subjects gained or lose weight, who started working or changed their working environment, had big change in their lifestyles. Also, some subjects lose weight, which moved to a new house, did much more extra heavy house work than usual.

5.25 Relationship Between Body Weight Changes and Initial BW/BMI

The figures below show the relationship between initial body weight/BMI and body weight changes (Figure 21 & 22). It was found that changes of body weight had a negative relationship with the subjects' initial body weight and body mass index. Subjects who had a higher initial body weight/BMI lost more after the intervention. On the other hand, subjects who had a lower body weight/BMI before the intervention tended to gain body weight/BMI. This demonstrated that the obese subjects ($BMI > 30$) found it easier to lose their body weight than the normal and underweight subjects ($BMI \leq 25$).

Figure 21: Relationship between initial body weight and body weight changes

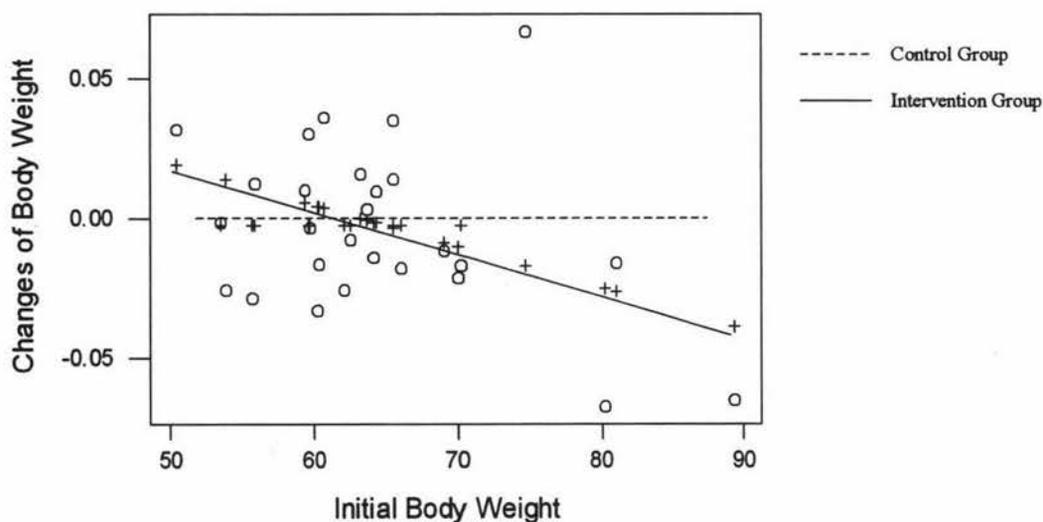
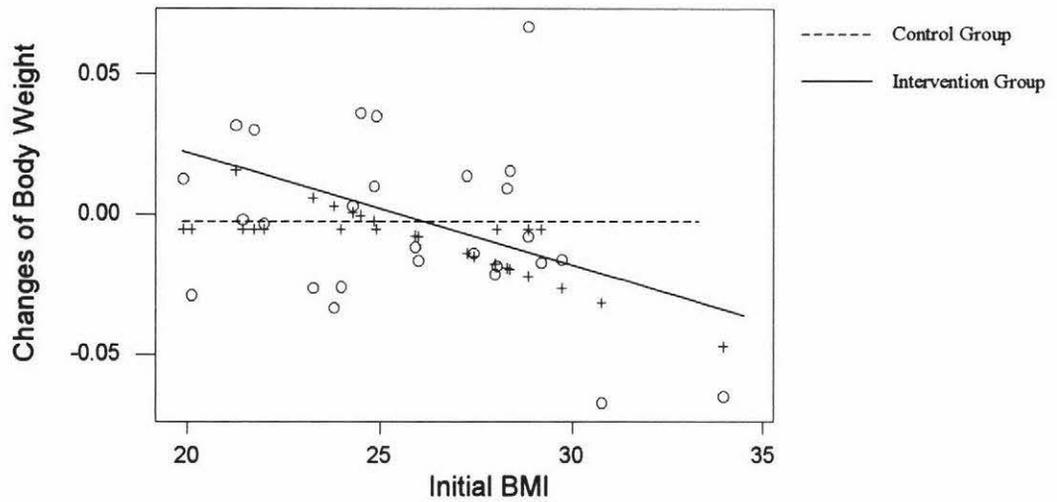
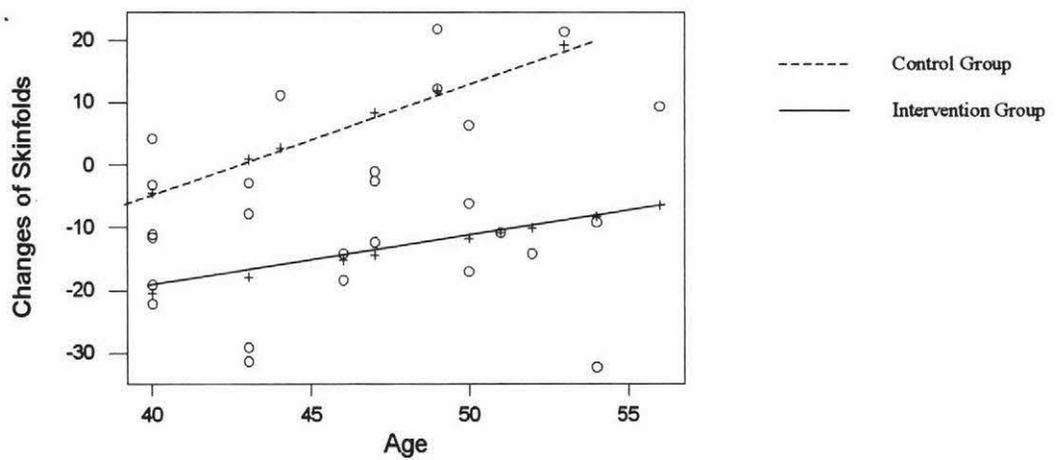


Figure 22: Relationship between initial BMI and body weight changes



5.26 Relationship Between Age and Changes in Total Skinfolts

Figure 23: Relationship between total skinfolts differences and age



The figure above shows the relationship between age of the subject and changes in total skinfolds (Figure 23). It was found that the older subjects lost less fat than the younger ones in the intervention group. In the control group, older subjects gained more fat than the younger ones.

5.3 Exercise Intervention

5.3.1 Habitual Physical Activity Before Study

In the 1996/97 New Zealand Health Survey (Ministry of Health, 1999), levels of physical activity were categorized as in the Table 30 below, which was used in this study.

Table 30: Physical activity category table

Physically Inactive	Sedentary	No sports/activities in the previous seven days.
	Relatively Inactive	Took part in some leisure-time physical activity in the previous seven days, but less than 2.5 hours in total.
Physically Active	Relatively Active	Took part in at least 2.5 hours, but less than five hours of leisure-time physical activity in the previous seven days.
	Highly Active	Took part in five hours or more of leisure-time physical activity in the previous seven days.

When comparing the physical activity levels in all subjects before the study with that of women in New Zealand (Table 31), a greater percentage of the subjects (66.6%) were categorized as physically inactive than women in New Zealand (62.5%). The percentage of physically highly active women was higher in the subjects (48.1%) than New Zealand Women (40.0%) (Ministry of Health, 1999).

On the other hand, a lower percentage of the subjects (22.2%) were physically inactive than women in New Zealand (38.0%). Both the sedentary and relatively inactive percentage were lower in the subjects, 7.4% and 14.8% respectively, compare to 13.5% and 24.5% respectively of the women in New Zealand.

Table 31: Comparison table of physical activity levels between all subjects and women in New Zealand

	<i>All Subjects (Aged 40-60)</i>	<i>Women in NZ (Aged 45-64)</i>
Physically Inactive	22.2 %	38.0 %
Sedentary	(7.4 %)	(13.5 %)
Relatively Inactive	(14.8 %)	(24.5 %)
Physically Active	66.6 %	62.5 %
Relatively Active	(18.5 %)	(22.5 %)
Highly Active	(48.1 %)	(40.0 %)

In New Zealand, the most popular activities were walking (61%), gardening (36%) and exercising at home (14%) (Ministry of Health, 1999). For the middle-aged Taiwanese women living in New Zealand, walking was also the most popular activity. Forty-eight percent of all 27 subjects said walking was their habitual exercise before the study. Swimming (22%) and playing golf (15%) were the next two most popular sports before the study.

5.32 *Previous Weight Loss Program Experienced by Exercise*

Weight loss programs are very popular in Taiwanese women, with 81.5% of all subjects trying them previously and 29.6% trying them recently. Of the subjects who had previously tried to lose weight, only 31.8% of them had included exercise in their program.

5.33 *Physical Activity After Study*

During the intervention, subjects increased their energy expenditure mostly by increasing their sports activities. Energy expenditure on these increased by 11.5 kJ/kg/day on average (Table 17). Working activities also increased slightly by 2.0 kJ/kg/day, but everyday activities decreased by 1.4 kJ/kg/day. In general, subjects were more active than they were before the study.

Compared to the intervention group, energy expenditure by subjects in the control group decreased in their working activities, everyday activities and sport activities by 16.5 kJ/kg/day, 17.9 kJ/kg/day and 0.4 kJ/kg/day respectively (Table 17).

The total inactive time, which includes the time spent every day on sleeping, napping and lying down, decreased by 27.4 mins/day during the intervention; from 650.9 mins/day to 623.5 mins/day (Table 18). On the other hand, it increased by 8.5 mins/day in the control group.

Walking, swimming and playing golf were the most popular sports for our subjects. These sports were also the top three, subjects in the intervention group chose to participate in during their exercise intervention (73% walking, 33% swimming and 13% playing golf). Subjects who did regular exercise before the study, also found it easier to follow and maintain the exercise plan if it used the sport they were most familiar with.

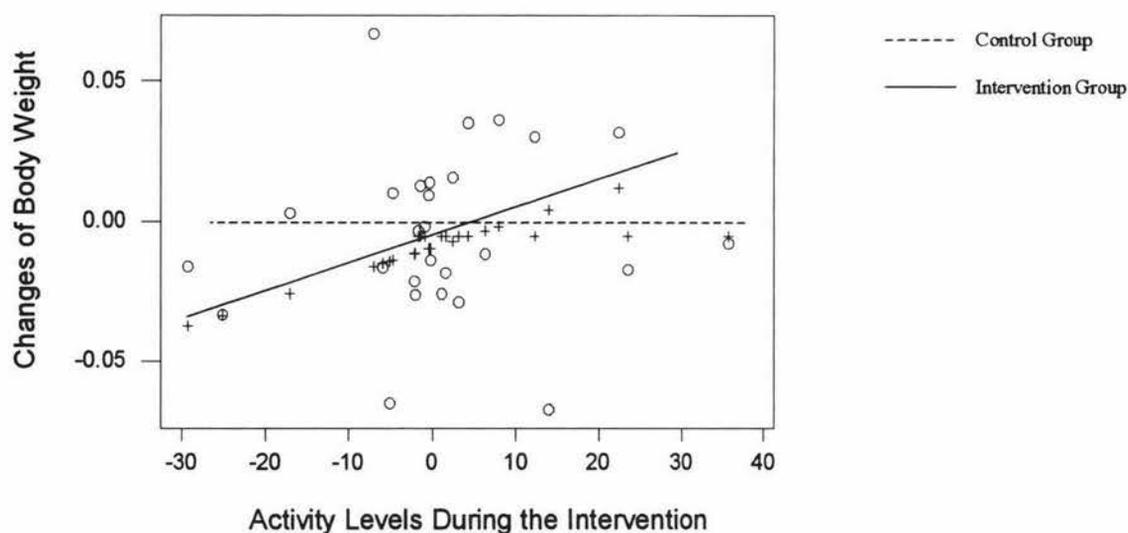
Also, children are an important influence on physical activity in middle-aged women. Subjects with young children tended to do more exercise during children's school holidays. They were more active when spending time with their children.

Taiwanese women have more body image concerns about their lower body (legs) than upper body (arms). They also concerned about their central body (waist and hip area) due to middle-aged women having a higher Waist/Hip ratio than younger women. Therefore, the subjects preferred lower body exercise (e.g. walking, jogging) than upper body exercise. Also, abdominal exercises such as sit-ups were more acceptable to the subjects than push-ups, as most Taiwanese women don't want to develop muscular arms.

5.34 The Relationship Between Physical Activity and Body Composition

The figure below shows the relationship between body weight changes and physical activity levels during the intervention (Figure 24). It was found that subjects who increased their physical activity during the intervention gained more body weight. On the other hand, subjects who decreased their physical activity during the intervention lost more body weight. This demonstrates that the more active people gained more body weight from the increase of muscle mass.

Figure 24: Relationship between body weight changes and activity levels during the intervention



Observations indicated that the site of body fat decrease after the intervention was related to the type of exercise chosen by the subjects. When walking was chosen, the subject lost more fat on her lower body (thigh and calf) than upper body (forearm and upper arm).

5.4 Nutrition Intervention

5.4.1 Nutrient Intake of the Subjects Compared to the Recommendations

The percentage of total energy intake from fat was higher than the recommended value; all saturated fatty acid, monounsaturated fatty acid and polyunsaturated fatty acid intakes were much higher than the NZ/Aus RDI (Table 32). Mean cholesterol intake was within recommendations and sugar close to recommendations.

The nutrient intake of all subjects before the intervention was compared with the RDNA in Taiwan and the RDI in New Zealand/Australia. The intake of protein was almost double the recommendation. Although the average fiber intake of all subjects was higher than that of women in Taiwan, it is still only half the NZ/Aus RDI value.

In general, most vitamins and minerals intake meet the standard recommended values (thiamin, riboflavin, niacin, vitamins A, C, E, B₆, B₁₂ and calcium). However, folate and zinc intakes were lower than both NZ/Aus RDI and Taiwanese RDNA.

Table 32: Median value of nutrient intake among all subjects (n=27) before the study

	<i>Median</i>	RDI NZ/Aus (1990)	<i>RDNA Taiwan</i> (1993)
Protein (g)	71.4	45 or 0.75 g / kg	55
% of Total Energy from Fat	34.2	30-33 %	Less than 30 %
% of Total Energy from Saturated Fatty Acid	38.2	No more than 12 %	-
% of Total Energy from Monounsaturated Fatty Acid	38.7	Up to 20 %	-
% of Total Energy from Polyunsaturated Fatty Acid	22.3	6-10 %	-
% CHO	44.9	50-55 %	-
% Sugar	16.9	No more than 15 %	-
Cholesterol (mg)	284.3	300	-
Fiber (g)	13.0	25-30	-
Thiamine (mg)	0.9	0.8	*1.0
Riboflavin (mg)	1.2	1.2	*1.0
Niacin Eq (mg)	25.6	13	*13.0
Vit. C (mg)	118.9	30	60
Vit. E (mg)	8.1	7.0	10
Vit. B6 (mg)	1.1	0.9-1.4	1.4
Vit. B12 (ug)	3.0	2.0	2.0
Folate (ug)	164.9	200	200
Total Vit. A Eq (ug)	616.3	750	500
Calcium (mg)	599.2	800	600
Iron (mg)	14.9	12-16	15
Zinc (mg)	9.0	12	-

*Based on the subjects who had moderated daily activity.

Aus/NZ RDI (Recommended Daily Intake) ~for 19-54 years old females: It was recommended in *Food of Health: the report of the nutrition taskforce to the department of health*, that the revised Australian Dietary Intakes 1990 be adopted by New Zealand until an extensive revision of New Zealand's RDIs is conducted (New Zealand Nutrition Taskforce, 1990). This is in process at this moment.

Taiwan RDNA (Recommended Daily Nutrient Allowances) ~for 35-55 years old females: Department of Health, Republic of China

5.42 *Comparison of Nutritional Status of Taiwanese Women in New Zealand to that of those in Taiwan*

On immigration to New Zealand, the subjects changed their eating habits, and thus their nutrient intake. Their protein intakes were higher and carbohydrate intakes lower than women of a comparable age in Taiwan (Pan and Chang et al., 1999). See Table 33 below.

Although total fat intake was similar to women in Taiwan, the saturated fatty acid intake as a percentage of total fat intake was much higher in the subjects. On the other hand, polyunsaturated fatty acid intake as a percentage of total fat intake was lower. Cholesterol intake/1000 kJ was also higher in the subjects. However, the mean intakes of fiber of the subjects who moved to New Zealand were much higher than those of women in Taiwan.

In general, the mean intakes of most vitamins and minerals were rather similar (thiamin and riboflavin) or higher (niacin, vitamin E, calcium and iron) in the subjects than women in Taiwan. However, the average vitamin C intakes were higher in Taiwan than in New Zealand and the intakes of vitamin A and sodium in Taiwan were much higher than in New Zealand due to the salty Chinese foods.

Table 33: Nutrients intake and nutrition density of diets in all subjects compared to that of women in Taiwan of a similar age

	<i>All Subjects</i> <i><Aged: 40-60></i>			<i>Women in Taiwan (NAHSIT1993-1996)</i>					
	<i>Mean</i>	<i>(SD)</i>	<i>Nutrient Density /1000 kJ</i>	<i><Aged: 35-54></i>			<i><Aged: 55-64></i>		
				<i>Mean</i>	<i>(SD)</i>	<i>Nutrient Density /1000 kJ</i>	<i>Mean</i>	<i>(SD)</i>	<i>Nutrient Density /1000 kJ</i>
Energy (kJ)	6365	(1200)	1	7100	(6869)	1000	6204	(4069)	1
Protein (g)	72.0	(18.5)	11.3	66.0	(45.8)	9.3	57.0	(33.3)	9.2
Fat (g)	55.7	(20.0)	8.7	65.7	(118.0)	9.3	48.3	(87.2)	7.8
CHO (g)	182	(36)	29	210	(145)	30	207	(96)	33
% Protein	19.3	(4.2)	-	15.6	-	-	15.3	-	-
% Fat	31.9	(7.6)	-	34.9	-	-	29.2	-	-
% CHO	46.1	(7.2)	-	49.6	-	-	55.5	-	-
Fiber (g)	15.4	(5.8)	2.4	5.7	(5.4)	0.8	5.1	(4.9)	0.8
Cholesterol (mg)	250	(93)	40	252	(253)	36	183	(247)	30
Sat (g)	21.5	(7.8)	3.4	20.0	(38.0)	2.8	15.2	(28.6)	2.5
Mono (g)	23.1	(9.2)	3.6	23.4	(52.8)	3.3	17.0	(39.6)	2.7
Poly (g)	13.8	(6.0)	2.2	19.3	(23.4)	2.7	14.0	(18.6)	2.3
% Sat	37.3	(7.0)	-	32.0	-	-	32.9	-	-
% Mono	39.3	(4.0)	-	37.4	-	-	36.8	-	-
% Poly	23.4	(4.9)	-	30.4	-	-	30.3	-	-
Thiamin (mg)	1.6	(1.6)	0.2	1.2	(1.5)	0.2	1.1	(1.4)	0.2
Riboflavin (mg)	1.4	(1.0)	0.2	1.2	(1.0)	0.2	1.2	(1.6)	0.2
Niacin Eq (mg)	26.7	(8.3)	4.2	12.6	(10.0)	1.8	10.3	(6.4)	1.7
Vitamin C (mg)	129	(60)	20	188	(271)	27	170	(233)	27
Vitamin E (mg)	13.0	(16.8)	2.0	8.2	(8.1)	1.2	6.5	(6.1)	1.0
Vitamin A Eq (ug)	727	(427)	115	2582	(3750)	364	3011	(3785)	485
Sodium (mg)	1992	(938)	313	4160	(6461)	586	3548	(4241)	572
Calcium (mg)	619	(210)	97	555	(496)	78	552	(587)	89
Iron (mg)	15.3	(5.5)	2.4	12.6	(11.6)	1.8	10.0	(6.6)	1.6

5.43 *Meal Habits*

Some subjects prepared and ate meals alone. The most common reasons for this were spouse working/living overseas (mostly in Taiwan), living with adult children who managed their own meals or the subject had a bad family relationship. These subjects found it hard to prepare a diet with a wide variety of food, especially vegetables and fruits, when they were the only person eating.

