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THE EFFECT DIFFERENCES OF 30-MINUTES VERSUS 60-MINUTES TELE-EXERCISE ON FITNESS LEVEL OF OBESE EMPLOYEES

Mury Kuswari[1,2*], Rimbawan Rimbawan[2], Hardinsyah Hardinsyah[2], Mira Dewi[2], Nazhif Gifari[1]
[1]Departemen Ilmu Gizi Universitas Esa Unggul
[2]Departemen Ilmu Gizi IPB University
*E-mail: rimbawan@apps.ipb.ac.id

ABSTRACT

The ongoing COVID-19 pandemic causes lower physical activity while exercise intensity also decreases. At the same time, the stress level is increasing, causing low physical fitness level. Due to the importance of human health and company cost to increase their employees' physical fitness level, and with regard to the limited time of office employees, this research aimed to analyze the effect of tele-exercise duration on the fitness level of obese employees. The design of this study was pre-posttest quasi-experimental design. The subjects of this research were male and female obese employees, aged 18–45 years old, from Fast Moving Consumer Goods (FMCG) company in Jakarta, Indonesia. Subjects then were randomly assi gned to a 30-minutes exercise session group (n = 20) or 60-minutes exercise session group (n = 19). Statistical analysis included paired t-test and independent t-test to analyze differences between groups. All aspects of fitness analyzed in this study (strength, flexibility, and cardiorespiratory endurance) were increased in both groups significantly ($p<0.05$). It was shown that 60-minutes exercise sessions improve overall aspects of fitness better than 30-minutes exercise sessions, except for cardiovascular fitness (VO_2 Max). Using an independent t-test, there were no significant differences between 30-minute and 60-minute exercise sessions in terms of mean changes ($p>0.05$). This study showed that tele-exercise, even if it is done in a short period, 30-minute duration, may improve the overall aspect of fitness level significantly for obese employees. Moreover, in this pandemic time, this kind of program is a better alternative than face-to-face, direct exercise intervention.

Keywords: body composition, combined exercise, fitness level, obesity, tele-exercise

INTRODUCTION

For office employees, an unhealthy lifestyle may affect the risk of cardiovascular disease and other chronic diseases, as well as having a negative effect associated with the workplace. Physical activity that does not fulfill the WHO's requirement of minimum 150 minutes per week is negatively associated with physical work capacity (Ilmarinen, 2001), while it is also positively associated with time spent off sick (Proper et al., 2006). Thus, the aforementioned conditions are an important push on the indirect cost of the employer (Andersen et al., 2010; Katzmarzyk & Janssen, 2004; Schmier et al., 2006). Therefore, a unified approach to management is essential for preventing the negative effects of a sedentary lifestyle and improving the fitness level of office employees. On the other hand, one of the greatest obstacles for wellness programs intended to improve fitness levels is maintaining individual compliance or adherence to the program itself, with limited time being the leading cause of low compliance (Trost et al., 2002).

Physical fitness is one of the main factors that affect the health status of every individual (Lipecki & Rutowicz, 2015). Simply put, fitness can be defined as the ability of a person to do a specific task with maximal effort but still in an efficient form without experiencing extreme fatigue, as well as not doing that task with the risk of health-related disorder (Bile & Suharharjana, 2019). The current COVID-19 pandemic that has been affecting Indonesia for the past two years is causing the closing of fitness centers, stadiums, swimming pools, dance studios, physiotherapy centers, and playgrounds. Due to this condition, many people, including office employees, cannot exercise in a group or even outside of their living place or home. In this condition, both physical activity and exercise intensity are reduced. While at the same time, the stress level is increasing, causing low physical fitness level (Almandoz et al., 2020), screen time is simultaneously increasing (Qin et al., 2020; ten Velde et al., 2021; Wagner et al., 2021).

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The problem of physical inactivity, to this day, is still a growing problem With over 30% of adults failing to attain their goals of the required physical activity level (Bachmann et al., 2015). This condition indicates that the accumulation of physical activity in a day due to work routine is not sufficient to maintain general physical fitness. Thus, it is required for employers to make a routine physical activity or exercises for their employees, such as in the form of wellness programs, systematically and continuously (Irianto, 2007), to improve or maintain the physical fitness level of employees at an optimal level (Bile & Suharharjana, 2019).

