Moderate Intensity Exercise Reduced Metabolic Diseases

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Abstract. As employees on company which work behind the desk raised the health risk because barely do no significant physical activity. Less physical activity induced the show up of diseases such as hypertension, cardiovascular diseases, diabetes, cancer, fatigue, stress, depression, musculoskeletal disorder, general health complaint and also raised the mortality rate. Research found that there are an association between time spent in sedentary behaviour and the metabolic diseases. On this study, we chose 29 people from Pertamina Company in Surabaya. Subjects screened by their waist circumference, fat percentage and body weight which above the standard. Subjects treated with moderate intensity exercise and diet, we evaluated the subject every 2 weeks in 3 months. Every participant must accomplish their physical program with the recommendation stretching and warming up, cardio/endurance 60-75% from HRmax, Strength exercise 60-75 % 1RM 15x/ set until two sets and cooling down. Participants were also dieting by reducing 3/4 - 1/2 the size of the meal. Result showed there are significant decreased in waist circumference (2.5–6.3centimetre), fat percentage (0.8–2.2%), and body weight (0.9–3.6 kg) and increased in VO2max level (1.7-4.3ml/kg/minute). Conclusion: employee which work behind the table need moderate intensity exercise to decrease metabolic diseases.

1. Introduction

Metabolic syndrome (MetS) is a condition of accumulated risk factors of metabolic origin [1] [2]. The risk factors include central obesity, hypertension, insulin resistance, impaired glucose tolerance and dyslipidemia [1] [3] [4]. Abdominal obesity [1] and insulin resistance [1] [6] play key roles in metabolic syndrome and a sedentary lifestyle along with dietary and genetic factors are thought to be implicated in the pathogenesis [4] [5]. Cross sectional analyses have suggested that physical activity may prevent obesity as well as insulin resistance potentially reducing risk of metabolic syndrome development [5]. Recent study indicates that intensity rather than volume of physical activity is important to reduce cardiovascular risk [7] [8]. The risk of developing metabolic syndrome maybe reduced as much as 35-50% in subjects who are more physically active [9]. There is a threshold below which physical activity does not confer protection against metabolic syndrome, longitudinal analyses showed that subjects who were physically active 2-4h/week but who did not engage in physical activity with more intensity (fast walking, jogging) were not protected against the development of the metabolic syndrome [9]. Significantly lower risk of metabolic syndrome was found in the moderately and highly physically active

groups compared to their sedentary counterparts whereas light physical activity and even more than 1 hour of walking daily did not confer protection against metabolic syndrome [9]. Participation in regular moderate or vigorous activity such as brisk walking could improve cardiorespiratory fitness and decrease metabolic syndrome [9].

Prevalence of metabolic syndrome varies between populations, with estimation of approximately 13-30% of adults in developing countries and 35% in developed countries [10]. Several risk factors are responsible for the majority of metabolic syndrome cases and cardiovascular diseases in developed countries, include overweight, obesity, physical inactivity, hypertension, and limited fruit and vegetable intake [11]. It is essential to address poor diet, physical inactivity, and sedentary behavior to reduce the prevalence of metabolic syndrome and related chronic diseases [12].

2. Materials and Methods

Subjects were screened by their BMI (>25kg/m2, WHO), waist circumference (men > 90cm; women > 80cm) and Laboratory test. After underwent initial test, subjects were assigned to specific physical activity program for 3 months based on the assessment of initial test. We asked subjects to fill PAQ-Q , then did initial test and evaluate them using standardized protocols cardiovascular fitness test, waist circumference, body composition, flexibility, muscular strength and muscular endurance.

Concern to limited time the office employee have, we created an easy and applicable exercise or physical activity program which could give health benefit and fits for their timetable using FITT method (Frequency, Intensity, Type, Time). According to ACSM's Guidelines for exercise testing and prescription below.

Table 1. General Exercise Recommendations for Adults Using FITT

Weekly Frequency	Types of Exercise
a. At least 5 d/week	Moderate Intensity (65% – 74% VO_2max) aerobic (cardiovascular endurance) activities, weight-bearing exercise, flexibility exercise
At least 3 d/week	Vigorous intensity (75% - 85% VO_2max) aerobic activities, weight-bearing exercise, flexibility exercise
3-5 days	A combination of moderate- and vigorous-intensity aerobic activities, weight-bearing exercise, flexibility exercise
2-3 days	Muscular strength and endurance, resistance exercise, calisthenics, balance and agility exercise.

The recommended rate of progression from ACMS in an exercise program depends on the individual's health status, exercise tolerance and exercise program goals. Progression may consist of increasing any of the components of the FITT framework as tolerated by individual. During the initial phase of the exercise program, increasing exercise duration (i.e., minutes per session) is recommended.