Another reason given for the low consumption of vegetables and fruits was that not many of the varieties they were used to were available in New Zealand, and/or the subjects did not know how to prepare/cook Kiwi vegetables and fruits. The easiest way they can cook is to put them in salads. However, salad is not a popular food for Taiwanese women, as they prefer hot foods to cold foods.

5.44 *Previous Weight Loss Program Experienced by Diet*

Most subjects (77.8%) had attempted weight loss by dieting before the study. The most popular methods used were following a special diet menu (38%), fasting or reducing food intake (33%) and changing eating habits (29%) by eating a healthier or more balanced diet.

Subjects tended to follow their own diet menus obtained from TV, magazines or friends. However, the nutrient content of this diet contains inadequate amounts of protein, carbohydrate, fat and other nutrients. In addition, the time of cooking was too long, which may cause the destruction of water-soluble vitamins from the vegetables.

The other popular way to lose weight was to skip meals. As dinner is the most important meal in the day for the Chinese, subjects usually skipped breakfasts and lunches to reduce energy intake. This may result in low blood sugar levels during the day, and the deposition fat at night after the big dinner.

In addition when dieting, most subjects omit rice from their regular meals, which is the main source of carbohydrate in the Chinese diet. In the long-term if continued, this high protein, high fat, low carbohydrate diet may result in accelerated fat deposition in the arteries.

5.45 Nutritional Status at The End of The Intervention

Significant differences in nutrient intake in both the intervention and control group before and after the study are shown in Table 34 below. In general, subjects in the intervention group decreased their energy intakes significantly ($p < 0.001$) after the study, while there was no significant difference in the control group ($p > 0.05$).

Total amount of fat intake was decreased in the intervention group, as well as all classes of fatty acid (saturated, mono-unsaturated and poly-unsaturated) ($P < 0.001$). Also, total carbohydrate intake decreased significantly ($p < 0.01$) in the intervention group.

Table 34: Significant differences in nutrient intake before and after the study

	<i>Intervention Group</i>			<i>Control Group</i>		
	<i>Mean</i>	<i>(SD)</i>	<i>P- value</i>	<i>Mean</i>	<i>(SD)</i>	<i>P-value</i>
Weight of food (g)	-355	(731)	0.063	-553	(721)	0.038*
Energy (kJ)	-1709	(1389)	0.000*	-635	(1482)	0.209
Total Fat (g)	-24.2	(17.3)	0.000*	-5.9	(16.9)	0.297
Sat (g)	-7.7	(5.8)	0.000*	-1.7	(7.4)	0.482
Mono (g)	-11.2	(8.5)	0.000*	-0.4	(9.8)	0.900
Poly (g)	-7.0	(6.2)	0.000*	-1.1	(6.6)	0.609
CHO (g)	-36.2	(50.5)	0.009*	-14.4	(57.0)	0.446
Fiber (g)	-4.7	(8.0)	0.026*	-2.6	(3.7)	0.049*
Thiamin (mg)	-1.0	(1.8)	0.032*	-0.1	(0.4)	0.405
Vit. E (mg)	-11.3	(19.9)	0.032*	-0.8	(4.4)	0.565
Iron (mg)	-4.0	(5.6)	0.010*	-1.8	(6.5)	0.400

*($p < 0.05$)

However, during the intervention, some subjects ate smaller quantities of foods than before, or reported that they couldn't eat much. This caused their vitamin and mineral intake to decrease after the intervention. For instance, the intake of fiber, thiamin, vitamin E, iron decreased significantly ($p < 0.05$) after the intervention.

Since Taiwanese middle-aged women play an important role in food shopping and preparing meals for their family, they were more aware of nutrient intake, especially the importance of fruit and vegetable consumption, than the other family members. However, their diets were also affected by the needs and preferences of their children. For example, they drank milk regularly because it was a good source of calcium for their growing children, but they drank whole milk during the intervention instead of trim milk because their children preferred the taste of whole milk.

5.46 Limitations of the Study

The behaviour of the subjects during the study might have been influenced by their participation in the study. Subjects might omit some foods from their food records to create the impression that their diet was healthier than it really was. In addition, some subjects in the control group might have changed their eating behaviour during the study. Change of lifestyles might also have affected the body measurements in the control group. For example, travelling, house moving or changing their occupation might influence body measurements.

The food and physical activity records were only based on a few days before and after the intervention. This could not show the true nutrient intake and physical activity pattern of the subjects during the study. Also, most of the subjects in this study ate many Chinese foods. The New Zealand Food Composition database did not include many Chinese foods. Recipes for the Chinese foods input were based on the ingredients before cooking and this would affect the nutrient value estimated. In addition, food records may not have been accurate when it came to the weight or volume of food records.

5.47 Recommendations for Further Research

A long-term intervention in older Taiwanese woman would be useful to measure body fat regain rate and find whether the diet and exercise combination long-term is a good way to loss body fat. Health status measurements, such as heart rates, blood sugar and blood lipids profiles should also be monitored in this study to measure the effect of diet and exercise on risk factors for heart disease and diabetes.

Chapter 6

CONCLUSION

6.1 Conclusion

Middle aged Taiwanese immigrant women living in New Zealand are a special group, with different eating habits and lifestyles compared to women in Taiwan. In this study, they have higher body weight and BMI, therefore, overweight and obesity prevalence is higher in our subjects than women in Taiwan.

This short-term intervention, which combined moderate exercise and diet modification did change the body composition. Skinfolds changed significantly in our 9-week study, which resulted in the decreased body fat percentages. Subjects who had the higher initial body weights and BMI, lost more body weight after the intervention. Besides, the younger subjects lost more fat than the older subjects during the intervention.

Taiwanese women who immigrated to New Zealand were more active than the average women in New Zealand in a similar age group. In this study, it was also concluded that physical activity level had a positive relationship with body weight. Subjects gained more body weight and muscle mass with higher physical activity during the intervention.

The nutritional intake of Taiwanese migrant women in New Zealand was different to that of women in Taiwan. They had higher intakes of protein, carbohydrate, and lower intakes of fat. However, the fat and protein intakes were higher than the recommendation in Taiwan, New Zealand and Australia. During the intervention, subjects had lower intake of all nutrients mainly from the lower amount of food, which further caused the lower body fat percentages.

**Appendix 1: Approved letter by the Massey University Albany
Campus Human Ethics Committee Reference MUAHEC 00/040**



24 August 2001

Jenny Chen
C/O Patsy Watson
Institute of Food Nutrition and Health
Massey University
Albany

Dear Jenny

**HUMAN ETHICS APPROVAL APPLICATION – MUAHEC 01/040:
THE EFFECTS OF AN INDIVIDUALISED DIET AND EXERCISE PROGRAMME ON BODY
FAT LEVELS IN TAIWANESE FEMALES AGED 40-60.**

Thank you for your amended application details, which we recently received and have been placed on our files.

The amendments you have made now meet the requirements of the Massey University, Albany Campus, Human Ethics Committee and the ethics of your application, therefore, are approved.

Yours sincerely



Associate-Professor Mike O'Brien
**CHAIRPERSON,
MASSEY UNIVERSITY, ALBANY CAMPUS
HUMAN ETHICS COMMITTEE**

cc. Patsy Watson, Institute of Food Nutrition and Health

Appendix 2: Advertising pamphlet (E/C)

*Would you like to take part in a
9 week diet and exercise program
to lose weight??*



There is no cost for this program.
It is a part of Massey University
research project.

*Do you worry about that you don't have enough exercise,
or don't know how to control your diet?*

*Are you looking for a healthy way
to tone up your body?*

*We will design your own diet and exercise programme based on
your eating habits and usual activity levels for free!!*

**You are very welcome to join our
9 week diet and exercise programme**

*This programme is designed by
Massey University Master's student
for her thesis in Human Nutrition.*

*The title of the thesis is: the effects of an
individualized diet and exercise programme
on body fat levels in Taiwanese females aged
40-60*

*We want 30 Taiwanese females
aged 40-60 who would like to
improve their body shape using
our diet and exercise programme*

***Absolutely Free!
Please join us!!***

**This study has been approved by the
Massey University Albany Campus
Human Ethics Committee
Reference MUAHEC 00/040**

If you are interested in this study, please contact us by phone or email,
or you can complete the form at right, tear it off and send it back to us.
We will provide you with an information sheet, which provides
more detailed information!

Please contact us now!

Jenny Chen --Can speak Mandarin or Taiwanese



**Patsy Watson (Supervisor)
Massey University
Institute for Food, Nutrition and Human Health
Albany Campus
Private Bag 102 904, North Shore Mail Centre, Auckland
Phone: (09) 443 9627
Facsimile: (09) 443 9640
E-mail: P.Watson@massey.ac.nz**

Contact Details

- Name: _____
- Date: _____
- Phone:(day) _____
(night) _____
- Facsimile: _____
- E-mail: _____
- Address: _____

If you take part in this study, you will:

- ◇ Receive a free analysis of your diet!
- ◇ Learn how to control your diet!
- ◇ Receive a free analysis of your physical activity!
- ◇ Increase your physical activity!
- ◇ Learn how to improve your body shape healthily and naturally!

Besides, remember, that improved diet and increased activity levels can help prevent:

- ◇ Cardiovascular disease!
- ◇ Hypertension!
- ◇ Diabetes!

參加這次的研究活動，妳將可以：

- ◇ 得到免費分析自的飲食！
②
- ◇ 學會如何正確地控制妳的飲食！
- ◇ 得到免費分析妳的日常活動量！
- ◇ 學會如何增加生活中的活動量！
- ◇ 學會如何改善妳的身材！

此外，別忘了，良好的飲食習慣及增加日常活動量將可以幫助妳預防：

- ◇ 心血管疾病！
- ◇ 高血壓！
- ◇ 糖尿病！

妳想要參加9周

飲食運動課程

來減輕體重嗎？



此課程完全免費
屬於梅西大學的研究計畫

妳正在為運動不足，或不知
如何控制飲食而煩惱嗎？

妳正在為尋找健康的
瘦身途徑而煩惱嗎？

我們免費根據你的飲食習慣和
日常生活習慣，為妳量身訂做一份
屬於妳自己的飲食運動計畫！！

歡迎參加我們的
“九週飲食運動課程”

此活動是由梅西大學研究所
碩士班學生為她的人類營養學
碩士論文所舉辦

徵求 30 位 40-60 歲想要藉由飲食及
運動來改善身材的台灣婦女

完全免費！
歡迎報名參加！！

此研究已經由 The Massey University
Albany Campus Human Ethics Committee
所核准 (Reference MUAHEC/00/040)

如果妳對這次的研究活動有興趣，請與
我們研究人員以電話或 E-mail 聯絡，或
填妥右列的表格，並撕下寄回給我們，
我們會提供妳一份完整的研究計畫手
冊，提供更詳細的研究細節！！

請立刻聯絡：

Jenny Chen (國、台語均可)

████████████████████

████████ ██████████

████████████████████

████████ ██████████

Patsy Watson (Supervisor)

Massey University

Institute for Food, Nutrition and Human Health

Albany Campus

Private Bag 102 904, North Shore Mail Centre,

Auckland

Phone: (09) 443 9627

Facsimile: (09) 443 9640

E-mail: P.Watson@massey.ac.nz

聯絡資料

姓名：_____

日期：_____

電話 (白天) _____

(晚上) _____

傳真：_____

E-mail：_____

住址：_____

Appendix 3: Participant information sheet (E/C)



Institute for Food, Nutrition and Human Health
Albany Campus

**THE EFFECTS OF AN INDIVIDUALIZED DIET AND EXERCISE
PROGRAMME ON BODY FAT LEVELS IN TAIWANESE FEMALES
AGED 40-60**

Participant Information Sheet

*Do you worry about that you don't have enough
exercise, or don't know how to control your diet?*

*Are you looking for a healthy way
to improve your body shape?*

***Volunteers Are Wanted For A Study of
"The Effects of An Individualized Diet And Exercise
Programme On Body Fat Levels In Taiwanese Females
Aged 40-60"***

You Are Very Welcome to Join Our Study!

**This study has been approved by the Massey University
Albany Campus Human Ethics Committee
Reference MUAHEC 00/040**

Researcher Background

This study is being conducted by Jenny, Yun-Wen Chen. She was a pharmacist in Taiwan with a Bachelor's degree of Science in Pharmacy from Kaohsiung Medical College. She is currently completing her Master's degree of Nutritional Science at Massey University. She has been living with her family in New Zealand for 3 years. Her supervisor is Patsy Watson, a nutritionist and programme leader in Human Nutrition in the Institute of Food, Nutrition and Human Health of Massey University in Albany Campus.

Study Outline

Obesity and overweight especially in the recent years is a major public health problem in Taiwan, New Zealand and worldwide. Both obesity and overweight may increase the occurrence of cardiovascular and heart disease and diabetes, which are the 3rd and 5th most frequent cause of death in Taiwan in 2000. Eating healthily, having enough exercise will help Taiwanese women at their middle age to prevent these diseases and maintaining a healthy body shape. In order to find a safe and effective way to lose fat, we are going to assess the efficiency of an individualized daily diet and exercise intervention programme.

The subjects will be divided into the control and experimental group. Body fat levels, dietary intake and physical activity will be analyzed in each volunteer at the beginning of this study. This will provide the information for the researcher to give appropriate diet and exercise advice to the subjects in experimental group. Each volunteer in the experimental group will then be given a diet and exercise plan which she will carry out over 9 weeks. During this time, the researcher will phone the volunteer 5 times to help with any problems and provide with support. On each of these phone calls, the volunteer will weigh herself on bathroom scales and the researcher will record her weight. At the end of the intervention period, body fat levels, dietary intake and physical activity will again be measured in both control and experimental group.

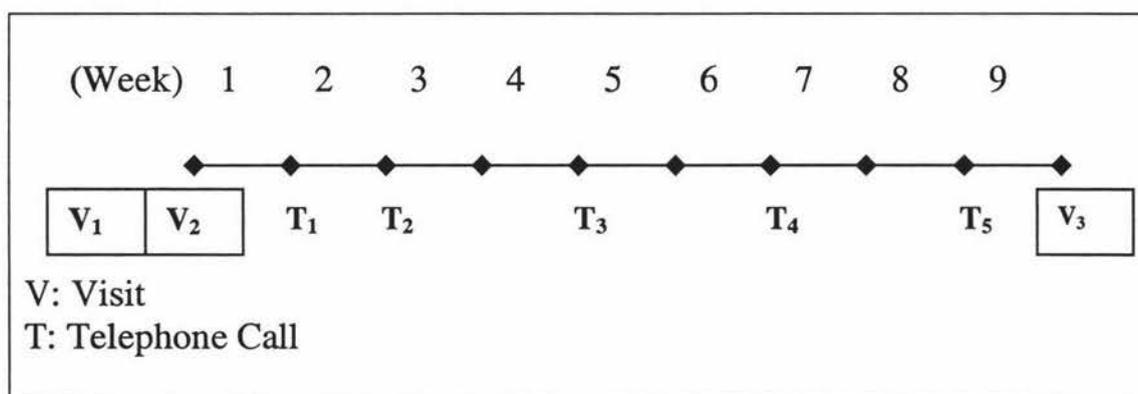
Change in body fat levels will be estimated at the end of the intervention period. This information will show the effectiveness of fat loss using individualized diet and exercise program. The result of this study will provide the reference for the Taiwanese women who intend to change their body composition, either change their body weight or change their fat mass percentage, by diet and exercise.

What you will need if you want to take part in this study?

- You will need a home telephone or mobile number, which we can contact you.
- You will need a set of bathroom scale.

What will you be asked to do if you are a participant?

- The whole program will take about twelve weeks.
- For the control group, there will be two visits (V₁ and V₃) to you as shown in the diagram below.
- For the experimental group, there will be three visits (V₁₋₃) and five telephone calls (T₁₋₅) to you, as shown in the diagram below.
- You may have a friend or family member present at all or any intervention if you wish.



♣ **First Visit** (Requires around one hour) (For Both Control and Experimental Group)

- A general questionnaire to determine your health, lifestyle and weight history will be administered by the researcher. This information is necessary for the study.
- A physical activity questionnaire to determine your current physical activity status will be administered by the researcher. This information will help the researcher to develop your individual exercise plan and help her to compare your physical activity before and after exercise intervention.
- The researcher will carry out a 24-hour recall interview on your dietary intake. This information will help the researcher to develop your individual diet plan.
- The researcher will explain to you how to keep three day diet record.

- The following body measurements will be taken:

1. Body Weight
2. Body Height
3. Skinfolts at the following sites
 - Forearm
 - Triceps (Back of upper arm)
 - Biceps (Front of upper arm)
 - Subscapular (Below the bottom tip of scapular)
 - Abdominal (At the side of umbilicus)
 - Suprailiac (Above the side of hip bone)
 - Thigh (At the midline of the thigh)

-The researcher will use special calipers to measure the width of a fold of skin.

-This produces a feeling of slight pressure, but no pain.

-The measurements will be taken on your right side of the body

4. Circumference at the following sites

- Waist
- Hip
- Abdomen
- Thigh
- Calf

Note: You will be asked to wear the T-shirt and loose pants or shorts for the body measurement.

--Between First and Second Visit--
(For Both Control and Experimental Group)

- You will be asked to describe and weigh all foods and drinks consumed during two complete weekdays and one weekend day, and record these details in the record book provided.
- To keep the diet record in each day requires around half an hour each day.
- You will be asked to send the diet record book back to the researcher the postage paid envelope provided when your record is complete. Your diet record will be analyzed before the second visit.

♣ **Second Visit** (Requires around 20-30 minutes)
(*For Experimental Group Only*)

- You will be given an individual diet and exercise plan and advice based on your body fat levels, activity and diet records.

--Between Second and Third Visit--
(*For Experimental Group Only*)

- You will be asked to follow the diet and exercise plan for the nine weeks intervention period.
- The researcher will phone you five times to record your current body weight and answer your questions regarding your diet and exercise if any. You will use your own bathroom scale to weight yourself.
- The telephone calls will be made at the end of week one, week two, week four, week six and week eight.
- Each telephone call will require 5-10 minutes.

♣ **Third Visit** (Requires around 40-50 minutes)
(*For Both Control and Experimental Group*)

- The second physical activity questionnaire will be given at the end of week nine, which will be similar to the first one.
- The second 24-hour recall will be given at the end of week nine, which will be the same as the first one.
- The second three day dietary record will be given at the end of week nine, which will be the same as the first one. And also, you will be asked again to send it back to researcher after it is finished.
- The second set of body measurements will be taken at the end of week nine. These will be the same as the first set of measurements.

What will you get out of taking part?

Each volunteer will receive a summary of the study results as well as a brief analysis of her nutrient intake, body composition results and the general diet and exercise guideline.

Rights of Participants

- Any volunteer receiving this information sheet may decline to take part in the study.
- Any volunteer may refuse to answer any question or have any body measurement made if they wish.
- All volunteers can withdraw from the study at any time.
- All volunteers have the right to ask questions about the study at any time during the study.
- All volunteers provide information on the understanding that their name will not be used.
- All volunteers will be given access to a summary of the findings of the study when complete.

If you have any queries or concerns regarding your rights as a participant in this research, you may contact the Health Advocate Trust, Phone (09) 638 9638.

Confidentiality

The results of this study will of course be **CONFIDENTIAL**. Anything a volunteer tells the researcher will be anonymous and remain confidential. Each volunteer will be identified by code number only, not by name, in the collection and analysis of all information. All data collected will be filed in a locked cabinet in a locked and alarmed room. A master list of the names, address and code numbers will be kept by the project supervisor under lock and key in a separate location. The analysis of the information will focus on the results for the group as a whole, not the individual.

