The Effects of Resistance Training with Different Focus Attention on Muscular Strength: Application to Teaching Methods in Physical Conditioning Class

Ali Md Nadzalan, Jeffrey Low Fook Lee, Mohamad Shahrul Azzfar, Nur Shazana Muhammad Shukri, Ebby Waqqash Mohamad Chan & Nur Ikhwan Mohamad

Abstract*: *This study aimed to determine the effects of resistance training with different focus attention on muscular strength adaptation. Thirty (n = 30, mean age = 21.60 ± 1.00 years old) healthy men were recruited and were divided into three groups; i) internal focus, ii) external focus and iii) control condition group. All participants underwent six weeks of resistance training with different focus attention instructions were given during the training based on their groups. 1RM strength test for squat and deadlift were conducted prior and after the six weeks. Results showed that all groups managed to improve in the post test. It was found that external focus group obtained greater percentage of improvement compared to the other two groups. As the conclusion, external focus attention instructions were suggested to be adopted during resistance training as it was shown to be the most effective in improving muscular strength.

Index Terms*: *External focus, Internal focus, Muscular strength adaptation, Resistance training

I. INTRODUCTION

Physical conditioning is one of the course/subject been taught in a sports science program. In physical conditioning course, one of the main topics included is resistance training. Resistance training has been shown to be one of the great alternatives to improve muscular strength [1]. As a way to improve the effectiveness of resistance training, it is suggested for the individuals to get supervision form skilled and knowledgeable trainer. The same applied during physical conditioning class. Students will get more benefits from a knowledgeable lecturer. For a physical conditioning lecturer, there are many things need to be considered during the training session [2].

Revised Manuscript Received on June 05, 2019.

Ali Md Nadzalan, Faculty of Sports Science and Coaching, Sultan Idris Education University, Malaysia.

Jeffrey Low Fook Lee, Faculty of Sports Science and Coaching, Sultan Idris Education University, Malaysia.

Mohamad Shahrul Azzfar, Faculty of Sports Science and Coaching, Sultan Idris Education University, Malaysia.

Nur Shazana Muhammad Shukri, Faculty of Sports Science and Coaching, Sultan Idris Education University, Malaysia.

Ebby Waqqash Mohamad Chan, Sports Centre, University of Malaya, Kuala Lumpur, Malaysia

Nur Ikhwan Mohamad, Faculty of Sports Science and Coaching, Sultan Idris Education University, Malaysia.

One of the teaching approaches during resistance training is the verbal instruction. Using verbal instruction, the lecturer can provide information on what the student need to do in order to improve their technique and performance. If the verbal instruction is effective, the students will get benefits of it. However, if the verbal instruction is not effective, then learning process and performance will be negatively affected.

Of the many verbal instructions that can be adopted by the lecturer, attentional focus during the task execution is one the variables that can influences the performance Wulf [3]. It has been shown in previous study that athletes tend to give their focus according to the instructions provided by the coach and not by learning or choosing the most effective focus attention by themselves [4]. This reflect the importance of a physical conditioning lecturer to have correct verbal instructions methods as it will affect the focus direction among the students that will later influence the physical adaptation and technical acquisition of the performer.

What is focus attention? Focus of attention refers to what the individual choose to focus while executing a physical task. During any task execution, there are three types of focus of attention identified to be adopted by individuals; i) internal, ii) external and iii) neutral [5]. Internal focus attention involves the focusing on individual's own body whereas external focus attention involves the focusing on the environment specific features or the movement effects [6]. Internal focus type of instructions has been the normal form of instruction utilised by instructors as well as in the literature on physical conditioning.

Researches on the effects of attentional focus had been done in many sports skills [7-9]. The effects on resistance training have also been conducted by several previous researchers [10-14].

Mixed results have been found on the effectiveness of internal and external focus of attention. One of the most referred explanations for the comparative benefits of adopting external focus compared to internal focus is the constrained action hypothesis [15, 16]. Based on this hypothesis, when individuals are asked

to focus on movement effect, it will result in more effective movement execution and performance. In contrast, focusing on internal focus will cause the individual to consciously control their movements, in which will constraint the motor system and inadvertently disrupts automatic control processes.