3. Results

Table 2. Correlations Pre and Post all Variables

ResultIndicators	N	Correlation	Sig.
Body weight pre & post	29	0,96	0,00
Waist circumference pre & post	29	0,81	0,00
IMT pre & post	29	0,96	0,00
Fat percentage pre & post	29	0,95	0,00
VO2max pre & post	29	0,81	0,00

Table 2 described that there are strong correlation between pre and post counting variables of body weight pre and post, waist circumference pre and post, IMT pre and post, fat percentage pre and post

and VO_2max pre and post, which are 0,961, 0,817, 0,958, 0,954, 0,812 with probability <0.05 and significance 0.000.

Table 3. The Mean Results of Treatment Using the FITT

	Mean±SD Before	**Mean±SD After**	**Mean±SD change before-after**	***p*value**
Body weight	75,50±12,6	73,22±12,6	2,28±3,53	0,00
Waist circumference	95,68±8,4	91,25±7,94	4,43±4,97	0,00
IMT	28,52±3,3	27,74±3,3	0,79±0,97	0,00
Fat Percentage	32,28±5,9	30,76±5,5	1,52±1,77	0,00
Vo_2max	25±5,6	28±5,3	-2,99±3,38	0,00

Table above describe means of body weight_pre is 75,50 kg with SD 12,61 and after treatment for 3 months means of body weight_post is 73,22 kg with SD 12,61. Means of waist circumference_pre is 95, 68 cm with SD 8, 42 and waist circumference_post is 91, 25 cm with SD 7, 93. Means of IMT_pre is 28, 52 kg.m-2 with SD 3, 31 and after treatment became 27, 74 kg.m-2 with SD 3, 36. Means of fat percentage_pre is 32, 28% with SD 5, 91 and posttest is 30, 76% with SD 5, and 56. Means of VO2max_pre is 25, 09 ml.kg-1.min-1 with SD 5, 64 and after treatment is 28, 08 ml.kg-1.min-1 with SD 5, 35.

Table 4. Interval of the Difference after Treatment Using the FITT

Health Indicator	Lower	Upper	T	***p* value**
Body weight	0,94	3,62	3,48	0,00
Waist circumference	2,54	6,32	4,80	0,00
IMT	0,42	1,16	4,37	0,00
Fat Percentage	0,85	2,20	4,65	0,00
Vo_2max	-4,27	-1,70	-4,76	0,00

As we can see on the table 3, there is a decreased of lowest body weight 0,9 kg and highest body weight 3,6 kg, waist circumference lowest decreased is 2,5 cm and highest is 6,3 cm, IMT lowest decreased is 0,4 kg.m-2 and highest is 1,2 kg.m-2, fat percentage lowest decreased is 0,8 % and highest is 2,2 %. VO2max has lowest increased is 1, 7 ml.kg-1.min-1 and highest increased is 4, 3 ml.kg-1.min-1. The result using paired-sample t test method is positive, the result of the calculation using the paired sample t test also showed positive results where the t-count higher than t-table. The results of the calculation at a significance level of 5% or 95% confidence level can be concluded that with the moderate intensity exercise program for three months there is some difference of pre-test.

4. Discussion

Metabolic syndrome (MetS) is a cluster of risk factors that increase an individual's risk of developing cardiovascular disease [13]. Individual with MetS are at greater risk of developing type 2 diabetes and atherosclerosis cardiovascular disease compared to individuals without MetS [14]. The cardiovascular disease mortality rate is also higher among people with Mets [15]. The Meta-Analysis study explain that overtime and extended work schedules could increase risk of hypertension, cardiovascular disease, fatigue, stress, depression, musculoskeletal disorder, chronic infections, diabetes, general health complaints and all-cause mortality [16]. Unhealthy lifestyles are believed to be strong correlated to chronic diseases. Lack of exercise and sedentary are common phenomena in the modern society. Their effect on the chronic diseases, also known as non-communicable diseases (NCDs), including cardiovascular diseases (such as heart attack and stroke), cancer, type 2 diabetes, and chronic respiratory diseases [17]. Recently, an emergence of research in sedentary behavior (SB) has indicated that SB as

an independent health risk factor, separate to lack of physical activity (PA), associated with successful aging, morbidity and mortality. The amount of time spent being sedentary is an important risk factor associated with several aspects of ill health, including overweight and obesity and associated metabolic diseases [18].

