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Increased leg muscle strength and power after 6 weeks of trapping exercise in male college students

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ABSTRACT

The aim of this study was to determine the effect of trapping exercise for 6 weeks on leg muscle strength and power in male college students. This was a quasi-experimental study with a research design of one-group pre-test/post-test design. The sample amounted to 11 male students. Trapping exercise were carried out for 6 weeks with a frequency of 3-times exercise per week. A back and leg dynamometer was used to measure strength and the Accupower was used to measure power. Strength and power were measured before and after the 6-week trapping training. Paired samples t test was used to compare pre-test and post-test. The results showed that there was a significant increase in the average strength between pre-test vs. post-test (104.50±18.10 vs. 114.40±20.60 kg, p=0.000). Likewise, the mean power between pre-test vs. post-test (636.20±58.30 vs 656.60±64.00 Joules, p=0.000). The conclusion was that trapping exercise for 6 weeks with a frequency of 3-times exercise per week increased strength and power in male college students.

KEYWORDS

Trapping Exercise; Strength; Power; Male Students

1. INTRODUCTION

Exercise is an activity that is very beneficial for the health of the human body (McArdle, Katch & Katch, 2015). However, to get optimal exercise benefits, good physical condition is needed. This is because good physical condition can affect performance (US Department of Health and Human Services, 2018). Good physical condition can be obtained by doing regular exercises. There are various types of exercises that can be done. Therefore, it is important to choose the type of exercise that suits your needs so that it can help improve your physical condition (McArdle, Katch & Katch, 2015).

The physical condition is one of the most important factors in determining achievement in the world of sports (Magni et al., 2006). Basic components of physical condition include endurance, strength, power, speed, flexibility, agility, balance and coordination (Mkaouer et al., 2018). Components of a good physical condition will give a person good performance which has an impact on improving health conditions (Rejeki et al., 2022; Malm et al., 2019; Warburton et al., 2006). This is not only needed for athletes but also non-athletes (Janssen & Leblanc, 2010). For non-athletes, for example, sports students also need good physical conditions to support them in participating in lecture practices (Janssen & Leblanc, 2010). While in athletes the dominant physical condition component is also adjusted to the sport that is occupied, because this physical condition needs special attention (Edison et al., 2021).

Many sports require the ability to exert great force or energy in a relatively short time (Kawamori & Haff, 2004). The ability to expend energy or force in the shortest amount of time is closely related to the aspects of physical condition such as strength in an athlete (Stone et al., 2022). Not only strength but also power is needed (Eduardo et al., 2013). However, how to properly exercise to increase strength and power still needs to be further discussed.

Previous research conducted by Nugroho et al. (2021) shows that trapping circuit training increases the strength, speed, and agility of badminton players. Trapping exercise is a form of exercise that focuses on the lower limbs or legs to go up and down stairs with a variety of movements (Nugroho et al., 2021). However, the trapping exercise on the student sample is still not clear. Therefore, this study aims to determine how the effect of trapping exercise carried out for 6 weeks on the increasing strength and power of male college students.

2. METHODS

2.1. Participants

This was a quasi-experimental study with a research design of one-group pre-test/post-test design. The sample in this study was male students majoring in sports education, Adi Buana University Surabaya batch 2020. A total of 11 students with criteria aged 21.00±1.09 yrs, body mass index (BMI) 22.73±1.15 kg/m^2, blood pressure (systolic 116.55±7.51 mmHg; diastolic 71.45±7.12 mmHg), resting heart rate (RHR) 71.36±10.02 bpm, oxygen saturation (SpO_2) 97.55±1.29 %, body temperature 35.25±0.53 °C, no history of disease, and have received at least two doses of the coronavirus disease 2019 (COVID-19) vaccine. All samples obtained information about the research both orally and in writing and gave their consent by filling out and signing the informed consent form.

2.2. Experimental Design and Protocol

The trapping exercise program is implemented and supervised by professional officers from study program of sports education, Adi Buana University Surabaya. Trapping exercises are carried out for 30 minutes/session with an intensity of 80-90% HRmax, the frequency of exercise is 3 times a week for 6 weeks. Warming up and cooling down were each applied for 5 minutes with an intensity of 50% HRmax (Pranoto et al., 2023). The method for determining HRmax with the formula: HRmax – age in years (220 - age in the year) (Susanto et al., 2023). Trapping exercises are carried out every 07.00-09.00 a.m.

2.3. Instrument

There are two components of physical condition that are measured in this study, namely strength and power. A back and leg dynamometer was used to measure strength and an Accupower was used to measure power. Strength and power were measured before and after the 6-week trapping training.

2.4. Statistical Analysis

The data analysis technique in this study used SPSS version 20, including the normality test and the difference between pre-test and post-test used paired samples t test with a significant level of 5%.

3. RESULTS AND DISCUSSION

Based on the results of the study, there was a change in the average strength and power between the pre-test and post-test which can be seen in Table 1.

