The Effect Of Weight Training On Muscle Strength, Muscle Endurance And Body Composition Among Overweight Individuals

Muhammad Nor Faiz Abd Aziz, Norhazira Abd Rahim, Nor Aijratul Mohammad Shalan, Nor Fazila Abd Malek & Ali Md Nadzalan

Abstract—Weight training is one of the training method that often been used to gain muscle strength and size. The aim of this study was to identify the effects of weight training on body mass index (BMI), muscle mass, body fat percentage, hand grip strength and maximal repetition of weight gain in overweight men. This study was conducted using experimental method through pre- and post-test. Body composition analyzer was used to measure BMI, fat percentage and muscle mass. Muscle strength was measured by using the maximum hand grip test while muscle endurance by using the maximum push-up test. The subjects of this study were consisted of 20 individuals (male, BMI 25.76 ± 1.35, age 23.05 ± 2.14 years old). Weight training intervention was conducted 3 times per week for 4 weeks. The result shows there was a significant effect of weight training on maximum push-up repetition (p = .000, p < .005). However there were no significant effect of weight training on BMI (p = .586), mass muscle (p = .163), body fat percentage (p = .659) and maximum hand grip (p = .179). In conclusion, the 4-weeks weight training is able to increase the muscle endurance among overweight males. Therefore, it can be suggested that weight training as one of the strategy to improve muscle endurance among overweight males. For future study, it is suggested that the duration of the weight training intervention to be extended to obtain a significant effect.

1 INTRODUCTION

OVERWEIGHT is defined as excess body fat or an abnormal amount of fat that can affect your health. The use of body mass index (BMI) is often used to identify measures of overweight or obesity for both sexes (men and women) and for various ages. However, this body mass index (BMI) should be considered a rough guide as it may not correspond to different levels of fat in different individuals. Furthermore, weight training or physical exercise is a healthy activity for everyone regardless of any age and gender. In addition, physical activity is any activity that enhances or maintains weight and overall health and well-being [1]. These activities are carried out for a variety of purposes, including promoting growth and expansion, preventing aging, strengthening the muscles and heart systems, strengthening sports skills, losing weight or endurance, as well as for fun. Physical training is not just for ordinary people but physical training is also used by athletes in sports. Usually athletes perform physical activities such as anaerobic or aerobic in order to improve their sports performance. The majority of the movements or actions produced in a competition must have the strength and endurance of the muscle to improve performance or to have the advantage of the opponent [2]. Therefore, it is important that athletes or individuals who specialize in physical training especially in weight training should be aware of the effects of training through various training methods or models to improve muscle strength and body composition whether in terms of acute responses [3-5] or chronic adaptations [6], [7], [8], [9], [10], [11]. Muscle strength is an essential component of achieving optimum performance [12], especially exercises that affect large muscles such as the major pectoral, bicep, triceps and even back muscles. In addition, the most commonly used bilateral training techniques are bench press, bent-over rolls and curl-ups. The purpose of this study was to identify the effect of weight training on body mass index, muscle mass, and body fat percentage and musculoskeletal fitness. Next, this exercise focuses on upper body exercises and the specific muscles studied are the major pectoral muscles, biceps, triceps and back muscles. Additionally, this study established a training program to identify the effectiveness of this weight training so that participants can adapt as well as to muscle development [13, 14].

2 METHODOLOGY

2.1 Participants

A total of 20 male students will be selected as participants in this study. Selection of the study participants was the use of objective sampling techniques. The study participants will be selected on the basis of inclusion and exclusion criteria including healthy male students, 21-24 years old, Body Mass Index (BMI) in the range 23.0-27.4. Study participants should be free of intelligence, and Not take any supplements throughout this study was conducted. However, the selection of participants will be eliminated if they have suffered muscle spasms in the last 2 years, are still in treatment or medical sessions, and have had body surgeries for the last 2 years.

2.2 Data Collection

This session required participants come to the lab to measure body composition using the Inbody 230 tool to measure body mass index (BMI), muscle mass, and body fat percentage. In addition, participants were measured using a dynamometer handgrip to measure their maximum grip and the participants also had to perform maximum pressures to determine their upper body strength. Next, for Inbody 230 body composition measurement the participants will need to stand upright on this device by removing the shoes and the accessories to avoid errors during the test. Accordingly, the participant should perform a maximum grip strength test using the Handgrip dynamometer. The participant should stand upright and hold the device at 90° hand position and not touch any part of the body. During this session participants need to attend the gym for 3 weeks a week for 4 consecutive weeks [12]. The exercises

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they will perform are bench press exercises, bent roll over, biceps curl and overhead tricep extension. During this loading exercise, participants had to make 60-70% 1RM (repetition maximum) of 3 sets with 10 repetitions of each set, participants having to rest for 1-2 minutes between sets [15] for the first and second weeks. Training will continue for up to 4 weeks and 1RM will be increased to 80% [16].

