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Functional Training Has the Potential to Reduce Fat Mass and Increase Growth Hormone in Overweight Women

El entrenamiento funcional tiene el potencial de reducir la masa grasa y aumentar la hormona del crecimiento en mujeres con sobrepeso

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Abstract. This study aims to analyze the effects of fungtional training on fat mass and growth hormone in overweight individuals. This type of research is experimental research. Research subjects were selected using a purposive sampling technique, then the subjects were divided into 2 groups, namely group (K1) with low-intensity fungtional training and group (K2) with medium intensity fungtional training. A total of 30 women with an average age of 21 years and overweight participated in this study. The inclusion criteria in this study were female gender, BMI ranging from 25 kg/m2 to 30 kg/m2, and not having metabolic disease or heart problems. Exclusion criteria in this study were subjects under 20 years of age. Data was taken from the pre-test and post-test by taking blood before and after the intervention was taken by fasting at night and taking blood in the morning after fasting. Fat mass measurements were carried out using the Body Fat Monitor tool. Next, the blood samples were analyzed in the laboratory using the ELISA method with the Human GH ELISA kit catalog number E1030Hu. After the data was obtained statistical analysis in this study used the IBM SPSS version 27 application, a descriptive test was performed to obtain the mean and standard deviation. Furthermore, the normality test was carried out using the Shapiro-Wilk method, if the data were normally distributed the different test was carried out using the paired t-test, but if the data was not normally distributed, the difference was carried out using the Wilcoxon signed rank test. The results of this study report that fungtional training carried out at low and moderate intensity is able to increase growth hormone and reduce fat mass in overweight women. We recommend that fungtional training be applied daily to reduce fat mass and maintain an ideal body.
Keywords: Functional training, exercise, growth hormone, fat mass

Abstracto. Este estudio tiene como objetivo analizar los efectos del entrenamiento funcional sobre la masa grasa y la hormona del crecimiento en personas con sobrepeso. Este tipo de investigación es una investigación experimental. Los sujetos de investigación se seleccionaron utilizando una técnica de muestreo intencional, luego los sujetos se dividieron en 2 grupos, a saber, el grupo (K1) con entrenamiento funcional de baja intensidad y el grupo (K2) con entrenamiento funcional de intensidad media. En este estudio participaron un total de 30 mujeres con una edad promedio de 21 años y sobrepeso. Los criterios de inclusión en este estudio fueron sexo femenino, IMC entre 25 kg/m2 y 30 kg/m2 y no tener enfermedades metabólicas ni problemas cardíacos. Los criterios de exclusión en este estudio fueron sujetos menores de 20 años. Los datos se tomaron de la prueba previa y posterior mediante extracción de sangre antes y después de la intervención, en ayunas por la noche y extracción de sangre por la mañana después del ayuno. Las mediciones de masa grasa se llevaron a cabo utilizando la herramienta Body Fat Monitor. A continuación, las muestras de sangre se analizaron en el laboratorio mediante el método ELISA con el kit Human GH ELISA número de catálogo E1030Hu. Luego de obtener los datos, el análisis estadístico en este estudio utilizó la aplicación IBM SPSS versión 27, se realizó una prueba descriptiva para obtener la media y la desviación estándar. Además, la prueba de normalidad se realizó mediante el método de Shapiro-Wilk, si los datos estaban distribuidos normalmente se realizó la prueba diferente utilizando la prueba t pareada, pero si los datos no estaban distribuidos normalmente, la diferencia se realizó utilizando el Prueba de rango firmada de Wilcoxon. Los resultados de este estudio informan que el entrenamiento funcional realizado a intensidad baja y moderada es capaz de aumentar la hormona del crecimiento y reducir la masa grasa en mujeres con sobrepeso. Recomendamos aplicar diariamente entrenamiento funcional para reducir la masa grasa y mantener un cuerpo ideal.
Palabras clave: entrenamiento funcional, ejercicio, hormona del crecimiento, masa grasa.

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Introduction

Having an ideal body with a low percentage of fat is very important for women in supporting their daily appearance in addition to maintaining fitness and body health (C.-C. Liu & Tsai, 2021). Fat is better known as lipid, the largest energy provider in the body (Devi et al., 2023; Ryan et al., 2020). This is because fat has the most atomic chain bonds compared to other energy providers such as carbohydrates (A. G. Liu et al., 2017). Each gram of fat contains two and a half times the energy of carbohydrates, therefore a person's body's energy reserves in the form of fat are 150 times greater than the energy from carbohydrates (Hall, 2012). In addition, approximately 50,000 to 60,000 kcal more energy comes from fat than energy produced from carbohydrates (Coyle & D, 1995).