Table 1. Mean of strength and power between pre-test vs. post-test

Variable	n	Pre-test	Post-test	p-value
Strength (kg)	11	104.50±18.10	114.40±20.60**	0.000
Power (Joule)	11	636.20±58.30	656.60±64.00**	0.000

NOTE: The p-value was obtained using the paired samples t test. (**) Significant at pre-test (p ≤ 0.001). Data is displayed with mean±SD

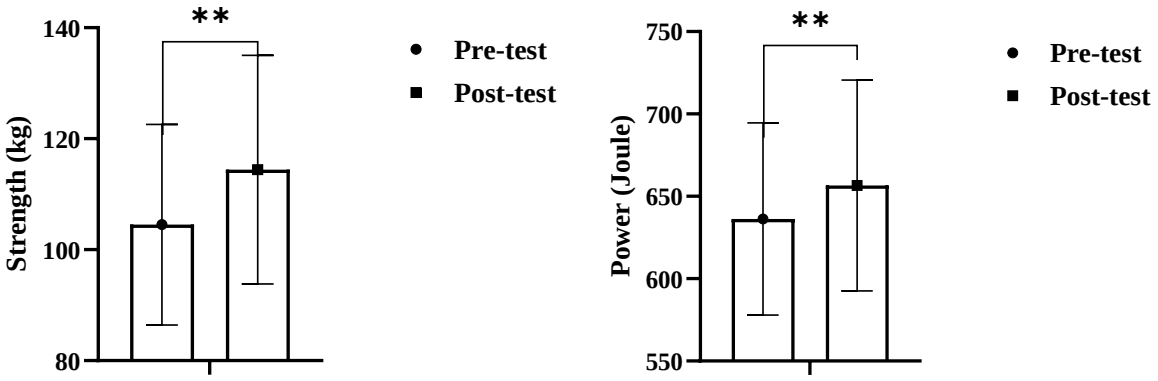

Figure 1. The average value of strength and power between pre-test vs. post-test. (**) Significant at pre-test ($p \leq 0.001$). Data is displayed with mean±SD.

Based on Table 1 and Figure 1, it can be seen that there is a significant increase in the average strength between pre-test vs post-test (104.50±18.10 vs 114.40±20.60 kg, p-value=0.000). Likewise, the average power between pre-test vs post-test (636.20±58.30 vs 656.60±64.00 joule, p-value=0.000).

The results of this study indicate that there was a significant effect of trapping exercise for 6 weeks on strength and power. The results obtained in this study are in accordance with Beato's explanation which states that one of the activities that can stimulate an increase in the physical ability of the lower limbs is exercise by applying the trapping method (Beato et al., 2020). Similar research shows that trapping circuit training improves strength, speed and agility in badminton players (Nugroho et al., 2021). It is possible that the movement in trapping exercise has a suitable component in increasing the strength and power of the leg muscles.

Trapping exercise is a form of exercise that focuses on the lower limbs or legs to go up and down stairs with a variety of movements. When doing the trapping movement up and down stairs,

many muscles will be involved. So that this trapping movement is much better than movements that are only done by walking, jogging or running on flat terrain. When a person moves on flat ground, muscle building occurs only in the legs. Meanwhile, by going up and down stairs, the muscles will feel tight in the lower extremities or glutes, namely the buttocks and hips, quadriceps and also back. This increase in strength ability was found to be due to the type of trapping treatment. Physical exercise with trapping is a form of exercise carried out by optimizing the lower limbs by going up and down stairs as high as 15 cm (Nugroho et al., 2021). The increased strength from the training results is the result of trapping movements that are carried out repeatedly in a structured and programmed manner according to a predetermined training program (Lorenz & Morrison, 2015). The trapping exercise program in this study uses self-weight so that the ability to perform movements up and down stairs can be carried out maximally and quickly, this ability is in line with the nature of power which is an explosive movement. Good explosive biomotor abilities allow a person to perform high and fast activities during a match in order to be able to carry out biomotor movements as needed optimally (Gamble, 2010).

4. CONCLUSIONS

In summary, there was a significant effect of trapping training increasing on strength and power, so that trapping exercise for 6 weeks with a frequency of exercise 3 times a week effective in increased strength and power in male college students.

5. REFERENCES

Beato, M., de Keijzer, K. L., Fleming, A., Coates, A., La Spina, O., Coratella, G., & McErlain-Naylor, S. A. (2020). Post Flywheel Squat Vs. Flywheel Deadlift Potentiation of Lower Limb Isokinetic Peak Torques in Male Athletes. *Sports Biomechanics, 22*(11), 1514–1527. https://doi.org/10.1080/14763141.2020.1810750

Edison, B. R., Christino, M. A., & Rizzone, K. H. (2021). Athletic Identity in Youth Athletes: A Systematic Review of the Literature. *International Journal of Environmental Research and Public Health, 18*(14), 7331. https://doi.org/10.3390/ijerph18147331

Eduardo Saez de V, Bernardo Requena, Mikel, I., & Juan, Jose. (2013). Enhancing Sprint and Strenght Performance: Combined Versus Maximal Power, Traditional Heavy-Resistance and

Plyometric Training. *Journal of Science and Medicine in Sport, 16,* 146-150. https://doi.org/10.1016/j.jsams.2012.05.007

Gamble, P. (2010). *Strength and Conditioning for Team Sports: Sport specific physical preparation for high performance.* London: Taylor & Francis Group.