2.3 Statistical analysis
This study has two research questions that need to be answered. Both questions to determine whether there was a significant relationship between LD and squat and DL test scores were analyzed using SPSS (Statistical Package for Social Science) version 20.0. The obtained data are analyzed using Pearson Correlation. The Pearson product-moment correlation test is a type of bivariate analysis that involves two variables (IV and DV). In this study the researcher conducted a parametric test to determine whether the hypotheses that were constructed were acceptable or rejected and to identify the relationship between IV and DV with intervals or ratios. The Alpha value set in this study to find the significance level is 0.01.

3 Results
Statistical analysis will be performed using the Statistical Package for the Social Sciences (SPSS) Version 23. Average overall score mean percentage of body fat, body mass index, muscle mass, skin thickness, maximum grip and maximum strength in upper body in the analysis using T-Test Two Tailed statistical test.

<table>
<thead>
<tr>
<th>TABLE 1</th>
<th>PARTICIPANTS DEMOGRAPHIC</th>
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<tbody>
<tr>
<td></td>
<td>Demographic</td>
</tr>
<tr>
<td>Age</td>
<td>23.05</td>
</tr>
<tr>
<td>Weight (kg)</td>
<td>73.91</td>
</tr>
<tr>
<td>Height (cm)</td>
<td>170.5</td>
</tr>
<tr>
<td>BMI</td>
<td>25.76</td>
</tr>
</tbody>
</table>

Paired t-test analysis results were used to compare the mean BMI pre-test scores with the post-test BMI mean scores for male overweight individuals showing that the BMI mean score for pre-test (M = 25.76, SD = 1.35) was higher than the mean score Post-test BMI (M = 25.65, SD = 1.21). Thus, the study findings for this body mass index did not have a significant effect t (19) = .554, p = .586. However, there has a slight decrease of 1.2% on the BMI mean score post-exercise test after weight training intervention during four weeks.

<table>
<thead>
<tr>
<th>TABLE 2</th>
<th>BODY MASS INDEX SCORES ON PRE- AND POST-WEIGHT-TRAINING INTERVENTION.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test</td>
<td>M</td>
</tr>
<tr>
<td>Pre</td>
<td>25.76</td>
</tr>
<tr>
<td>Post</td>
<td>25.65</td>
</tr>
</tbody>
</table>

Notes, a = significantly different from conventional deadlift, p < 0.05
The findings on body fat percentage study showed no significant effect on pre- and post-test after four weeks of weight training conducted t (19) = -.448, p = .659. The results showed that the mean body mass score for the post-test (M = 24.55, SD = 4.50) was higher than the pre-test (M = 24.35, SD = 4.51). However, through the graph it can be seen that there is a slight change in the percentage of body fat in the post-test (M = 24.55) with the pre-test (M = 24.35). This indicates that although there was no significant effect on the study findings, there was still a slight increase of 0.9% fat in the post-test.

<table>
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<tr>
<th>TABLE 3</th>
<th>FAT PERCENTAGE SCORES OF PRE-TEST AND POST-WEIGHT TRAINING INTERVENTION.</th>
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</thead>
<tbody>
<tr>
<td>Test</td>
<td>M</td>
</tr>
<tr>
<td>Pre</td>
<td>24.35</td>
</tr>
<tr>
<td>Post</td>
<td>24.55</td>
</tr>
</tbody>
</table>

Notes, a = significantly different from conventional deadlift, p < .05
Through paired t-test analysis, the results showed that the mean post-test muscle mass mean score (M = 33.6, SD = 4.09) was higher than the pre-test muscle mass mean score (M = 32.74, SD = 3.97). However, the results showed that there was no significant difference between pre-test (M = 32.74, SD = 3.97) and post-test (M = 33.6, SD = 4.09), t (19) = -1.452, p = .163. However, there was a slight increase in the post-test (M = 33.6, SD = 4.0) shown in table 4. This indicates that the 4-week weight-training exercise had a slight effect on 2.6% of muscle mass.