Despite of several researches has been conducted on investigating the effects of focus attention focus on exercise performances, most of the researches been conducted only focus on acute effects, which just reflect what possibly happened if was continued for a certain period of time. One of the lack information right now is the chronic effects of adopting different attentional focus during training. Questions exist whether is there any differences of muscular strength adaptations between internal and external focus attention group in the chronic study? The objective of this study is to compare muscular strength adaptations between internal and external focus attention group. In addition, this study also compared the focus attentions instructions with the control condition, to look if there is possibility the performance would be better without any focus attention instructions.

II. METHODOLOGY

A. Participants

Thirty students enrolled in resistance training class were recruited as the participants of this study based on volunteerism (N = 30, age: 20-25 years old). To be included as participants, they should be able to perform the squat and deadlift exercises with correct technique. Participants were screened prior to testing using Physical Activity Readiness Questionnaire. Informed consent need to be read and signed by each participant. All the procedures were informed to participants during the familiarization session.

B. Procedures

After familiarization and all the consent form has been signed, 1-repetition maximum (1RM) test for squat and deadlift were conducted as a measurement of muscular strength [2]. The 1RM test was conducted prior and after six weeks of training.

After pre-test, participants were divided into three training groups; i) internal focus, ii) external focus and iii) control condition group. All participants were required to perform deadlift and squat in the training session. The deadlift training exercise was set to be started with the plates touching the floor. Their hips and knees need to be extended while pulling up the barbell. The elbow need to be straight during the ascend phase. During descend phase, the barbell need to be kept near the legs. Participants need to just slightly touch the plates with the floor before continue with another repetitions as much as they can.

All the focus conditions (internal, external and control) were given common task instruction that is 'perform as may repetitions as you can'. Prior and during the execution of both deadlift and squat exercises, the external and internal focus groups were given additional instructions during lifting the weights. Participants in the external focus group were given "focus your attention on pulling the bar up" instructions while participants in the internal focus group were given "focus your attention on extending your knees and hips" instructions.

Squat training exercise was conducted similar to deadlift. Besides common instruction that is to lift the weight as much repetitions as possible, participants in external focus group were given additional instruction "focus on moving and exerting force through and against the barbell", while participants in the internal focus group were given ("Focus on moving and exerting force with your legs") instructions.

After six weeks of training intervention, participants were tested again for their deadlift and squat 1RM.

C. Statistical Analysis

Physical characteristics and mean score were analysed using descriptive statistics. Repeated measures analysis of variances (ANOVA) was used to examine differences of 1RM score in the pre- and post-test within all the three groups. One way ANOVA was then conducted to compare the percentage differences of post-pre score between all the three groups. α-level of $p \leq 0.05$ was set as the value for statistical significance.

III. RESULTS

Physical characteristics of participants involved in this study were shown in Table 1.

Table 1. Physical characteristics of participants

Variables	Mean ± SD
Age (years)	21.60 ± 1.00
Body Mass (kg) pre-test	70.05 ± 2.93
Body Mass (kg) post-test	72.31 ± 4.24
Height (cm)	172.80 ± 3.50

Table 2 and Table 4 showed the pre- and post-test data of the squat and deadlift 1RM score. Table 3 and Table 5 showed the percentage differences between pre- and post-test data.

Analysis on each group had found significant main effects in internal focus attention in both squat and deadlift 1RM: i) squat 1RM, $F(1,9) = 392.30$; $p = 0.000$, ii) deadlift 1RM, $F(1,9) = 358.12$; $p = 0.000$. Similar to the internal focus group, significant main effects were also found in external focus group in both squat and deadlift tests: i) squat 1RM, $F(1,9) = 437.73$; $p = 0.000$, ii) deadlift 1RM, $F(1,9) = 590.13$; $p = 0.000$. Significant main effects were also found in both squat and deadlift tests in control group group: i) squat 1RM, $F(1,9) = 290.59$; $p = 0.000$, ii) deadlift 1RM, $F(1,9) = 464.94$; $p = 0.000$.