A theory reports that fatty acids are hydrocarbon structures containing carbon and hydrogen atoms formed by 4 or more carbons bonded to an acidic functional group called a carboxyl group. (Frihart, 2023). Fat oxidation occurs when the availability of carbohydrates that have been processed in the form of glycogen begins to run out (Spriet, 2014). The current problem, in recent years it has been reported that more than 1.9 billion (39%) adults aged 18 years and over worldwide are overweight (Ajayi et al., 2016). Projections show that 2.16 billion (38%) of the world's adult population will be overweight and 1.12 billion (20%) will be obese by 2030 (Zubery et al., 2021). Furthermore, it has been reported that several factors cause excess weight, namely genetics, gender, diet, and physical

activity (Thaker, 2017). On the other hand, a study reports that being overweight is also influenced by growth hormone (GH) (Kopchick et al., 2020). The interaction between growth hormone (GH) and adipose tissue can be considered a cycle, GH is lipolytic and acts to reduce body fat. in turn, obesity is characterized by reduced GH output (Hjelholt et al., 2020).

Alternative solutions need to be sought to overcome these problems. Functional Training (FT) is currently popularly discussed and appears in various literary sources, presenting exercises that are multicomponent training, and explores different planes of movement, presenting a multiplanar training character (La Scala Teixeira et al., 2017). It is important to note that FT tries to listen in training sessions to the demands of the body to perform activities of daily living (Monteiro et al., 2023). In this way, FT takes into account the principle of specificity by promoting synergistic and integrated adaptations in physical abilities, stimulating these abilities in a pattern similar to activities of daily living. Recently, literature reported that FT has the potential to improve components of physical condition such as muscle strength, speed, balance, agility, flexibility and muscle endurance among athletes. (Xiao et al., 2021). However, until now it has not been reported that FT has the potential to increase body weight and fat loss.

This study aims to analyze the effect of FT on fat mass and GH in overweight women.

Materials and Methods

Study Design

This type of research is experimental research. Research subjects were selected using a purposive sampling technique, then the subjects were divided into 2 groups, namely group (K1) with low intensity FT and group (K2) with medium intensity FT.

Subjects

A total of 30 women with an average age of 21 years and overweight participated in this study. The inclusion criteria in this study were female, with Body Mass Index (BMI) ranging from 25 kg/m2 to 30 kg/m2, and not having metabolic disease or heart problems. Exclusion criteria in this study were subjects under 20 years of age.

Prosedure

1. Subjects agreed to become participants by filling out an informed consent agreement.
2. Subjects were divided into 2 groups, each group numbering 15 people.
3. Data is taken from the pre-test and post-test by taking blood and measuring fat mass.
4. Exercises were given for approximately 6 weeks 4 times/week and carried out for 45 minutes/session.
5. Before doing the exercise, the subject warms up for five minutes and then continues with giving FT depending on the group. Heart rate was monitored continuously using a Polar Heart Rate Monitor (P10). The polar connects to an Ipad to make it easier to monitor participants' heart rates. While exercising, the study participants' heart rates were monitored with reference to polar heart rate zones, between 60%-70% of maximum heart rate for K1 and 70%-80% for K2.
6. After exercising, all subjects cooled down for approximately 5 minutes. Fat mass measurements were carried out using the Body Fat Monitor tool.
7. Next, the blood samples were analyzed in the laboratory using the ELISA method with the Human GH ELISA kit catalog number E1030Hu.

CONSORT Flowchard

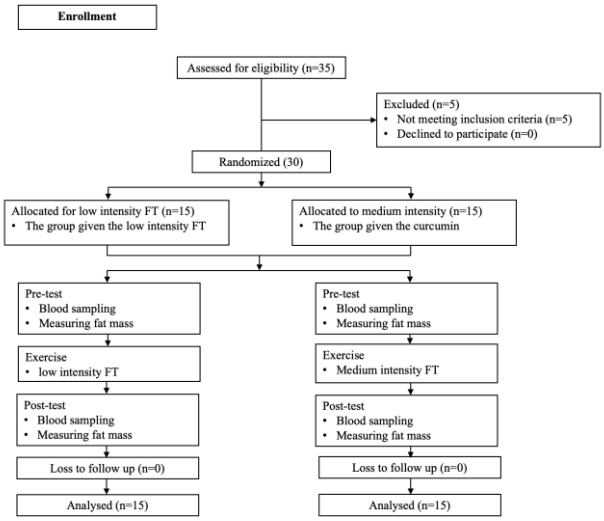

Figure 1. The CONSORT Flowchard

Exercise Program

Table 1. Exercise Program

Exercise	Stage	Activity	Repetition	Set	Recovery between Sets (Second)
Fungtional Training (Low Intensity)	Stretching	Stretching			
	Fungtional Training (Low Intensity)	Squats	10	4	60
		Push up	10	4	60
		Box jump	10	4	60
		Lunges	10	4	60
		Plank	30 Sec	4	60
	Colling Down	Walk			
Fungtional Training (Medium Intensity)	Stretching	Stretching			
	Fungtional Training (Medium Intensity)	TRX squats	8	4	45
		Wall balls	30 Sec	4	45
		Kettlebell swings	8	4	45
		Battle rope double slam	30 Sec	4	45
		Dumbbell press	8	4	45
	Colling Down	Walk			

Statistical analysis

Statistical analysis in this study used the IBM SPSS version 27 application, a descriptive test was performed to obtain the mean dan standard deviation. Furthermore, the normality test was carried out using the Shapiro-Wilk method, if the data were normally distributed the different test was carried

out using the paired t-test, but if the data was not normally distributed, the difference was carried out using the Wilcoxon signed rank test.

