HEALTH EVALUATION OF FEMALES BY COMBINED PHYSICAL EXERCISE AND IMPROVED FOOD OR PHYSICAL EXERCISE

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ABSTRACT

This study is to investigate the effects of the physical activity and intake of improved food levels of twenty-eight female on their body compositions. Women started with a three to six-months run-in period, wherein a standardised diet was prescribed aiming to stabilise body weight and achieve similarity in diet composition among the study participants. 20s-A is the result of a survey of four 63-70-kg women in their 20s. After exercise and food control, the body weight of 20s with exercise and food (A) and with only exercise without control foods (B) decreased about 4.66 kg and 3.80 kg after 6 months, respectively. The difference between total weight change measurements at 30s women was associated with water loss (intracellular water and extracellular water). The F value of visceral fat for 40s with exercise (A) was 5.760 ($p < 0.05$), which was significant difference. The body weight of 50s with exercise and food (A) and only exercise (B) decreased about 3.66 kg and 1.97 kg, respectively. Loss of body weight reflected the combined effects of exercise and improved diet.

Keywords: Body weight, female, improved food, physical activity.

INTRODUCTION

According to the World Health Organisation, the worldwide prevalence of obesity has doubled since 1980 (WHO, 2013). The obesity epidemic has spread inexorably across societies in all parts of the globe. Obese individuals are at an increased risk of chronic diseases such as diabetes, cardiovascular diseases and cancer (WHO, 2013; Gement et al., 2015). Negative effects on quality of life are more pronounced in women than men (Muennig et al., 2006). Physical activity is any bodily movement produced by the contraction of skeletal muscle that increases energy expenditure above a basal level. In these guidelines, physical activity generally refers to the subset of physical activity that enhances health.

Public health actions to reduce obesity have mostly focused on individuals, encouraging them to eat healthier and to exercise more. Many people do physical activity or exercise. But so far, these approaches are failing as not a single country has succeeded in reducing obesity rates in the past 30 years (Ng et al. (2014). Whether this is due to failure to restrict energy intake or to maintain high levels of energy expenditure has yet to be determined conclusively, and the relative importance of these two elements has been the subject of sparking debate (Wiklund, 2016).

Body weight and energy balance can be maintained by adapting energy intake to changes in energy expenditure and vice versa, whereas short-term changes in energy expenditure are mainly caused by physical activity (Westerterp, 2010). Health humans should maintain a balance between their energy intake and energy expenditure levels, as demonstrated by the constancy of body weight and body composition. This can be achieved by controlling either energy intake or expenditure. The modern way of living promotes comfort and well-being in a less energy-demanding environment. Energy flux is regulated by a complex neuro-humoral system which has become increasingly well understood (Luke & Cooper, 2014). Feedback mechanisms linking the gut and the brain, with additional input from fat stores and other metabolically more active tissues, regulate appetite and satiety (Dhillo, 2007).

The purpose of this study is to investigate the effects of the physical activity and improved food levels of women on their body compositions. We used inBody720 to measure total Body weight, intracellular and extracellular water, protein, mineral, body fat, and so on as manual (InBody, 2014).

METHODOLOGY

Exercise training program

Inclusion criteria were ages 25–55 year old women. Twenty-eight women, with no resistance training experience or clinical problems, were randomly assigned to a PEF group (14 women with physical exercise and food: marked as A) and CONTROL group (14 women with exercise, food intake is free: marked as B) for this six-month study. PEF women started with a three to six-months run-in period, wherein a standardised diet was prescribed aiming to stabilise body weight and achieve similarity in diet composition among the study participants. All volunteers did a pre-exercise screening to make sure they could complete the exercise interventions of the study. A 30-minute rest period was provided between the aerobic fitness assessment and the muscular fitness assessment. All volunteers programmed to perform as uniform motion as possible.

