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Electromyographical Analysis and Performance During Bench Press Exercise: The Influence of Self-Talk

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Abstract*: This study was conducted to determine and compare the effects of different self-talk approach on performance and muscle activation during bench press exercise. Thirty trained men were recruited and were required to performed bench press exercise in three self-talk approach; i) motivational self-talk, ii) instructional self-talk, and iii) control condition (without self-talk). The performance of bench press is measured by the number of repetitions that were accomplished while the muscle activation was obtained from the pectoralis major muscle using electromyography (EMG) method. Results showed greatest number of repetitions was recorded when performing motivational self-talk followed by control condition and lastly instructional self-talk. In contrast, instructional self-talk recorded the highest pectoralis major muscle activation. As the conclusion, motivational self-talk is suggested to be adopted during resistance training as it was shown to produce greatest performance while been economic in terms of muscle activation.

***Index Terms*: Performance, Psychology approach, Resistance training, Self-talk**

I. INTRODUCTION

Self-talk is one of the ways to improve performance in games and during training [1, 2]. Self-talk can be referred as the words or sentences that were said to selves for a specific purpose, such as to increase motivation or to improve ability in performing a skill. Several studies have been conducted on the effectiveness of several types of self-talk. This includes instructional and motivational self-talk [3, 4]. Instructional self-talk is designed to increase performance through enhancing techniques in performing a skill [5, 6]. Instructional self-talk also focused on improving individuals' focus attention and strategy during skill execution. On the other hand, motivational self-talk is designed to improve performance through increasing self-confidence, effort and positive moods [7]. The effectiveness of self-talk in improving athletic performance should be considered by coaches as one of the approach that can be used in training session. As a way to enhance physical ability, resistance training is one of the most popular training methods. Mounting of evidences were shown from previous studies about the effectiveness of resistance training in enhancing physical abilities [8-10]. Until now, the number of researches conducted on determining the way to improve the effectiveness of resistance training keeps increasing. Acute and chronic studies had never stop been conducted in resistance training. The results of acute studies in resistance training are believed to affect the outcome longitudinally.

The effectiveness of resistance training can be measured through several variables such as the performance during performing any exercises. Among them is the number of repetitions and amount of weight lifted. Ability to perform an exercise with greater loads or higher number of repetitions is believed to provide more positive adaptations for the muscles. Until now, it is hardly to find researches conducted on the effectiveness of self-talk in enhancing resistance training performance. Most of studies in self-talk has been conducted on sports skills [2, 11]. Additionally, the comparison of the effects of instructional and motivational self-talk in enhancing resistance training is needed. Most studies conducted in examining the effects of self-talk have used performance outcome measures [1, 4, 6] but until now, it hard to find studies that used performance production measure such as electromyography (EMG) analysis during the movement. EMG analysis have the advantage that they provide insight into how motor control is organized by the nervous system when individuals adopt different self-talk approaches. The lack of studies conducted on the application of psychological skills in resistance training might cause individuals involve in this training not aware of the importance of adopting the methods.

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The aim of this study is to determine and compare the effects of self-talk on performance and muscle activation during bench press exercise. The bench press is selected as it is believed to be one of the most popular exercise been performed by any individuals involved in resistance training.

II. METHODOLOGY

A. Participants

Forty-five trained men (age 20 – 25 years old), having at least six months experience with consistence training were recruited as participants in this study. All participants were free of injury and had been screened through Physical Activity Readiness Questionnaire (PAR-Q). Participants were required to sign the informed consent. They are permitted to withdraw from the study without having to give any reason.

B. Procedures

Participants were needed to attend the laboratory for five times in two weeks' time. The first been for familiarization. Participants were informed about the objectives and important of studies, along with how the study will be conducted. After that, participants were required to perform the correct techniques of bench press. Inability to perform correct technique will cause the participants to be excluded from becoming research participants. In the next session, participants were required to perform one repetition maximum (1RM) bench press test. The 1RM test was based on the guidelines provided by Baechle and Earle [12]. The other three sessions were designed for data collection, in which participants need to perform bench press with 80% of 1RM loading in three self-talk conditions; i) instructional self-talk, ii) motivational self-talk and iii) control condition (without self-talk). The orders of self-talk were counterbalanced to avoid order effects. During the instructional self-talk, participants were needed to say loudly the phrase 'Push upward, straight the elbow!' before and during performing the bench press test. During motivational self-talk, participants need to say loudly the phrase 'keep pushing, I can push it!' before and during the bench press test. During the control condition, participants performed the bench press without any self-talk. All testing session was conducted in a well-equipped sports biomechanics laboratory. The bench press test was conducted using barbell (Ivanko OB, USA), plate (Ivanko rubber E-Z Lift® plate, USA), and power rack (BodySolid, USA). The muscle activation was obtained using electromyography (EMG) method which using a wireless electromyogram (TrignoDelsys, US). The electrodes were placed on the participants' pectoralis major [13]. Participants were tested on the maximum voluntary contraction (MVC) during the second session. All the EMG data obtained during session three, four and five were converted to percentage of MVC.

