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The Effectiveness of Push Up Training for Improving the Power of Arm Muscle Among the Participants of Sports Extracurricular Activities

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***Abstract*— This study aimed at analyzing the influence of wall push up and floor push up training on the improvement of arm muscles power among the participants of sports extracurricular activities. The total amount of the sample was 34 female students. The result of anava sig. F = 0.000 < α = 0.05. And the results of the extended test LSD sig. t = 0.000 < α = 0.05. Based on the findings, it was concluded that a significant influence was indicated from the application of wall push-up and floor push-up on the improvement of arm muscle power. Additionally, floor push up training worked better than wall push up in improving the power of arm muscle.**

Keywords*— *training, wall push-up and floor push-up, power of arm muscle, sports.

I. INTRODUCTION

Generally, sports training are designed by focusing on the aspects that may sustain and support the performance of an athlete, that is the common physical capability such as muscle strength, power, endurance, and flexibility. That is because, those aspects are the key determiner of their success. Unfortunately, though each athlete would always have that certain physical aspect to be improved like power, speed, agility, etc., often times the training portion is not yet balanced and less optimized. Therefore, it is important to develop the well-designed and sustainable training program in order to improve the necessary physical aspect. Physical aspect that is required to be improve in regards to support the athlete's performance is muscle power since it will always be needed in any type of sports and it has become a determining aspect in athlete's performance such as badminton, baseball, gymnastic, volleyball, tennis, etc (1).

Muscle power is the ability of our body to withstand resistance/weight in a very fast movement (2). In volleyball, muscle power needed in performing the sport includes arms and legs muscle power in doing take off movement during jump service, smash or blocking. In doing the game, the ability to master every basic technique such as service, passing, block, and smash is very essential (3).

In respect to the imbalance and less-optimal training portion for certain physical condition, the solution to this problem is by designing a well-program and varied physical training. The training model that is suitable for improving muscle power is (a) strength training, (b) speed training, (c) the combination of both at once that is usually referred as plyometric exercises (2). In this study, to improve the muscle power, particularly for the arms, the researcher give wall push up and floor push up with internal weight, that is the weight of each individual.

Strength exercises with internal weight allow the athlete to improve the muscle power (4). The improvement on arm muscle power is measured using test instrument of throwing medicine ball without preparation position (5). Cahyono, et. al. conducted a research about "The Influence on Traditional Push Up training, Plyometric, and Incline Push Up on the Strength, Power, and Endurance of Arm Muscle" (6).

In this study, due to the problem raised on the less-optimal training program for arms muscle power, the researcher conducted a study titled "The Effectiveness of Wall and Floor Push Up Training for Improving The Power of Arm Muscle Among the Participants of Sports Extracurricular Activities in SMA Negeri I Turen Malang Regency". This study purpose at analyzing the influence of wall and floor push up exercise on the improvement of arms muscle power among the participants of sports extracurricular activities in SMA Negeri 1 Turen Malang Regency..

II. METHODS

This study applied experiment research design, particularly Randomized Control Group Pretest-Posttest Design. The variables in this research were (1) arms muscle power as the dependent variable, and (2) wall and floor push up exercise as the independent variable. The total of the population is 38 people with 34 samples. The samples were chosen through systematic purposive proportional random sampling. After selected, the samples were divided into two groups using ordinal pairing matching technique. The data were collected using the technique (a) measuring the form of physical test, and (b) experiment. The data then analyzed with one way anava and extended test of Least Significance Different (LSD) technique test..

III. RESULT

The result of normality test during the initial test and final test, it was acquired sig. D > α 0,05. It means that the data have normal distribution. T test sample functions to analyze the improvement before and after the treatment was administered, each of the group gained sig. t = 0,000, in that case sig. t < α = 0,05. In other words, there is a significant influence on the improvement of arms muscle power discovered after wall and floor push up exercises were given. From the extended test of LCD, it was found that the mean was 65.1765 and coefficient LSD α = 0.05 to =13.2812 (sig. t < α = 0,05). Therefore, there is a significant difference on the arms muscle power between before and after treatment. The score difference in the power test of arms muscle (by throwing medicine ball without starting position) during the pretest and posttest in wall push up was $\bar{=}$ 35.88 cm and for floor push up was $\bar{=}$ 101.06 cm. The floor push up training is better than the wall push up training upon the improvement of muscle power of the arms.

IV. DISCUSSION

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A. The difference on the Improvement of Arms Muscle Power Before and After Wall Push Up is Given to the Members of Sports Extracurricular

Based on the data analysis using t-test technique, the correlation was found sig. t 0,000 < α = 0,05. Therefore, the hypothesis that stated that there is a difference on the improvement of arms muscle power between before and after the treatment given is accepted. In other words, there is a difference on the power of arms muscle bet ween before and after doing wall and floor push up.

