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The role of mental imagery and stress management training in the performance of female swimmers

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ABSTRACT

Objectives: The purpose of this research was to study the role of mental imagery and stress management training in the performance of female swimmers.

Methods: The present study included 30 female amateur swimmers (age range 12-15 years) of the swimming team of Zahedan (Iran). A total of 15 swimmers were randomly assigned to the experimental group and the other 15 to the control group. The experimental group received mental imagery and stress management training. Stress management was assessed with the Short Form of the Depression, Anxiety and Stress Scale (DASS-21), mental imagery was evaluated with the Movement Imagery Questionnaire-Revised (MIQ-R), and swimming performance swimming front crawl 25 meters.

Findings: After the intervention program, the participants of the experimental group significantly improved their DASS-21 scores (mean difference between pre-test and post-test = 4.37), their MIQ-R scores (mean difference between pre-test and post-test = 4.54) and their swimming performance (mean difference between pre-test and post-test = 0.83 seconds).

Conclusions: Mental imagery and stress management training can significantly improve the performance of female swimmers. These results should be considered by swimmers and coaches and should be applied to swimming training.

KEYWORDS

Mental imagery; Stress management; Female athletes.

1. INTRODUCTION

The psychology of applied science and the study of behavior and mental processes are based on scientific findings. Behavior refers to activities that are visible and measurable, such as talking and walking. However, mental processes refer to actions and processes that cannot be directly understood and seen, and their development may be seen in behavior and other processes, such as thinking,

excitement, fear [1]. In other words, psychology deals with psychological behavior and processes, which refers to the behavior of all the direct and indirect visible actions, and the meaning of psychological processes such as feelings, perceptions, thinking, intelligence, personality, excitement, incitement, memory [2].

The first psychological lab was founded in 1879 in the city of Leipzig [3, 4]. Psychology studies topics such as perception, learning and individual differences (using different tests of intelligence, measuring individual physical disabilities and psychological actions). Psychology has been introduced as a scientific discipline for a closer look at the subjects studied. Some subdisciplines are clinical psychology, psychosocial education, psychoanalysis of exceptional children, incitement and excitement.

One of the major disciplines of psychology, which is very studied nowadays, is the psychology of sport. Sports psychology is a branch of sport science that seeks to provide answers to various questions about human behavior in sport. As psychology deals with the study of behavior, sports psychology is also the study of movements in all aspects. Sport psychology was recognized as a discipline of psychology in 1986 [5]. Studies have shown that various factors affect athletic performance of athletes of different sports. Various psychological variables such as self-esteem, concentration, and stress management skills are among the factors influencing athletes' performance. Also, the role of mental imagery (as one of the most influential variables) and hardiness are the most important psychological characteristics in reaching sports success [6]. Hardiness is the ability to withstand hardships that allows athletes to learn repeatedly from failures and obstacles. In sum, hardiness or endurance is the ability to cope with hardships and pressures, to overcome obstacles and failures, to focus on the goal, to maintain calm after failure, to run stably at high competitive levels and to compete [7].

Imagery has many forms that are often known as "mental exercises" in sports psychology. Subjective imaging is a general process, while mental training is considered as a form of imagery. Imagery may be applied based on the learning process, the type of skill information and divided into two types of visual (external-internal) visualization and motion imagery, whose external form is most commonly used in the early stages of skill learning. Gradually, the athlete, while learning the skill, internalizes it (inner imagery) to the point where he imagines all the movements using his muscle sensation (motion picture) [8]. Some athletes use it as a strategy to monitor their performance and correct their mistakes [9]. In this case, imagery eases the raise of one's sense of worth. Bandura (1986) pointed out that, if people self-portrayed others in the practice of doing something, then they would be able to do it better [10].

Athletes pursue different goals using imaginary imagery [11]. These goals have already been introduced by Hausenblas et al. (1999): a) Visual imaging used by the athlete to reach apparent goals, such as weight loss and better body figure; b) Energy imagery used to strengthen and overcome stress; c) Athletes who use the technique of imagery to review the correct state and form of the body during execution [11]. The environment as an element in mental imagery is the simulation of the competitive environment and the mental imagery environment [12]. In this part of the model, Smith and Holmes (2004) found that gymnasts and field hockey players had better performance after mental imagery in the same environment [13].