Publication of Results

Results of this study will be written up in a thesis, and presented at nutrition conference and as a scientific paper.

If you are interested in taking part in this study and we hope you will be, please contact the researcher by phone or email or complete the attached form and send it to:

Jenny Chen

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED] [REDACTED]
[REDACTED] [REDACTED]
[REDACTED] [REDACTED]

Patsy Watson (Supervisor)
Massey University
Institute for Food, Nutrition and Human Health
Albany Campus
Private Bag 102 904,
North Shore Mail Centre,
Auckland
Phone: (09) 443 9627
Facsimile: (09) 443 9640
E-mail: P.Watson@massey.ac.nz

Contact Detail

Yes, I am interested in taking part in this study and here are my contact details!

▪ Date Today: _____

▪ Name: _____

▪ Phone Number: (Day) _____

(Night) _____

▪ Mobil Number: _____

▪ E-Mail Address: _____

▪ Facsimile: _____

▪ Home Address: _____



Institute for Food, Nutrition and Human Health
Albany Campus

**THE EFFECTS OF AN INDIVIDUALIZED DIET AND EXERCISE
PROGRAMME ON BODY FAT LEVELS IN TAIWANESE FEMALES
AGED 40-60**

研究說明書

妳正在為運動不足，或不知如何控制飲食而煩惱嗎？

妳正在為尋找健康的瘦身途徑而煩惱嗎？

徵求研究自願參加者

***“The Effects of Diet and Exercise On Body
Composition In Taiwanese Females Aged 40-60”***

非常歡迎妳來參加我們的研究

此研究已經由 The Massey University Albany Campus
Human Ethics Committee 所核准 (Reference MUAHEC/00/040)

研究者的背景

這次的研究是由陳韻文(Jenny)所策劃執行。她是位台灣的藥師，畢業於高雄醫學院藥學系。她目前正在攻讀梅西大學營養科學研究所的碩士學位。她的指導教授是 Patsy Watson，她是位資深營養師及梅西大學 Albany 分校 Food, Nutrition and Human Health 研究所的領導者。

研究概要

不論在台灣或是世界各地，特別是最近幾年內，肥胖或體重過重成爲主要的公共健康問題。因爲肥胖或是體重過重會增加心血管疾病及糖尿病的病發率，他們分別在 2000 年佔台灣十大死因中的第三和第五位。因此健康的飲食和足量的運動可以幫助台灣中年婦女預防這些疾病的發生及維持健康的身材。爲了要找出有效的瘦身方法，我們將對於個別飲食控制及增加日常生活運動量的瘦身方法進行評估。

所有的研究對象將分成兩組，分別爲實驗組和對照組。剛開始，我們會先分析實驗組和對照組中每個人的飲食攝取量、日常運動量和體脂肪百分比。這些資料將可以幫助我們對於實驗組中每個人的飲食及運動給予適當的個別建議。這些在實驗組中的成員，將進行 9 週飲食及運動的計畫，在這九週當中，我們每隔兩週將會以電話聯絡，幫助解決任何運動及飲食上的問題。在這些電話裡，我們也會記錄下成員們以家裡磅秤測量出當時的體重。在九週結束後，我們將會再一次測量實驗組和對照組中所有人的飲食攝取量、日常運動量和體脂肪百分比。

在實驗結束後，我們將分析體脂肪百分比的改變程度。這項資料將可以顯示，利用飲食及運動對於減少脂肪量的有效程度。這次的實驗結果，將可以提供給有意藉由飲食及運動來改善身材的台灣婦女作爲參考。

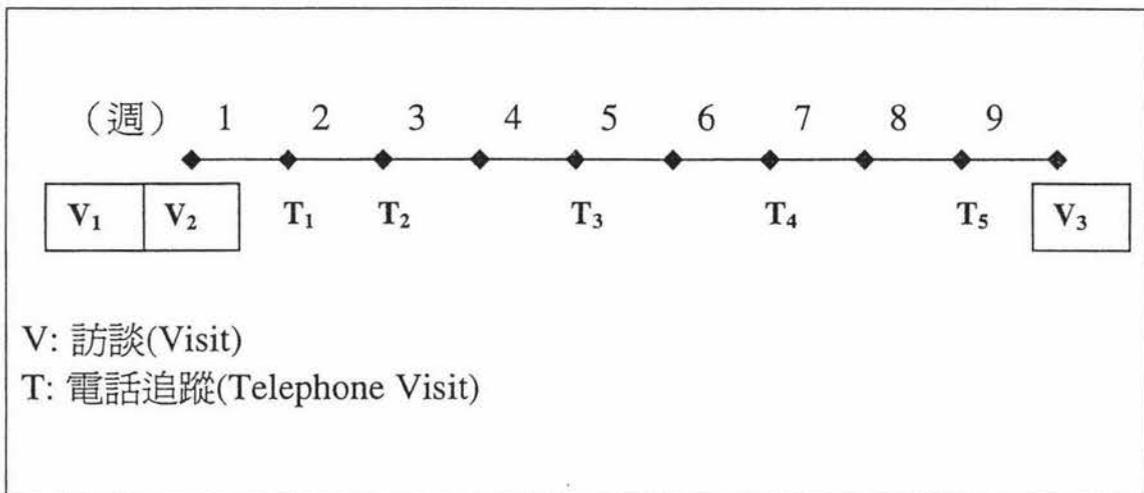
如果妳參加這次研究的話，須要準備些什麼？

- 妳須要有一般家用電話或是行動電話。
- 妳須要有一台體重計。

如果妳參加這次研究的話，將須要做些什麼？

所有的研究計畫進行約 12 週左右

- 對照組的成員，將做兩次的訪談(V₁和V₃)，如下圖所示。
- 實驗組的成員，將做三次的訪談(V₁₋₃)和五次的電話追蹤(T₁₋₅)，如下圖所示。
- 妳如果希望，可以有朋友或家人陪妳做訪談。



❖ 第一次拜訪（大約需一個鐘頭）－ 實驗組和對照組

- 我們將填寫一般問卷表，評估妳的健康、生活習慣和體重變化，這些是研究所需的資料。
- 我們將填寫日常運動量評估問卷表，評估妳目前的運動狀況，這些資料將可以幫助我們對於妳的運動作出適當的計畫。
- 我們將填寫 **24** 小時回憶飲食記錄，這些資料將幫助我們對於妳的飲食作出適當的計畫。
- 我們將為妳說明如何填寫三日飲食記錄。
- 我們將做以下所列的體測量：為了便於體測量，妳需要穿著 T 恤和寬鬆褲子或短褲。

1. 體重
2. 身高
3. 以下部位的皮下脂肪層
 - 前臂(Forearm)
 - 三頭肌(Triceps) (上手臂的後面)
 - 二頭肌(Biceps) (上手臂的前面)
 - 下肩胛骨(Subscapular) (肩胛骨的尾端下面)
 - 腹部(Abdominal) (肚臍旁邊)
 - 腰骨(Suprailiac) (腰骨上面)
 - 大腿(Thigh)

-將使用皮下脂肪測量器，測量皮下脂肪層的厚度。
-此過程會有捏的感覺，但不會痛。
-將測量妳身體的右側。

4. 以下部位的圓周圍
 - 腰圍
 - 臀圍
 - 腹部
 - 大腿
 - 小腿

--在第一次和第二次拜訪之間--
— 實驗組和對照組

- 妳需要填寫三日飲食記錄，記錄妳所吃的所有食物和飲料的份量，這必須包含兩個平常日和一個週末日。
- 每一天的飲食記錄最多需花半個鐘頭。
- 當飲食記錄結束時，妳需要使用所附的回郵信封，將飲食記錄本寄回給研究者。我們將會在下一次的拜訪前，分析好妳的飲食記錄。

♣ 第二次拜訪（大約需 20-30 分鐘）－ 實驗組

- 我們將依妳的體脂肪百分比、日常活動習慣和飲食記錄，作出適合妳的飲食和運動計畫。

--在第二次和第三次拜訪之間--
－ 實驗組

- 妳需要依照所給的運動和飲食計畫，進行 9 週的時間。
- 我們將會打 5 通的電話追蹤，回答妳有關飲食和運動的任何問題，並記錄妳當時在家中所量的體重。
- 電話追蹤將會在第一、二、四、六、八週進行。
- 每一通電話大約花 5-10 分鐘左右。

♣ 第三次拜訪（大約需 40-50 分鐘）－ 實驗組和對照組

- 在第九週結束之後，會再填寫一次日常運動量評估問卷，這次的問卷將和第一次所填寫的類似。
- 在第九週結束之後，會再填寫一次 24 小時回憶飲食記錄，這次的記錄將和第一次所填寫的相同。
- 在第九週結束之後，會再做一次體測量，這次的測量項目將和第一次所作的相同。
- 在第九週結束之後，會再填寫一次三日飲食記錄，這次的記錄將和第一次所填寫的相同。一樣地，妳需要在記錄完成之後，將記錄本寄回給我們。

如果你參加了這次的研究，將可以得到什麼？

每位參加者將可以收到這次研究結果的簡報，以及自己的營養攝取分析、體脂肪百分比結果和一般飲食運動的指導方針。

參加者的權利

- 所有收到這份研究說明的參加者，可以拒絕參加這項研究。
- 所有參加者，可以拒絕回答任何特定的問題。
- 所有參加者，可以隨時地退出這項研究。
- 所有的參加者，有權隨時詢問關於這項研究的任何問題。
- 所有參加者所提供的資料，必須在了解她們的名字並不會被使用的情況下提供。
- 所有的參加者，將可以獲得在研究結束後所得的結論。

如果你對關於參加這次研究的權利有任何問題，你可以聯絡 Health Advocate Trust 電話 (09) 638 9638。

完全保密

這次的研究結果必須完全保密。所有參加者所提供研究者的資料必須匿名且保密。當在收集和分析所有資料時，每位參加者的名字必須以代碼表示。所有收集到的數據，將會被鎖在有警鈴和有鎖的房間櫃子裡。而記有參加者姓名、地址和代碼的名單，將由指導教授所保管，鎖在不同的房間內。分析後所得到的資料結果，將會著重在整個團體，而非一個人的。

結果公佈

這次研究的結果將會寫成論文，並會以科學報告的形式公佈在營養學研討會中。

如果你有興趣參加這項研究，請以電話或 *e-mail* 與我們聯絡，或是填妥所附的表格並寄回：

Jenny Chen



Patsy Watson (Supervisor)
Massey University
Institute for Food, Nutrition and Human Health
Albany Campus
Private Bag 102 904,
North Shore Mail Centre,
Auckland
Phone: (09) 443 9627
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E-mail: P.Watson@massey.ac.nz

聯絡資料

我有興趣參加這次的研究，以下是我的聯絡資料！

▪ 今天日期：_____

▪ 姓名：_____

▪ 電話號碼： (白天)_____

(晚上)_____

▪ 行動電話：_____

▪ E-mail 地址：_____

▪ 傳真號碼：_____

▪ 住址： _____

Appendix 4: Consent form (E/C)

**THE EFFECTS OF AN INDIVIDUALIZED DIET AND EXERCISE
PROGRAMME ON BODY FAT LEVELS IN TAIWANESE FEMALES
AGED 40-60**

Consent Form

This study has been approved by the Massey University Albany Campus Human Ethics Committee Reference MUAHEC 00/040.

If you would like to take part in this study, please complete this consent form and either post it back to me or my supervisor, Patsy Watson. Alternatively, I will collect it at the first visit.

Jenny Chen

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Patsy Watson (Supervisor)
Massey University
Institute for Food, Nutrition and Human Health
Albany Campus
Private Bag 102 904,
North Shore Mail Centre,
Auckland
Phone: (09) 443 9627
Facsimile: (09) 443 9640
E-mail: P.Watson@massey.ac.nz

Consent Form

- I have heard and understood an explanation of the study I have been invited to take part in.
- I have been given, and I have read, a written explanation of what is asked of me.
- I have had the opportunity to ask questions and to have them answered, and I understand that I may ask any further question at any time.
- I understand I have the right to withdraw from the study at any time and have the right to decline to answer any particular questions.
- I agree to provide information to the researcher on the understanding that my name will not be used.
- I understand that my consent to take part does not alter my legal rights.
- I agree to take part as a subject in this study, under the conditions set out in the information sheet.

Subject:

(Given Name)

(Surname)

(Signature)

(Date)

Witness:

In my opinion consent was given freely and with understanding.

(Given Name)

(Surname)

(Signature)

(Date)



Institute for Food, Nutrition and Human Health
Albany Campus

THE EFFECTS OF AN INDIVIDUALIZED DIET AND EXERCISE
PROGRAMME ON BODY FAT LEVELS IN TAIWANESE FEMALES
AGED 40-60

同意書

如果你願意參加這項研究，請填妥此同意書，妳可以寄回給我，或由我在第一次拜訪時收回。

此研究已經由 The Massey University Albany Campus Human Ethics Committee 所核准 (Reference MUAHEC/00/040)

Jenny Chen

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]

Patsy Watson (Supervisor)
Massey University
Institute for Food, Nutrition and Human Health
Albany Campus
Private Bag 102 904,
North Shore Mail Centre,
Auckland
電話: (09) 443 9627
傳真: (09) 443 9640
E-mail: P.Watson@massey.ac.nz

同意書

- 我已經聽過及了解邀請我參加的研究說明。
- 我有拿到並讀過我所要求的書面說明。
- 我有過機會詢問任何問題並且得到回答，而且我知道我將可以隨時詢問進一步的問題。
- 我了解我有權利可以隨時退出這項研究，並且有權利拒絕回答任何特定的問題。
- 在了解我的名字不會被使用的情況下，我同意提供資訊給研究人員。
- 我了解我的同意參加並不會改變我的合法權益。
- 在研究說明資料書中所列出的情況下，我同意成為被研究對象並參與這項研究。

被研究者

(名)

(姓)

(簽名)

(日期)

見證人

我認為此同意是在自由且明瞭的情況下達成的。

(名)

(姓)

(簽名)

(日期)

Appendix 5: Body measurements record

**THE EFFECTS OF AN INDIVIDUALIZED DIET AND EXERCISE
PROGRAMME ON BODY FAT LEVELS IN TAIWANESE FEMALES
AGED 40-60**

Body Measurements Record

Code Number of Subject:

--	--	--	--

Number of Measurement:

--

Date of Interview:

--	--

Day

--	--

Month

--	--

Year

Time of Interview

--	--

Hour

--	--

Minute

This study has been approved by the Massey University Albany Campus
Human Ethics Committee Reference MUAHEC 00/040.

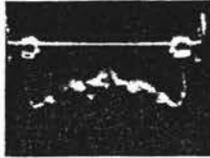
		1 st Measurement	2 nd Measurement	3 rd Measurement	Mean Value
Body Weight (kg)					
Body Height (cm)					
Skinfolds (mm)	*Forearm				
	*Triceps				
	*Biceps				
	*Subscapular				
	Abdominal				
	*Superiliac				
	*Thigh				
Circumferences (cm)	Waist				
	Abdomen				
	Hip				
	*Thigh				
	*Calf				

** The measurements are made on the right side of the body*

Appendix 6: Skinfolds measurements techniques by ISAK

Anthropometry

Level 1



Patria Hume
(Level 3 ISAK Anthropometrist)
The Auckland University

What is

Anthropometry?

- ◆ Human body measurement
- ◆ Kinanthropometry relates to human movement and sports science rather than forensics or ergonomics

Why assess body composition?

- ◆ Determine health risk classification
- ◆ Goal setting
- ◆ Track progress towards goals
- ◆ Use with other measures to check suitability for specific sports
- ◆ Discussion point about 'body image'

ISAK



- ◆ International Society for the Advancement of Kinanthropometry

Accreditation

- ◆ Level 1 - Technician restricted profile
- ◆ Level 2 - Technician full profile
- ◆ Level 3 - Instructor
- ◆ Level 4 - Criterion

Sydney 2000

- ◆ Anthropometry of all Olympic athletes - 22 sports
- ◆ Sydney, Auckland, Canberra, Perth, Brisbane, Adelaide
- ◆ 60 people per site
- ◆ Internet data acquisition



Course content

- ◆ Practical manipulation skills of anthropometry
- ◆ Consistency and standard practice
- ◆ International standards of measurement
- ◆ Theoretical understanding of concepts involved
- ◆ % body fat using regression equations
- ◆ Body mass index
- ◆ Percentile calculations

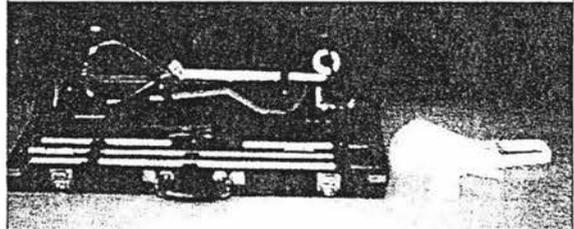
Outcomes

- ◆ Correct land marking
- ◆ Demonstrate use of equipment
- ◆ Take repeated measures in correct sequence
- ◆ Calculate TEMs for duplicate measures
- ◆ Intra-measurer TEMs <10% for skinfolds and <2% for other measures.
- ◆ Inter-measurer TEMs <12.5% for skinfolds and <2.5% for other measures
- ◆ Body density & % body fat using equations

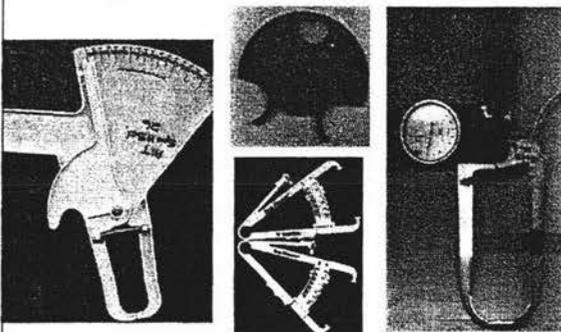
Anatomy

- ◆ Outline sites for restricted profile. *Anthropometrica*
- ◆ Identify on a skeleton and a person the bony landmarks used in the restriction profile
- ◆ Describe verbally the exact site you are looking for
- ◆ Identify muscles and ligaments which are near or overlie bony landmarks
- ◆ Understand directional terminology and other identifiers used in locating landmarks
- ◆ Understand composition of different tissue types in relation to palpation used during profiling

How do I measure it?



Calipers & skinfold calipers



Calibration

Make of skinfold caliper	Jaw area	Force (g)	Pressure g/sq mm
Skyndex	110	900	8.2
Harpندن*	90	900	10.0
Lange	30	500	16.7
Lafayette	30	300	10.0
TEC	30	450	15.0
Slim guide*	90	900	10.0

*Meets international criteria

Precision

- ◆ Ability to take repeated measures and get very similar readings
- ◆ Error - human, equipment, technique, subject
- ◆ Precision = Reliability



Accuracy

- ◆ Measure being very close to what it actually is
- ◆ Accuracy can only be validated against a better method or measure
- ◆ Accuracy = Validity



Precision & data range

Equipment	Precision	Low limit	High limit	Maximum
Bone calipers	0.1 cm	4 cm	13 cm	20 cm
Tapes	0.1 cm	18 cm	150 cm	200 cm
Scales	0.1 kg	20 kg	120 kg	200 kg
Stadiometer	0.1 cm	60 cm	213 cm	2 m
Slim guide	0.5 mm	2 mm	80+ mm	80 mm
Harpenden	0.2 mm	2 mm	80+ mm	40 mm

Scales

- ◆ Calibrate with known masses.
- ◆ Bathroom scales – compression spring
- ◆ Electronic – watch for drift
- ◆ Lever or balance arm. Cantilever system with a calibration screw
- ◆ Balance and compression depends on where you stand. Watch body position as looking down puts COG forward.

