Fat to Fit – an Asian Obesity Management Program and the Malaysian Case Study

Dee Dee A. SALLE*, Yii Bonn BONG, Abdul Majid MOHAMED, Asma Ahmad SHARIFF, Amir Feisal MERICAN
University of Malaya, Kuala Lumpur, Malaysia
*deedeefitness@gmail.com

Abstract: Fat to Fit was a 3-month weight loss program initiated for an Asian obesity management program. The aim of this study is to investigate the effect of physical activity and changes of body size and body composition. A total of 28 subjects ranging from 20-50 years old completed the 3-month program, which required them to follow a structured exercise thrice per week. Subjects were screened and selected through interviews. Anthropometric measurements for body weight, size [height, body dimension circumferences, body mass index (BMI), body composition (fat mass and lean mass)] and skin fold thickness were obtained using conventional method. Body composition was evaluated via Omron HBF 514C body composition monitor and scale. A guided 3-months physical exercise was used as the intervention. Pre- and post- test analysis was computed through paired t-test using IBM SPSS Statistics 22. Changes in body size were examined and the descriptive statistics were reported. Following the intervention, body mass and body composition was significantly lower than the baseline values. This study will be used as a national community intervention programme to combat obesity in Malaysia. This research will contribute to new information on obesity management in Asia Pacific region, which is rather limited at this moment.

Keywords: *Fat to fit, Asian, obesity, body size, body composition*

1. Introduction

"Globesity", an escalating global epidemic of overweight and obesity, is taking over many parts of the world. The obesity epidemic is not only restricted to industrialized nations, but in the developing countries as well. Obesity rates across developed countries such as the USA, England, France and others are alarmingly high, ranging from 3-4% in Korea and Japan to more than 30% in the United States (Organisation for Economic Cooperation and Development, 2014). Flegal et al. (2010) expressed that many Asian countries have rates which are similar to that of the United States too. Malaysia is now the fattest country in South-East Asia (The Malaysian Insider, 2014). A 2013 study in Lancet recorded that nearly 45% of Malaysian men and almost half of the women population are obese. The World Health Organization (WHO, 2013) reported that in 2008, more than 1.4 billion of the world's adult population was overweight (BMI 25-29.9 kg/m^2) and 11% were obese (BMI > 30kg/m^2). Obesity brings metabolic diseases which hampers the functional capacity, thus negating the quality of health. Although men may have higher rates of overweight, women have higher rates of obesity (300 million women versus 200 million men) (WHO, 2015). Obesity poses a major risk for non-communicable diseases, including diabetes mellitus, cardiovascular disease, hypertension and stroke. It is the significant independent risk factor for cardiovascular disease among women as reported in the Framingham Heart Study (Hubert et al., 1983). Furthermore, Wolin et al. (2010) stated that about 20% of all cancers are caused by excess weight. Obesity may also interfere with the ability to deliver other forms of treatment.

Anthropometric measurements are used for evaluation of health and dietary status, disease risk and body composition changes over time (Fryar, Gu & Ogden, 2012). Body circumference measurements have been recognized as simple indicators for disease prevalence and nutritional assessment. Body mass index (BMI) may be the most frequently-used and easiest indicator for overweight and obesity status, but studies have shown that waist and hip circumferences may be more strongly related to obesity-related diseases (Bosy-Westphal et al., 2006; Rexrode et al., 1998). In view of greater lean mass in non-abdominal regions, hip and thigh circumferences show a protective effect with health risk (Janssen, Katzmarzyk & Ross, 2004). Yusof et al. (2005) found that greater hip circumference has been linked to a reduced likelihood of myocardial infarction. Physical activity is a common recommendation to promote weight loss as well as improve fitness in the overweight and obese population. However, the latest research survey by Mohd Salleh Aman et.al (2014) pointed that only 40.8% Malaysians are active in sports. Fat to Fit was an initiation for an Asian obesity management program. The 3-month weight loss program was televised as a TV segment on RTM Malaysia's national Television channel, had parallel programmes in Singapore and Malaysia and is expanding into Thailand, Indonesia, Philippines and Brunei. The aim of this study is to investigate the effectiveness of Fat to Fit program in combating overweight and obesity.

2. Methodology

Subjects: The study followed a randomization design. A total of 30 subjects ranging from 20-50 years old were recruited for the study. However, 2 subjects pulled out in the middle of the program. They were screened and selected through interviews conducted in University of Malaya, Kuala Lumpur. All participants were academic and non-academic staffs working in the university. Participants were briefed and agreed to follow a 3-month physical training program (intervention). Socio-demographic characteristics of the subjects were obtained through survey form.

