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**Research article**

# THE EFFECTS OF COMBINED SELF-TALK, IMAGERY AND VIDEO-MODELLING INTERVENTIONS ON ANAEROBIC PERFORMANCE, HEART RATE RESPONSE AND SELF-EFFICACY

Nursahaniza Sato[1], Thariq Khan Azizuddin Khan[1] & Normah Jusoh[1]

[1]Faculty of Sport Science and Coaching, Universiti Pendidikan Sultan Idris, Malaysia

## Abstract

*Journal of Sports Science and Physical Education* 6(1): 1-10, 2017 – The aim of this study was to investigate the effects of instructional and motivational self-talk combine with imagery and video-modelling interventions on anaerobic performance, heart rate response and self-efficacy. Forty-five active male participants were recruited in this study as they passed the screening test of Sport Imagery Ability Measure (SIAM) and scored between moderate and high. All the participants were randomly assigned into 3 groups, namely instructional group (n=15), motivational group (n=15) and control group (n=15). Participants in the instructional and motivational groups performed 12 sessions of intervention within 4 weeks. Participant in control group did not receive any specific treatment or intervention. All participants performed 30 seconds anaerobic Wingate test during the pre-test and post-test. During this test the participants' peak power, total work, fatigue index, maximum heart rate, average heart rate and self-efficacy were measured. Participants in the instructional and motivational groups answered a social validation questions within one week after the post-test. The data obtained was analyzed using a mixed-design ANOVA. The results indicated that there was a significant difference ($p<0.05$) only for instructional group showed specifically increased their peak power score as well as the total work in two time period (pre-test and post-test). For the self-efficacy measure, the instructional and motivational group showed the main effects and increased in the self-efficacy score during two time period. However, no significant differences were found for the fatigue index, maximum heart rate and average heart rate. Therefore, the instructional and motivational self-talk combined with imagery and video-modelling were found to be beneficial to increase individual specific task and improve their level of self-efficacy during the 30 seconds Wingate test. Overall, the instructional and motivational self-talk combine with imagery and video-modelling interventions is a useful method to improve anaerobic capacity and self-efficacy.

Keywords: Self-talk, Imagery, Video-Modelling, Self-efficacy, 30 Seconds Wingate Test

## Introduction

The sport psychological skills specifically self-talk was a predominantly method used to improve athletes performance (Thelwell & Greenlees, 2003). Moreover, the self-talk intervention was normally combined with other psychology skills such as imagery training (Afsanepurak & Bahram, 2012), imagery with video-modelling training (SooHoo, Takemoto & McCullagh, 2004), and self-talk with video-modelling training (Barzouka, Sotiroupoulus & Kiomourtzoglou, 2015) to enhance specific skills performance and self-efficacy. According to Hardy, Gammage and Hall (2001), self-talk was a personal dialogue, which the athletes interprets feelings and perceptions, regulates and changes, evaluation and convictions, or give him/herself instructions and reinforcement. There are two main functions of self-talk, namely a cognitive or instructional self-talk and motivational self-talk. According to Hardy (2006), a cognitive or instructional self-talk referring to statements focused on the task relevant cue, technical information, the choice of tactics and focus attention. For motivational self-talk refers it's to statements that focus on improving the efforts, positive emotions, and to enhance the confidence level.

Imagery intervention also plays a role as a cognitive or instructional and motivational factor to influence the behaviour. However, different types of imagery provide different functions depend on the individual's interpretation (Moritz, Hall, Martin, & Vadocz, 1996). One of effective procedure to deliver imagery intervention was using the video recording showing athletes performance. Interventions based video imagery normally also involves observation to increase sports performance and self-efficacy (Clark & Ste-Marie, 2007). Moreover, imagery sometime was combined with video recording itself (Smith & Holmes, 2004).