With regard to the COVID-19 pandemic, the effort to maintain optimal physical fitness must be done as a preventive measurement to improve the immune system specifically and maintain health generally (Hale et al., 2018). It cannot be denied that the Working from Home (WFH) system in this pandemic time is heavily affecting the intensity of physical activity performed by office employees. The easiness of access to online working material due to smartphones and computers utilization, as well as other electronic media, indirectly implicates low physical activity level. These conditions may induce a tendency to shift employee lifestyle to become more sedentary, which will increase the risk of having a health disorder such as increased body mass index (BMI), cardiovascular disease, as well as lowering immunity and other degenerative diseases (Knaeps et al., 2018), which will cause the employee, mainly the obese ones, in having a low fitness level, further increasing the risk of having a COVID-19 disease.

In this case, online intervention during working hours that is done at every subject's house can be an effective solution to the problem of limited time for exercise and low level of physical activity motivation. In this pandemic situation, implementing a workplace wellness program is one way to provide this intervention, primarily in every subject's house; with an online system (i.e. live, synchronous video conference), which will provide a series of physical practices from work activity that is done during working hours. This type of intervention, which is called tele-exercise (Hong et al., 2017), is aimed to balance body structure changes during work; strengthen muscles that are not used during work; and maintain strength and flexibility, which are parts of fitness level (Hayden et al., 2005). Due to the importance of human health and company cost to increase employees' physical fitness level, and with regard to the limited time of office employees, this study aims to analyze the effect of tele-exercise duration on the fitness level of obese office employees.

METHODS

The subject of this study is obese male and female office employees, aged 18–45 years old, from FMCG company in Jakarta, Indonesia. During the duration of tele-exercise by using Zoom application, subjects can exercise either in the office or at home, depending on the office schedule regarding Work From Home (WFH) and Work From Office (WFO) system, which was planned by the office. The design of this study is pre-posttest quasi-experimental design. This study was done on two groups without involving a control group, covering both male and female employees. Screening for subjects was done beforehand with BMI criteria > 23 kg/m^2 is required since it is the minimal range of an individual in Asia-Pacific countries to be categorized as obese (Pan & Yeh, 2008). Inclusion criteria were subject is an office employee who worked from morning till early evening without physical activity other than what was given in this intervention, having a healthy heart (which was screened by medical check-up beforehand), did not have any severe diseases that may be worsened by doing exercise, commuting to the office with public transportation or walking less than 2 km per day, not having a problem on doing high-intensity exercises, not currently on a specific diet and/or regular exercises program, and willing to adhere to the intervention until the conclusion of the trial without compulsion or pressure from others. Exclusion criteria were pregnant, currently have a chronic disease, did not complete the intervention protocol until the end, and having an injury. Sampling was done purposely, while the total subjects that met the criteria and were willing to be intervened were 39 people. Subjects then were randomly assigned to a 30-minutes exercise session group (n = 20) or 60-minutes exercise session group (n = 19).

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Exercises that were given are the kind of intervention that did not have a high risk of injury considering that subjects are prone to injury since they are obese. The exercises were done according to the subjects' capability of doing exercise, accompanied by a professional fitness coach. All interventions use the combined strength and cardio protocol. Subjects performed combined strength and cardiovascular tele-exercise for 30 minutes every session, three times per week, for 12 weeks. The exercise duration was doubled for the 60-minutes exercise group. Exercise interventions consist of four kinds of exercise: high-intensity interval training (HIIT), low-high impact aerobic exercise, circuit training, and Zumba. Exercises were started by doing a 2-5 minutes warm-up, followed by main training for 20 to 25 minutes, then ended by a 2-5 minutes cooling down session.

Every Tuesday and Thursday, strength workouts were performed, and every Saturday cardio exercises were performed. Baseline data were collected at weeks 0 and 12, before and after the intervention, respectively. Output variables were VO_2 Max, 1-minute push-up count, 1-minute sit-up count, and sit-and-reach distance. Data were collected by a professional coach with VO_2Max being processed from beep test result using the formula by Ramsbottom et al. (1988), with beep test being performed before work in the morning.

VO_2 Max was assessed by counting the number of returns and processed by (Ramsbottom et al.'s (1988) formula: VO_2 Max = 12.1 + (Number of Returns x 3.48). The descriptive distribution of the data was determined through univariate analysis. Output data for week 0 and t -test to prove this study hypothesis. Independent sample t-tests were done on the mean difference between the two groups of intervention. All analyses were done using SPSS 26.0 for Windows. This study protocol is approved by the Research Ethic Committee Faculty of Medicine Universitas Indonesia - RSUPN Dr. Cipto Mangunkusumo No. 20-10-1309.