Experimental design: Participants for the Fat to Fit program were screened prior of the study. Only those who were previously sedentary, having overweight or obese problem and not on medications that would affect the outcome of the study were selected. Participants then completed an administered survey form and body composition assessment before started the exercise intervention program. The subjects completed a 3-month (12-week) training program and another body composition evaluation at the conclusion of the weight management program. The entire anthropometric measurements and body composition assessment was carried out on the same day. Height, body weight, circumference for neck, arm, chest, waist, hip, thigh and subcutaneous skin fold thickness were manually obtained. The BMI, waist-to-hip ratio and relative weight loss were calculated. Measurement protocols were the same for both pre and post- intervention.

Anthropometric methods and body composition assessment: Anthropometric measurements of the subjects were taken manually after subjects had changed into tight-fitting clothing made from a mixture of Lycra and cotton. Height and body weight were measured t the nearest 0.1cm and 0.1kg, respectively, using the Seca body meter (Seca, Germany) and the Omron HBF 514C body composition monitor and scale (Omron Healthcare Inc., USA). Circumference measurements for neck, arm, chest, waist, hip and thigh were taken to the nearest 0.1 cm using Myotape (AccuFitness LLC, USA). Skin fold thickness measurements were made to the nearest 0.1mm at the triceps, abdominal and thigh with a Holtain callipers (Holtain Ltd, UK). This was achieved by the measurer gently grasping the fold of skin and underlying subcutaneous adipose tissue of the subjects, with the amount grasped depending on the thickness of this tissue. All measurements followed the procedures recommended by Lohman et al. (1988) and were taken in duplicate on the right side of the body.

Exercise training intervention: A guided 3-months thrice weekly physical exercise was used as the intervention. Dynamic warm ups are utilized as opposed to static stretching warm ups because of its effects on power and agility (Macmillian et al., 2006). The exercise training interventions consisted of dynamic warm ups for 5 minutes, intensity intervals and bodyweight exercises (consisting of modified push ups, modified curl ups, burpees, bodyweight squats, planks) of 20 minutes, dynamic cool down and static stretches of 5 minutes. The intensity intervals of the bodyweight movements will be executed in three sets of 12, 9, and 6 repetitions, respectively with 90 seconds of rest in between sets. Midway through the 12 weeks intervention, their rest will be shortened to 30 seconds intra sets. Cardiorespiratory endurance exercises was incorporated from walks/jogs/runs in the Arena Stadium at University Malaya. The twelve static stretches consist of the Quadriceps Stretch, Adductor Stretch, Hamstring Stretch, Tibialis Anterior Stretch, Gastrocnemius Stretch, Oblique Stretch, Latissimus Dorsi Stretch, Pectorals Stretch, Deltoids Stretch, Triceps Stretch and Sternocledomastoid stretches.

Data analysis and statistical methods: The Statistical Package for the Social Science version 22.0 (IBM SPSS Statistics, Armonk, NY, USA) was used for data entry and descriptive statistical analysis. Data were expressed as means ± standard deviations. Descriptive statistics showed the characteristics and changes in body dimensions of the subjects. A matched pair t-test was used to determine the significance of differences between pre and post- intervention data. The level of significance used was $\alpha = 0.05$. Finally, a two-way analysis of variance (ANOVA) was conducted to determine the influence of age, gender, marital status and income on relative weight loss.

3. Results and Discussion

Table 1: Distribution of subjects according to socio-demographics (n=28)

Demographic Variables	Male Mean ±SD n (%)	Female Mean ±SD n (%)	Total Mean ±SD n (%)
Gender	8 (28.6)	20 (71.4)	28 (100)
Age	34.1 ± 8.7	33.5± 7.3	33.6 ±7.6
≤ 30	4 (50.0)	9 (45.0)	13 (46.4)
31-39	2 (25.0)	7 (35.0)	9 (32.1)
≥40	2 (25.0)	4 (20.0)	6 (21.4)
Marital status			
Single	2 (25.0)	6 (30.0)	8 (28.6)
Married	6 (75.0)	10 (50.0)	16 (57.1)
Divorced	0	4 (20.0)	4 (14.3)
Income (RM)			
<1500	0 (0)	6 (30.0)	6 (21.4)
1500-3500	7(87.5)	10 (50.0)	17 (60.7)
>3500	1 (12.5)	4 (20.0)	5 (17.9)

Note: income status: - Low < RM 1500, Moderate - RM 1500 – 3500, High - > RM3500 (Malaysian Economic Planning Unit Classification)

The demographic characteristics of the subjects in this study are shown in Table 1. The mean and standard deviation of age for the studied subjects were 33.6 and 7.6 years old, respectively. About 78.5% of the subjects were in the ≤ 30 years old and 31 - 39 years old groups; the rest were in the ≥ 40 years old group. Most of the participants were married (57.1%). The distribution of economic status among the participants was 21.4% low income group, 60.7% earning middle income and 17.9% in the high income group, according to the Malaysian Economic Planning Unit Classification.