Ethics

This research protocol has been declared ethical in accordance with 7 (seven) WHO 2011 standards, namely 1) social value, 2) scientific value, 3) distribution of burdens and benefits, 4) risk, 5) seduction / exploitation, 6) confidentiality and privacy 7) Approval after explanation, which refers to the 2016 CIOMS guidelines. This is shown by the fulfillment of indicators for each standard. Declaration of ethics was approved by the Health Research Ethics Committee of the Faculty of Medicine, Universitas Airlangga with registration number (No.300/EC/KEPK/FKUA/2018).

Results

The distribution of sample characteristics is shown in table 1

Table 2. Descriptive analysis of sample characteristics

Characteristics	n	Minimun	Maximum	Mean±SD
Age (year)	30	20	25	21,54±2,37
BMI (kg/m^2)	30	25,03	29,52	27,32±1,82

Results of growth hormone and fat mass analysis. The results of Fat mass analysis between pre-test and post-test. in each group are presented in Figure 2. The results of GH analysis between pre-test and post-test in each group are presented in Figure 3.

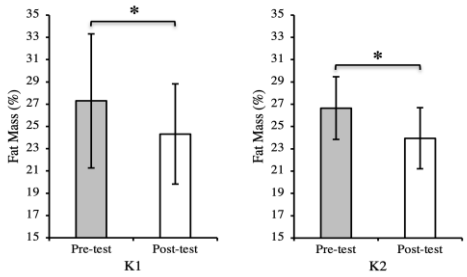

Figure 2. Group (K1) and group (K2) that received low-intensity and medium intensity FT treatment were able to reduce fat mass significantly (*p<0.05). Data are presented as Mean ± Std Deviation. P-value was obtained using the paired t test to compare the pre-test and post-test for each group.

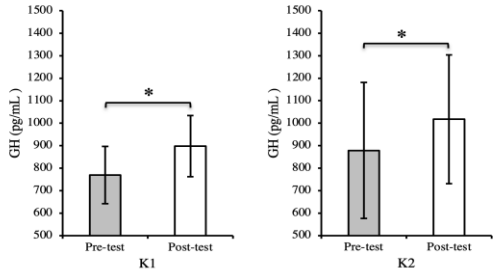

Figure 3. Group (K1) and group (K2) treated with low intensity and medium intensity FT were able to increase GH fat significantly (*p<0.05). Data are presented as Mean ± Std Deviation. P-value was obtained using the paired t test to compare the pre-test and post-test for each group.

Discussion

The results of this study reported that there was a significant decrease in fat mass and increase in GH in both groups (P<0.05). In this regard, our research is supported by a study which reports that aerobic exercise can influence growth hormone concentration levels both directly (acute) and long term (chronic) (Sabag et al., 2021). On the other hand, GH plays an important role in growth and development from childhood to adulthood and the regulation of body composition, metabolism, and lifelong aerobic exercise capacity (Vijayakumar et al., 2011). Increased lipolysis and changes in free fatty acids are the main effects of GH on metabolism (Kopchick et al., 2020). There are physiological factors that influence GH secretion, such as age, estrogen, nutrition, sleep, body composition, body fat distribution, stress, insulin, fitness, physical exercise (Lewitt, 2017). In our study, FT was reported to stimulate the release of GH concentrations.

In general, GH is released following a circadian rhythm, which is released during sleep and exercise (Carson & Manolagas, 2015). The increase in GH during exercise is caused by increased fat metabolism (Sabag et al., 2021). Before fat is utilized first, carbohydrates will be used as the main energy in the human body (Holesh et al., 2023). When carbohydrates run out, fat reserves in the body will be used as energy reserves (Purdom et al., 2018). On the other hand, FT will stimulate the hypothalamus to release GH which is found in the body's accumulated stress during exercise (Devesa, 2021). GH works when resting from sports activities and at night (Zueger et al., 2016). GH is known to influence the development of adipose tissue and other functions, namely as a therapeutic indication for people who are overweight (Kopchick et al., 2020). In this study, FT seems to be able to stimulate growth hormone which can reduce fat mass. The intramuscular fat supply is broken down during FT. The results of our research are strengthened by a literature study which reports that FT intervention is able to reduce fat mass in elderly women (Monteiro et al., 2023). Furthermore, clinical trial research also reports that FT is able to reduce body fat and improve fitness in postmenopausal women (Neves et al., 2017). In contrast to a study which reported that FT carried out at high intensity for 12 weeks was able to increase muscle strength but did not reduce fat mass. (Kapsis et al., 2022). In this case, it seems that exercise intensity also influences fat mass reduction.

In summary, the new findings in our study report that FT performed at low and moderate intensity can increase GH and reduce fat mass in overweight women. On the other hand, the limitation of our research is that it only analyzes women. We recommend future research to analyze the effects of FT on male subjects.

Conclusion

FT performed at low or moderate intensity can increase

GH and reduce fat mass in overweight women. We recommend that FT be applied in daily life to reduce fat mass and maintain an ideal body.

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Conflict of interest

There is no conflict of interest between the authors.

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