RESULTS

Table 1 shows the baseline characteristics of subjects. Most of subjects are female (n = 26, 66.67%). The mean body weight for the 30-minutes exercise group was 69.6±10.65 kg, while for the 60-minutes exercise group was 72.65±11.65 kg. The mean initial BMI was slightly lower for the 30-minutes group (25.98±2.43 kg/m^2) than the 60-minutes group, being 27.92±4.98 kg/m^2.

Table 2 shows the changes of body weight (BW) and BMI for all groups. There's a decrease on body weight and BMI for both groups. Body weight on 30-minute intervention group decreased from 69.60±10.65 kg to 68.40±10.55 kg (Δ = -1.20 kg), while for 60-minute intervention group, the body weight decreased from 72.65±11.65 kg to 68.49±11.18 kg (Δ = -4.16 kg). BMI for 30-minute group decreased from 25.98±2.43 kg/m^2 to 25.54±2.70 kg/m^2 (Δ = -0.44 kg/m^2), while for 60-minute group the BMI decreased from 27.92±4.98 kg/m^2 to 26.44±4.33 kg/m^2 (Δ = -1.48 kg/m^2).

Table 1. Baseline characteristics

Group	n (%)	Age	Sex		Initial Body Weight (kg)	Initial BMI (kg/m^2)
			Male (n (%))	Female (n (%))		
30 minutes	20 (51.28)	31.60±6.04	8 (20.51)	12 (30.77)	69.6±10.65	25.98±2.43
60 minutes	19 (48.72)	37.85±10.50	5 (12.82)	14 (20.51)	72.65±11.65	27.92±4.98
Total	39 (100)	[redacted]	13 (33.33)	26 (66.67)	[redacted]	

Table 2. Changes in subject's body weight and BMI on both intervention groups

Group	BW*1	BW*2	Δ	BMI**1	BMI**2	Δ
30 minutes	69.60±10.65	68.40±10.55	-1.20	25.98±2.43	25.54±2.70	-0.44
60 minutes	72.65±11.65	68.49±11.18	-4.16	27.92±4.98	26.44±4.33	-1.48

*BW:Body Weight
**BMI: Body Mass Index

Table 3 shows the fitness level of subjects before and after the intervention. All aspects of fitness analyzed in this study (strength, flexibility, and cardiorespiratory endurance) were increased in both groups significantly ($p<0.05$). It is shown that 60-minutes exercise session improves overall aspects of fitness better than 30-minutes exercise session, except for cardiovascular fitness (VO_2 Max). However, there are no significant differences in mean changes of overall aspect of fitness between 30-minutes and 60-minutes exercise sessions, which was analyzed using independent t-test ($p>0.05$).

Table 3. Fitness level before and after intervention

Fitness test	30-minutes				60-minutes				p-value for independent t-test
	Pre	Post	Delta	p-value	Pre	Post	Delta	p-value	
Push-up count (n)	27.8±6.31	34.85±7.94	6.89[a]	<0.001*	19.26±7.19	29.79±7.46	10.53[a]	<0.001*	0.152
Sit-up count (n)	22.45±8.24	29.7±7.71	7.25[a]	<0.001*	18.89±5.22	28.74±9.57	9.84[a]	<0.001*	0.222
Sit-and-Reach distance (cm)	-0.48±8.05	7.58±5.79	8.05[a]	<0.001*	3.79±10.05	14.82±9.41	11.03[a]	<0.001*	0.085
VO_2 Max (ml/kg.min)	21.58±2.51	24.17±3.54	2.59[a]	<0.001*	20.78±1.82	22.92±3.14	2.14[a]	<0.001*	0.445

* p-value denotes significant difference between pre- and posttest ab) independent t-test between groups' mean changes show significant differences if it has a different letter

DISCUSSION

Our findings show that both duration of exercise improves the overall aspect of fitness significantly ($p<0.05$). Mean push-up count for 30-minute group was categorized as good for before and after intervention (>22), while for 60-minutes group, beforehand it was categorized as average, then became categorized as good. Mean sit-up count for 30-minutes group and 60-minutes group was beforehand categorized as below average (<22), then became categorized as good (>26). Sit-and-reach distance before intervention in both groups was categorized as below average (<13 cm), and stayed still for 30-minute group while became average for 60-minute group (14-16 cm) (International Fitness Association, 2004). VO_2max (Heyward, 1997) for both groups was categorized as very poor (<22.8 ml/kg/min) before intervention, and became poor (22.8–26.9 ml/kg/min) after intervention.