Modelling was an effective teaching method for the behaviour or action that cannot be described verbally yet can be demonstrated visually. According to Zetou, Tzetzis, Vernadakis and Kioumourtzoglou (2002), the use of visual modelling or demonstration was very important tool to teach new motor skills that usually beneficial for beginner athletes. In addition, the use of video was found can improve athletic performance and as well as can be used as a routine as part of preparation, implementation and to maintain current skills. However, the studies that associated with self-talk, imagery and video-modelling in one intervention examine the effectiveness of the two main functions of self-talk and imagery namely, a cognitive or instructional and motivational are less to find. Moreover, this combine intervention examines the effects on anaerobic performance by using 30-seconds Wingate test protocol among athletes and non-athletes are lacking. Furthermore, according to Smith et al. (2004), an athlete's performance may be increase with imagery training that employed audio and video footage compared than using only a written imagery script. By watching at the video footage, the potential to provide internal stimulus to external cue are increasing. For example, Forzoni (2006) explains that the vicarious experience and performance were likely to increase performance by athletes viewing video recordings involving mastery of skills. In conclusion, combine imagery, observation and self –talk interventions, can be useful methods particularly when develop according to their athletes specific skills.

## Methodology

### *Participants*

Forty-five male participants were recruited from Faculty of Sports Science and Coaching and selected based on participants' similar imagery capabilities with SIAM scores between 150 to 400.

### *Procedures*

Prior to pre-test, the participants were located in the waiting room before being called individually to the exercise physiology testing lab. During the first meeting, the participants were briefed, given and asked to sign the participation consent form, self-efficacy evaluation form and anthropometric information form.

During the pre-test, the participants did a specific warm-up and stretching before any test. The participants wear a Polar heart rate monitor chest strap on their sternum. Then, they were asked to seat on ergometer bicycle and the seat height was adjusted according to participants' height. Participants also used the pedal clip. Participants' information was computed in Lode Ergometry Manager System software and they were briefed on the procedures of 30 seconds Wingate test protocol. Cue words as an instruction were used such as "ready" to start in 1 minute and "warm-up" on the ergometer bicycle with 70 to 80 revolutions per minute. Participants were provided with cue word "go" to start to pedal as fast as they can or 'all out' within 30 seconds. Then, cue word "stop" was provided for them to slow down pedalling and for 2 minutes cooling-down on a mild resistance load. Finally, a cue word "done" were used for them to stop pedalling. The participants' anaerobic result encompasses the peak power, total work, and fatigue index were recorded. During intervention sessions, the participant in the instructional and motivational employed interventions for 4 weeks with training frequencies were 3 times per week, which consisted of 12 training session (Kuan, 2014). The procedures for the post-test were as similar as in the pre-test. The control group did not employ any intervention.

### *Measurements*

The instruments used in this study were ergometer cycle, SIAM questionnaire, self-talk, imagery and video-modelling interventions, self-efficacy evaluation form and the Polar heart rate monitor watch.

### *Ergometer Bicycle*

Participants' peak anaerobic power (watt), total work (kilojoule) and fatigue index (%) were measured using the Corival ergometer bicycle (Lode, Netherlands) for 30 seconds Wingate test protocol with electromagnetic brake mechanism. Data for each 30-second Wingate test was obtained through the Lode Ergometry Manager System software. Resistance load on the bicycle wheel was automatically set from manufacturer software in the range of 0.7 kg torque factor (default setting Lode) of the participants' weight specific for males adult.

***Sport Imagery Ability Measure Questionnaire***

The Sport Imagery Ability Measure (SIAM; Watt, Morris & Anderson, 2004) was used in this study. The SIAM was a 48-item self-report questionnaire that examines participants experience on 60 seconds of imagery for each of four sport-related scenes on 12 sub-scales associated with imagery. This measure was used as imagery abilities screening device.

***Self-efficacy Evaluation Form***

The Self-efficacy Evaluation form was created based on Bandura's Guidelines for Constructing Self-efficacy Measures (2006) that contain a task series that stated the variation of difficulties level and each item were used the term phrase namely "succeed to keep pedalling fast".

***Polar Heart Rate Monitor***

Maximum heart rate (bpm) and average heart rate (bpm) were measured using Polar RCX5 heart rate watch (Kempele, Finland).

***Video-modelling***

For video modelling, the video clip of ergometer bicycle pedalled by a male model with peak power (watt) was used. The video clip was recorded using a digital video recorder (JVC HD Everio). The video footage was then transferred to the laptop and edited using the Microsoft Windows Movie Maker and combined with imagery audio (female voice) and self-talk interventions. Video recording interventions involves two types of cycling ergometer, which was first video involves cognitive or instructional recordings and the second one was motivational recordings. Each of the video-modelling was saved in MP4 and employed by participants using the Samsung Galaxy Tab 10-inches tablet with screen size display was 65.8% screen-to-body ratio.