Recording...

Appendix 7: Anthropometry Protocol

Recording...

- ◆ 1 or 7
- ◆ 6 or 0
- ◆ 14 or 40

Restricted profile

- ◆Skinfolds x 8
- ◆Girths x 5
- ◆Widths/breadths x 2
- ◆Standing height and Mass

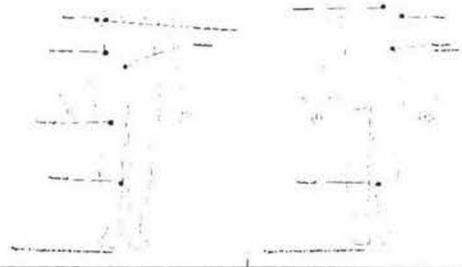
Full profile

- ◆Skinfolds x 8
- ◆Girths 5 + 8
- ◆Lengths x 8
- ◆Widths/breadths 2 + 6
- ◆Standing height and Mass

Skinfolds

- ◆Triceps
- ◆Subscapular
- ◆Biceps
- ◆Iliac crest
- ◆Supraspinale
- ◆Abdominal
- ◆Front thigh
- ◆Medial calf
- ◆*Mid-axilla*

Skinfold sites



Girths

- ◆Head
- ◆Neck
- ◆Arm (relaxed)
- ◆Arm (flexed)
- ◆Forearm (max)
- ◆Wrist (min)
- ◆Chest
- ◆Waist (min)
- ◆Gluteal (hip)
- ◆Thigh (1 cm)
- ◆Thigh (mid tro tib)
- ◆Calf (max)
- ◆Ankle (min)

Lengths

- ◆Acromiale-radiale
- ◆Radiale-styilion
- ◆Midstyliion-dactyliion
- ◆Iliospinale box height
- ◆Trochanterion box height
- ◆Trochanterion-tibiale laterale
- ◆Tibiale laterale to floor
- ◆Tibiale mediale-sphy. tibiale

Widths

- ◆Biacromial
- ◆Biliocrystal
- ◆Foot length
- ◆Sitting height
- ◆Standing height
- ◆Transverse chest
- ◆A-P chest depth
- ◆Humerus
- ◆Femur

Mass

- ◆Look ahead
- ◆Middle of scales

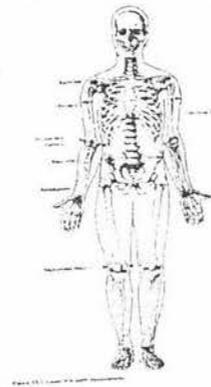


Standing height

- ◆Frankfort plane
- ◆Tragion and orbitale aligned horizontally



Marking subjects



Acromiale

- ◆Superior, lateral
- ◆Acromion process
- ◆Midway anterior posterior borders of deltoid



Radiale

- ◆Proximal, lateral head of radius



Mid acromiale-radiale

- ◆ _ way
- ◆ Anatomical position



Biceps

- ◆ Most anterior

Triceps

- ◆ Most posterior



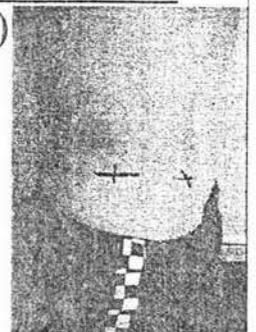
Subscapulare

- ◆ Under most tip inferior angle scapula
- ◆ 2cm 45° lateral



Iliocristale/iliac crest (suprailiac)

- ◆ Lateral, superior iliac tubercle
- ◆ Ilio-axilla line - Mid point of arm pit with lateral superior edge of ilium



Iliocristale/iliac crest (suprailiac)

- ◆ Bend sideways to help find it



Iliospinale

- ◆ Inferior anterior superior iliac spine
- ◆ Internal and external rotation of femur



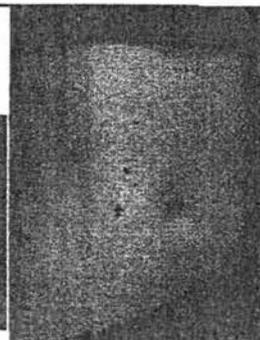
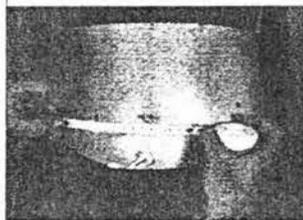
Supraspinale

- ◆ 45° angle
- ◆ Intersect iliospinale and iliocristale



Abdominal

- ◆ 5cm lateral from umbilicus



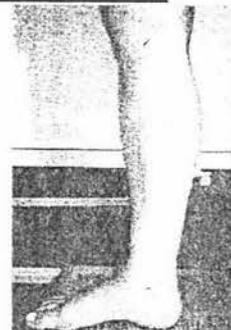
Mid thigh

- ◆ Inguinal crease to anterior superior edge patella
- ◆ Mark _ way



Mid calf

- ◆ Medial maximum circumference (view from front)



Skinfolds

- ◆ Must have parallel sides - No Rangitoto's
- ◆ Contain only 2 thicknesses of skin + subcutaneous adipose tissue - NO muscle fascia or organs.
- ◆ Fingers aligned on the skin marked cross, calipers 1cm lateral from the mark.
- ◆ Keep fingers pinching skin throughout measurement
- ◆ Measure after 2 seconds
- ◆ Compare data with LINZ tables

Skinfold principles

- ◆ RIGHT, left, preferred, or non-preferred side?
- ◆ hold pinch while measuring skinfold
- ◆ 2 seconds
- ◆ 3 trials-median score
- ◆ Calibrated equipment
- ◆ Mark 8 sites first and recheck (30% error when you move only 1cm away from correct site)

Skinfolds - General guidelines

- ◆ M&M - Measure & mark all sites
- ◆ LOT - Location, Orientation, & Technique
- ◆ Use correct calipers



Skinfold techniques

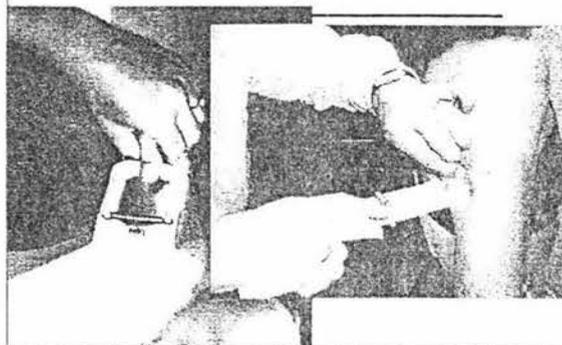
- ◆ Thumb and index finger draw the fold so that their edges are in line with the mark.
- ◆ Fold must have parallel sides otherwise abandon measure - eg Thigh SF.
- ◆ Caliper applied so jaw is 1cm away from mark, to same depth as pinch.
- ◆ Iliac crest - Thumb positioned on landmark and fingers used to draw sufficient tissue to form skinfold

Skinfold techniques

- ◆ Gripping hand NEVER comes off
- ◆ 1cm between grip and caliper jaws
- ◆ Take reading 2 sec after releasing jaws
- ◆ Avoid parallax
- ◆ Take 3 readings (at least)
- ◆ Use median (middle #) not mean (average)



Triceps



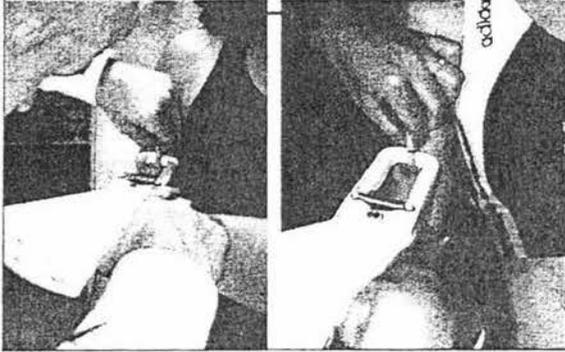
Subscapular



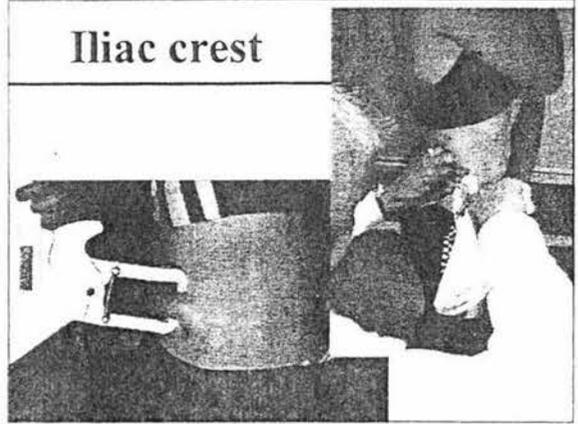
What is wrong with this?



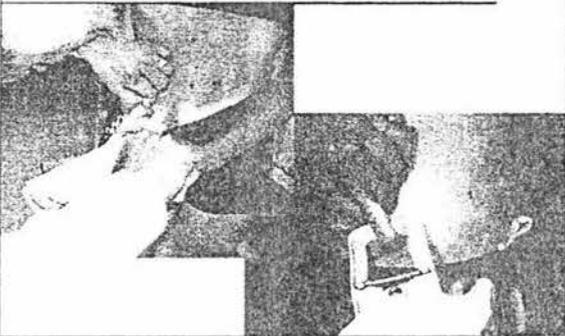
Biceps



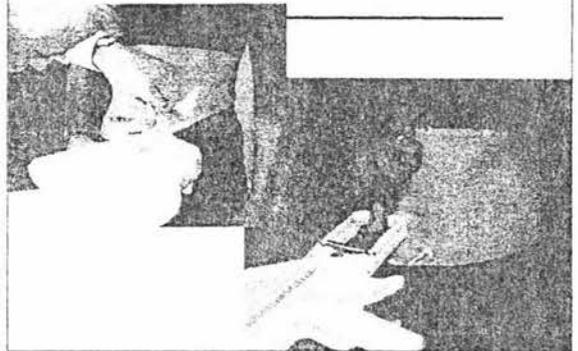
Iliac crest



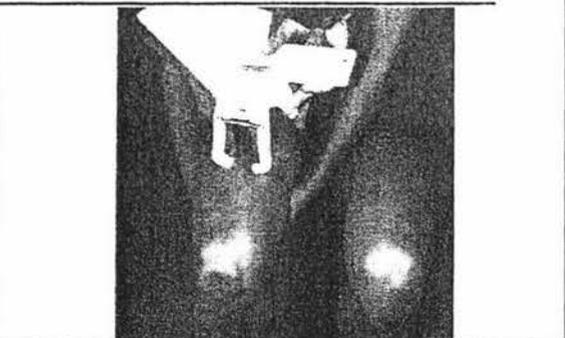
Supraspinale



Abdominal



Front thigh



Medial calf



What is wrong with this?



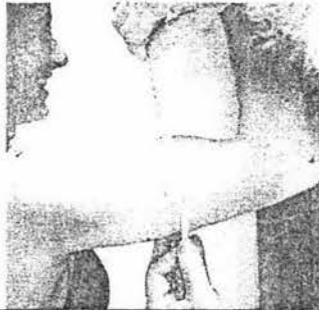
Arm relaxed

- ◆ Relaxed at side
- ◆ Mid-acromiale-radiale
- ◆ Perpendicular to humerus long axis



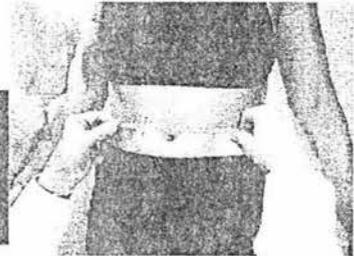
Arm tensed

- ◆ Maximum circumference
- ◆ Horizontal upper arm
- ◆ Forearm 45°



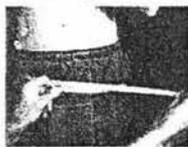
Waist

- ◆ Mid point lower costal rib and iliac crest
- ◆ Narrowest
- ◆ End tidal



Gluteal (hip)

- ◆ Posterior protuberance – symphysis
- ◆ Feet together
- ◆ Pubis level
- ◆ Pull tight for clothes

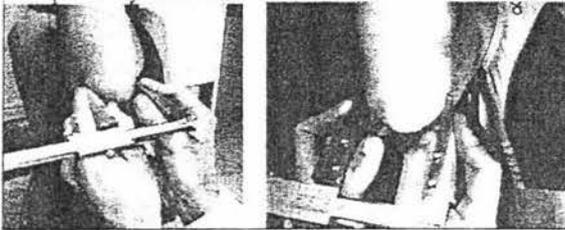
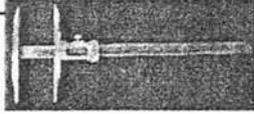


Calf (maximum)



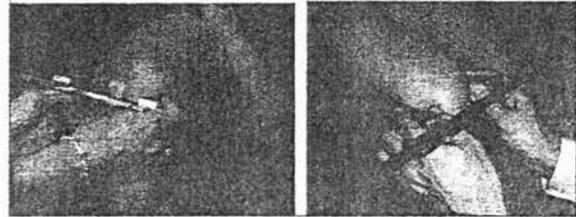
Biepicondylar humerus

- ◆ 45° down
- ◆ Medial and lateral epicondyles humerus



Biepicondylar femur

- ◆ 45° down
- ◆ Medial/lateral epicondyles femur



Other methods

- ◆ Scales measure weight only not composition
- ◆ Height/weight tables, insurance companies, are a measure of heaviness, not composition, not suitable for exercising people
- ◆ BMI similar to hgt/wgt, heaviness scale only
- ◆ Tape measures/girths - some equations estimate % fat. Is the girth muscle or fat?

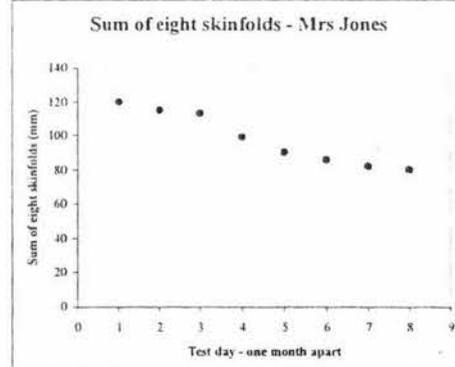


Sum of skinfolds

- ◆ When assessing sum of skinfolds look at the magnitude of the difference. Is it beyond the measurement error?
- ◆ Mrs Jones example.

Mrs Jones

- ◆ When assessing sum of skinfolds look at the magnitude of the difference. Is it beyond the measurement error?
- ◆ Mrs Jones example.



Mrs Jones is a 30 year old non-athlete.

TEMs

- ◆ TEM value indicates measurer precision
- ◆ When is it appropriate to calculate a TEM?
- ◆ Use TEMs to determine confidence limits for a single measurement
- ◆ Margins for error can be reduced by taking multiple measurements
- ◆ Use TEMs to determine whether a real change has occurred over time in a individual

TEMs - validity

Subject	Criterion	Joe measurer
1	X1.1	X2.1
2	X1.2	X2.2
3	X1.3	X2.3
4	X1.4	X2.4
n	X1.n	X2.n

◆ X1.1 = median 3 scores or mean 2 scores

TEMs - validity

$$TEM = \sqrt{(\sum(X2.1-X1.1)^2/2n)}$$

- ◆ X1.1 = median 3 scores or mean 2 scores
- ◆ X1's = criterions score on variable X.
- ◆ X2's = Joe measurer score on variable X.
- ◆ 2n = number of pairs of scores.
- ◆ %TEM <10% skinfolds, <2% girths/breadth

TEMs - reliability

Subject	Trial 1	Trial 2
1	X1.1	X2.1
2	X1.2	X2.2
3	X1.3	X2.3
4	X1.4	X2.4
n	X1.n	X2.n

◆ X1.1 = median 3 scores or mean 2 scores

TEMs - reliability

$$TEM = \sqrt{(\sum(X2.1-X1.1)^2/2n)}$$

- ◆ X1.1 = median 3 scores or mean 2 scores.
- ◆ X2.1 = Joe's score on trial 2 for variable X.
- ◆ X1.1 = Joe's score on trial 1 for variable X.
- ◆ 2n = number of pairs of scores.
- ◆ %TEM <7.5% skinfolds, <1.5% girths/breadths

Appendix 7: General questionnaire (E/C)

**THE EFFECTS OF AN INDIVIDUALIZED DIET AND EXERCISE
PROGRAMME ON BODY FAT LEVELS IN TAIWANESE FEMALES
AGED 40-60**

General Questionnaire

Code Number of Subject:

--	--	--	--

Date of Interview:

--	--

Day

--	--

Month

--	--

Year

Time of Interview:

--	--

Hour

--	--

Minute

This study has been approved by the Massey University Albany Campus
Human Ethics Committee Reference MUAHEC 00/040.

General Background

1. What is your date of birth?

<input type="text"/>									
----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------	----------------------

Day Month Year

2. How many children do you have?

<input type="checkbox"/>	1	0	- skip to question 4
	2	1	
	3	2	
	4	3 or more	

3. How old is your youngest child?

<input type="checkbox"/>	1	Below 5
	2	5-10
	3	10-20
	4	Over 20

4. How many years of education do you have?

<input type="checkbox"/>	1	Less than 12 years
	2	12 years
	3	12-16 years
	4	More than 16 years

5. Are you on any diet or exercise program now?

<input type="checkbox"/>	1	Yes
	2	No -skin to question 7

1. Age

<input type="text"/>	<input type="text"/>	Years
----------------------	----------------------	-------

2. Children Number

<input type="checkbox"/>
1=1
2=2
3=3
4=4
88=NA
99=Don't know

3. Last Pregnant Time

<input type="checkbox"/>
1=1
2=2
3=3
4=4
88=NA
99=Don't know

4. Education

<input type="checkbox"/>
1=1
2=2
3=3
4=4
88=NA
99=Don't know

5. Current Program

<input type="checkbox"/>
1=1
2=2
88=NA
99=Don't know

6. Please write down what kind of programme it is?

7. Do you have any medical condition which may effect your physical activity?

- 1 Yes
 2 No - skip to question 9

8. Please write down the medical condition you have, which may effect your physical activity.

9. Are you on any medication now?

- 1 Yes
 2 No - skip to question 11

10. Please write down the medicine you are taking.

11. Have you ever tried any method to lose weight?

- 1 Yes
 2 No - skip to question 15

12. Please write down what kind of method you used to lose weight?

6.