It is also shown that 60-minutes exercise sessions improve fitness better than 30-minutes exercise. However, the insignificant results of mean differences between the two groups indicate that even short-duration exercise sessions can induce improvement in fitness level.

Cohort prospective studies with large and diverse populations show clearly that approximately 1000 kilocalories per week energy expended by moderate-intensity physical activity, or equal to 150 minutes per week (30 minutes/day for five days) is correlated with lower cardiovascular disease rate as well as lowered premature mortality (Lee et al., 2001; Manson et al., 2002; Sesso et al., 2000; Tanasescu et al., 2002). This also may be achieved with vigorous-intensity physical activity performed equal to or more than three days per week for equal to or more than 20 minutes per day, for a total of equal to 75 minutes/week, according to the stand of the American College of Sports Medicine (ACSM) on prescribed exercise to meet fitness requirement (Garber et al., 2011). This was done in the current intervention.

More intense physical activity done by an individual means more energy is needed for muscles to contract. The heart as a blood pump to transport nutrients and oxygen must work harder to compensate for the need of that. Higher and faster heart pulses while exercising cause the heart muscle to increase in size (hypertrophic) so that the heart will be stronger. With a stronger heart, the quality of the heart as a blood pump will also be increased. The heart does not have to work harder to supply the need for energy to skeletal muscle. The improvement of heart quality can also be seen by the decrement in pulse during rest after exercise. With endurance and resistance exercise, the number of capillary blood vessels in skeletal muscles will increase, enabling easier oxygen diffusion. Thus, for a trained person, they can transport and use oxygen more efficiently than an untrained person, marked by increased VO_2 Max. Therefore, the endurance aspect of fitness will also be increased (Prativi et al., 2013).

Stretching aims to prepare muscles and joints before the main exercise is performed. Other than that, routinely performed exercise may affect the body's flexibility generally. Muscles that are routinely stretched will increase their flexibility. Joints that are routinely stretched will also be increased in range of motion (ROM) (Prativi et al., 2013).

Every exercise in this intervention repeated the flexibility session for cooling down. Since 2-4 flexibility exercise is effective, joint range of motion will be enhanced, especially if done at least for 3–12 weeks (Bandy et al., 1997; Decoster et al., 2005; Nelson et al., 2007). It is recommended that each flexibility exercise includes a total stretching time of 60 seconds, adjusted to repetition and duration to meet the needs of each individual. Stretching exercise should be performed to 2-3 days per week to be induced more flexibility score (Decoster et al., 2005; Kramer & Erickson, 2007), but greater gains in joint ROM may be induced with flexibility exercise daily (Feland et al., 2001; Guissard & Duchateau, 2004; Porter et al., 2002; Rees et al., 2007; Willy et al., 2001).

Strength in each group was notably and significantly increased, marked by 1-minute sit-up count and 1-minute push-up count. This may happen due to muscle hypertrophy as a result of muscle overload since strength is trained. Step-by-step muscle training induces hypertrophy because the number of muscle fibers increases (Prativi et al., 2013). It is known that the general population favorably responds to 2–4 sets of resistance exercises per muscle group (Kraemer et al., 2002; Wernbom et al., 2007) which was done in this study. However, even a single exercise set can significantly increase muscle size and strength, especially in beginners. (Kraemer et al., 2002; Pollock et al., 1998). Total number of targeted muscle groups per set can be accomplished with a single resistance exercise or a combination of multiple resistance exercises. Overall, the tele-exercise aspect of this intervention does not hinder participant's willingness to exercise, and improves the overall fitness aspect of the subject in this intervention. This is in accordance with research by Kuswari et al. (2022), stating that tele-exercise may improve fitness level significantly.

CONCLUSION

This study shows that tele-exercise, even if it is done in a short, 30-minute duration, may improve the overall aspect of fitness level significantly for obese office employees. There was no significant difference between mean changes of fitness level between 30-minutes and 60-minutes tele-exercise groups. Employees could choose between 30-minutes or 60-minutes tele-exercise as they felt suitable for their exercise program. Moreover, in this pandemic time, this kind of program could be a better alternative than face-to-face, direct exercise intervention. We recommend e future research to use a control group with a better and more complex design such as a randomized controlled trial.

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