***Instructional Self-Talk with Imagery-Video Modelling Footage***

An instructional self-talk cue words given to the participants for practiced were "Pedal Faster!" and "Push Hard". However, the participants were free to use any cue words which was suitable to an instructional self-talk list provided. The instructional video footage started with the imagery audio instruction using female voice based on an imagery script composed by pedalling on an ergometer bicycle situation. Then, the footage showed the whole body of the model pedalling on an ergometer bicycle with peak power (watt) results. Blank screen was displayed at the end of video recording to allow the participants to begin their self-talk and imagery practice.

***Motivational Self- Talk with Imagery-Video Modelling Footage***

A motivational self-talk cue words given to the participants for practice were "I can do it" and "Keep Going". However, the participants were free to use any cue words which was suitable to a motivational self-talk list provided. The motivational video footage started with the imagery audio instruction using female voice based on an imagery script composed by pedalling on an ergometer bicycle situation. Then, the footage only showed the leg pedalling

of the model on an ergometer bicycle. The blank screen was displayed at the end of video recording to allow the participants to begin their self-talk and imagery practice.

***Statistical analyses***

All data were normally distributed, anaerobic performance was analyzed using the Mixed-Design ANOVA and post hoc Tukey HSD to measure significance differences.

**Results**

The total of 45 males participated in this study. The results showed that mean age was 21 ± 1 years old, mean body weight was 63.03 ± 8.18 kg, mean body height was 1.68 ± 0.05 m, and mean body mass index was 19.24 ± 2.5 kg/m². The 30 seconds Wingate test protocols was used to measure the peak power, total work, fatigue index, maximum heart rate, average heart rate and self-efficacy in pre and post-test that involved three groups, namely instructional, motivational and control group.

**Table 1.** Pre-test and post-test for peak power, total work and fatigue index within 30 seconds Wingate test mean scores

| Group | Peak Power (watt) | | Total Work (kilojoule) | | Fatigue Index (%) | |
|---|---|---|---|---|---|---|
| | Pre-test (Mean±SD) | Post-test (Mean±SD) | Pre-test (Mean±SD) | Post-test (Mean±SD) | Pre-test (Mean±SD) | Post-test (Mean±SD) |
| Instructional | 917.52 ± 171.84 | 942.22 ± 206.49 | 16.85 ± 1.19 | 15.80 ± 1.76 | 69.88 ± 17.09 | 71.74 ± 13.85 |
| Motivational | 741.07 ± 62.45 | 797.45 ± 94.79 | 14.85 ± 1.69 | 13.95 ± 1.61 | 63.96 ± 9.16 | 74.53 ± 9.85 |
| Control | 611.29 ± 77.50 | 723.24 ± 103.69 | 13.26 ± 2.15 | 13.02 ± 1.33 | 58.88 ± 11.88 | 74.04 ± 8.16 |

Table 1 showed the mean and standard deviation of participants' anaerobic performance. For peak power, there was significant difference between groups, $F$ (1, 42) = 21.97, $p < 0.000$, partial $\eta^2 = 0.51$, large effect size. There were significant differences ($p < 0.05$) in post hoc Tukey HSD test between groups except for motivational and control group ($p > 0.05$). These showed that the method applied in instructional group was effective to improve participants' peak power performance.

Moreover, there was a significant difference in peak power within subjects effect, which was in pre-test and post-test, Wilks' Lambda = .61, $F$ (3, 40) = 8.68, $p$ = 0.000, partial $\eta^2 = 0.39$, large effect size. These results showed that there were some increases in peak power scores across between the two time period. For the interaction between time and group, there was a significant difference from Wilks' Lambda = .71, $F$ (6, 80) = 2.45, $p$ = 0.032, partial $\eta^2 = .16$, with large effect size.

In total work, there was significant difference between groups, $F$ (1, 42) = 5.24, $p$ < 0.05, partial ŋ² = 0.20, with large effect size. There were significant differences (p < 0.05) in post hoc Tukey HSD test between groups only for instructional and control group. These results showed the effectiveness in instructional group participants' for total work results.

Furthermore, there was a significant difference in total work within subjects effect during the pre-test and post-test, Wilks' Lambda = .61, $F$ (3, 40) = 8.68, $p$ = 0.000, partial ŋ² = 0.39, with large effect size. These results showed that there were data increases for total work scores across the two time period. For the interaction between time and group, there was a significant difference from Wilks' Lambda = .71, $F$ (6, 80) = 2.45, $p$ = 0.032, partial ŋ² = .16, with large effect size.