There are two basic physiological considerations that need to be addressed in designing any conditioning program. First, the major source of energy utilized to perform the given activity must be identified. The second consideration involved in program design is developing a progressive overload system that will develop that particular energy source.

Resting energy expenditure was measured for the purpose of estimating daily energy requirements (Vatansever-Ozen et al., 2011). The energy expended during the exercise and resting sessions (t = 0-60 min) was calculated using the Weir equation (Weir, 1990). An aerobic capacity test to measure maximum oxygen consumption (VO_2 max) (Prudhomme et al., 1984) was performed to precisely determine the exercise intensities during the experimental conditions (Pomerleau et al., 2004) (Table 1). Energy and macronutrient contents were assessed by using Canadian Nutrient File software (Canada, 2015).

Participants undertook combined physical exercise and improved food. The physical exercises included the chest press, seated row, shoulder press, triceps extension, leg press, leg extension and leg curl, with abdominal crunches also performed (Galva˜o et al., 2010). Sessions commenced and concluded with general flexibility exercises. The aerobic component of the training program conducted 30 minutes twice a week for six months.

Direct segmental multi-frequency bioelectrical impedance analysis (DSM-BIA)

DSM-BIA was performed using the In-Body (720) body composition analyzer. This equipment has previously been shown to have high test-pretest reliability and accuracy (Gibson et al., 2008; Galva˜o et al., 2010; Gement et al., 2015).

Statistical Analyses

The measurements were prepared in triplicate for each analysis. Data were analyzed using the SPSS version 21 (SPSS Inc, Chicago, IL) statistical software package. The Greenhouse-Geisser is used to assess the change in a continuous outcome with three observations across time or within-subjects**.** Means and standard deviations should be reported for each observation of the outcome with Greenhouse-Geisser corrections.

Ethical approval

All men and women were consented by approved methods before participation.

RESULTS

Characteristics of body composition and balance of food calories over six months are reported in Table 2. PEF (group A) is the result of a survey of four 63-70-kg women in their 20s. After exercise and food control, the body weight of 20s with exercise and food (A) and with only exercise without control foods (B) decreased about 4.66 kg and 3.80 kg after 6 months, respectively. If the *p*-values were 0.776 (between baseline and 3 months), 0.805 (between 3 months and 6 months), and 4.902 (between baseline and 6 months), respectively, then 20s women had evidence of that a significant main effect existed amongst the observations of the outcome or within-weights. Their skeletal muscle mass (SMM) of both groups increased slightly through exercise. On the other hand, their percentage of body fat (PBF) decreased by 0.75%. Thus, the divergent results for % fat change may be attributable to the marked fat loss coupled with changes in lean mass from the exercise. However, both (SMM and PBF) were not shown significant differences among 20s A and B groups. 30s PEF (group 30s A) was the result of a survey of mean 67.25 kg (baseline). The body weight of 30s with exercise and food (30s A) and only exercise (30s B) decreased about 4.82 kg and 1.81 kg after 6 months, respectively. Although the decrease in total body weight of 30s A was correlated with the increase in SMM, there was not shown significant. However, difference between total weight change measurements was associated with water loss (intracellular water and extracellular water) (Table 3). They performed exercise and food control very well (Fig. 1). Although 30s B performed exercise, there were not shown significant decrease loss of body weight and visceral fat. 30s A performed exercise and food control very well and 30s B did not do them (Fig. 1). The body weight of 40s with exercise and food (A) and only exercise (B) decreased about 4.35 kg and 2.68 kg, respectively. The F value of visceral fat for 40s with exercise (A) was 5.760 ($p < 0.05$), which was significant difference. Because of obesity, each person exercised diet and exercise. They lost a lot of weight and body fat. Though they were not a food control group, they performed exercise and food control very well (Fig. 1). The body weight of 50s with exercise and food (A) and only exercise (B) decreased about 3.66 kg and 1.97 kg, respectively. The 50s A performed exercise and food control, but the group 50s B did not do food control very well (Fig. 1). The 50s women A is deemed to be decreasing-weight due to the decreased intracellular water.The women of the group 50s B-participants were sometimes absent from the exercise session or were eating irregular meals. Table 3 shows body composition analysis and change over six months exercise training. Total body water decreased significance in 20s (groups A and B), 30s (group A), and 40s (group A), all other values did not shown significant differences. Difference between total body water was related to BMI indices and body fat loss. Protein and minerals increased in the most group. Though mineral help the body preserve and play a care role in the human body, there were not increased significance among all group.