Janssen, I., & Leblanc, A. G. (2010). Systematic review of the health benefits of physical activity and fitness in school-aged children and youth. *The International Journal of Behavioral Nutrition and Physical Activity, 7,* 40. https://doi.org/10.1186/1479-5868-7-40

Kawamori N., & Haff, G. G. (2004). The Optimal Training Load For the Development of Muccular Power. *Journal of Strenght and Conditioning Research, 18,* 675-684.

Lorenz, D., & Morrison, S. (2015). Current Concepts in Periodization of Strength and Conditioning for The Sports Physical Therapist. *International Journal of Sports Physical Therapy, 10*(6), 734–747.

Magni, M., Allan, P., & Jorge, G. P. (2006). *Training and Testing the Elite Athlete, a Review Article. Denmark: Copenhagen Muscle Research Centre*. Institute of Exercise and Sport Science, University of Copenhagen.

Malm, C., Jakobsson, J., & Isaksson, A. (2019). Physical Activity and Sports-Real Health Benefits: A Review with Insight into the Public Health of Sweden. *Sports, 7*(5), 127. https://doi.org/10.3390/sports7050127

Mkaouer, B., Hammoudi-Nassib, S., Amara, S., & Chaabène, H. (2018). Evaluating The Physical and Basic Gymnastics Skills Assessment for Talent Identification in Men's Artistic Gymnastics Proposed by The International Gymnastics Federation. *Biology of Sport, 35*(4), 383.

McArdle, W. D., Katch, F. I., & Katch, V. L. (2015). *Exercise physiology: Nutrition, energy, and human performance.* Lippincott Williams & Wilkins.

Nugroho, S., Nasrulloh, A., Karyono, T. H., Dwihandaka, R., & Pratama, K. W. (2021). Effect of Intensity and Interval Levels of Trapping Circuit Training On the Physical Condition of Badminton Players. *Journal of Physical Education and Sport, 21*(3), 1981 – 1987. https://doi.org/10.7752/jpes.2021.s3252

Pranoto, A., Cahyono, M.B.A., Yakobus, R., Izzatunnisa, N., Ramadhan, R.N., Rejeki, P.S., Miftahussurur, M., Effendi, W.I., Wungu, C.D.K., Yamaoka, Y. (2023). Long-Term

Resistance–Endurance Combined Training Reduces Pro-Inflammatory Cytokines in Young Adult Females with Obesity. *Sports, 11,* 1-54. https://doi.org/10.3390/sports11030054

Pranoto, A., Rejeki, P. S., Miftahussurur, M., Setiawan, H. K., Yosika, G. F., Munir, M., Maesaroh, S., Purwoto, S. P., Waritsu, C., & Yamaoka, Y. (2023). Single 30 min treadmill exercise session suppresses the production of pro-inflammatory cytokines and oxidative stress in obese female adolescents. *Journal of Basic and Clinical Physiology and Pharmacology, 34*(2), 235–242. https://doi.org/10.1515/jbcpp-2022-0196

Putera, S. H. P., Setijono, H., Wiriawan, O., Nurhasan, Muhammad, H. N., Hariyanto, A., Sholikhah, A. M., & Pranoto, A. (2023). Positive Effects of Plyometric Training on Increasing Speed, Strength and Limb Muscles Power in Adolescent Males. *Physical Education Theory and Methodology, 23*(1), 42–48. https://doi.org/10.17309/tmfv.2023.1.06

Stone, M.H., Moir, G., Glaister, M., & Sanders, R. (2022). How Much Strenght is Necessary? *Journal of Physical Therapy of Sport, 3,* 88 – 96.

Susanto, H., Sugiharto, Taufiq, A., Pranoto, A., & Dwi Trijoyo Purnomo, J. (2023). Dynamic alteration of plasma levels of betatrophin in younger female onset obesity post-acute moderate-intensity exercise training. *Saudi Journal of Biological Sciences, 30*(2), 103546. https://doi.org/10.1016/j.sjbs.2022.103546

Department of Health and Human Services. (2018). *Physical Activity Guidelines for Americans, 2nd edition.* Department of Health and Human Services.

Warburton, D. E., Nicol, C. W., & Bredin, S. S. (2006). Health benefits of physical activity: the evidence. *Canadian Medical Association Journal, 174*(6), 801–809. https://doi.org/10.1503/cmaj.051351

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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