Conversely, for fatigue index, there were no significant difference between groups, $F$ (1, 42) = 2.74, $p$ > 0.05, partial ŋ² = 0.12, moderate effect size. These results showed that there were no differences among instructional and motivational intervention participants 'for fatigue index.

Moreover, there was a significant difference in fatigue index results within subjects during the pre-test and post-test, Wilks' Lambda = .61, $F$ (3, 40) = 8.68, $p$ = 0.000, partial ŋ² = 0.39, with large effect size. These results showed that there were data improvements for total work scores across the two time period.

**Table 2**. Pre-test and post-test for maximum heart rate and average heart rate within 30 seconds Wingate test mean scores

| Group | Maximum Heart Rate (bpm) | | Average Heart Rate (bpm) | |
|---|---|---|---|---|
| | Pre-test | Post-test | Pre-test | Post-test |
| | (Mean±SD) | | (Mean±SD) | |
| Instructional | 165.27 ± 12.78 | 164.07 ± 9.20 | 126.93 ± 11.34 | 124.40 ± 7.92 |
| Motivational | 171.07 ± 15.99 | 168.80 ± 11.97 | 130.27 ± 14.40 | 125.93 ± 13.06 |
| Control | 169.73 ± 15.81 | 167.80 ± 11.31 | 125.80 ± 18.78 | 120.73 ± 13.89 |

Table 2 showed the mean and standard deviation of maximum heart rate and average heart rate among instructional, motivational and control group, before and after 30 seconds Wingate test. In maximum heart rate, there was no significant difference between groups, $F$ (1, 42) = 1.16, $p$ > 0.005, partial ŋ² = 0.05, small effect size. These showed that instructional and motivational intervention does not affect to participants' maximum heart rate.

There were also no significant difference in maximum heart rate within subjects in pre-test and post-test, Wilks' Lambda = .92, $F$ (2, 41) = 1.74, $p$ = 0.189, partial ŋ² = 0.78, large effect size. These showed no increases of maximum heart rate scores across the two time period.

For average heart rate, there were no significant difference between groups, $F$ (1, 42) = 0.74, $p$ > 0.005, partial ŋ² = 0.03, small effect size.

**Table 3.** Pre-test and post-test for self-efficacy within 30 seconds Wingate test mean scores

| Group | Self-efficacy (%) | |
|---|---|---|
| | Pre-test (Mean±SD) | Post-test (Mean±SD) |
| Instructional | 66.53 ± 10.03 | 73.64 ± 7.11 |
| Motivational | 82.91 ± 8.31 | 83.21 ± 7.47 |
| Control | 50.49 ± 10.43 | 58.58 ± 8.15 |

Table 3 showed the mean and standard deviation of self-efficacy among instructional, motivational and control group, before and after 30 seconds Wingate test. There was significant difference between groups, $F$ (1, 42) = 64.75, $p < 0.05$, partial $\eta^2 = 0.10$, with moderate effect size. There was significant difference ($p < 0.05$) in post hoc Tukey HSD test between groups. These showed that the instructional and motivational intervention does affect participants' self-efficacy.

Moreover, there was significant difference in participants' self-efficacy within subjects during the pre-test and post-test, Wilks' Lambda = .79, $F$ (1, 42) = 10.75, $p = 0.002$, partial $\eta^2 = 0.20$, with large effect size. These results showed increases of self-efficacy scores across the two time period. However, there was no interaction between time and group, Wilks' Lambda = .89, $F$ (2, 42) = 2.42, $p = 0.102$, partial $\eta^2 = 0$ .10, with moderate effect size.

**Discussion**

Based on the findings, there were significant differences among the three groups ($p < 0.05$) and also across the two time periods ($p < 0.05$), particularly during the pre and post-tests. However, only the instructional group indicate major effects especially in the peak power and total work scores. For fatigue index score, there was no significant difference ($p > 0.05$) among the three groups. However, there is an increased fatigue index score ($p < 0.05$) across two time periods pre and post-test for all three groups. This indicates that the anaerobic capacity in instructional group was higher than the control and motivational group. Anaerobic capacity can be defined as the amount of work done or energy produced in the anaerobic process during a short period of time and high-intensity training is complete. In other words, the anaerobic capacity is the ability of an individual to survive in physical activity, repeated short-term (up to 90 seconds) at a maximum or near-maximum (Foran, 2001).