Fournier et al. (2005) viewed the impact of a psychological skills training program on the performance and mental skills of ten female national gymnasts. The results showed that the psychological skills training program had the highest impact on image, relaxation, concentration and recovery skills, but did not affect the response to stress [14]. Special focus on imagery was reported to improve performance [15]; for example, some studies have determined that professional golfers divide their performance into normal shots, such as putting ball and perception of each section separately [16]. The results of previous studies in this field show that mental imagery is more effective than infertility, but has less influence in comparison with physical training [17, 18]. Olson et al. (2008) illustrated the effect of imagery on jump height in skilled jumpers and showed that imagery in combination with physical exercise significantly raises the jump height [19]. In another study, Robabeh et al. (2009) compared the outcome of physical exercises, cognitive-physical exercises, and motivational-physical exercises imagery on the acquisition, retention and transfer of free basketball shots, finding that the physical training group was better at the acquisition stage, although the cognitive imaging group reached better results in transfer and retention tests [20]. Based on the symbolic learning theory, imagery creates a motion program in the central nervous system, and this motion program leads to the creation of a brain plan for proper movement. Also, imagery helps beginners to learn the cognitive elements associated with successful performance [19, 21, 22].

According to previous research, the main question of the current research is that, by using mental imagery, performance and tactics of athletes may be significantly improved [23]. Motivational imagery tends to be more effective on motivational and cognitive aspects [24]. Also, mental imagery can improve motor performance in aerobic athletes [25]. Hatami, Tahmasbi & Shahmir (2017) looked at the effect of the observation and imagery of the action on the suppression of the mu rhythm in a basketball free throw. The results of the study showed that the suppression of myocardial rhythm is more related to observation than to imagery and, therefore, viewing is more effective than visual imaging in the educational process [26]. Hans Selye (1956) describes stress as follows: An

environmental factor that has the property of harm and causes physical damage that may be detected with extensive physiological effects. According to this author, these physiological effects and responses are the same for all people, and this process has three stages of physical and psychological knowledge, which is known as public compatibility [27, 28].

The study of stress in the academic realm is a fairly new chapter in sports psychology. The growth and reputation of sport psychology is based on the fact that exercise performance does not depend on physiological factors, such as physical fitness, and biomechanics, such as technique. Psychological factors, including psychological fitness, play a valuable role in determining the performance of athletes, especially in the final stages [29, 30]. In a study of the factors influencing sports performance on Canadian Olympic athletes, it was concluded that, among the three main factors of physical and mental fitness that were evaluated, mental fitness was the only factor significantly related to final classifying for the Olympics [31].

Noblet and Gifford (2002) identified football game stressors, job requirements and educational needs as sources of stress for Australian footballers [32]. Miller and Kerr (2002) found that the educational needs of these subjects are an important source of stress [33]. Cohn (1990) confirmed the above finding in student golfers [34]. Goyen and Anshel (1998) studied the sources of athletes' stress with regard to age and gender, regardless of their sport, and concluded that the main source of stress in athletic women was social evaluation [35]. Other studies found that other sources of stress in athletes were fear of injury, fear of lack of concentration, hearing loss, media attention, coach, companions and bad weather. Also, the lack of correct tactics for coping may be accompanied by a drop in performance in the athletes [36, 37].

Imagery is a multi-sensory experience that does not occur in the mind without an environmental view. Imagery allows the athletes to practice their skills and techniques of exercising the mind without real environmental stress [38]. Vealey (1988) argues that skilled athletes skillfully manage their mental imagery, control it and adjust it to reach predetermined goals [39]. Mental imaging is effective as a physical exercise and as a replacement for physical exercise. Also, mentors and athletes consider mental imagery as a positive and fulfilling task to help in various aspects of athletic performance [39]. Research has shown that mental training, like physical training, may improve motor skills [40-44], as the same nervous mechanisms are activated in learning with physical exercise or mental training [45, 46].

The purpose of this research was to study the role of mental imagery and stress management training in the performance of female swimmers.

2. METHODS

2.1. Participants

The present study included 30 female amateur swimmers (age range 12-15 years) of the swimming team of Zahedan (Iran). All 30 swimmers had previously trained front crawl. A total of 15 swimmers were randomly assigned to the experimental group (age 13.6 ± 3.5 years) and the other 15 were randomly assigned to the control group (age 13.4 ± 3.6 years). This study was approved by the Physical Education Organization of Zahedan (Iran). The coaches of the swimming team were informed about the study and agreed to collaborate. The swimmers that participated in the study signed and informed consent.

2.2. Intervention program

Both experimental and control groups participated in 7 sessions of 90 minutes (2 sessions per week). In each session, the control group only had the usual swimming training during the 90 minutes, while the experimental group swam during 80 minutes and had 10 minutes of mental imagery and stress management training.