Table 2: Changes in anthropometric measurements and body composition pre- to post- training

Measurements	Pre-training (Mean±SD)	Post-training (Mean±SD)	Paired differences (Mean±SD)
Height	1.62 ± 0.08	1.62 ± 0.08	0.00 ± 0.003
Weight	88.51 ± 17.07	82.51 ± 16.59	5.99 ± 5.12
Body Fat Percentage	43.51 ± 6.75	40.24 ± 7.87	3.26 ± 3.23
Body Muscle Percentage	25.34 ± 3.79	26.86 ± 4.37	-1.52 ± 1.66
Visceral Fat	10.39 ± 4.18	9.25 ± 3.69	1.14 ± 1.19
Triceps skin fold	31.66 ± 8.86	27.14 ± 7.72	4.52 ± 5.84
Thigh skin fold	49.79 ±14.06	44.46 ± 14.39	5.33 ± 7.24
Abdominal skin fold	44.88 ± 14.61	37.95 ± 12.53	6.93 ± 10.10
Neck circumference	38.09 ± 4.38	36.52 ± 3.43	1.57 ± 2.52
Arm circumference	36.40 ± 3.72	34.58 ± 4.01	1.83 ± 1.74
Chest circumference	105.18 ± 8.75	94.21 ± 23.00	10.97 ± 21.76
Waist circumference	102.51 ± 11.76	97.69 ± 11.20	4.83 ± 5.90
Hip circumference	113.17 ± 10.67	108.94 ± 10.29	4.23 ± 3.77
Thigh circumference	67.10 ± 6.91	63.88 ± 5.93	3.22 ± 3.22
Body Mass Index (BMI)	33.45 ± 4.67	31.18 ± 4.69	2.27 ± 1.87

Waist-to-hip ratio	0.91 ± 0.08	0.90 ± 0.07	0.01 ± 0.04

The pre- and post- training data for anthropometric measurements and body composition variables are presented in Table 2. There were significant ($p<0.01$) decreases in body weight, body fat percentage, visceral fat, skin fold thickness, circumference measurements and BMI, but the magnitude of changes was generally small. The largest changes were obtained from skin fold thickness (triceps, thigh and abdominal) with a percentage ranging from 10.71% to 15.44%. There was a small yet significant ($p<0.001$) increase in the body muscle percentage or the lean mass (+6.00%). However, the decrease in waist-to-hip ratio (1.10%) was not significant ($p=0.197$). Paired sample t-test (Table 3) was conducted to evaluate the impact of physical activity training on body mass and body composition in a 3-month interval. There were statistically significant decrease in body mass and body composition from pre-training to post-training ($p<0.05$). The eta squared statistic indicated large effect size, with a substantial difference in the body mass and body composition before and after intervention based on Cohen's (1988) interpretation. However, the waist-to-hip ratio (WHR) showed moderate effect (0.061). Waist-to-hip ratio is an easy way to see how much weight a person carries around the abdomen as opposed to around the hip region. Adults who store most of their body fat around their waists have an increased risk of high blood pressure, type 2 diabetes, heart disease and stroke compared with those who have the same amount of body fat stored around their hips and thighs. According to the University of Maryland Medical System, women with a WHR 0.8 or less, and men with a ratio 0.9 or less, are considered safe.

Table 3: Paired sample t-test of anthropometric measurements and body composition pre- and post- training

Paired statistics	**Correlation *r***	**T**	**Sig.**	**Eta squared**
Height (pre) Height (post)	0.999	0.000	1.000	0.000
Weight (pre) Weight (post)	0.954	6.197	0.000	0.587
Body fat (pre) Body fat (post)	0.913	5.337	0.000	0.513
Body muscle (pre) Body muscle (post)	0.927	-4.850	0.000	0.466
Visceral fat (pre) Visceral fat (post)	0.962	5.069	0.000	0.488
Triceps skin fold (pre) Triceps skin fold (post)	0.760	4.096	0.000	0.383
Thigh skin fold (pre) Thigh skin fold (post)	0.871	3.894	0.001	0.360
Abdominal skin fold (pre) Abdominal skin fold (post)	0.733	3.630	0.001	0.328
Neck circumference (pre) Neck circumference (post)	0.818	3.288	0.003	0.286
Arm circumference (pre) Arm circumference (post)	0.902	5.573	0.000	0.535