Table 4 shows women obesity analysis and change, throughout six months of exercise and/or controlled food, had minimal change. Overall, the BMI index improved significantly through exercise. There was a significant decrease in BMI in the 20s A, 20s B, and 30s A. Waist-Hip ratio (WHR) is was a significant decrease in the 20s A. Though, the other group were no significance, but the WHR index improved in most group. Indices of visceral fat were was a significant decrease in the 20s A and40s A. The other were not significantly different among groups, but was much lowered.

DISCUSSION

In 1992, a task force of the International Dietary Energy Consultative Group of the ACC Sub-Committee on Nutrition suggested that body mass index (BMI) be used to define adult chronic dietary energy deficiency (Norgan, 1994). BMI is widely used as an index of relative weight, often expressed as standard deviation score (SDS) to take into account age and sex (Wells & Fewtrell, 2006). BMI is used a global index of nutritional status. This may be important for their nutritional management, as the low BMI may lead to inappropriate overfeeding. Overall, the BMI index improved significantly through exercise (Table 4). Our study has all the limitations of post hoc analyses from prospective randomized trials. The particularly correlations among baseline variables, may be influenced by the set of women who chose to enroll in this exercise trial. BMI was our only index of obesity; there are no measures of body composition or fat mass or other anthropometric indices such as waist circumference or waist-to-hip ratio (Horwich et al., 2011).

Weight alone does not correctly reflect the effects of exercise (Table 2). Loss of body weight reflected the combined effects of exercise and improved diet (Fig. 1). Gemert et al (2015) reported that modest weight loss of 6%-7% resulted in a positive change in self-perceived health status in a population of healthy overweight and obese, inactive, postmenopausal women. These variables include exercise protocols, subject characteristics, types and amounts of food available for consumption, environmental conditions, and sociocultural factors. Participants were asked to maintain their normal dietary and physical activity programs throughout the duration of the study.

Mineral help the body preserve and play a care role in the human body. Mineral mass was closely related to protein and soft lean mass. Protein and minerals increased in the 20s A, 30s A, and 50s women (A and B). Some women in 20s B and 40s B have lost her protein and minerals.

Waist-Hip ratio (WHR) is determined by dividing the waist circumference from the navel line by the hip's maximum circumference. It is a useful indicator for comprehending the distribution of body fat. There was no significance, but the WHR index improved except 20s B. Visceral fat area is defined here as the cross-sectional area of visceral fat found in the abdomen. Indices of visceral fat were not significantly different among groups, but was much lowered.

Table 1. Energy expenditure and duration of the low- and high-intensity exercise sessions and daily macronutrient intake

Variable	Low-intensity exercise	High-intensity exercise
Energy expenditure (kcal)	312±15.6	356±18.9
Duration (min)	40±4.7	60±5.1
Intensity (% VO_2 peak)	43±2.8	65±3.6
Carbohydrate (g)	240±35.4	274±27.9
Lipid (g)	89±12.3	95±16.4
Protein (g)	70±11.8	80±8.3

All value are mean±SD. The main effects of the model were assessed with repeated-measures ANOVA ($P < 0.05$). Post hoc testing was followed by paired *t* tests (Bonferonni corrections were applied for multiple comparisons.) Means in a row with different superscript letters are significantly different ($P < 0.05$).

