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Does Hand Grip Correlate with Muscle Mass and Fat Mass?

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Keywords

strength, hand grip, muscle mass, fat mass, college student

Abstract

Introduction: In daily routines, especially in heavy weight lifting activities, grip strength is important. This study aims to investigate grip strength with muscle mass and fat mass in the arms. **Methods**: Cross-sectional study with the subjects of this study were 45 students (15 females and 30 males) with male characteristics (age 19.8±0.83, height 168±6.10, weight 64.7±11.5, BMI 22.9±3.82) while in women (age 20±0.78, height 159.3±4.43, weight 57.3±11.6, BMI 22.6±4.33). Spearman correlation from SPSS version 26 with a significance level of P-value < 0.05. **Finding**: Based on the data, there was no significant correlation between grip strength and muscle ma and arm fat mass. Then the muscle mass of the right side with (P-value: 0.079, r: 0.265) and the left side (P-value: 0.059, r: 0.284), while the mass of fat on the right side (P-value: 0.090, r-value -0.256) and the mass of fat on the left (P-value: 0.180, r-value: -0.204). **Conclusion**: This study proves that there is no correlation between grip strength and muscle mass or arm fat mass.

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INTRODUCTION

Lifting is necessary in daily life, to do one lift requires adequate hand strength (Atacan et al., 2021). One way to measure hand strength is to use the hand grip method (Medica & Article, 2017). Hand grip strength test is one of the easy and inexpensive tests to find out the strength the hand squeeze (Bohannon, 2019). Hand grips can be used by athletes and non-athletes (Moscatelli et al., 2016). In athletes, hand grips are used in extreme upper sports, especially those that use rackets and sticks (Rdzanek et al., 2019). On the other hand, in non-athletes, hand grips

can also be used as a tool to assess longevity, a person's depression level, potential risk of cancer, suicidal ideation, cardiovascular disease, diabetes, and heart disease (Soysal et al., 2021). Strength is affected by muscle mass, the greater the muscle mass the higher the streng (Chen et al., 2013). On the other hand, someone who has more fat mass tends to have lower strength results (Jiang et al., 2020). There are several functions of hand grip strength, namely measuring the relationship between hand grip strength and a person's depression, more than 280 million people of all ages suffer from depression (Ganipineni et al., 2023). Hand grip test can associated with sleep duration, research has found that shorter sleep duration will affect weak hand squeezing strength (López-Bueno et al., 2022). In addition, there is a correlation between the force of the hand squeeze and all causes of death, The study involving two million participants found that higher levels of hand squeezes were associated with a lower risk of all causes of death (García-Hermoso et al., 2018).

Grip strength serves as a reliable substitute instrument for complex measurements because it strongly correlates with the strength measurements of other muscles, including the lower limbs (Wen et al., 2023). Grip strength is also related to cognitive decline so that it helps stratify students (Moncada-Jiménez et al., 2023). Grip strength can also be used to measure muscle strength in women breast cancer survivors (e Silva et al., 2022). All causes and deaths of cancer (López-Bueno et al., 2022).

It is necessary to measure the hand grip periodically in order to be able to monitor and evaluate the results of hand squeeze force so that it has an impact on one's work productivity (Beaudart et al., 2019). To improve the hand grip stregth, the right training method is needed, TST (is one of the weight resistance exercises that has two grips and uses the body as resistance to perform multi-planar and multi-joint exercises (Gaedtke & Morat, 2015). On the other hand, TST can improve strength, endurance, wrinkles, functional ability, core stability, and also show a significant increase in muscle mass (Giancotti et al., 2018). This exercise method is suitable f

students or non-athletes because the exercise method can be done at home (Kristin et al., 2019). Exercising upper extremity muscle strength will increase the strength of the hand squeeze (Sahin et al., 2023). On the other hand, increasing the fat percentage will limit the ability to produce maximum strength (Zembura et al., 2023). Previous studies have shown that the higher the fat percentage, the lower the hand squeeze strength (Confortin et al., 2022). Therefore, this study finds out the correlation between hand grip strength in muscle mass and fat mass whi aims to provide early indications regarding physical health and long-term health risks (Dodds et al., 2014). Given that many important physiological changes occur during youth, measuring grip strength can help identify individuals who may need early intervention to increase or maintain their muscle strength (Leong et al., 2015)

METHODS

Participants

An observational study with a Cross-Sectional type involving forty-five research subjects the Sports Science Study Program, State University of Surabaya with the characteristics of 30 males (age 19.8±0.83, height 168±6.10, weight 64.7±11.5, BMI 22.9±3.82) and 15 females (age 20±0.78, height 159.3±4.43, weight 57.3±11.6, BMI 22.6±4.33). This data was taken on April 25, 2024, the inclusion criteria: (1) Age 19 to 24 years; (2) Not having a shoulder injury; (3) Have permission to take measurement and sports test courses. Exclusion criteria: (1) Age over 25 years and under 18 years old (2) Have a history of shoulder injury (3) Have a physical condition that can be dangerous at the time of the study.