The difference of arms muscle power was able to be detected since the exercises has been executed for six week, twice every week for 90 minutes using the training intensity of 50%-65% and with addition and reduction of intensity of 5-10% per week. Suitable model of power training for novice athlete is intensity of 60-70%, 1-3 set and 8-12 repetition per week in 2-3 times of training (7). According to the results of descriptive analysis about the average arms muscle power in wall push up group, the initial score of the arms muscle power was 318.94 cm and elevated 354.82 cm in the final test. It means that the average of final score is higher than the initial test. In other words, based on the result above, it can be concluded that wall push up exercise may influence on the improvement of arms muscle power if executed for certain period of time.

Muscle power is an important biometric component in sports, since power determines how strong someone able to hit, how far someone could throw, how high someone could jump, how fast someone could run, and so on (2). It proves that muscle power is indeed essential to be improved. Muscle power can be improve through training some aspects that help to build the muscle power such as (a) strength aspect, (b) speed aspect, or (c) the combination of strength muscle and movement speed (1). Wall push up exercise is classified to power training that is done for 15 seconds in each set. The weight addition was given by adding the number of repetition or number of sets in each week throughout six weeks training period. If the training was taken continuously, regularly and the weight is gradually added, it will affect to the improvement of the arms muscle power.

Lunden conducted a study on "Shoulder Kinematics During the Wall Push-Up Plus Exercise ", the results of research during push-ups on the wall plus exercise, from the initial position to push-ups plus positions, there was a significant increase in downward rotation of the scapula (P <.05) and internal rotation (P <.05). The glenohumeral motion pattern is humeral elevation (P <.05) and anterior motion to the scapular plane (P <.05), with the remaining external rotation of the humerus relatively constant. It can be concluded that during wall push-ups plus exercise in healthy volunteers, shoulder blades are placed in positions that are potentially associated with impingement shoulders (8).

Additionally, Cahyono, et. al. conducted a research on “The Influence of Traditional Push Up, plyometric Push Up, and Incline Push Up to the Strength, Power, and Endurance of Arms Muscle”. The findings of this research reported that the results of paired sample t-test indicated that traditional push up give significant influence on muscle strength variable (6). Meanwhile, the group of plyometric push up presented a significant influence of the variable of arm muscle power. Last, the group of incline push up showed a significant influence on strength and endurance variables. Based on this study, it can be concluded that traditional push up, plyometric push up and incline push up exercise are effective to improve upper body performance, particularly the strength and power of arm muscle.

A study titled "Comparison of the Middle and Lower Serratus Anterior Muscle Activities During Various Wall Push-Up Plus Exercises" was conducted by Yoo. The results of this study showed condition 3 (39.9 ± 12.4%) in a significantly increased MSA activity compared to condition 1 (32.0 ± 16.8%). Condition 2 (40.7 ± 15.2%) significantly increased LSA activity compared to condition 1 (32.6 ± 10.5%) (9). It can be concluded that the anterior one hundred center (MSA) shows greater activity in stabilizing the scapular position when the surface of the labile wall is used than when the stable wall surface is used.

By that, it means that the practice in improving the physical condition by using the practice of wall push up can improve the muscle power of arms has been supported by the theory related and is supported by the result of the previous research from several researchers.

B. The Difference of Floor Push Up upon the Improvement of the Muscle power of arms of the Participants of the Activity of Sport Extracurricular

The result of data analysis in using the related sampling t-test technique has gained the score of sig. $t = 0.000 < \alpha = 0.05$, so that the null hypothesis is refused and the hypothesis that mentions the presence of muscle power of arms between the before and after the floor push up is accepted. It means that the difference of the muscle power of arms between the before and after the floor push up. In this research, the treatment given is the floor push up training. Push up training is a form of training of muscle power using the weight of the bodyweight, which means that both arms support the weight of the body. With that, if the training is done continuously and programmed, it will affect the change of muscle power improved, which means that the muscle power of arms will experience the improvement (2).

The improvement of muscle power because of the training is caused by the changes of physiology that happened on the neuromuscular system. The changes are because of the muscle hypertrophy, the addition of muscle size (hypertrophy) is frequently caused by the addition of muscle fiber that presence from the training (7). Floor push up training is a form of aerobic practice that aims to strengthen the biceps muscle as well as the triceps on the arms (4). Nurrochmah in the conclusion of the result of the research reported that the kinesis training in the form of lateral hop jump using the dynamic weight can increase the hand muscle power and the legs power ($p < \alpha = 0.05$) (5).

Research about The Effect of Push up Plus Exercise with Visual Biofeedback on The Activity of Shoulder Stabilizer Muscles for Winged Scapula has showed significant differences between the experimental group and the control group ($p < 0.05$) (10). It can be concluded that the provision of visual biofeedback during push ups plus exercise makes exercise more effective for winged shoulder blades.

The results of the study about Effect of Push up Training On Upper Body Strength and Power on Young Adults showed that there was no significant difference in the improvement at 1RM but showed a significant difference in improvement in drug balls making the distance between the two groups at the 5% significance level (11). It can be concluded that plyometric push up exercises are superior to dynamic push up exercises in terms of strength and power.