Parra, Cadefau, Rodas, Amigo and Cusso (2000) study reported after 4 weeks of training, the peak power and total work in 30-seconds Wingate test increased significantly for group training. In addition, the Stathis, Febbraio, Carey and Snow (1994) study also found that there is a change in the total work that involves a maximum work of 30 seconds after 7 weeks of training. According to Bar-Or et al. (1987) high total work can be obtained with maximum power and time, which is used to determine the production of anaerobic phosphagen. Therefore, the amount of work done in a maximum of 30 seconds or an average power will be the base index of anaerobic capacity. In other word, the higher the energy

capacity, the higher the potential implementation of a work that involves high intensity to maintain effort beyond. According to Inbar, Bar-Or and Skinner (1996), the increase in activity associated with a peak power is strongly associated with an increase in the amount of ATP and the rate of decline in full. The increase in activities related to the total work is basically leads to increased levels of glycolysis which cause an increase in peak power output, the maximum concentration of lactate and maximum oxygen debt for a period of 20 to 45 seconds. However, Zupan, Arata, Dawson, Wile, Payn and Hannon (2009) stated that the fatigue index is inconsistent with the peak power. Individual with high or low fatigue index does not directly indicate the ability of an individual. But, if there are two people who are equally strong athletes, and that one person has a lower fatigue index, then physiologically, that person is an individual who is better on the field. Additionally, no specific values found in any study that builds a classification system for fatigue index (Zupan et al., 2009).

Results from this study indicate that interventions that incorporate self-talk, imagery and video-modelling had a positive effect on participant's instructional groups. This shows that, self-talk and imagery in the form of instructional helps individual get information more precisely about something more specific in improving performance. In this study, video-modelling has been used as an additional tool for conveying information at a skill more clearly, and this facilitates the study participants to replicate the treatment, as shown by the model in the video and by the use of cue self-talk and imagery. According to Theodorakis (2000), the effectiveness of self-talk is dependent on the 'nature' of the task carried out. Therefore, the instructional self-talk is more beneficial to the characteristics of assignments in the form of accuracy for the implementation of these skills that can be assisted through increased focus attention on the technical side of implementation. For motivational self-talk there was some beneficial to the characteristics of assignments in the form of strength and endurance for the implementation of these skills can be assisted through increased trend.

In the study of Ram, Riggs, Scaling and Landers (2007), they found significant differences between groups that combined imagery and video-modelling. They suggested that among new athletes (novice), intervention modelling can contribute to better performance compared to that obtained from the purely physical exercise. In addition, an improvement in performance is also dependent on the climate of motivation or a positive social environment that influence and modulate motivation of individuals involved in the performance of a skill. This study result is also in line with the Social Cognitive Theory adapted from Bandura (1997) puts the network structure of cause and effect that depend on agents behaviour of individual effort itself, the personal belief of individuals, and the environmental conditions that feedback whether positive or negative. According to Karaba-Jakovljevic, Popadić-Gacesa, Grujic, Barak and Drapsin (2007), bio-feedback techniques such as verbal encouragement and visual feedback is often used to enhance performance.

In the current study, the positive feedback is video-modelling that showed model testing Wingate 30 seconds and feedback can also be known as visual feedback and verbal encouragement was helped by the positive self-talk. Both these feedback techniques either in the form of instructional or motivational research has helped participants to better trust themselves in 30 seconds Wingate test to perform it more effectively. In fact, both of these techniques also works with imagery exercises that helps participants to shape or reshape the

treatment of a skill demonstrated by the model in the video-modelling it in their minds before the image is applied in real situations and skills. Karaba-Jakovljevic et al. (2007) also stated that, motivation self-talk plays an important role in all the tests that require a comprehensive energy and maximum effort. When assessing the capabilities and requires maximum effort, it is very important to achieve a high level of motivation. Thus, the results obtained shown that motivation self-talk will help reflect the maximum individual effort.

## Conclusion

In conclusion, results in this study showed that the intervention that combined the self-talk, imagery and video-modelling whether in the form of instructional and motivational has affected participants to increase their performance in peak power and total work but not for the fatigue index.


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Nursahaniza Sato
Faculty of Sports Science and Coaching,
Sultan Idris Education University,
Tg Malim, Perak
E-mail: nursahanizasato@gmail.com