Inbody

In the measurement of fat mass and body muscle mass was measured using the In Body 270 (Seoul, South Korea). During the assessment, participants were encouraged not to wear footwear and accessories that were metal or iron. In addition, avoid eating before the measurement and do not exercise before the measurement for at least 2-3 hours. The first step the body is to measure weight and

align the legs with electrodes/sensors. Next, user data input enters personal data such as age, gender, height through the screen. The participant holds the handrail with both hands and places the soles of the feet on the foot electrodes, the tool will send an electrical signal to measure the impedance. The measurement process takes less than 60 seconds. Once the measurement is complete, the InBody 270 will print the results of a detailed body composition analysis including Arm Muscle Mass (FFM) and Free Fat Mass (BFM) on the participant's body.

Grip Strength

HGS was measured using Handem, the subject stood with his elbows straight at the sides of the body. Hold the Handem with your right and left hands, making sure the tool is set to the size of the hand. Instruct the participant to squeeze Handem as hard as possible for 3 to 5 seconds. Repeat the measurement 2 times, for each hand with a 30-second break. The highest measurement result in units (kg).

Data Analysis

Inbody and HGS are tools that have validity to link a person's fitness and the correlation high (Jiang et al., 2020). The data was analyzed using SPSS statistical software version 26, with the Kolmogorov smirnov test method used to test whether the data was normally distributed or not. Spearman correlation analysis (abnormal data) was used to analyze the relationship between grip strength and muscle mass and fat mass. Coefficient or r-value is classified into five grou 0.00-0.199 is very low, (2) 0.20-0.399 is low, (3) 0.40-0.599 is moderate, (4) 0.60-0.799 is strong, (5) 0.80-1.00 is very strong and $p<0.05$ is a significance value. If the correlation coefficient is posi then the two variables move in the same direction. If the correlation coefficient is negative, shows that the two variables tend to move in opposite directions.

RESULTS AND DISCUSSION

From the results of the normality test in SPSS version 26 using the one-sample kolmogorov-smirnov test method, it shows that all data are not normally distributed. Based on the data that has been found and the correlation test using spearman correlations analysis, there is no significant correlation between HGS and FFM and BF

Table 1. Correlation between Hand grip and muscle mass and fat mass

	FFM Right	FFM Left	BFM Right	BFM Left
HGS Right	0.090 r = -0.256		0.079 r = 0.265	
HGS Left		0.180 r = -0.204		0.059 r = 0.284

The main purpose of this study is to find out the correlation or relationship between ha grip strength (Kg) with an average right of 181.20 and left 199.98 with free fat mass (%) with an average of 0.89 right and 0.93 left and body fat mass (%) with an average right of 2.47 and left 2.41 in sports students. For this purpose, FFM and BFM are determined through a body composition test (InBody 270), then hand grip strength using HGS. The main results of this study showed that there was no significant correlation between HGS right and FFM right (p-value: 0.090, r-valu -0.256), HGS left and FFM left (p-value: 0.180, r-value: -0.204), HGS right with BFM right p-value: 0.079, r-value: 0.265), HGS left and BFM left (p-value: 0.059, r-value: 0.284). With this result, it proves that there is no correlation between FFM and BFM and HGS, in FFM showing a negative result, the higher the FFM, the weaker the HGS.

Regarding the correlation between HGS and FFM and BFM, there is no significa correlation. These results are contrary to research (Patnaik et al., 2021) previous studies have shown that FFM has a positive relationship with HGS. This happens because the number of samples in previous studies is larger. In addition, the data was taken at a temperature of 20-24 degrees C at 11.00-13.00 (explained what resulted in). In another study, the association between HGS and BFM was evaluated showing that high levels of HGS may not be associated with greater muscle mass (Benavides-Rodríguez et al., 2017). In this study, the results of the relationship between BFM and HGS had positive results.

Meanwhile, the results in this study showed that muscle mass did not have a correlation with HGS. However, in the research (Chan et al., 2022) As we age, HGS will always decline from all genders.

There are so many factors that affect this study. Especially in the sample part used. Th research was carried out in the morning at around 07.00. Qualitatively, many students sleep for a short duration, so when taking the test in the morning they do not do it optimally because it is affected by less sleep hours(Liu et al., 2023). In addition, the number of assignments to students also one of the factors that reduce HGS, because a person's level of depression also affects HGS be low (Ganipineni et al., 2023).

CONCLUSIONS

Hand grip strenght is often used as an indicator of muscle health. The results of the study found a positive relationship between BFM and FFM with hand grip strength. Meanwhile, the results of this study did not have a significant correlation between HGS and BFM and FFM. Bu There is a negative association in fat mass, which means that the strength of HGS will be lower as fat mass increases. Therefore, the importance of HGS training as a general health indicator that shows the condition of muscle mass and body fat mass and provides important insights into the health risks associated with aging.

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