7. Medical Status

1=1
2=2
88=NA
99=Don't know

8. Medical Condition

9. Medication

1=1
2=2
88=NA
99=Don't know

10. Medicines

11. Previous Treatment

1=1
2=2
88=NA
99=Don't know

12. Previous Treatment Method

13. How long did the treatment last for?

- 1 Less than 1 month
 2 1-3 months
 3 3-6 months
 4 6 months-1 year
 5 more than 1 year

14. How did your weight change?

- 1 Did not change
 2 Decreased over 5 kg
 3 Decreased under 5 kg
 4 Decreased, but I don't know the amount
 5 Increased under 5 kg
 6 Increased over 5 kg
 7 Increased, but I don't know the amount

15. Is there any history of your weight dramatically changing in the past for reasons other than weight control?

- 1 Yes
 2 No - skip to question 18

16. How long ago?

- 1 Less than 1 year
 2 1-3 years
 3 3-5 years
 4 More than 5 years

13. Previous Treatment Period

- 1=1
2=2
3=3
4=4
5=5
88=NA
99=Don't know

14. Previous Treatment Result

- 1=1
2=2
3=3
4=4
5=5
6=6
7=7
88=NA
99=Don't know

15. Weight Change History

- 1=1
2=2
88=NA
99=Don't know

16. History Time

- 1=1
2=2
3=3
4=4
88=NA
99=Don't know

17. How did your weight change?

- 1 Decreased over 5 kg
 2 Decreased under 5 kg
 3 Decreased, but I don't know the amount
 4 Increased under 5 kg
 5 Increased over 5 kg
 6 Increased, but I don't know the amount

18. Have you experienced menopause?

- 1 Yes
 2 No - skip to question 22

19. How long ago?

- 1 Less than 1 year
 2 1-3 years
 3 3-5 years
 4 More than 5 years

20. Did your weight change before and after menopause?

- 1 Yes
 2 No - skip to question 22

21. How did your weight change?

- 1 Decreased over 5 kg
 2 Decreased under 5 kg
 3 Decreased, but I don't know the amount
 4 Increased under 5 kg
 5 Increased over 5 kg
 6 Increased, but I don't know the amount

17. Amount of Weight Change in History

- 1=1
2=2
3=3
4=4
5=5
6=6
88=NA
99=Don't know

18. Menopause

- 1=1
2=2
88=NA
99=Don't know

19. Menopause Time

- 1=1
2=2
3=3
4=4
88=NA
99=Don't know

20. Menopause and Weight Change

- 1=1
2=2
88=NA
99=Don't know

21. Amount of Weight change in Menopause

- 2=2
3=3
4=4
5=5
6=6
88=NA
99=Don't know

22. Do you smoke?

- 1 Non-smoker
 2 Former smoker
3 Smoking starter
4 Current smoker

23. Do you drink alcoholic beverages?

- 1 Don't drink at all
 2 Drink occasionally
3 Regular drinker
4 Regular and heavy drinker

24. How many cups of coffee do you usually drink a day?

- 1 None
2 1-3 cups
3 3-5 cups
4 more than 5 cups

22. Smoke

- 1=1
2=2
3=3
4=4
88=NA
99=Don't know

23. Alcohol

- 1=1
2=2
3=3
4=4
88=NA
99=Don't know

24. Coffee

- 1=1
2=2
3=3
4=4
88=NA
99=Don't know

THE EFFECTS OF AN INDIVIDUALIZED DIET AND EXERCISE
PROGRAMME ON BODY FAT LEVELS IN TAIWANESE FEMALES
AGED 40-60

一般問卷表

受訪者代碼：

--	--	--	--

訪視日期：

--	--

--	--

--	--

日

月

年

訪視時間：

--	--

--	--

時

分

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1. 妳的生日是西元的哪一天？

--	--	--	--	--	--

日 月 年

2. 妳有幾個孩子？

- 1 沒有（請跳到問題 4）
- 2 1 個
- 3 2 個
- 4 3 個以上

3. 妳年紀最小的孩子是幾歲？

- 1 5 歲以下
- 2 5-10 歲
- 3 10-20 歲
- 4 20 歲以上

4. 妳曾經受過幾年的教育？

- 1 12 年以下
- 2 12 年
- 3 12-16 年
- 4 16 年以上

5. 妳目前有任何正在進行中的減重計畫嗎？

- 1 有
- 2 沒有（請跳到問題 7）

1. Age

Years

2. Children Number

1=1
2=2
3=3
4=4
88=NA
99=Don't know

3. Last Pregnant Time

1=1
2=2
3=3
4=4
88=NA
99=Don't know

4. Education

1=1
2=2
3=3
4=4
88=NA
99=Don't know

5. Current Program

1=1
2=2
88=NA
99=Don't know

6. 請寫下妳目前正在進行的減重計畫。

7. 妳目前有任何會影響日常運動的病況嗎？

- 1 有
 2 沒有（請跳到問題 9）

8. 請寫出目前會影響妳日常運動的病況？

9. 妳目前有在服用任何藥物嗎？

- 1 有
 2 沒有（請跳至問題 11）

10. 請寫出妳目前正在服用的藥物。

11. 妳曾經試過任何方法來減重嗎？

- 1 有
 2 沒有（請跳到問題 15）

12. 請寫下妳曾經嘗試過的方法？

6.

7. Medical Status

1=1
2=2
88=NA
99=Don't know

8. Medical Condition

9. Medication

1=1
2=2
88=NA
99=Don't know

10. Medicines

11. Previous Treatment

1=1
2=2
88=NA
99=Don't know

12. Previous Treatment Method

13. 這減重方法妳持續做了多久？

- 1 未滿一個月
 2 1-3 個月
 3 3-6 個月
 4 6 個月以上

14. 妳的體重因此而改變了多少？

- 1 沒有改變
 2 減少 5 公斤以上
 3 減少不到 5 公斤
 4 有減少，但是我不知道多少
 5 增加 5 公斤以上
 6 增加不到 5 公斤
 7 有增加，但是我不知道多少

15. 除了刻意減重之外，妳的體重有沒有曾因其他原因而明顯地改變過？

- 1 有
 2 沒有（請跳到問題 18）

16. 這是在多久以前？

- 1 不到 1 年
 2 1-3 年
 3 3-5 年
 4 超過 5 年

13. Previous Treatment Period

- 1=1
2=2
3=3
4=4
5=5
88=NA
99=Don't know

14. Previous Treatment Result

- 1=1
2=2
3=3
4=4
5=5
6=6
7=7
88=NA
99=Don't know

15. Weight Change History

- 1=1
2=2
88=NA
99=Don't know

16. History Time

- 1=1
2=2
3=3
4=4
88=NA
99=Don't know

17. 妳的體重因此而改變了多少？

- 1 減少 5 公斤以上
 2 減少不到 5 公斤
 3 有減少，但是我不知道多少
 4 增加 5 公斤以上
 5 增加不到 5 公斤
 6 有增加，但是我不知道多少

18. 妳曾經歷過更年期嗎？

- 1 有
 2 沒有（請跳到問題 22）

19. 這是在多久以前？

- 1 不到 1 年
 2 1-3 年
 3 3-5 年
 4 超過 5 年

20. 妳的體重在更年期前後有沒有改變？

- 1 有
 2 沒有（請跳到問題 22）

17. Amount of Weight Change in History

- 1=1
2=2
3=3
4=4
5=5
6=6
88=NA
99=Don't know

18. Menopause

- 1=1
2=2
88=NA
99=Don't know

19. Menopause Time

- 1=1
2=2
3=3
4=4
88=NA
99=Don't know

20. Menopause and Weight Change

- 1=1
2=2
88=NA
99=Don't know

21. 妳的體重因此而改變了多少？

- 1 減少 5 公斤以上
 2 減少不到 5 公斤
 3 有減少，但是我不知道多少
 4 增加 5 公斤以上
 5 增加不到 5 公斤
 6 有增加，但是我不知道多少

22. 妳有吸菸嗎？

- 1 非吸煙者
 2 戒煙者
 3 剛開始吸菸
 4 目前有吸菸

23. 妳有喝酒嗎？

- 1 完全不喝酒
 2 偶爾喝酒
 3 例行性喝酒
 4 例行性且多量的喝酒

24. 妳通常一天喝多少杯咖啡？

- 1 不喝咖啡
 2 1-3 杯
 3 3-5 杯
 4 5 杯以上

21. Amount of Weight change in Menopause

- 1=1
2=2
3=3
4=4
5=5
6=6
88=NA
99=Don't know

22. Smoke

- 1=1
2=2
3=3
4=4
88=NA
99=Don't know

23. Alcohol

- 1=1
2=2
3=3
4=4
88=NA
99=Don't know

24. Coffee

- 1=1
2=2
3=3
4=4
88=NA
99=Don't know

Appendix 8: Physical activity questionnaire part 1& part 2 (E/C)



Massey University
COLLEGE OF SCIENCES

Institute for Food, Nutrition and Human Health
Albany Campus

**THE EFFECTS OF AN INDIVIDUALIZED DIET AND EXERCISE
PROGRAMME ON BODY FAT LEVELS IN TAIWANESE FEMALES
AGED 40-60**

Physical Activity Questionnaire 1

Code Number of Subject:

--	--	--	--

Date of Interview:

--	--

Day

--	--

Month

--	--

Year

Time of Interview:

--	--

Hour

--	--

Minute

This study has been approved by the Massey University Albany Campus
Human Ethics Committee Reference MUAHEC 00/040.

Occupational Activity

1. Please choose one or two of the following, which best describe you during the last 12 months.

- 1 Student
- 2 Homemaker
- 3 Retired
- 4 Disabled
- 5 Unemployed
- 6 Employed - skip to question 3
- 7 Other

2. Do you do any volunteer work?

- 1 Yes
- 2 No - skip to question 10

3. Please write down what your main occupation is during the last 12 months?

4. Please write down what your husband or partner's main occupation is during the last 12 months?

1. Job

1=1
2=2
3=3
4=4
5=5
6=6
7=7
88=NA
99=Don't know

2. Volunteer work

1=1
2=2
88=NA
99=Don't know

3. Occupation

4. Husband/Partner
Occupation

5. How many days a week do you usually work?

(Days)

6. How many hours a day do you usually work?

(Hours)

7. On a day at work, how much time do you usually spend on sitting? (Do not include time spent on going to and from work.)

(Hours)

(Minutes)

8. On a day at work while you are not sitting, how much time do you usually spend on light activity?

(Hours)

(Minutes)

For example:

- Standing still
- General office work (typing, writing)
- Occasional short distance walking
- Driving a car, van
- Light cleaning – ironing, cooking, doing dishes, dusting
- Knitting, sewing

5. Working days

Days

88=NA
99=Don't know

6. Working hours

Hours

88=NA
99=Don't know

7. Sitting (work)

Minutes

88=NA
99=Don't know

8. Slight activity

Minutes

88=NA
99=Don't know

9. On a day at work while you are not sitting, how much time do you usually spend on moderate activity?

--	--

 (Hours)

--	--

 (Minutes)

For example:

- Carrying light loads – carrying baby
- Continuous walking – shopping
- Heavy cleaning – mopping, sweeping, vacuuming, laundry, cleaning windows
- Gardening – planting, weeding
- Car washing
- Painting

10. On a day at work while you are not sitting, how much time do you usually spend on heavy activity?

--	--

 (Hours)

--	--

 (Minutes)

For example:

- Carrying moderate to heavy loads (more than 10 kg)
- Gardening–digging, mowing raking
- Chopping, sawing wood

9. Moderate activity

--	--	--

 Minutes

88=NA

99=Don't know

10. Heavy activity

--	--	--

 Minutes

88=NA

99=Don't know

Transportation

11. How much time do you spend on driving in each day?

--	--

 (Hours)

--	--

 (Minutes)

12. How much time do you spend on walking going to and from work, school, visiting or shopping in each day? (Do not include walking for sport, exercise or pleasure.)

--	--

 (Hours)

--	--

 (Minutes)

Leisure Time Activity

13. During an average week, how many hours do you spend on walking for pleasure or exercise? (Please include the time for shopping)

--	--

 (Hours)

14. How much time on average each day do you spend on doing moderate, vigorous or very vigorous housework at home; such as sweeping, vacuuming, washing clothes, scrubbing floors, etc.?

--	--

 (Hours)

--	--

 (Minutes)

11. **Driving (transport)**

--	--	--

 Minutes

88=NA
99=Don't know

12. **Walking (transport)**

--	--	--

 Minutes

88=NA
99=Don't know

13. **Walking (Leisure)**

--	--

 Hours

88=NA
99=Don't know

14. **Housework**

--	--	--

 Minutes

88=NA
99=Don't know

15. How long do you usually sleep at night each day?

--	--

 (Hours)

--	--

 (Minutes)

16. How long do you usually nap each day? (Do not include regular night sleep.)

--	--

 (Hours)

--	--

 (Minutes)

17. How long do you usually sit or lie down each day while watching TV, reading newspapers, talking on the phone, etc?

--	--

 (Hours)

--	--

 (Minutes)

Sport & Exercise

18. During the last 12 months, did you play any sports or do any exercises such as running, tennis, golf, gardening, aerobics, etc. for exercise or pleasure at least 12 times?

- 1 Yes
2 No - (end of questionnaire)

15. Sleep

--	--	--

 Minutes

88=NA
99=Don't know

16. Napping

--	--	--

 Minutes

88=NA
99=Don't know

17. Lying down

--	--	--

 Minutes

88=NA
99=Don't know

18. Sport-1

1=1
2=2
88=NA
99=Don't know

19. Please write down what sport or exercise you did most frequently?

20. How many months did you do this sport or exercise in the last 12 months?

--	--

 (Months)

21. In the months when you did this sport, how many times per week did you usually do it?

--	--

 (Times)

22. When you did this sport or exercise, how much time did you usually spend on each session?

--	--

 (Hours)

--	--

 (Minutes)

23. During the last 12 months, did you play another sport or do any exercise at least 12 times?

--

- 1 Yes
2 No - (end of questionnaire)

24. Please write down what sport or exercise it was?

19. Sport-1 method

20. Sport-1 months

--	--

 Months

88=NA
99=Don't know

21. Sport-1 frequency

--	--

 Times

88=NA
99=Don't Know

22. Sport-1 session

--	--	--

 Minutes

88=NA
99=Don't know

23. Sport-2

--

1=1
2=2
99=NA
00=Don't know

24. Sport-2 method

25. How many months did you do this sport or exercise in the last 12 months?

--	--

 (Months)

26. In the months when you did this sport, how many times per week did you usually do it?

--	--

 (Times)

27. When you did this sport or exercise, how much time did you usually spend for each session?

--	--

 (Hours)

--	--

 (Minutes)

25. **Sport-2 months**

--	--

 Months

88=NA
99=Don't know

26. **Sport-2 frequency**

--	--

 Times

88=NA
99=Don't know

27. **Sport-2 session**

--	--	--

 Minutes

88=NA
99=Don't know

(End of questionnaire)

Thank you very much for your help!

**THE EFFECTS OF AN INDIVIDUALIZED DIET AND EXERCISE
PROGRAMME ON BODY FAT LEVELS IN TAIWANESE FEMALES
AGED 40-60**

Physical Activity Questionnaire 2

Code Number of Subject:

--	--	--	--

Date of Interview:

--	--

Day

--	--

Month

--	--

Year

Time of Interview:

--	--

Hour

--	--

Minute

This study has been approved by the Massey University Albany Campus
Human Ethics Committee Reference MUAHEC 00/040.

Occupational Activity

1. Please choose one or two of the following, which best describe you during the last 9 weeks.

- 8 Student
- 9 Homemaker
- 10 Retired
- 11 Disabled
- 12 Unemployed
- 13 Employed - skip to question 3
- 14 Other

2. Did you do any volunteer work in the last 9 weeks?

- 3 Yes
- 4 No - skip to question 10

3. Please write down what your main occupation was during the last 9 weeks?

4. Please write down what your husband or partner's main occupation was during the last 9 weeks?

1. Job

1=1
2=2
3=3
4=4
5=5
6=6
7=7
88=NA
99=Don't know

2. Volunteer work

1=1
2=2
88=NA
99=Don't know

3. Occupation

4. Husband/Partner Occupation

5. How many days a week did you usually work during the last 9 weeks?

(Days)

6. How many hours a day did you usually work during the last 9 weeks?

(Hours)

7. On a day at work during the last 9 weeks, how much time did you usually spend sitting? (Do not include time spent going to and from work.)

(Hours)

(Minutes)

8. On a day at work while you are not sitting during the last 9 weeks, how much time did you usually spend on light activity?

(Hours)

(Minutes)

For example:

- Standing still
- General office work (typing, writing)
- Occasional short distance walking
- Driving a car, van
- Light cleaning – ironing, cooking, doing dishes, dusting
- Knitting, sewing

5. Working days

Days

88=NA

99=Don't know

6. Working hours

Hours

88=NA

99=Don't know

7. Sitting (work)

Minutes

88=NA

99=Don't know

8. Slight activity

Minutes

88=NA

99=Don't know

9. On a day at work while you are not sitting during the last 9 weeks, how much time did you usually spend on moderate activity?

--	--

 (Hours)

--	--

 (Minutes)

For example:

- Carrying light loads – carrying baby
- Continuous walking – shopping
- Heavy cleaning – mopping, sweeping, vacuuming, laundry, cleaning windows
- Gardening – planting, weeding
- Car washing
- Painting

10. On a day at work while you are not sitting during the last 9 weeks, how much time did you usually spend on heavy activity?

--	--

 (Hours)

--	--

 (Minutes)

For example:

- Carrying moderate to heavy loads (more than 10 kg)
- Gardening–digging, mowing raking
- Chopping, sawing wood

9. Moderate activity

--	--	--

 Minutes

88=NA

99=Don't know

10. Heavy activity

--	--	--

 Minutes

88=NA

99=Don't know

Transportation

11. How much time did you spend driving in each day during the last 9 weeks?

--	--

 (Hours)

--	--

 (Minutes)

12. How much time did you spend walking going to and from work, school, visiting or shopping in each day during the last 9 weeks? (Do not include walking for sport, exercise or pleasure.)

--	--

 (Hours)

--	--

 (Minutes)

Leisure Time Activity

13. During an average week during the last 9 weeks, how many hours did you spend walking for pleasure or exercise? (Please include the time for shopping)

--	--

 (Hours)

14. During the last 9 weeks, how much time on average each day did you spend doing moderate, vigorous or very vigorous housework at home; such as sweeping, vacuuming, washing clothes, scrubbing floors, etc.?

--	--

 (Hours)

--	--

 (Minutes)

11. **Driving (transport)**

--	--	--

 Minutes

88=NA
99=Don't know

12. **Walking (transport)**

--	--	--

 Minutes

88=NA
99=Don't know

13. **Walking (Leisure)**

--	--

 Hours

88=NA
99=Don't know

14. **Housework**

--	--	--

 Minutes

88=NA
99=Don't know

15. During the last 9 weeks, how long did you usually sleep at night each day?

--	--

 (Hours)

--	--

 (Minutes)

16. During the last 9 weeks, how long did you usually nap each day? (Do not include regular night sleep.)

--	--

 (Hours)

--	--

 (Minutes)

17. During the last 9 weeks, how long did you usually sit or lie down each day while watching TV, reading newspapers, talking on the phone, etc?

--	--

 (Hours)

--	--

 (Minutes)

Sport & Exercise

18. During the last 9 weeks, did you play any sports or do any exercises such as running, tennis, golf, gardening, aerobics, etc. for exercise or pleasure at least twice?

--

- 1 Yes
- 2 No - (end of questionnaire)

15. Sleep

--	--	--

 Minutes

88=NA
99=Don't know

16. Napping

--	--	--

 Minutes

88=NA
99=Don't know

17. Lying down

--	--	--

 Minutes

88=NA
99=Don't know

18. Sport-1

1=1
2=2
88=NA
99=Don't know

19. Please write down what sport or exercise you did most frequently?

20. During the last 9 weeks, how many times per week did you usually do it?

(Times)

21. During the last 9 weeks, how much time did you usually spend on each session?

(Hours)

(Minutes)

22. During the last 9 weeks, did you play another sport or do any exercise at least twice?

1 Yes

2 No - (end of questionnaire)

23. Please write down what sport or exercise it was?

24. During the last 9 weeks, how many times per week did you usually do it?

(Times)

19. Sport-1 method

20. Sport-1 frequency

Times

88=NA

99=Don't Know

21. Sport-1 session

Minutes

88=NA

99=Don't know

22. Sport-2

1=1

2=2

99=NA

00=Don't know

23. Sport-2 method

24. Sport-2 frequency

Times

88=NA

99=Don't know

25. During the last 9 weeks, how much time did you usually spend for each session?

		(Hours)
--	--	---------

		(Minutes)
--	--	-----------

25. Sport-2 session

			Minutes
--	--	--	---------

88=NA

99=Don't know

(End of questionnaire)

Thank you very much for your help!