All groups increased their squat and deadlift 1RM significantly after six weeks of training program. The different of training

Published By:
Blue Eyes Intelligence Engineering
& Sciences Publication

adaptations in this study were measured by the percentages of differences between post-test and pre-test.

For squat, looking at the post test, it is found that percentages increment of external focus group was significantly greater in squat 1RM compared to internal focus group, p = 0.001 and control group, p = 0.002. No significant differences of percentage increment between control group and internal focus group, p = 0.737.

For deadlift, looking at the post test, it is found that percentages increment of external focus group was significantly greater in deadlift 1RM compared to internal focus group, p = 0.000 and control condition, p = 0.007. No significant differences of percentage increment between control group and internal focus, p = 0.191.

Table 2. Squat 1RM Score

	Internal focus	External focus	Control
Pre-test (kg)	104.21 ± 12.37	105.96 ± 13.54	108.33 ± 14.45
Post-test (kg)	113.64 ± 12.82	119.53 ± 12.89	118.39 ± 14.19

Table 3. Percentage differences of pre and post test

	Internal focus	External focus	Control
Post-Pre (%)	9.12 ± 1.54[b]	13.07 ± 2.86[ac]	9.47 ± 2.43[b]

[a] = significantly different from internal focus group
[b] = significantly different from external focus group
[c] = significantly different from control group

Table 4. Deadlift 1RM Score

	Internal focus	External focus	Control
Pre-test (kg)	123.07 ± 14.81	120.56 ± 13.54	124.70 ± 13.74
Post-test (kg)	133.92 ± 13.91	136.89 ± 14.04	136.17 ± 12.95

Table 5. Percentage differences of pre and post test

	Internal focus	External focus	Control
Post-Pre (%)	9.02 ± 2.24[b]	12.91 ± 0.98[ac]	10.19 ± 2.33[b]

[a] = significantly different from internal focus group
[b] = significantly different from external focus group
[c] = significantly different from control group

IV. DISCUSSIONS

This study aimed to determine and compare the muscular strength adaptations of three different focus attentions adopted during resistance training. Thirty active participants were recruited from a resistance training class and were divided into three groups; i) internal focus, ii) external focus, and iii) control condition. Results demonstrated all groups increased their squat and deadlift 1RM significantly after six weeks of training program. The different of training adaptations in this study were measured by the percentages of differences between post-test and pre-test.

For deadlift, looking at the post test, it was found that percentages increment of external focus group was significantly greater in deadlift 1RM compared to internal focus group and control condition. No significant differences of percentage increment between control group and internal focus. For squat, looking at the post test, it was found that percentages increment of external focus group was significantly greater in squat 1RM compared to internal focus group and control group. No significant differences of percentage increment between control group and internal focus group.

What can we see in this study is that, although internal focus attention has been used widely in giving instructions during teaching process of a skill, the effectiveness of it is actually not as good as external focus attention. Several reasons existed to explain on this. Internal focus attention result in decreased capability to produce maximal force, and this is related to inefficient muscular activation that limits force production. Previous studies suggested that internal focus increase "noise" in the motor system as quantified through greater muscular activity [17, 18]. Increased noise in the motor system reflects the increased muscular activity is not transferred to the movement output. Thus, the participant in the internal focus group might actually train with less movement economy during training, which then brings to lesser improvement in muscular strength comparted to external focus group.

The findings of this study demonstrate evidence that physical effort exerted to produce a given outcome could be depending on the individual's attentional focus. Directing focus externally was proven to be a more effective focus attention verbal instruction as shown by greater muscular strength adaptation found in this study. Thus, during a physical conditioning class, for a group of students that already know on how to perform the exercises, external focus of attention instruction is suggested to be adopted to maximize muscular strength adaptation. Future research is suggested to be conducted on how different focus attentions instructions affected the techniques acquisition among those that are not familiar with resistance training. Since techniques are really important aspect in resistance training (due to the injury risk), internal focus attention instructions that focused on the body parts might be better to be adopted.