Sedentary behavior, too much sitting as distinct from too little exercise, is defined by low energy expenditure (ranging from 1.0-1.5 METs; metabolic equivalents or multiples of the basal metabolic rate) in sitting or reclining position during waking hours [19]. Total time spent in sedentary behavior (i.e., time accumulated across all sedentary behaviors) is starting to receive greater attention as a distinct behavioral entity and risk factor for host of adverse health outcomes and cardio metabolic risk, which may be additional to the risk associated with lack of moderate-to-vigorous physical activity (MVPA) during leisure time [20]. In this research, we focus on sedentary behavior in a context of reducing metabolic syndrome risk which are the high volumes of sedentary behavior observed in official employees, the distinctions between physical inactivity and sedentary behavior, recent evidence from observational epidemiology studies on the associations of sedentary behavior with metabolic syndrome, the potential cardio metabolic benefits of breaking up sedentary behavior for the prevention and potential management of type 2 diabetes and cardiovascular risk, and the important of a population based approach [21].

Evidence from observational studies on sitting time and health Outcomes was reported deleterious associations of sedentary behavior with cardio metabolic health and mortality in adults [21]. A published meta-analysis prospective studies was showed positive association of television viewing time with type2 diabetes, cardiovascular disease and all-cause mortality [20]. The meta-analysis review (having identified 6 relevant studies) quantifying the prospective associations and dose-response relationships of total daily sitting and all-cause mortality risk [22]. After adjustment for MVPA, which had a moderate protective role (18% reduction in mortality risk), dose-response modeling estimated a 34% higher mortality for adult sitting 10 hours/day vs. 1 hour/day.

Metabolic syndrome is most commonly defined according to the National Cholesterol Education Program's Adult Treatment Panel (NCEP ATP) III criteria as three or more of the following conditions: abdominal obesity, high glycerides, low HDL cholesterol, hypertension and hyperglycemia [23]. People with metabolic syndrome have an increased to develop health problems such as heart diseases, diabetes, and stroke [24]. Because its high prevalence and significant health consequences, it is important to understand the risk factors of metabolic syndrome. Physical inactivity [25], often defined as the lack of moderate-to-vigorous PA and sedentary behavior [26] has been shown to be important risk factors of metabolic syndrome. On this research found that people without metabolic syndrome spent more hours and a greater percentage of their wear time as sedentary. People with metabolic syndrome had a longer average sedentary bout, a lower intensity during sedentary time and fewer breaks in sedentary time. A higher percentage of total wear time spent as sedentary time was associated with a significantly greater likelihood of metabolic syndrome even after adjustment for PA. Fewer sedentary breaks were associated with a higher likelihood of metabolic syndrome, and a significant trend was found for intensity during sedentary time where the likelihood of metabolic syndrome increased with a decreased in intensity. This study's result that not only a total of sedentary time is an important health risk factor, but patterns (i.e., the way sedentary time is accumulated) of sedentary behaviors might be important risk factors as well [27].

Prevalence of metabolic syndrome decreased by 44% in the high amount/vigorous intensity group, whereas the low amount/vigorous intensity group did not change prevalence. Interestingly, the low amount/moderate intensity group decreased the prevalence to the same extent as the group training at high amount/vigorous intensity, both having exercised the same amount of minutes per week. Moderate intensity aerobic exercise of 30-60 min performed 3-5 days/week has been found to decrease plasma TG by 12% and to increase plasma HDL by 4% with no changes with regard to plasma LDL and total cholesterol. This study concluded that a small dose of physical exercise is healthier than none, and a moderate dose of exercise is better than a small dose but a moderate dose of daily physical exercise appears to be nearly or just as good as high dose [28].

Waist circumference has been strongly and positively associated with all-cause mortality for both men and women in most study. It is also strongly correlated with abdominal obesity and is the most commonly used clinical measure of body fat distribution. Abdominal obesity appears to be more strongly associated with multiple chronic through adverse metabolic effects (i.e., decreased glucose tolerance, reduced insulin sensitivity, and adverse lipid profile) of visceral relative to subcutaneous fat. Found that losses in life expectancy at 40 years of age were approximately 3 years for men and 5 years for women when comparing those in the highest and lowest waist circumference. Waist circumference was more strongly associated with cardiovascular disease and respiratory disease than cancer mortality. Body composition, in terms of fat and fat-free mass, cab be an important predictor of health because the link between excess fat mass, chronic disease (non-communicable disease and physical performance [29].

5. Conclusion

The exercise program for three months of moderate intensity gave a positive result. Occurred some significant changes are weight loss, BMI becomes normal, decreased fat percentage and shrinkage belts and improving the status of VO2max. Thereby reducing the risk of Metabolic Diseases.

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