THE EFFECTS OF AN INDIVIDUALIZED DIET AND EXERCISE
PROGRAMME ON BODY FAT LEVELS IN TAIWANESE FEMALES
AGED 40-60

日常運動量評估問卷表 1

受訪者代碼：

訪視日期：
日 月 年

訪視時間：
時 分

此研究已經由 The Massey University Albany Campus

Human Ethics Committee 所核准 (Reference MUAHEC/00/040)

工作運動量

1. 請選出在過去的 12 個月中，下列哪一項最適合形容妳的狀況。(可複選)

- 1 學生
- 2 家庭主婦
- 3 退休人員
- 4 殘障人員
- 5 失業者
- 6 就業者 (請跳到問題 3)
- 7 其他

2. 妳有從事其他的自願工作嗎？

- 1 有
- 2 沒有 (請跳到問題 10)

3. 請寫出妳在過去的 12 個月中主要的工作。

4. 請寫出妳的配偶在過去的 12 個月中主要的工作。

1. Job

1=1
2=2
3=3
4=4
5=5
6=6
7=7
88=NA
99=Don't know

2. Volunteer work

1=1
2=2
88=NA
99=Don't know

3. Occupation

4. Husband/Partner
Occupation

5. 妳通常一個星期工作幾天？

(天)

6. 妳通常一天工作多少小時？

(小時)

7. 在有工作的那一天當中，妳通常花多久時間光是坐著？（不要包含工作來回所花的時間）

(小時)

(分鐘)

8. 在有工作的那一天當中，當妳不光坐著的時候，妳通常花多久時間做較輕量的活動？

(小時)

(分鐘)

例如：

- 站著
- 一般辦公工作（打字，寫字）
- 偶而短距離的走動
- 開車
- 輕便的打掃工作（燙衣服，烹飪，洗碗，揮灰塵）
- 編織，縫紉

5. Working days

Days

88=NA

99=Don't know

6. Working hours

Hours

88=NA

99=Don't know

7. Sitting (work)

Minutes

88=NA

99=Don't know

8. Slight activity

Minutes

88=NA

99=Don't know

9. 在有工作的那一天當中，當妳不光坐著的時候，妳通常花多久時間做中量的運動？

--	--

 (小時)

--	--

 (分鐘)

例如：

- 搬運 5-10 公斤的物體 (抱小孩，提菜籃)
- 持續性地走動 (逛街購物)
- 較重的打掃工作 (掃地、拖地、吸塵、洗衣、清洗窗戶)
- 輕便的園藝工作 (種花，播種)
- 洗車
- 油漆

10. 在有工作的那一天當中，當妳不光坐著的時候，妳通常花多久時間做較重量的運動？

--	--

 (小時)

--	--

 (分鐘)

例如：

- 搬運 10 公斤以上的重物
- 煩重的園藝工作 (挖土，除草，耙地)
- 砍木頭，鋸木頭

9. Moderate activity

--	--	--

 Minutes

88=NA

99=Don't know

10. Heavy activity

--	--	--

 Minutes

88=NA

99=Don't know

運輸工具

11. 妳通常一天花多久時間在開車？

--	--

 (小時)

--	--

 (分鐘)

12. 妳通常一天花多久時間在步行往返於工作、學校、逛街購物和拜訪親友之間？（不要包含在運動或休閒時的步行時間）

--	--

 (小時)

--	--

 (分鐘)

休閒活動量

13. 在運動和休閒的時間裡，妳平均一週花幾個小時步行？（包含逛街購物的步行時間）

--	--

 (小時)

14. 妳平均每天花多長時間做家務及打掃工作（例如：烹飪、掃地、拖地、吸塵、洗衣）

--	--

 (小時)

--	--

 (分鐘)

11. Driving (transport)

--	--	--

 Minutes

88=NA

99=Don't know

12. Walking (transport)

--	--	--

 Minutes

88=NA

99=Don't know

13. Walking (Leisure)

--	--

 Hours

88=NA

99=Don't know

14. Housework

--	--	--

 Minutes

88=NA

99=Don't know

15. 妳平均每天睡眠時間有多長？

--	--

 (小時)

--	--

 (分鐘)

16. 妳平均每天午睡時間有多長？（不要包含每晚的睡眠時間）

--	--

 (小時)

--	--

 (分鐘)

17. 妳平均每天當妳看電視、看報紙或講電話時，坐著或躺著的時間有多長？

--	--

 (小時)

--	--

 (分鐘)

體育運動量

18. 在過去的 12 個月中，妳有從事任何的運動超過 12 次以上嗎？（平均一個月一次以上）

- 1 有
- 2 沒有(問卷結束)

15. Sleep

--	--	--

 Minutes

88=NA
99=Don't know

16. Napping

--	--	--

 Minutes

88=NA
99=Don't know

17. Lying down

--	--	--

 Minutes

88=NA
99=Don't know

18. Sport-1

1=1
2=2
88=NA
99=Don't know

19. 請寫下妳最常做的運動項目。

20. 在過去的 12 個月裡，這一項運動妳做了幾個月？

(個月)

21. 在妳有做這一項運動的月份當中，妳平均一個禮拜做幾次？

(次)

22. 當妳在做這一項運動的時候，妳通常一次做多久時間？

(小時)

(分鐘)

23. 除了之前的運動之外，在過去的 12 個月中，妳有從事任何其他的運動超過 12 次以上嗎？

- 1 有
- 2 沒有 (問卷結束)

19. Sport-1 method

20. Sport-1 months

Months

88=NA
99=Don't know

21. Sport-1 frequency

Times

88=NA
99=Don't Know

22. Sport-1 session

Minutes

88=NA
99=Don't know

23. Sport-2

1=1
2=2
99=NA
00=Don't know

24. 請寫下這項運動的名稱。

25. 在過去的 12 個月裡，這一項運動妳做了幾個月？

--	--

 (個月)

26. 在妳有做這一項運動的月份當中，妳平均一個禮拜做幾次？

--	--

 (次)

27. 當妳在做這一項運動的時候，妳通常一次做多久時間？

--	--

 (小時)

--	--

 (分鐘)

24. Sport-2 method

25. Sport-2 months

--	--

 Months

88=NA

99=Don't know

26. Sport-2 frequency

--	--

 Times

88=NA

99=Don't know

27. Sport-2 session

--	--	--

 Minutes

88=NA

99=Don't know

(問卷結束)
非常感謝妳的幫忙！

THE EFFECTS OF AN INDIVIDUALIZED DIET AND EXERCISE
PROGRAMME ON BODY FAT LEVELS IN TAIWANESE FEMALES

AGED 40-60

日常運動量評估問卷表 2

受訪者代碼：

訪視日期：
日 月 年

訪視時間：
時 分

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工作運動量

1. 請選出在過去的九週裡，下列哪一項最適合形容妳的狀況。(可複選)

- 1 學生
- 2 家庭主婦
- 3 退休人員
- 4 殘障人員
- 5 失業者
- 6 就業者 (請跳到問題 3)
- 7 其他

2. 妳有從事其他的自願工作嗎？

- 1 有
- 2 沒有 (請跳到問題 10)

3. 請寫出妳在過去的九週裡主要的工作。

4. 請寫出妳的配偶在過去的九週裡主要的工作。

1. Job

1=1
2=2
3=3
4=4
5=5
6=6
7=7
88=NA
99=Don't know

2. Employment

1=1
2=2
88=NA
99=Don't know

3. Occupation

4. Husband/Partner
Occupation

5. 在過去的九週裡，妳通常一個星期工作幾天？

(天)

6. 在過去的九週裡，妳通常一天工作多少小時？

(小時)

7. 在過去的九週裡，有工作的那一天當中，妳通常花多久時間光是坐著？（不要包含工作來回所花的時間）

(小時)

(分鐘)

8. 在過去的九週裡，有工作的那一天當中，當妳不光坐著的時候，妳通常花多久時間做較輕量的活動？

(小時)

(分鐘)

例如：

- 站著
- 一般辦公工作（打字，寫字）
- 偶而短距離的走動
- 開車
- 輕便的打掃工作（燙衣服，烹飪，洗碗，揮灰塵）
- 編織，縫紉

5. Working days

Days

88=NA

99=Don't know

6. Working hours

Hours

88=NA

99=Don't know

7. Sitting (work)

Minutes

88=NA

99=Don't know

8. Slight activity

Minutes

88=NA

99=Don't know

9. 在過去的九週裡，有工作的那一天當中，當妳不光坐著的時候，妳通常花多久時間做中量的運動？

--	--

 (小時)

--	--

 (分鐘)

例如：

- 搬運 5—10 公斤的物體（抱小孩，提菜籃）
- 持續性地走動（逛街購物）
- 較重的打掃工作（掃地、拖地、吸塵、洗衣、清洗窗戶）
- 輕便的園藝工作（種花，播種）
- 洗車
- 油漆

10. 在過去的九週裡，有工作的那一天當中，當妳不光坐著的時候，妳通常花多久時間做較重量的運動？

--	--

 (小時)

--	--

 (分鐘)

例如：

- 搬運 10 公斤以上的重物
- 煩重的園藝工作（挖土，除草，耙地）
- 砍木頭，鋸木頭

9. Moderate activity

--	--	--

 Minutes

88=NA

99=Don't know

10. Heavy activity

--	--	--

 Minutes

88=NA

99=Don't know

運輸工具

11. 在過去的九週裡，妳通常一天花多久時間在開車？

--	--

 (小時)

--	--

 (分鐘)

12. 在過去的九週裡，妳通常一天花多久時間在步行往返於工作、學校、逛街購物和拜訪親友之間？（不要包含在運動或休閒時的步行時間）

--	--

 (小時)

--	--

 (分鐘)

休閒活動量

13. 在過去九週運動和休閒的時間裡，妳平均一週花幾個小時步行？（包含逛街購物的步行時間）

--	--

 (小時)

14. 在過去的九週裡，妳平均每天花多長時間做家務及打掃工作（例如：烹飪、掃地、拖地、吸塵、洗衣）

--	--

 (小時)

--	--

 (分鐘)

11. Driving (transport)

--	--	--

 Minutes

88=NA

99=Don't know

12. Walking (transport)

--	--	--

 Minutes

88=NA

99=Don't know

13. Walking (Leisure)

--	--

 Hours

88=NA

99=Don't know

14. Housework

--	--	--

 Minutes

88=NA

99=Don't know

15. 在過去的九週裡，妳平均每天睡眠時間有多長？

--	--

 (小時)

--	--

 (分鐘)

16. 在過去的九週裡，妳平均每天午睡時間有多長？（不要包含每晚的睡眠時間）

--	--

 (小時)

--	--

 (分鐘)

17. 在過去的九週裡，妳平均每天當妳看電視、看報紙或講電話時，坐著或躺著的時間有多長？

--	--

 (小時)

--	--

 (分鐘)

體育運動量

18. 在過去的九週裡，妳有從事任何的運動超過兩次以上嗎？

--

- 1 有
- 2 沒有(問卷結束)

15. Sleep

--	--	--

 Minutes

88=NA
99=Don't know

16. Napping

--	--	--

 Minutes

88=NA
99=Don't know

17. Lying down

--	--	--

 Minutes

88=NA
99=Don't know

18. Sport-1

1=1
2=2
88=NA
99=Don't know

19. 請寫下妳最常做的運動項目。

20. 在過去的九週裡，妳平均一個禮拜做幾次？

--	--

 (次)

21. 當妳在過去的九週裡做這一項運動的時候，妳通常一次做多久時間？

--	--

 (小時)

--	--

 (分鐘)

22. 除了之前的運動之外，在過去的九週中，妳有從事任何其他的運動超過兩次以上嗎？

- 1 有
- 2 沒有 (問卷結束)

23. 請寫下這項運動的名稱。

19. Sport-1 method

20. Sport-1 frequency

--	--

 Times

88=NA
99=Don't Know

21. Sport-1 session

--	--	--

 Minutes

88=NA
99=Don't know

22. Sport-2

1=1
2=2
99=NA
00=Don't know

23. Sport-2 method

24. 在過去的九週裡，妳平均一個禮拜做幾次？

--	--

 (次)

25. 當妳在過去的九週裡做這一項運動的時候，妳通常一次做多久時間？

--	--

 (小時)

--	--

 (分鐘)

24. Sport-2 frequency

--	--

 Times

88=NA

99=Don't know

25. Sport-2 session

--	--	--

 Minutes

88=NA

99=Don't know

(問卷結束)

非常感謝妳的幫忙！

Appendix 9: 24-hour recall

**THE EFFECTS OF AN INDIVIDUALIZED DIET AND EXERCISE
PROGRAMME ON BODY FAT LEVELS IN TAIWANESE FEMALES
AGED 40-60**

24-Hour Recall

Code Number of Subject:

--	--	--	--

Date of Interview:

--	--

Day

--	--

Month

--	--

Year

Time Started:

--	--

Hour

--	--

Minute

Time Finished:

--	--

Hour

--	--

Minute

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Appendix 10: Three-day diet record (E/C)

**THE EFFECTS OF AN INDIVIDUALIZED DIET AND EXERCISE
PROGRAMME ON BODY FAT LEVELS IN TAIWANESE FEMALES
AGED 40-60**

Three-Day Diet Record

Please record your actual diet as it is eaten for three days.
The record has to include
Two Weekdays and One Weekend Day.

Note:

- Use the diet record sheets provided to list the details of ALL food and drink consumed.
- Each day's record may start at any time but must continue for 24 hours.
- Record as accurately as possible the amount or volume of each food or drink. Please record the volume of food in terms of teaspoons, tablespoons or cups. Otherwise record the number of units eaten e.g. 6 slices of white bread, 2 apples etc.
- Many brought foods have the weight or volume recorded on the container. You may use these figures for the record.
- After a meal the amount of any left over edible food must be estimated and subtracted from the amount originally recorded.

Code Number:

--	--	--	--

This study has been approved by the Massey University Albany Campus Human Ethics Committee Reference MUAHEC 00/040.

If you have any question regarding your diet record, please do not hesitate to ask the researcher at any time. After you finish this record, please return it to Jenny Chen or Patsy Watson in the stamped addressed envelope provided.

Jenny Chen

[REDACTED]

Patsy Watson (Supervisor)
Massey University
Institute for Food, Nutrition and Human Health
Albany Campus
Private Bag 102 904,
North Shore Mail Centre,
Auckland
Phone: (09) 443 9627
Facsimile: (09) 443 9640
E-mail: P.Watson@massey.ac.nz

DON'T FORGET!!

Return your dietary record book back to the researcher when your dietary record is complete.

**THE EFFECTS OF AN INDIVIDUALIZED DIET AND EXERCISE
PROGRAMME ON BODY FAT LEVELS IN TAIWANESE FEMALES
AGED 40-60**

三日飲食記錄本

請記錄下您三天所吃的實際飲食，
這記錄必須包含兩個平常日和一個週末日。

注意事項:

- 請在飲食記錄表上，詳細地列出您吃下的所有食物及飲料。
- 每一日的記錄可從任一時間開始，但必須持續 24 個小時。
- 請儘可能精確地記錄食物及飲料的數量。請使用適當的度量單位，例如一茶匙、一湯匙或一杯。不然也可以記錄下所吃的數量單位，例如六片白土司或是兩個蘋果。
- 在許多購買的食物包裝中有標示重量或容量，您也可以使用這些數字來做記錄。
- 在飯後所吃剩的食物必須扣除於原本所記錄的食物數量。

代碼：

--	--	--	--

如果您有關於您飲食記錄上的任何問題，歡迎隨時詢問研究人員。
在您完成記錄後，請利用所附的回郵信封，將此寄回給 Jenny Chen
或 Patsy Watson:

Jenny Chen



Patsy Watson (Supervisor)
Massey University
Institute for Food, Nutrition and Human Health
Albany Campus
Private Bag 102 904,
North Shore Mail Centre,
Auckland
電話: (09) 443 9627
傳真: (09) 443 9640
E-mail: P.Watson@massey.ac.nz

別忘了！！

請當您完成記錄後，
將記錄本寄回給研究人員。

此研究已經由 The Massey University Albany Campus
Human Ethics Committee 所核准 (Reference MUAHEC/00/040)

Appendix 11: Guidelines for diet program

Diet Intervention Guidelines

1. Cut down food amount

- ✓ Use the plate-mouth technique
- ✓ Think if you are hungry before eating
- ✓ Only eat 70% full for the dinner
- ✓ Share your foods or dessert with others if the size is big
- ✓ Avoid snacking when watching TV, movies, talking

2. Cut down energy source

- Fat
 - ✓ Avoid or cut down deep fried food
 - ✓ Cook foods by steam, boil or less oil pan-fried instead of deep fried
 - ✓ Remove the animal fat before cooking or eating (ex. chicken skin)
 - ✓ Choose less-fat part of meat for cooking
 - ✓ Choose low-fat or fat-free products instead of whole fat products (ex. drink skim milk instead of whole milk)
 - ✓ Avoid or cut down high-fat containing foods (ex. ice cream, chocolates, salad dressing, gravy)
- Carbohydrate (Simple CHO –sugars, Complex CHO –rice)
 - ✓ Cut down carbohydrate intake (ex. sugar, rice, noodles, breads)
 - ✓ Cut down high-sugar containing foods (ex. cakes, chocolates, sweets)
 - ✓ Cut down high-sugar containing drinks (ex. fruit juice, soft drinks)
 - ✓ Choose sugar-free products instead of normal sugar contained products (ex. sorbitals, artificial sweeteners)
- Protein
 - ✓ Cut down meat products (beef, pork, chicken, lamb)
- Alcohol
 - ✓ Avoid over-drinking and cut down alcohol beverages

3. Suggest the carbohydrate/protein/fat energy ratio

- ✓ 50-55: 12-15: 30

4. Increase Dietary Fibre Intake

- ✓ Understanding that dietary fibre can make you feel full
- ✓ Understanding that dietary fibre can slow the absorption of sugar and fat in your body
- ✓ Eat more vegetables
- ✓ Eat more fruits instead of drinking fruit juice

5. Increase Vitamins & Minerals Intake (Vegetables & Fruits)

- ✓ Eat more vegetables and fruits
- ✓ Avoid over-cooking of the vegetables
- ✓ You can increase the vitamins and minerals intake by eating suitable foods source from the food sources table of vitamins and minerals.

6. Increase Water Intake

- ✓ Always have free access to clean water
- ✓ Drink water with food
- ✓ Drink enough water before and after exercise

Appendix 12: Eating out recommendations

Eating Out Recommendations

- ***At Restaurants:***

The key to making wise food choices when eating out is to look for nutritious foods and avoid those that are high in fat, have a high GI levels, or do not provide desirable carbohydrates or proteins. The following table illustrates some healthier food choices when eating out:

	<i>Look For</i>	<i>Avoid</i>
General	Grilled Poached Red sauce Light wine sauce Raw or steamed Vegetables	Coconut Sour cream Fried or deep fried Cream or creamy Butter or buttery Sauteed vegetables
Chinese Restaurant	Braised Steamed Simmered Lobster sauce Light wine sauce Fresh fish whole or fillets	Spare ribs Peking duck Satay, curry Egg foo youg Sweet and sour Fried or deep fried Cashews or peanuts Crispy chinese noodles Crispy skin or lemon chicken

- ***At Take Away and Fast Foods shops***

While often a necessary convenience, take away and fast food does not have to strip us of all of our nutrition. If you are on the run and need to eat a quick meal, try one of the following alternatives to higher caloric and fatty items:

General Souvlaki Falafel and salad kebab BBQ chicken (no skin, no stuffing) Sandwiches (wholegrain bread, no butter, lean meat or tuna or salmon, salad)
Japanese Tuna sashimi Salmon sashimi California rolls Miso soup with tofu Inari Sushi (bean curd pouches with sushi)
Pizza Hut Vegetarian Thin'n Crispy
Subway 6" cold subs (veggie delite, ham, turkey breast and ham turkey breast, roast beef, tuna)

Appendix 13: Food labels education sheet

Food Labels

Nutrition Information			
Serving per package:	10	Per	Per
Serving size:	21g	21g	100g
Energy		161kJ	769kJ
Protein		5.0g	25g
Fat		1.0g	7.0g
-saturated		0.2g	1.4g
Carbohydrate		1.0g	5.0g
-sugars		1.0g	5.0g
Sodium		313mg	1490mg

Following are the legal definitions of some important food jarfon (which can often be misleading):

- **Fat Free:** Less than 0.5gram fat per serving.
- **Low Fat:** Three grams of fat or less per serving.
- **Lean:** Fewer than 10 grams of fat, 4 grams of saturated fat and 95 milligrams of cholesterol per serving.
- **Light/Lite:** One-third fewer kilojoules or no more than half as much fat as higher-kilojoule, higher-fat version. If related to sodium content, can contain no more than half the original sodium (check the nutritional panel as this claims may mean the products is light in color, texture or flavor).
- **Cholesterol Free:** Less than 2 milligrams of cholesterol and 2 grams or less of saturated fat per serving.
- **Low in saturated fat:** One gram saturated or less per serving and not more than 15 percent of kilojoules from saturated fat.
- **Reduced Fat/Less Fat:** At least 25 percent less fat per serving than higher-fat version (be careful of this claim as it does not mean the product is necessarily low in fat, particularly if the regular food is high in fat already).
- **High Fibre:** Five grams of fiber or more per serving.