V. CONCLUSIONS

To conclude, adopting external focus attention during resistance training was proven to be more effective compared to internal focus

attention in terms of chronic adaptations of muscular strength. The findings of this study add the information to the body of knowledge in attentional focus, which this study extends the current knowledge on the effectiveness of external focus which has been shown to be more effective in acute studies. Athletes, physical trainers, coaches and individuals should be aware of the different effects of different focus attention direction. Based on the findings of this study, it is recommended to adopt external focus attention in order to increased muscular strength adaptation. However, it should be noted that this study focusing on muscular strength adaptation among already know of the exercises techniques participants. More focus should be given on individuals that are novice/unfamiliar individuals as for this population, technique acquisition are more important.

ACKNOWLEDGEMENT

This study was part of research funded by the Sultan Idris Education University (GPU Code: 2017-0243-107-01).

REFERENCES

1. T. J. Suchomel, S. Nimphius, C. R. Bellon, M. H. Stone. The importance of muscular strength: Training considerations. Sports Medicine. 2018;48(4):765-85.
2. G. G. Haff, N. T. Triplett. Essentials of strength training and conditioning 4th edition: Human Kinetics; 2015.
3. G. Wulf. Attentional focus and motor learning: a review of 15 years. International Review of Sport and Exercise Psychology. 2013;6(1):77-104.
4. J. Porter, W. Wu, J. Partridge. Focus of attention and verbal instructions: Strategies of elite track and field coaches and athletes. Sport Science Review. 2010;19(3-4):77-89.
5. H. Makaruk, J. M. Porter. Focus of attention for strength and conditioning training. Strength & Conditioning Journal. 2014;36(1):16-22.
6. G. Wulf. Attention and motor skill learning: Human Kinetics; 2007.
7. R. Abdollahipour, G. Wulf, R. Psotta, M. Palomo Nieto. Performance of gymnastics skill benefits from an external focus of attention. Journal of Sports Sciences. 2015;33(17):1807-13.
8. R. Rienhoff, L. Fischer, B. Strauss, J. Baker, J. Schorer. Focus of attention influences quiet-eye behavior: An exploratory investigation of different skill levels in female basketball players. Sport, Exercise, and Performance Psychology. 2015;4(1):62.
9. A. M. Freudenheim, G. Wulf, F. Madureira, S. C. Pasetto, U. C. Corrêa. An external focus of attention results in greater swimming speed. International Journal of Sports Science & Coaching. 2010;5(4):533-42.
10. D. C. Marchant, M. Greig, C. Scott. Attentional focusing instructions influence force production and muscular activity during isokinetic elbow flexions. The Journal of Strength & Conditioning Research. 2009;23(8):2358-66.
11. D. C. Marchant. Attentional focusing instructions and force production. Frontiers in Psychology. 2011;1:210.
12. D. C. Marchant, M. Greig, J. Bullough, D. Hitchen. Instructions to adopt an external focus enhance muscular endurance. Research Quarterly for Exercise and Sport. 2011;82(3):466-73.
13. I. Halperin, K.J. Williams, D. T. Martin, D. W. Chapman. The effects of attentional focusing instructions on force production during the isometric midthigh pull. The Journal of Strength & Conditioning Research. 2016;30(4):919-23.
14. A. M. Nadzalan, J. L. F. Lee, N. I. Mohamad. The Effects of Focus Attention Instructions on Strength Training Performances. International Journal of Humanities and Management Sciences. 2015;3(6):418-23.
15. N. H. McNevin, C. H. Shea, G. Wulf. Increasing the distance of an external focus of attention enhances learning. Psychological Research. 2003;67(1):22-9.
16. G. Wulf, N. McNevin, C. H. Shea. The automaticity of complex motor skill learning as a function of attentional focus. The Quarterly Journal of Experimental Psychology Section A. 2001;54(4):1143-54.
17. T. Zachry, G. Wulf, J. Mercer, N. Bezodis. Increased movement accuracy and reduced EMG activity as the result of adopting an external focus of attention. Brain Research Bulletin. 2005;67(4):304-9.
18. J. Vance, G. Wulf, T. Töllner, N. McNevin, J. Mercer. EMG activity as a function of the performer's focus of attention. Journal of Motor Behavior. 2004;36(4):450-9.