<table>
<thead>
<tr>
<th>TABLE 4</th>
<th>MUSCLE MASS SCORE OF PRE AND POST-WEIGHT TRAINING INTERVENTIONS.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Test</td>
<td>M</td>
</tr>
<tr>
<td>Pre</td>
<td>32.74</td>
</tr>
<tr>
<td>Post</td>
<td>33.60</td>
</tr>
</tbody>
</table>

Notes, a = significantly different from conventional deadlift, p < 0.05
Through paired t tests, the results of this study show the mean minimum handshake strength test scores of pre and post-test for overweight men. The mean score for the pre-test (M = 33.66, SD = 7.33) was lower than the post-test (M = 35.77, SD = 5.28). However, the results of this maximum hand grip did not show significant change in pre- and post-t test (19) = -1.39, p = .178. Although the sample did not show significant change, there was a slight increase in post-test (M = 35.77, SD = 5.28) as shown in table 5.

<table>
<thead>
<tr>
<th>TABLE 5</th>
<th>SCORE OF TEST PRE AND POST-WEIGHT TRAINING INTERVENTION.</th>
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<tbody>
<tr>
<td>Test</td>
<td>M</td>
</tr>
<tr>
<td>Pre</td>
<td>33.6650</td>
</tr>
<tr>
<td>Post</td>
<td>35.7700</td>
</tr>
</tbody>
</table>

Notes, a = significantly different from conventional deadlift, p < 0.05
The paired t test was performed, showing mean muscle endurance score (push-up) on pre- and post-test for overweight men. Results showed that the mean post-test mean score (M = 28.3, SD = 10.55) was higher than the pre-test (M = 21.9, SD = 11.41). This indicates that there is a significant effect on the mean score of the post-test compared to the pre-test after the four-week load training as shown in table 6.
4 Discussion

Weight training is one of the most commonly used training methods to increase muscle mass and muscle strength, this study has been carried out to determine whether weight training can reduce body mass index (BMI), reduce fat percentage, increase muscle mass, increase grip strength and increase muscle endurance (push up). Previous studies that have studied the effects of weight training are beneficial to losing weight and gaining an ideal body such as a decrease in BMI [17], [18] a decrease in fat percentage [19], [18], [19], [20], [21], [22], increased muscle mass [2] [19], [23], an increase in the maximum strength of the forearm [19], [24], [25] [26] and an increase in repeat pressures [27], [28]. However, the findings of the weight training study showed no significant effect on body composition and maximum arm strength. Previous studies by [29], [30], [31] are in line with the findings of this study because of several factors and reasons why there is no significant effect on muscle mass in weight training. Factors that cause no significant effects are due to lack of exercise and weight training techniques as well as reduced neural response function and muscle metabolism, as well as no combination of weight training and dietary supplementation [29] In addition, the findings of this study of muscle mass also focus more on muscle strength than on increasing muscle mass [31]. Furthermore, the findings of this study of muscle mass also do not carry out aerobic (blood circulation) exercises which results in slow muscle mass growth [23]. Furthermore, previous studies [32], [33], [34], [35] are consistent and support the findings of this fat percentage study due to the small sample size [32], long breaks between sets (RMRs) [33], less experienced participants in load training [34] and less use of repeated sets [35] It is these factors that led to the finding that the percentage of fat was not significant in this study. In addition, the findings of previous studies [29], [36], [37] are consistent with the findings of this study because they had no significant effect on the maximum strength of the hand grip. The findings of this study are not significant due to lack of dietary control to improve muscle, short training period, and lack of training focused on hand grip. Finally, previous studies support the findings of this study as there are supporting components and advantages of tubular pressures after 4 weeks of weight training [27], [28], [38]. Furthermore, in this study the study of muscle endurance (push-up) was significant as there was muscle support in the abdomen, triceps, deltoids, and back muscles which caused participants to produce multiple repetitions of the push-ups after the intervention. In addition, participants also had the advantage of doing a push-up on the floor compared to the bench press holding the bar. Therefore, press the tube by placing your hands on the floor with less muscle in the arm than with the bench press.

5 Conclusion

In summary, the results of this study found that body mass index, muscle mass, fat percentage and maximum arm strength had no significant effect on short-term (4-week) weight training among overweight individuals. However, there was a significant effect on the maximum repetition of the push-up after the weight training intervention. Based on the findings of this study, this chapter has discussed in detail the possible reasons why such findings are found in studies based on support and relevance made from previous studies. In addition, the researchers found suggestions for improvement in future studies.

Acknowledgment

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References