Study about effects of push up exercise on shoulder stabilizer muscle activation accordance to the grip thickness of the push up bar showed significant differences in each of them (a) between 0% and 50%, (b) a significant difference between 0% and 75% (12). It can be concluded that the use of push up bars of different thicknesses adjusted to personal characteristics, rather than conventional standards, can be more effective for training and rehabilitation.

With that, it means that the training to improve the physical condition using the wall push up training can improve the power muscle of arms has been supported by the theory that is related to and supported by the result of the previous research from several researchers.

C. The Influence Of Wall And Floor Push Up Training Upon The Improvement Of Muscle Power Of Arms Of The Participants of Sport Extracurricular).

The result of one way anava gained the sig. $F\ 0.000 < \alpha = 0.05$. Since the sig. $F = 0.000 < \alpha = 0.05$, then the advance test of Least Significance Difference (LSD) gained the sig. $t = 0.000 < \alpha = 0.05$. So, the result of analysis indicated the presence of difference that is significant between the group of wall and floor push up training upon the improvement of the muscle power of arms. The group of wall push up training has the margin of average of calculation between initial and final test in 35.883 cm and the floor push up training with the margin of 101.059 cm. It means that the floor push up training is better than the wall push up upon the improvement of muscle power of arms. The training is to increase muscle power of arms can be done with the training such as the training of squat using dumbbell or plyometric training (4). Meanwhile in this study, the form of training that is given such as the training of power in the form of push up using the internal burden that is the bodyweight of each of the participants.

The presence of the wall and floor push up training upon the improvement of muscle power of arms because each groups gained the treatment for six weeks, every week the training is done three times, every training is done for 90 minutes. Besides, the shapes of the training or the identic treatment with the stimulation which means that the body of every individual gained the same stimulation of push up that is done repeatedly with the variation that is close to exactly same. Improving the muscle power through the strength training optimally which can improve the power faster (2).

The research of "Changes in Speed and Strength in Volleyball Players for Women During and After the Plyometric Training Program", showed the results of this program support the opinion that plyometric exercises are effective in developing power explosions and speed in young athletes. This research focuses on objective and statistically important changes in the tendency of volleyball player motors ($p < 0.05$) (13). Other research, by Vossen about "Comparison of Dynamic Push up Training and Plyometric Push up Training on Upper Body Explosive Power and Strength" showed a significant increase in results ($p = 0.05$) which means the increase of the two groups was the plyometric push up (PPU) group and dynamic push up group (DPU) (14). The plyometric push up (PPU) group experienced a much greater increase than the DPU group in the put drug ball ($p < 0.03$).

Vishen & Sen conducted a study of "Comparison Of Dynamic Push up Training and Plyometric Push up Training On Upper Body Performance Test In Cricket Player" showing a t-test result within Group A between Pre & post one arm hop test of right side ($p = 0.033$), left side ($p = 0.003$) and Group B between Pre & post one arm hop test of right side ($p=0.004$), left side ($p=0.011$) which means that dynamic push up training and Plyometric push up training, both are effective in improving upper body performance but not superior regimens done all at once (15).

Hinshaw, et al. conducted a study on " Effect of External Loading On Force and Power Production During Plyometric Push ups" showed no significant differences were observed for peak power between push ups with or without external loads (0.4 ⩾ Cohen dz ⩾ 0,1) (16). It means push ups without additional weights are better for fast movements.

The size of improvement of muscle power of arms due to the wall push up training has the average margin score from the initial and final calculation of 35.88 cm meanwhile the size of the increase of power muscle of arms is because of the weight on the floor push up with both arms supports the entire bodyweight. On the wall push up training, the dominant weight of the upper body, in other words the floor push up training has the greater weight compared to the training of wall push up (4).

With that, it can be concluded that the presence of improvement of muscle power training because of the wall and floor push up training is supported by the relevant theories, and is supported by several previous results by the researchers. Besides, it is also seen that the research that is done that is in the form wall and floor push up, meanwhile the form of training in the previous research is conventional push up training and push up plyometric, dynamic kinetic weight training, and there is also training of push up using the external weight.

V. CONCLUSION

A. Conclusion

The result of the research concluded that: (1) there is significant difference between the before and after result of wall and floor push up training upon the muscle power of arms. (2) there is a significant difference between the before and after results of wall push up upon the muscle power of arms. And (3) there is a significant influence between the wall and floor push up upon the improvement of muscle power of arms. The floor push up training is better than the wall push up training upon the improvement of muscle power of the arms.

B. Recommendations

The suggestion from this research are (a) for the trainers of extracurricular that the training of wall and floor push up training can be used in improving muscle power of the arms and also that it can be used as the training variation of strength or the power of the upper arms. (b) for the participants of extracurricular of wall and floor push up training can be used for the independent training in improving the muscle power of the arms muscle.

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