2.3. Measures

2.3.1. Short Form of the Depression, Anxiety and Stress Scale (DASS-21).

It consists of 21 items, 7 items per subscale: depression, anxiety and stress. The DASS-21 questions are graded based on a four-point Likert scale (response options 0, 1, 2, 3). Patients are asked to score every item on a scale from 0 (did not apply to me at all) to 3 (applied to me very much). The total score is computed by adding up the scores on the 21 items. Sum scores for the total DASS scale thus range between 0 and 63. A cut-off score of 31.5 is used for the total DASS score, meaning that a score >31.5 is considered “high” or “severe”. The validity of this questionnaire in Iran was investigated by Siamak & Bahram (2007), obtaining a test re-test reliability of 0.77, 0.76 and 0.80 for depression, anxiety and stress, respectively [47]. Also, the Cronbach's alpha that these authors reported was 0.82 [47].

2.3.2. Movement Imagery Questionnaire-Revised (MIQ-R).

It is a questionnaire to assess motor imagery ability that was developed as a short version of the Movement Imagery Questionnaire (MIQ). The MIQ consists of 18 items (9 items each for visual

and kinesthetic subscales), and the short version, the MIQ-R, consists of 8 items (4 items each for visual and kinesthetic subscales). The MIQ-R total score ranges from 8 to 56. Response options are presented in a Likert scale of seven grades (1 very difficult - 7 very easy). MIQ-R is an appropriate instrument for the assessment of visual and kinesthetic movement imagery abilities [48].

2.3.3. Swimming performance.

The test consisted of swimming front crawl 25 meters as fast as possible. The time of each swimmer was recorded.

2.4. Statistical analysis

Descriptive statistics (mean, standard deviation, minimum and maximum) were used to analyse all the variables. Paired sample t-test was used to calculate differences between pre-test and post-test in both experimental and control groups. The statistical analysis was performed with SPSS 23. The level of statistical significance was set at $P < 0.05$.

3. RESULTS

The participants of the experimental group significantly improved their DASS-21 scores after the intervention program (mean difference between pre-test and post-test = 4.37), while the mean difference in the control group was lower (mean difference between pre-test and post-test = 1.16). (Table 1).

Table 1. DASS-21 scores in pre-test and post-test in experimental and control group

Groups	N	Mean Pre-test	Mean Post-test	Mean Difference
Experimental	15	14.86	10.49	4.37
Control	15	8.37	7.21	1.16

Short Form of the Depression, Anxiety and Stress Scale (DASS-21).
Minimum possible score: 0. Maximum possible score: 63.

The participants of the experimental group significantly improved their MIQ-R scores after the intervention program (mean difference between pre-test and post-test = 4.54), while the mean difference in the control group was lower (mean difference between pre-test and post-test = 1.07). (Table 2).

Table 2. MIQ-R scores in pre-test and post-test in experimental and control group

Groups	N	Mean Pre-test	Mean Post-test	Mean Difference
Experimental	15	44.06	48.60	4.54
Control	15	21.20	22.27	1.07

Movement Imagery Questionnaire-Revised (MIQ-R).
Minimum possible score: 8. Maximum possible score: 56.

The improvement in time performance of the experimental group was significant (mean difference between pre-test and post-test = 0.83 seconds), while the mean difference in the control group was lower (mean difference between pre-test and post-test = 0.06 seconds). (Table 3).

Table 3. Time performance in front crawl 25 meters in pre-test and post-test in experimental and control group

Groups	Time Performance	N	Mean	Std. dev.	Minimum	Maximum
Experimental	Pre-test	15	19.54	2.47	16.55	25.42
	Post-test	15	18.71	2.09	15.97	24.61
Control	Pre-test	15	25.77	2.47	21.88	29.60
	Post-test	15	25.71	2.46	21.78	29.75

4. DISCUSSION

The findings of this study showed that the training of stress management skills reduces the stress of female swimmers. These results are similar to those found by other previous studies [23-26]. Furthermore, it was found that stress management skills training has an effect on enhancing mental imaging. These results are consistent with the results of other authors who studied other sports such as rugby or volleyball [49-53].

In this study, it was found too that mental imagery and stress management training can improve the performance of female swimmers. This result is consistent with the results of Thelwell et al., who found that using psychological skills training can improve motor performance in soccer midfielders [54]. The main advantage of mental imagery is that is a type of exercise that is available to athletes anywhere and anytime.

Considering the positive results of the present study, the authors suggest that future studies consider the gender factor too including also males in the sample, as the participants of this study were all females and it was not possible to assess the influence of gender. It is recommendable too to carry out similar studies in different age groups and control the influence of other variables such as level of

physical activity, diet, mental health and motivation. In addition, in this study only swimmers were analysed, therefore future research should pay attention to other sports too. Finally, other related line of research would be the analysis of injured athletes and the potential of mental imagery to prevent a severe decline in their technical abilities, or the use of mental exercises as a way to rehabilitate patients who have lost their skills as a result of an injury or illness.

5. CONCLUSIONS

In conclusion, mental imagery and stress management training can significantly improve the performance of female swimmers. These results should be considered by swimmers and coaches and should be applied to swimming training.

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CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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