Table 2. Total weight, muscle-fat analysis and change over six months exercise training and/or controlled food

Gender (Age)	Measure	Baseline	3 month	6 month	*F*, *P*
Female (20s) A	Total Weight, kg	63.33±3.06	61.97±3.05	58.67±2.31	4.898, *
	SMM, kg	25.76±3.94	24.50±2.89	27.38±3.20	0.732, NS
	PBF, %	19.58±2.16	18.89±1.75	18.83±2.03	0.179, NS
Female (20s) B	Weight	71.65±2.67	69.54±3.10	67.85±3.54	1.480, NS
	SMM	26.02±1.63	30.63±1.29	30.03±1.35	12.302, **
	PBF	12.80±2.62	11.94±2.16	11.33±2.16	0.884, NS
Female (30s) A	Weight	67.25±2.22	64.90±2.44	62.43±2.34	4.267, *
	SMM	23.55±1.17	23.65±1.13	23.90±1.12	0.100, NS
	PBF	15.50±0.39	15.40±0.43	15.28±0.38	0.316, NS
Female (30s) B	Weight	72.43±5.05	71.15±4.66	70.62±4.57	0.152, NS
	SMM	27.50±2.08	27.43±1.42	27.92±1.43	0.093, NS
	PBT	13.15±1.55	12.95±1.40	12.95±1.47	0.223, NS
Female (40s) A	Weight	67.13±1.89	64.98±1.98	62.78±1.75	5.382, *
	SMM	21.60±1.35	21.88±1.36	21.80±1.44	0.042, NS
	PBF	18.25±2.06	17.63±1.73	17.10±1.41	0.431, NS
Female (40s) B	Weight	78.51±3.91	77.37±4.06	75.83±3.74	0.479, NS
	SMM	25.23±1.29	26.43±2.15	26.70±2.29	0.641, NS
	PBF	14.98±2.15	14.48±1.71	14.40±1.29	0.127, NS
Female (50s) A	Weight	64.11±3.92	62.30±3.96	60.45±3.48	0.876, NS
	SMM	19.02±0.82	19.25±0.74	19.38±0.74	0.249, NS
	PBF	17.00±0.82	16.85±0.66	16.70±0.71	0.170, NS
Female (50s) B	Weight	68.65±2.19	67.81±2.30	66.97±2.25	0.494, NS
	SMM	23.98±2.66	24.35±4.12	24.88±2.66	0.024, NS
	PBF	15.50±3.32	16.50±5.20	15.08±2.89	0.013, NS

SMM: Skeletal Muscle Mass.
PBF: Percentage of Body Fat.
Results are from three experiments and are expressed as mean ± SD.
NS: Non-significant, $P > 0.05$.
*: Significant, $P < 0.05$.

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Table 3. Body composition analysis and change over one year exercise training