C. Statistical Analysis

Descriptive analysis was conducted to determine the mean and standard deviation of physical characteristics and mean score. Repeated measure analysis of variances (ANOVA) was used to compare the effects of the three self-talk conditions on the number of repetitions and the muscle activation during the bench press exercise. All data analyses were run using Statistical Package for the Social Science (SPSS) version 23. Significant value was set at $p < 0.05$.

III. RESULTS

Table 1 showed the demographic data of participants involved in this study.

Table 1. Demographic data of research participants

	Min	Max	Mean	SD
Age (years)	20	25	21.20	1.15
Height (cm)	161	180	170.93	5.09
Body mass (kg)	60	77	65.13	5.85

Table 2 showed the number of repetitions completed in each set following bench press exercises in three different self-talk conditions. The results showed that motivational self-talk produced significantly higher total number of repetitions in all three sets compared to control ($p = 0.000$) and instructional self-talk ($p = 0.000$) conditions. Control condition was shown to produced greater number of repetitions compared to instructional self-talk condition ($p = 0.000$).

Table 2. Number of repetitions performed in three self-talk conditions

ST	Set 1	Set 2	Set 3	Total
I-ST	6.60 ± 0.50	6.07 ± 0.25	5.27 ± 0.45	17.93 ± 0.94
M-ST	8.53 ± 0.51	8.33 ± 0.48	7.53 ± 0.51	24.40 ± 1.33
CON	7.40 ± 0.50	6.47 ± 0.51	6.20 ± 0.41	20.07 ± 0.94

ST = Self-talk
I-ST = Instructional self-talk
M-ST = Motivational self-talk
CON = Control group

Table 3 showed the mean muscle activation of pectoralis major in each set following bench press exercises in three different self-talk conditions. The data was presented as percentage of MVC.

The results showed that in all three sets, instructional self-talk produced greater muscle activation of pectoralis major compared to the other two conditions ($p = 0.000$). No significant differences were found between motivational self-talk and control conditions in all three sets ($p > 0.05$).

Table 3. Muscle activation of pectoralis major in three self-talk conditions

	EMG Value (% of MVC)		
ST	Set 1	Set 2	Set 3
I-ST	74.25 ± 8.61	72.41 ± 10.58	72.31 ± 13.82
M-ST	69.84 ± 5.03	69.72 ± 7.02	68.42 ± 6.38
CON	70.54 ± 9.37	69.49 ± 6.42	70.42 ± 9.30

ST = Self-talk
I-ST = Instructional self-talk
M-ST = Motivational self-talk
CON = Control group

IV. DISCUSSIONS

The objective of this study was to determine and compare the effects of instructional self-talk, motivational self-talk and control condition (without self-talk) towards performance of bench press that was measured by the number of repetitions completed and muscle activation of pectoralis major. Knowing and understanding the effects of self-talk on performance will provide further knowledge on the importance of adopting self-talk during resistance training. Performance can be measured by several ways including the number of repetitions completed, weight lifted and many more. Looking at the results, we can see that number of repetitions completed were the highest during motivational self-talk followed by control condition and lastly instructional self-talk. This happened in every set and finally brought to the total repetitions number for the sets. To conclude based on the number of repetitions completed, motivational self-talk provide positive effects while instructional self-talk cause reduction in performance.Next, we look into the muscle activation produced. What we can see is that, the number of repetitions during the instructional self-talk was the highest during every set. This is significantly higher compared to the other two conditions. Increasing muscle activation usually marked the efforts produced by the individuals increased, and this normally is positive. However, in this study, we have to relate the muscle activation recorded to the number of repetitions completed. What we can see is that, the instructional self-talk condition cause participant to produce highest value of muscle activation but the outcome is the lowest number of repetitions completed. This was in contrast with motivational self-talk condition which shown greatest number of repetitions despite lower muscle activation. These in contrast findings demonstrated that motivational self-talk permit the participants to save their effort and energy to produce greater performance while the instructional self-talk just demand more effort and energy but still lower performance achieved.

The findings of this study were in similar condition with findings from the attention focus studies previously. It seems that instructional self-talk is as the same as internal focus condition in which greater muscle activation produced, but with less performance achievement [14, 15]. The mechanism might be the same, as the instructional self-talk in this study also contains the element of internal focus condition where participants need to focus on pushing the loads by straighten their elbows.

V. CONCLUSIONS

Based on the results of this study, it is recommended for individuals to adopt motivational self-talk during their training as it was shown to produced greater performance without having their muscle to be more activated as the instructional self-talk.

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