Appendix 14: Guidelines for exercise program

Exercise Intervention Guidelines

1. Sport

- Choose Sport: Discuss with the subject and find the suitable sport for her
 - ✓ Current Sport (ex. golf, tennis, swimming)
 - ✓ Walking/ Jogging
 - ✓ Gardening
- Programming Setting
 - ✓ Speed- need to meet the certain heart beat for fat burning, but not exceed. It will depends on the age and weight of the subject
 - ✓ Frequency- at least 2-3 times a week
 - ✓ Duration- depends on the sport. For walking/ jogging, 20-30mins in the beginning and make it longer afterwards

2. Lifestyle

- Occupation
 - ✓ Moving around after long time of sitting, standing
- Transport
 - ✓ Walk to the shops, dairy stores or restaurants close your home
 - ✓ Park car in the walking distance and walk down to the place
 - ✓ Stair climbing instead of using lift
- Leisure Time
 - ✓ Be more active
- Relaxation
 - ✓ Have good quality of sleep
 - ✓ Have regular sleeping time

Appendix 15: Reference programs for walking/jogging

Reference Walking Program

	<i>Walking Slowly (Warm-up)</i>	<i>Walking Briskly</i>	<i>Walking Slowly (Cool-down)</i>
Week 1	5 Minutes	5 Minutes	5 Minutes
Week 2	5 Minutes	7 Minutes	5 Minutes
Week 3	5 Minutes	9 Minutes	5 Minutes
Week 4	5 Minutes	11 Minutes	5 Minutes
Week 5	5 Minutes	13 Minutes	5 Minutes
Week 6	5 Minutes	15 Minutes	5 Minutes
Week 7	5 Minutes	18 Minutes	5 Minutes
Week 8	5 Minutes	20 Minutes	5 Minutes
Week 9	5 Minutes	23 Minutes	5 Minutes

Reference Jogging Program

	<i>Warm-up</i>	<i>Walking</i>	<i>Jogging</i>	<i>Walking</i>	<i>Jogging</i>	<i>Cool-down</i>
Week 1		10 Minutes	-	-	-	
Week 2		5 Minutes	1 Minutes	5 Minutes	1 Minutes	
Week 3		5 Minutes	3 Minutes	5 Minutes	3 Minutes	
Week 4		5 Minutes	4 Minutes	5 Minutes	4 Minutes	
Week 5		4 Minutes	5 Minutes	4 Minutes	5 Minutes	
Week 6		4 Minutes	6 Minutes	4 Minutes	6 Minutes	
Week 7		4 Minutes	7 Minutes	4 Minutes	7 Minutes	
Week 8		4 Minutes	8 Minutes	4 Minutes	8 Minutes	
Week 9		4 Minutes	9 Minutes	4 Minutes	9 Minutes	

For **Warm-up**: Stretch and limber up for 5 minutes

For **Cool-down**: walking slowly for 3 minutes, stretch for 2 minutes

Appendix 16: Tips for effective walking

Tips for Effective Walking

- Your heel should contact the ground first. Then roll the foot in a straight line, through the arch to the ball to the toes.
- Hold your head up, with your chin parallel to the ground. Keep your pelvis under your shoulders (note that your hips should move forward and back, not side to side), and pull in your abdomens.
- Don't over-exaggerate your arm movements. Instead, bend your elbow at a 90-degree angle and pump your arms from the shoulder. Tuck your elbows close to your body, and with a fluid motion, swing your arms forwards, as if they were in a groove. Keep your hands empty and unclenched (clip your personal stereo or water bottle to a fitness belt).
- When you want to go faster, don't take longer "over-strides", which can stress the lower back and the knees. Opt for more frequent steps to quicken the pace. And to avoid straining your leg muscles when you are tacking a steep hill, lean forward and bend your knees slightly.

Appendix 17: Resistance exercises education sheet

Push-up

Muscle Worked Upper chest or pectoral muscles

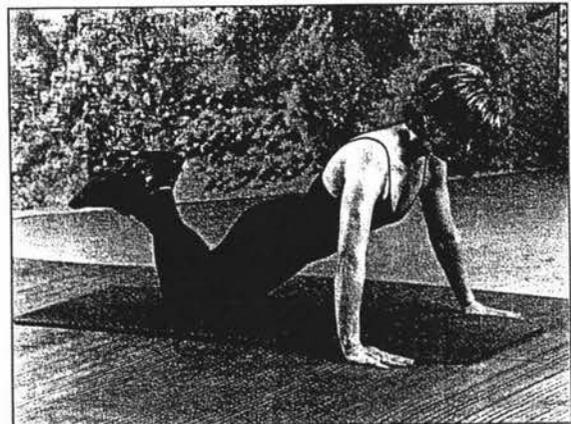
Starting Position Keeping your back and neck straight, support yourself on your knees and your outstretched palms. Your legs should be at about a 45 degrees angle. Your arms should be straight, your hands resting on the floor in front of you, should wider-width apart.

Exercise Performance Slowly lower your upper body to the ground, keeping your torso straight and your elbows pointing up. Raise yourself back to the starting position. Repeat the movement for the appropriate number of repetitions in the set.

Start



Finish



Exercise Tip

Make sure that you extend your arms way out in front of you for push-ups. This will place more emphasis on the upper pectorals. Exercising your upper pectorals will lift your breasts and make them appear firmer and higher.

Biceps Curl

Muscle Worked Biceps of the upper arms and the forearms

Starting Position Sit in a chair with your back straight and shoulders back. Hold a dumbbell in each hand, palms facing towards your body. Anchor your elbows firmly against the sides of your waist and keep them there throughout the exercise.

Exercise Performance Lock your waists bent slightly upwards. Curl your right arm up until it reaches your right shoulder. As you begin to return to the starting position, begin curling your left arm up towards your left shoulder. Continue alternating arms until you have completed your set. Without resting, begin your next exercise, the twisting dumbbell curl.

Start



Finish



Exercise Tip

Maximize your biceps conditioning by minimizing your body movement: do not lean forward or backward, and do not move your head. Flex your biceps on the upwards movement, and let the muscle stretch out on the downward movement.

Twisting Dumbbell Curl

Muscle Worked Biceps of the upper arms and the forearms

Starting Position Sit in a chair with your back straight and shoulders back. Let your arms hang down naturally at your sides. With your palms facing each other, hold a dumbbell in each hand.

Exercise Performance Lock your wrists. Exhale. Curl both arms up until they reach your shoulders. As you curl your arms, rotate your hands so your palms face your body at the top of the movements. Inhale. Lower your arms slowly to the starting position, rotating your hands back to the original.

Start



Finish



Exercise Tip

Keep your wrists locked and in line with your forearms. Do not use weights so heavy that they cause you to arch your back more than you would normally. Minimize your body movement: do not lean forward or backward, and do not move your head. Flex your biceps on the upward movement, and let the muscle stretch out on the downward movement.

Triceps Kickback

Muscle Worked Triceps or the back part of the upper arms

Starting Position Sit straight and tall with your knees and feet a few inches apart then bend forward while keeping your back straight. Hold a dumbbell in your right hand, palm facing your body, and place your left hand on top of your right thigh for support. Bend your right elbow and bring your arm up so your elbow rests lightly against the side of your hip.

Exercise Performance Slowly straighten your forearm behind you, then inhale and return to the starting position. Do the same number of repetitions with your left arm, then return to your second set of biceps exercise.

Start



Finish



Exercise Tip

Keep your wrist straight and in line with your forearm. Keep your abdomens tight: tight abdomens will help keep your lower back from arching too much. Don't lock your elbow at the top of the movement.

Alternate Lunge

Muscle Worked

Develops and tones the front thigh muscles (quads) as well as the hip-buttocks area.

Starting Position

Stand with your feet shoulder-width apart and your back and neck straight. Hold a dumbbell in each hand, palms facing your body, arms straight down at your sides.

Exercise Performance

Step or "lunge" forward about 2 to 3 feet with your right foot, bending your knee as you lunge forwards. Return to the starting position and repeat the movement with your other leg. Continue until you have completed the set.

Start



Finish



Exercise Tip

Maintain your balance by not looking down or bouncing as you move.

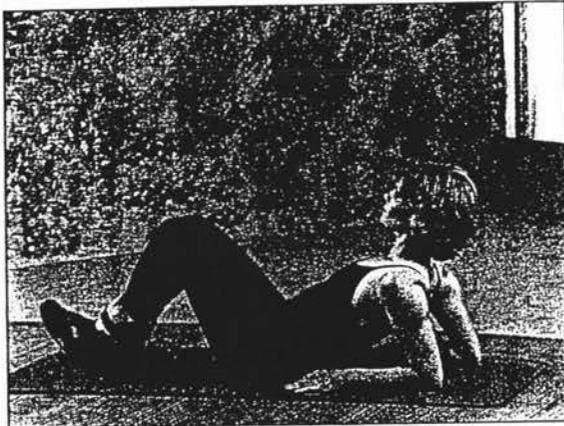
Leg Extension (With Weight)

Muscle Worked Front thigh muscles (quads)

Starting Position Sit on a padded surface with the appropriate weights strapped to your ankles.

Exercise Performance Slowly extend your leg until it is straight out in front of you, then hold that position for a moment. Maintain control and return your leg to the starting position. Repeat the movement until you have performed the appropriate number of repetitions for your set.

Start



Finish



Exercise Tip

Concentrate and focus on the muscle being worked. Look at your thighs and watch them flex. Never swing or bounce your leg up and down. Always maintain control throughout the full range of motion.

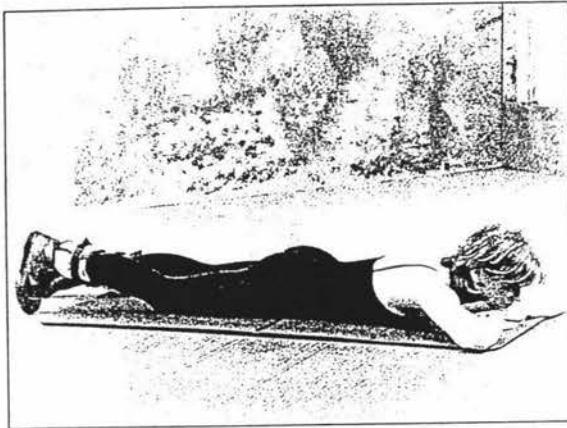
Leg Curl (With Weight)

Muscle Worked Back thigh muscles (hamstring)

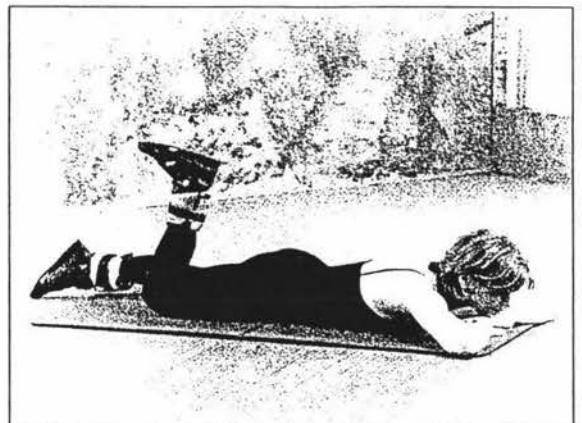
Starting Position Lie face down on a padded surface with the appropriate weights strapped around your ankles.

Exercise Performance Slowly bend your leg at the knee, raising your foot upwards until your leg is perpendicular to the floor. Hold the position for a split second and, maintaining control, return to the starting position. Repeat the movement until you have performed the correct number of repetitions for your set.

Start



Finish



Exercise Tip

Concentrate on the muscle being worked. Don't swing your leg up and down. Always use steady, controlled movements.

Crunch

Muscle Worked Upper fibers of the abdominal muscles

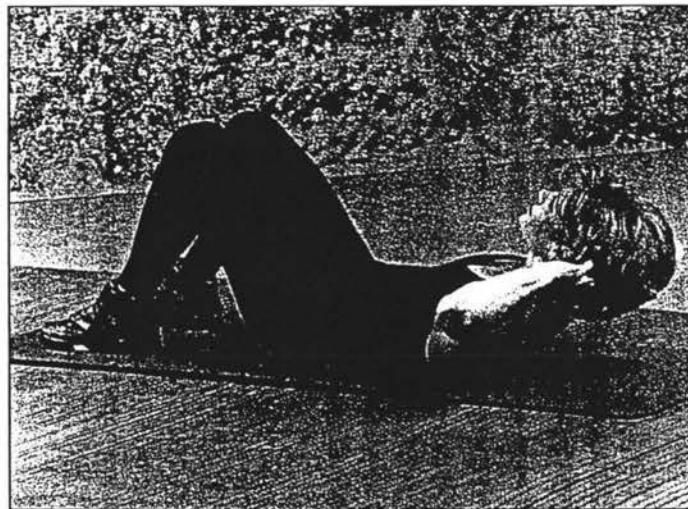
Starting Position Lie down with your back flat and knee bent. Place your hands on the back of your head.

Exercise Performance Keeping your lower back pressed against the floor, slowly lift your chin and shoulders straight towards the ceiling, raising your shoulders slightly off the ground. Slowly return to the starting position. Repeat the movement until you have completed your set.

Start



Finish



Exercise Tip

Make sure to keep your elbows pointing outward throughout the entire movement. Press your lower back against the floor. Do not pull on your head.

Reverse Crunch

Muscle Worked Lower fibers of abdominal muscles

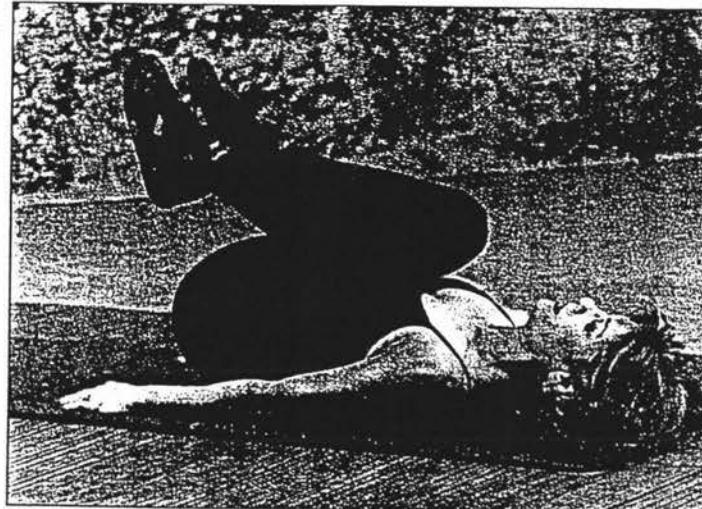
Starting Position Lie down with your back flat and your knees bent and brought forward above your body. Place your hands on the floor at your sides, palms down.

Exercise Performance Keeping your knees bent and your upper back pressed against the floor, slowly lift your buttocks and lower back towards the ceiling, bringing your knees toward your shoulders. Hold the position for a moment, then return to the starting position. Repeat the movement until you have completed your set.

Start



Finish



Exercise Tip

Keep your shoulders and head pressed to the floor during the entire movement. Maintain control of all your movements.

Appendix 18: Stretch exercises education sheet

SPORTSMART

SCREENING

WARM-UP/COOL-DOWN

PHYSICAL CONDITIONING

TECHNIQUE

FAIR PLAY

PROTECTIVE EQUIPMENT

HYDRATION & NUTRITION

INJURY SURVEILLANCE

ENVIRONMENTAL FACTORS

INJURY MANAGEMENT

Cold chewing gum doesn't stretch

② WARM-UP & STRETCH

Warming-up before playing sport prepares the mind, heart, muscles and joints for the upcoming event. It improves performance, helps players get mentally prepared and is a great step towards injury prevention. Equally important is cooling-down...



Release the pressure slowly

COOL-DOWN & STRETCH

After sport, cooling-down helps the body to recover while reducing the risk of aches and pains of muscle soreness!

Warm-up and stretch

Warming-up prepares the body for physical activity – it lowers blood pressure, improves blood flow to the heart, increases muscle temperature and makes muscles more pliable. By warming-up, players may improve their performance and reduce the risk of injury.

Just follow 3 simple steps!

1. Aerobic exercise

- Do some easy exercise (such as jogging, cycling and skipping) continuously for 5-10 minutes to raise the body temperature so the body is sweating lightly.

2. Stretching

- Stretch all the major muscle groups used when playing sport
- Hold each stretch for at least 15 seconds
- Repeat each stretch three times on both sides of the body.

3. Sport-specific exercises

- Do the sorts of exercises frequently used in your sport, such as short sprints, shuttle runs, changing direction quickly, shooting drills and defensive exercises with a partner.

Cool-down and stretch

Cooling-down and stretching after playing sport may reduce the risk of injuries happening. It also reduces potential muscle soreness and promotes flexibility. This low-intensity exercise should last for 5-15 minutes and include activity such as slow jogging and stretching.

Just follow 3 simple steps!

1. Aerobic exercise

- Slow jogging round the field or court is one of the best ways to cool-down
- Alternatives to jogging include low-intensity cycling or brisk walking.

2. Stretching

- Stretch for 10 minutes after the light jogging
- Follow the "keys to effective stretching" above
- If you want to achieve greater flexibility, hold the stretches for 60 seconds during the cool-down.

3. Recovery

- After any exercise, make sure players rehydrate
- Treat any injuries with the R.I.C.E.D. procedure.

THE KEYS TO EFFECTIVE STRETCHING

- 1 Do some easy exercise before starting stretching
- 2 Breathe normally
- 3 Apply each stretch slowly – take it to where tension can be felt, but not pain
- 4 Hold each stretch for at least 15 seconds
- 5 Don't bounce up and down while stretching
- 6 Repeat each stretch three times, on each side of the body if appropriate (e.g. both calves)

STRETCHING EXERCISES

-----> Movement to get stretch

=====> Area being stretched

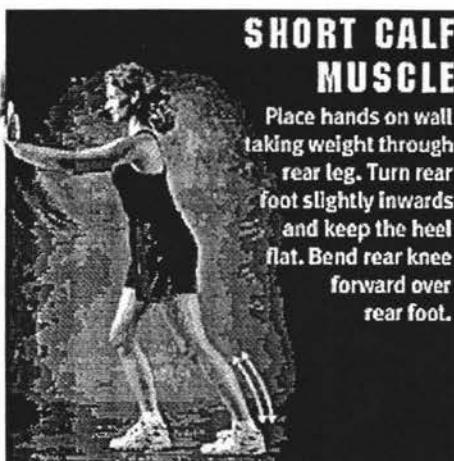
LONG CALF MUSCLE

Place hands on wall, with one leg to rear. Keep the rear leg locked straight and foot flat. Turn rear foot slightly inwards. Bend front leg taking stretch through rear calf.