Chest circumference (pre) Chest circumference (post)	0.328	2.667	0.013	0.209
Waist circumference (pre) Waist circumference (post)	0.869	4.328	0.000	0.410
Hip circumference (pre) Hip circumference (post)	0.936	5.936	0.000	0.566
Thigh circumference (pre) Thigh circumference (post)	0.886	5.303	0.000	0.510
BMI (pre) BMI (post)	0.920	6.424	0.000	0.604
Waist-hip ratio (pre) Waist-hip ratio (post)	0.877	1.324	0.197	0.061

The two-way between group analysis of variance was conducted to explore the impact of age, gender, marital status and income on relative body weight loss. It was found that there was no statistically significant interaction effect.

4. Conclusion

This study will be used as a national community intervention programme to combat obesity in Malaysia. At the same time, this research will contribute to new information on obesity management in Asia Pacific region, which is rather limited at this moment.

References

Bosy-Westphal, A., Geisler, C., Onur, S., Korth, O., Selberg, O., Schrezenmeir, J. & Muller, M.J. (2006). Value of body fat mass vs anthropometric obesity indices in the assessment of metabolic risk factors. International Journal of Obesity, 30(3), 475-483.

Flegal, K.M., Caroll, M.D., Ogden, C.L. & Curtin, L.R. (2010). Prevalence and trends in obesity among US adults, 1999-2008. Journal of the American Medical Association, 303(3), 235-241.

Fryar, C.D., Gu, Q. & Ogden, C.L. (2012). Anthropometric reference data for children and adults: United States, 2007-2010. Vital and Health Statistics, 11(252), 1-48.

Hubert, H.B., Feinleib, M., McNamara, P.M. & Castelli, W.P. (1983). Obesity as an independent risk factor for cardiovascular disease: a 26-year follow-up of participants in the Framingham Heart Study. Circulation, 67, 968-977.

Janssen, I., Katzmarzyk, P.T. & Ross, R. (2004). Waist circumference and not body mass index explains obesity-related health risk. American Journal of Clinical Nutrition, 79(3), 379-384.

Lohman, T.G., Roche, A.F., Martorell, F., eds. (1988). Anthropometric standardization reference manual. Champaign, IL: Human Kinetics Books.

Mohd Salleh Aman et.al (2014): Laporan akhir kajian budaya bersukan dalam kalangan masyarakat Malaysia. Putrajaya: Kementerian Belia dan Sukan. Incomplete information

Organisation for Economic Cooperation and Development (OECD). (2014). Obesity rates rising: 10 fattest countries in the developed world. Updated March 2014. Retrieved from http://www.oecd.org/els/health-systems/theeconomicsofprevention.htm.

Rexrode, K.M., Carey, V.J., Hennekens, C.H., Walters, E.E., Colditz, G.A., Stampfer, M.J., Willett, W.C. & Manson, J.E. (1998). Abdominal adiposity and coronary heart disease in women. JAMA, 280(21), 1843-1848.

The Malaysian Insider (2014). Malaysia is Southeast Asia's fattest country. Updated Nov 2014. Retrieved from http://www.themalaysianinsider.com/malaysia/article/malaysia-is-southeast-asians-fattest-country.

Wolin, K.Y., Carson, K. & Colditz, G.A. (2010). Obesity and cancer. Oncologist, 15(6), 556-565.

World Health Organization (2013). Media centre. Obesity and overweight. Fact sheet No 311. Updated March 2013. Retrieved from http://www.who.int/mediacentre/factsheets/fs311/en/

World Health Organization (2015). Nutrition. Controlling the global obesity epidemic. Updated March 2015. Retrieved from http://www.who.int/nutrition/topics/obesity/en/

Yusuf, S., Hawken, S., Ounpuu, S., Bautista, L., Franzosi, M.G., Commerford, P., Lang, C.C., Rumboldt, Z., Onen, C.L., Lisheng, L., Tanomsup, S., Wangai, P. Jr., Razak, F., Sharma, A.M., Anand, S.S. & INTERHEART Study Investigators. (2005). Obesity and the risk of myocardial infarction in 27,000 participants from 52 countries: a case-control study. Lancet, 366(9497), 1640-1649.