Gender (Age)	Measure	Baseline	6 month	One year	*F*, *P*
Female (20s) A	Intracellular Water	20.08±1.64	19.03±0.82	17.50±1.01	4.608, *
	Extracellular Water	12.90±0.52	12.20±0.73	10.95±1.24	4.406, *
	Protein	7.63±0.95	8.58±0.98	8.88±1.30	1.438, NS
	Mineral	3.51±0.31	3.70±0.47	3.57±0.39	0.018, NS
Female (20s) B	Intracellular Water	28.75±1.79	27.68±1.69	26.75±1.26	0.019, NS
	Extracellular Water	16.75±0.96	15.68±0.54	15.35±0.47	4.529, *
	Protein	9.50±1.29	10.23±1.70	10.40±1.61	0.381, NS
	Mineral	3.85±0.24	4.03±0.05	4.05±0.07	2.202, NS
Female (30s) C	Intracellular Water	20.14±1.41	19.08±1.27	18.13±0.85	5.481, *
	Extracellular Water	13.50±1.20	13.38±1.28	13.20±1.29	4.340, *
	Protein	7.20±0.28	7.38±0.17	7.50±0.18	2.353, NS
	Mineral	3.98±0.13	4.10±0.14	4.20±0.14	2.731, NS
Female (30s) D	Intracellular Water	27.55±1.91	26.85±1.86	26.50±1.91	0.318, NS
	Extracellular Water	17.30±1.78	16.98±1.86	16.78±1.60	0.092, NS
	Protein	10.58±1.71	11.03±1.56	11.40±1.58	0.261, NS
	Mineral	3.85±0.13	3.90±0.11	3.92±0.14	0.301, NS
Female (40s) E	Intracellular Water	20.12±1.41	18.51±1.29	16.83±0.57	7.589, *
	Extracellular Water	13.56±0.60	13.99±0.98	13.09±1.29	1.440, NS
	Protein	7.20±0.28	7.38±0.17	7.50±0.08	0.617, NS
	Mineral	3.98±0.13	4.11±0.14	4.20±0.14	0.308, NS
Female (40s) F	Intracellular Water	26.90±1.52	26.55±2.40	25.83±1.96	0.302, NS
	Extracellular Water	22.19±1.843	21.35±1.35	20.50±1.91	0.663, NS
	Protein	10.88±1.03	11.20±0.85	11.28±0.88	0.212, NS
	Mineral	3.76±0.26	3.80±0.24	3.82±0.20	0.069, NS
Female (50s) G	Intracellular Water	17.50±1.73	16.63±1.70	15.40±0.71	2.086, NS
	Extracellular Water	14.52±0.71	14.53±1.07	14.83±1.83	0.079, NS
	Protein	7.50±0.44	7.68±0.44	7.78±0.33	0.479, NS
	Mineral	2.97±0.41	3.06±0.42	3.15±0.31	0.217, NS
Female (50s) H	Intracellular Water	23.25±3.30	23.00±3.65	22.35±3.79	0.133, NS
	Extracellular Water	16.73±1.02	16.15±1.50	16.05±0.82	0.363, NS
	Protein	9.73±0.90	9.78±0.80	9.85±0.36	0.031, NS
	Mineral	3.45±0.16	3.41±0.15	3.64±0.05	1.225, NS

NS: Non-significant, $P > 0.05$.
*: Significant, $P < 0.05$.
**: Significant, $P < 0.01$.

Table 4 Obesity analysis and change over one year exercise training

Gender (Age)	Measure	Baseline	6 month	One year	*F, P*
Female (20s) A	BMI	27.80±2.10	25.74±1.37	24.28±1.91	5.327, *
	Waist-Hip Ratio	0.86±0.12	0.85±0.07	0.84±0.08	7.409, *
	Visceral Fat	8.50±0.71	6.75±1.26	5.75±1.25	5.561, *
Female (20s) B	BMI	26.47±0.52	25.69±0.45	25.06±0.58	7.431, *
	Waist-Hip Ratio	1.01±0.06	0.99±0.06	0.94±0.02	2.013, NS
	Visceral Fat	9.50±2.08	9.00±2.58	8.75±2.63	0.098, NS
Female (30) A	BMI	26.30±1.05	25.27±0.77	24.14±0.77	6.346, *
	Waist-Hip Ratio	0.92±0.03	0.91±0.06	0.85±0.07	2.154, NS
	Visceral Fat	7.50±0.71	7.25±1.52	6.50±1.29	2.784, NS
Female (30) B	BMI	28.64±1.78	28.29±1.43	28.21±1.63	0.071, NS
	Waist-Hip Ratio	0.96±0.08	0.96±0.11	0.95±0.09	0.005, NS
	Visceral Fat	10.00±2.58	9.50±2.65	9.25±2.63	1.694, NS
Female (40) A	BMI	27.28±0.43	26.05±1.33	25.15±1.15	1.961, NS
	Waist-Hip Ratio	0.93±0.04	0.93±0.05	0.89±0.04	0.876, NS
	Visceral Fat	8.02±0.15	7.25±1.26	6.25±0.50	5.760, *
Female (40) B	BMI	31.67±1.99	31.21±2.02	30.58±0.03	0.314, NS
	Waist-Hip Ratio	0.97±0.07	0.93±0.05	0.91±0.04	1.144, NS
	Visceral Fat	11.04±2.94	10.75±2.50	10.25±2.50	1.834, NS
Female (50) A	BMI	27.02±1.38	24.97±1.84	24.23±1.71	0.944, NS
	Waist-Hip Ratio	0.95±0.06	0.92±0.05	0.91±0.91	0.773, NS
	Visceral Fat	7.50±0.71	7.25±1.26	6.75±0.96	3.103, NS
Female (50) B	BMI	24.48±0.77	24.18±0.83	23.87±0.44	0.304, NS
	Waist-Hip Ratio	1.02±0.07	0.96±0.06	0.93±0.05	2.483, NS
	Visceral Fat	9.50±1.91	8.50±1.73	8.25±1.89	2.240, NS