SHORT CALF MUSCLE

Place hands on wall taking weight through rear leg. Turn rear foot slightly inwards and keep the heel flat. Bend rear knee forward over rear foot.



Kneel on ground with front knee at 90°. With the back straight, tilt the pelvis back by tucking the abdomen up and in and squeezing buttocks. Keep head up.

HIP FLEXOR



GROIN



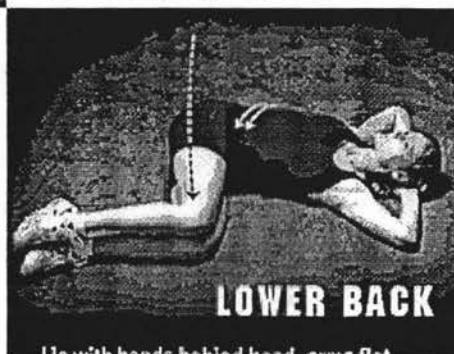
Sit on floor with back straight. Grasp the ankles and draw them towards groin. Use the elbows to apply a gradual downward and outward pressure on the knees.

SHOULDER CHEST

Stand with head up, chin in, hands clasped behind back. Pull shoulders down and back. Press shoulder blades together and down. Pull the stomach in to prevent arching of the



LOWER BACK



lower back.



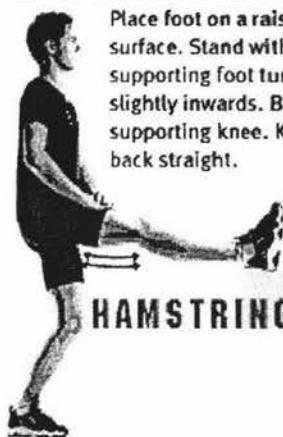
Bend hips and knees to 90°, feet together. Roll knees over to ground. Upper knee should be directly above lower knee.

FRONT THIGH

Pull heel to buttock. Keep back straight, knees together and in line.



Place foot on a raised surface. Stand with supporting foot turned slightly inwards. Bend supporting knee. Keep back straight.



HAMSTRINGS

Stand with feet comfortably apart. Fold arms above head. Bend to the side slowly. Stretch up with upper elbow.



TRUNK SIDE FLEXORS

BUTTOCK

Gluteals - Lie on back with both hands around one knee. Pull knee towards opposite shoulder. Keep head, shoulder and opposite leg relaxed.



Piriformis - lie on back and hold knee to chest. Pull knee and ankle towards opposite shoulder.

PECTORALS

Stand side-on to a wall or pole with closest leg forward. Place forearm on wall with shoulder slightly above 90°. Turn upper body away from wall or pole.



SHOULDER STRETCH

Place hands between shoulder blades. Place opposite hand on elbow. Pull elbow towards midline with help from opposite hand.



Appendix 19: Telephone visit record



**THE EFFECTS OF AN INDIVIDUALIZED DIET AND EXERCISE
PROGRAMME ON BODY FAT LEVELS IN TAIWANESE FEMALES
AGED 40-60**

Telephone Visit Record

Code Number of Subject:

Date of 1st Call:
Day Month Year

Date of 2nd Call:
Day Month Year

Date of 3rd Call:
Day Month Year

Date of 4th Call:
Day Month Year

Date of 5th Call:
Day Month Year

Body Weight Record

Initial Body Weight: _____ kg.

	Date (Day/Month/Year)	Time (Hour/Min)	Body Weight (kg)	Change of BW (+ or -)
1 st Call				
2 nd Call				
3 rd Call				
4 th Call				
5 th Call				

*The initial body weight measured at the first visit and based on the subject's own bathroom scales.

Appendix 20: Result report (E/C)

**THE EFFECTS OF AN INDIVIDUALIZED DIET AND EXERCISE
PROGRAMME ON BODY FAT LEVELS IN TAIWANESE FEMALES**

AGED 40-60

Result Report

Code Number of Subject:

--	--	--	--

Beginning of Intervention:

--	--

Day

--	--

Month

--	--

Year

End of Intervention

--	--

Day

--	--

Month

--	--

Year

Date of Report:

--	--

Day

--	--

Month

--	--

Year

Thank you for taking part in our study. Here is a brief report of your dietary intake, physical activity and body fat levels.

Dietary Intake: The following table shows your dietary intake before and after the intervention period.

	<i>Before</i>	<i>After</i>
Energy Ratios (mean all days) <ul style="list-style-type: none"> • Carbohydrate • Fat • Protein • Alcohol 		

It is recommended that 55-60% or more of daily energy intake should come from carbohydrate, 10% from protein and 30% or less from fat.

	<i>Before</i>	<i>After</i>
Fat Ratios (mean all days) <ul style="list-style-type: none"> • Saturated Fatty Acid • Monounsaturated Fatty Acid • Polyunsaturated Fatty Acid 		

It is recommended that less than 33% of fat intake come from saturated fatty acid, 33-50% from monounsaturated fatty acids and 33% of polyunsaturated fatty acids.

	<i>Before</i>	<i>After</i>	<i>RDA*</i>
Macro-Nutrients Intake (mean all days) <ul style="list-style-type: none"> • Total Energy • Protein • Fat • Carbohydrate • Sugar • Alcohol • Dietary Fiber • Water 			

<p>Micro-Nutrients Intake (mean all days)</p> <ul style="list-style-type: none"> • Vitamin A • Vitamin C • Vitamin E • Vitamin B₁ (Thiamin) • Vitamin B₂ (Riboflavin) • Folate • Sodium • Calcium • Iron • Zinc • Selenium 			
---	--	--	--

*RDAs (Recommended Dietary Allowances) are set to meet the average daily needs of almost all (97% to 98%) healthy individuals in a life-stage group.

From your dietary analysis, we have found that your intake of

- All nutrients are good.
- The following nutrients are too high.

- The following nutrients are too low.

- ❖ To decrease your intake of salt (sodium), you could decrease the intake of
 - Seasoning, such as soy sauce, oyster sauce, MSG
 - Processed foods, such as pickles
 - Processed meats, such as sausages
 - Foods with additives or preservatives

- ❖ To decrease your intake of fat, you can
 - Avoid deep fried foods or fast foods
 - Avoid fatty foods, such as doughnuts, ice cream, nuts, gravies, butter, cheeses, whole milk
 - Remove the animal fat before cooking or eating, such as chicken skin

- ❖ To increase the fluid intake, you can increase the intake of
 - Water
 - Fresh juice
 - Tea
 - Decaffeinated coffee

- ❖ Foods that are good sources of dietary fiber are:
 - Vegetables, such as cabbage, broccoli, celery, beans
 - Wholegrain cereals, such as wholegrain breads and rice
 - Fruits, such as citric fruit, kiwifruit, pineapple

- ❖ Foods that are good sources of vitamin A are:
 - Dairy products, such as milk, cheese, cream
 - Vegetables, such as carrot, spinach, apricot
 - Eggs

- ❖ Foods that are good sources of vitamin C are:
 - Fruits, such as orange, tomato, kiwifruit, grapefruit
 - Vegetables, such as Brussels sprout, green pepper

- ❖ Foods that are good sources of vitamin E are:
 - Nuts, such as peanuts, almonds
 - Vegetables, such as cabbage, broccoli, asparagus, spinach
 - Wholegrain cereals, such as wholegrain breads and rice

- ❖ Foods that are good sources of vitamin B₁ are:
 - Yeast
 - Raisins
 - Wholegrain cereals, such as wholegrain breads and rice
 - Vegetables, such as asparagus, corn, peas, beans, potatoes

- ❖ Foods that are good sources of vitamin B₂ are:
 - Dairy products, such as milk, cheese
 - Vegetables, such as avocados, beans, asparagus, broccoli, corn, peas, spinach
 - White meat, such as fish, poultry
 - Liver, heart, kidney
 - Eggs

- ❖ Foods that are good sources of folate are:
 - Cereals
 - Orange juice
 - Vegetables, such as asparagus, broccoli, beans, spinach

- ❖ Foods that are good sources of calcium are:
 - Dairy products, such as milk, cheese, yogurt
 - Seafood, such as shrimp, clams, oysters, salmon
 - Vegetables, such as broccoli, spinach

- ❖ Foods that are good sources of iron are:
 - Meat, such as beef, lamb, pork, poultry
 - Liver, kidney
 - Seafood, such as fish, shellfish, oyster
 - Vegetables, such as spinach, broccoli, beans, cabbage
 - Dried fruits, nuts, oats, wheat germ

- ❖ Foods that are good sources of zinc are:
 - Meats, such as poultry
 - Seafood, such as fish, crab, oyster
 - Eggs
 - Vegetables

❖ Foods that are good sources of selenium are:

- Seafood, such as fish
- Liver, kidney
- Wholegrain cereals, such as wholegrain breads and rice



Physical Activity: The following table shows your physical activity before and during the intervention period.

<i>Before Intervention Period</i>	<i>During Intervention Period</i>
Occupational Activity Kcal:	Occupational Activity Kcal:
Leisure Activity Kcal:	Leisure Activity Kcal:
Total Physical Activity Kcal:	Total Physical Activity Kcal:

Body Fat level: The following table shows your body fat levels before and after the intervention period.

	<i>Before Intervention Period</i>	<i>After Intervention Period</i>
Body Weight		
Body Mass Index (BMI)		
W/H Ratio		
Sum of Skinfolde		
Average % Body Fat*		

*The following equations are used to assess the percentage body fat.

1. *(Deurenberg et al., 1991)*

$$\% \text{ Body Fat} = 1.20 \times \text{BMI} + 0.23 \times \text{age} - 10.8 \times \text{sex} - 5.4$$

(Males = 1, Females = 0)

2. *(Durnin & Womersley, 1974)*

$$\text{Body Density} = 1.1333 - 0.0612 \times \log \text{ skinfolds sum (aged 40-49)}$$

$$\text{Body Density} = 1.1339 - 0.0645 \times \log \text{ skinfolds sum (aged over 50)}$$

(skinfolds sum = triceps + biceps + subscapular + suprailiac)

$$\% \text{ Body Fat (Siri, 1961)} = (4.95 / \text{Body Density} - 4.50) \times 100$$

3. *(Jackson et al., 1980)*

$$\text{Body Density} = 1.0960950 - 0.0006952 \times \text{skinfolds sum} + 0.0000011$$

$$\times (\text{skinfolds sum})^2 - 0.0000714 \times \text{age}$$

(skinfolds sum = triceps + abdominal + thigh + suprailiac)

$$\% \text{ Body Fat (Siri, 1961)} = (4.95 / \text{Body Density} - 4.50) \times 100$$

4. *(Fu and Fung, 1995)*

$$\% \text{ Body Fat} = 13.547 + 0.445 (\text{subscapular skinfold}) + 0.406 (\text{forearm skinfold})$$

5. *(McArdle, Katch & Katch, 1996)*

$$\% \text{ Body Fat} = \text{Constant A} + \text{Constant B} - \text{Constant C} - 18.4$$

(Constant A, B and C are converted by the circumference of abdominal, thigh and calf)

Reference:

1. Deurenberg P, Weststrate JA and Seidell JC. Body mass index as a measure of body fatness: age- and sex- specific prediction formulas. *Br J Nutr.* 65: 105-114, 1991
2. Durnin JVGA and Womersley J. Body fat assessed from total body density and its estimation from skinfold thickness: measurements on 481 men and women aged from 16 to 72 years. *Br J Nutr.* 32:77-97, 1974
3. Jackson AS, Pollock ML and Ward A. Generalized equations for predicting body density of women. *Med Sci Sports Exerc.* 12: 175-182, 1980
4. Fu FH and Fung L. Distribution of subcutaneous fat and equations for predicting percent body fat from skinfold measurements: A comparison between Chinese females from two age cohorts. *J Sports Med Phys Fitness.* 35:224-227, 1995
5. McArdle WD, Katch FI and Katch VL. AP. E. Body Composition, In: *Exercise Physiology* 4th Edition. 783-791, 1996)

Thank you very much for joining our study. If you have any further questions about this report or our study, please don't feel hesitate to contact us at any time!

Jenny Chen

[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED]
[REDACTED] [REDACTED]
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Institute for Food, Nutrition and Human Health
Albany Campus

THE EFFECTS OF AN INDIVIDUALIZED DIET AND EXERCISE PROGRAMME ON BODY FAT LEVELS IN TAIWANESE FEMALES

AGED 40-60

結果報告

代碼：

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開始日期：

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Day Month Year

結束日期：

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Day Month Year

報告日期：

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Day Month Year

此研究已經由 The Massey University Albany Campus

Human Ethics Committee 所核准 (Reference MUAHEC/00/040)

感謝妳參與我們的研究，以下是妳營養攝取，日常運動量和體脂肪百分比的簡要報告：

營養攝取：下列表格表示妳在計畫前後的營養攝取狀況。

	之前	之後
熱量來源（一日平均值） <ul style="list-style-type: none"> • 多醣類 • 脂肪 • 蛋白質 • 酒精 		

#一般建議 55-60%以上的熱量來源為多醣類，10%為蛋白質及 30%以下為脂肪。

	之前	之後
脂肪酸比例（一日平均值） <ul style="list-style-type: none"> • 飽和脂肪酸 • 單元不飽和脂肪酸 • 多元不飽和脂肪酸 		

#一般建議 33%以下的脂肪來自於飽和脂肪酸，33-50%來自於單元不飽和脂肪酸和 33%的多元不飽和脂肪酸。

	之前	之後	RDA*
巨量營養素（一日平均值） <ul style="list-style-type: none"> • 總熱量 • 蛋白質 • 脂肪 • 多醣類 • 糖類 • 酒精 • 纖維素 • 水 			

微量營養素（一日平均值）

- 維生素 A
- 維生素 C
- 維生素 E
- 維生素 B₁ (Thiamin)
- 維生素 B₂ (Riboflavin)
- 葉酸(Folate)
- 鈉(Sodium)
- 鈣(Calcium)
- 鐵(Iron)
- 鋅(Zinc)
- 硒(Selenium)

*RDAs (Recommended Dietary Allowances)建議每日營養攝取量適用於幾乎所有的(97% to 98%)在不同年齡層的健康民眾。

根據妳的飲食分析，我們發現妳所攝取的

各種營養素皆良好。

以下的營養素偏高。

以下的營養素偏低。

❖ 爲了減少鹽份的攝取，妳可以少吃

- 調味品，例如醬油、蠔油、味精
- 加工處理食品，例如醬菜
- 加工處理肉品，例如香腸、火腿
- 含添加劑及防腐劑的食品

❖ 爲了減少脂肪的攝取，妳可以

- 避免油炸食品，或速食食品
- 避免油脂多的食物，例如甜甜圈、冰淇淋、奶油、起士、全脂牛奶
- 在料理或食用前，除去動物的油脂，例如雞皮

❖ 爲了增加水份的攝取，妳可以多喝

- 水
- 新鮮果汁
- 茶
- 不含咖啡因的咖啡

❖ 良好的纖維素食物來源爲：

- 蔬菜類，例如花椰菜、豆莢、高麗菜、芹菜
- 穀類，例如全麥麵包或米飯
- 水果類，例如柑橘類、奇異果、鳳梨

❖ 良好的維生素 A 食物來源爲：

- 乳製品，例如牛奶、起士、鮮奶油
- 蔬菜類，例如菠菜、胡蘿蔔
- 雞蛋

❖ 良好的維生素 C 食物來源爲：

- 水果類，例如柳橙、蕃茄、奇異果、葡萄柚
- 蔬菜類，例如菜心、青椒

❖ 良好的維生素 E 食物來源為：

- 堅果類，例如花生、杏仁
- 蔬菜類，例如菠菜、花椰菜、蘆筍、高麗菜
- 穀類，例如全麥麵包或米飯

❖ 良好的維生素 B₁ 食物來源為：

- 酵母菌
- 葡萄乾
- 穀類，例如全麥麵包或米飯
- 蔬菜類，例如豆莢、蘆筍、玉米、馬鈴薯

❖ 良好的維生素 B₂ 食物來源為：

- 乳製品，例如牛奶、起士
- 蔬菜類，例如菠菜、花椰菜、豆莢、蘆筍、酪梨、玉米
- 肉類，例如魚肉、雞肉
- 肝臟、腎臟、心臟
- 雞蛋

❖ 良好的葉酸(Folate)食物來源為：

- 穀類
- 柳橙汁
- 蔬菜類，例如菠菜、花椰菜、豆莢、蘆筍

❖ 良好的鈣質(calcium)食物來源為：

- 乳製品，例如牛奶、起士、優格
- 海鮮類，例如蝦類、貝類、生蠔
- 蔬菜類，例如菠菜、花椰菜

❖ 良好的鐵質(iron)食物來源為：

- 肉類，例如牛肉、羊肉、豬肉、雞肉
- 肝臟、腎臟
- 海鮮類，例如魚肉、貝類、生蠔
- 蔬菜類，例如菠菜、花椰菜、豆莢、高麗菜
- 乾果類、堅果類、燕麥類

❖ 良好的鋅(zinc)食物來源為：

- 肉類，例如雞肉
- 海鮮類，例如魚肉、蟹肉、生蠔
- 雞蛋
- 蔬菜類

❖ 良好的硒(selenium)食物來源為：

- 海鮮類，例如魚肉
- 肝臟、腎臟
- 穀類，例如全麥麵包或米飯



日常運動量：下列表格表示妳在計畫前後的日常活動量。

<i>計畫前</i>	<i>計畫後</i>
工作活動量 消耗熱量(大卡)：	工作活動量 消耗熱量(大卡)：
休閒活動量 消耗熱量(大卡)：	休閒活動量 消耗熱量(大卡)：
總活動量 消耗熱量(大卡)：	總活動量 消耗熱量(大卡)：

體脂肪百分比：下列表格表示妳在計畫前後的體脂肪百分比。

	<i>計畫前</i>	<i>計畫後</i>
體重		
體重指數(BMI)		
腰臀比		
皮下脂肪層總和		
平均體脂肪百分比*		

*下列公式用於計算妳的體脂肪百分比

1. (Deurenberg et al., 1991)

體脂肪百分比 = $1.20 \times \text{BMI} + 0.23 \times \text{年齡} - 10.8 \times \text{性別} - 5.4$
(男性 = 1, 女性 = 0)

2. (Durnin & Womersley, 1974)

體比重 = $1.1333 - 0.0612 \times \log \text{皮下脂肪層總和}$ (40-49 歲)

體比重 = $1.1339 - 0.0645 \times \log \text{皮下脂肪層總和}$ (50 歲以上)

(皮下脂肪層總和 = 三頭肌 + 二頭肌 + 下肩胛骨 + 腰骨)

體脂肪百分比 (Siri, 1961) = $(4.95 / \text{體比重} - 4.50) \times 100$

3. (Jackson et al., 1980)

體比重 = $1.0960950 - 0.0006952 \times \text{皮下層脂肪總和} + 0.0000011$

$\times (\text{皮下脂肪層總和})^2 - 0.0000714 \times \text{年齡}$

(皮下脂肪層總和 = 三頭肌 + 腹部 + 大腿 + 腰骨)

體脂肪百分比 (Siri, 1961) = $(4.95 / \text{體比重} - 4.50) \times 100$

4. (Fu and Fung, 1995)

體脂肪百分比 = $13.547 + 0.445$ (下肩胛骨的皮下脂肪層)

+ 0.406 (前臂的皮下脂肪層)

5. (McArdle, Katch & Katch, 1996)

體脂肪百分比 = 常數 A + 常數 B - 常數 C - 18.4

(常數 A、B、C 是由腹圍、大腿圍和小腿圍所轉換來的)

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