BMI: Body mass index.
*: Significant, $P < 0.05$.

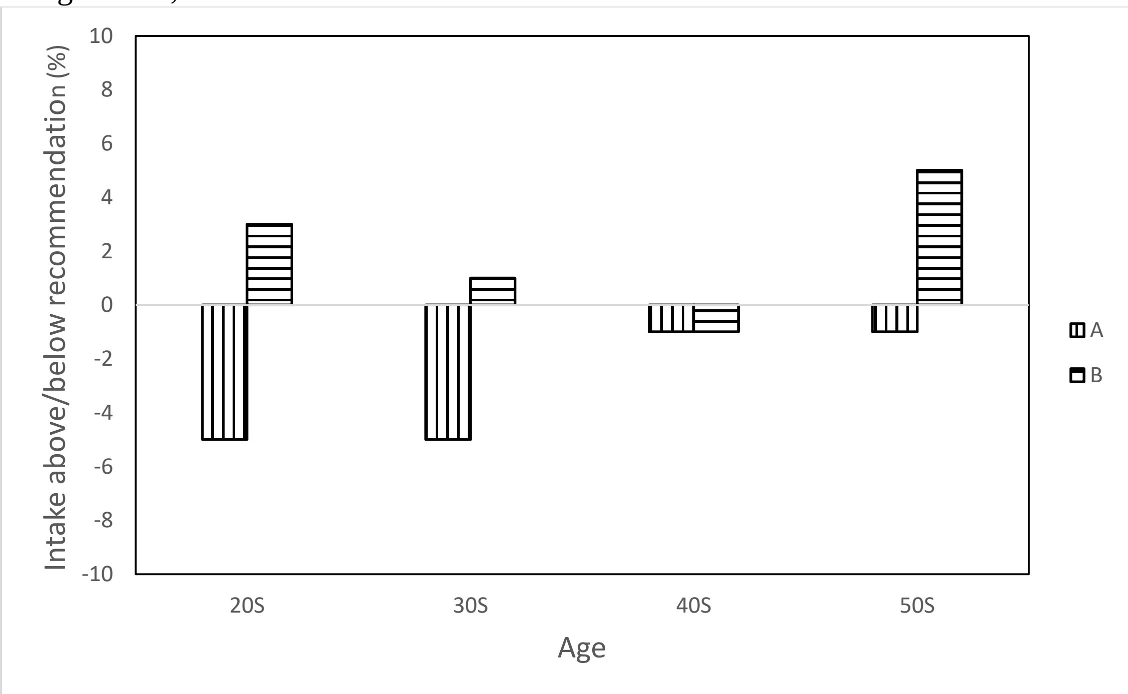

Fig. 1. Percentages (mean values) of intake food during six months above/below recomended dietary allowances according to ages.

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