World Journal of Sport Sciences 5 (2): 120-124, 2011
ISSN 2078-4724

Effect of Development of Some Mental Imagery Abilities on Some Skills and Brain Map for Competitive Swimmers

Ahmed A. Farag

Department of Physical Training, Faculty of Physical Education, Port Said University, Egypt

Abstract: This research aims to study the effect of using the audio, visual and movement imagery to imagine situations. Imagery can be used by the brain to provide repetition, elaboration, intensification and preservation of important athletic sequences and skills. These operations leads to change in cortical neurons activity that does appear in enhance beta wave. Where, the use of the EEG is commonly called brainwave training. Tiny electrical impulses from billions of brain cells can be detected by electrodes placed on the scalp and connected to an EEG. Four basic types of brain waves are associated with EEG recordings; Beta waves predominate during periods of excitement and high arousal. Alpha waves predominate when the swimmer relaxes and puts his mind in neutral. It is the alpha waves that the swimmer tries to produce. The other two types are theta waves, which predominate during drowsiness and delta waves, which are associated with deep sleep.

Key words: Front crawl · Beta wave · EEG

INTRODUCTION

Swimming is a physical activity became more related different sports science as physical training, sports physiology, sports biomechanics and sports psychology [1]. The trainers do the best efforts and do plans to prepare their athletes to achieve the best results but fail because of neglect the psychological variables such as mental abilities [2].

Mental imagery involves the athlete imagining themselves in an environment performing a specific activity using all of their senses (sight, hear, feel and smell). The images should have the athlete performing successfully and feeling satisfied with their performance [3]. The mental imagery helps players to understand movement skills in different situation during the game [3, 4]. Shamon [5] suggested that mental training is main part in preparation of swimmer to inter in competition period. It's including on imagery to motion, skills, situations, goals and all distance in the race.

Mental training plays important role to success in sports achievement and neglect this role may harmful the technique. So must care and develop the mental skills to reach to ideal performance [6].

Mental Imagery Authorities: Anan [7] indicated three basics authorities to explain mental imagery.

Psycho-neuro Muscular Theory: The mental imagery leads to neuro/mental pattern like movement pattern that used during movement skills until not do any clear effects in nerves system. So, any repeat order from brain to muscles. The neuro-muscle system will give opportunity to do movement pattern without true movement [7]. This theory maintains that imagery rehearsal duplicates the actual motor pattern that is being rehearsed. His view is that the motor patterns which are generated during imagery practice are the same as those used for physical practice [8].

Symbolic Learning Theory: This is different from the previous theory that instead of imagery working due to muscle activation, mental imagery works from the opportunity to practice the symbolic elements of a motor task [7-9]. Therefore, it is assumed that the learning obtained from imagery relates to cognitive learning [8, 9].

Arousal/activation Theory: This theory Connotes that by practicing imagery, one will obtain a level of arousal that is optimal for the specific performance. The arousal function is a way of "priming" the muscles which, result in a lowering of the sensory threshold of the performance to facilitate performance? [8, 9].

Corresponding Author: Ahmed A. Farag, Department of Physical Training,
Faculty of Physical Education, Port Said University, Egypt.

Peter Lang came up with an information-processing model of imagery which presumes that an image is a functionally organized, definite set of propositions stored by the brain. It is not simply a stimulus in a person's head to which one responds. This image has two main types of statements: response propositions and stimulus propositions. The latter describes the content of the scenario to be imagined. Response propositions, on the other hand, describe the imager's response to that scenario [10]. Lang further states that an image contains a motor program which holds instructions for the imager on how to respond to the image. Hence, the image is a template for overt responding [10]. So modifying either overt behavior or vivid imagery will result in a change in the other [7, 10].

Another popular theory is Suinn's visual motor behavior rehearsal (VMBR) model which posits that imagery should be a holistic process that includes a compete reintegration of experience. This includes visual, auditory, tactile, emotional and kinesthetic cues.[10] he has demonstrated that physiological responses can result from athlete's usage of mental imagery [10]. there recent model knows as Ahsen's triple code model of imagery. According to Ahsen there are three fundamental parts to an image. The first part is that the image itself must be a centrally arousing sensation so it is more like the real world. It has all the attributions of a sensation; the only difference is that it is internal [11]. this image provides the imager with so much realism that it can enable them to interact with the image as if it were the real world. Secondly, there exists a somatic response. Therefore, the very act of imaging results in psycho physiological changes in the body [11]. Finally, the third part of the image is the actual meaning of the image. Every image has a significant meaning and that specific meaning can imply something different to each individual. Since every person has a unique background and upbringing, the actual internal image can be quite different for each individual, even though the set of imagery instructions are the same [4, 11].

Kinds of Mental Imagery

External Imagery: It depends on player's ability to collect mind picture to skill or some situation happened before and it is seen from outside yourself, like watching a videotape of your performance [12].

Internal Imagery: It depends on player's ability to feedback the brain image to sports skill or any situation which he gained or thought. It's come from inner. Internal imagery has visual and kinaesthetic components; an image of what you actually see as you perform and the kinaesthetic image of how you feel? the body experience? [13].

Principle of Mental Imagery:	
Relaxation	Actual goals
Quality goals	Multi sense
Imagery by erect speed for performance	Irregular practice

Enjoy by doing mental imagery

The Different Using of Mental Imagery:

- The aid of rapidity teaching for movement skills.
- The aid of rapidity learning tactic.
- The aid of maintenance of performance problems.
- The practice on psychological skills.
- The aid of controlling on physiological responds.
- Review and analysis the performance.
- Improve the positive thinks and self-confidence.
- The aid on tolerance fatigue and rapid recovery [14].

The Basic Training on Mental Imagery: It's more important to training on mental imagery and enhances mental skills. Also, must include on three groups aim to:

- Vivid images.
- Controllability.
- Self perceptions [15].

Training Methods of Mental Imagery: There're many methods to train on mental imagery such as:

- Individual and group training.
- Using videotape training.
- Using mental training documents [16].

MATERIAL AND METHODS

6 swimmers subjects (12.7±0.95 years old, 54.5±2.22kg and 156.1±3.87cm) and all participated in the Mesocycle for 6 weeks of imagery training. Swimmers examined 100m freestyle record and evaluated the audio, visual and movement imagery by imagery chart in sports field for El Araby and Ismail (1996) and modified by the researcher [17]. Also, the researcher tested the brain map by EEG.

Statistical Analysis: Data were examined using SPSS statistical software (Version 16.0 SPSS for Windows, SPSS Inc., Chicago, IL). All subjects were represented for each test. Descriptive characteristics were expressed as mean values, standard deviations (SD) and nonparametric static. The level of significance was set at $p < 0.05$.

RESULTS AND DISCUSSION

Table 1 shows mean values ± standard deviation (SD) of age, training age, weight and length.

Table 2 shows mean values ± standard deviation (SD) of mental imagery abilities.

Table 3 shows mean values ± standard deviation (SD) of 100m freestyle record level for swimmers.

Tables 1-3 show mean values ± standard deviation (SD) of age, training age, weight, length, mental imagery abilities, 100m freestyle record level for swimmers.

Table 4 shows Wilcoxon Signed Ranks Test in all mental imagery variables and 100m freestyle record for swimmers.

On the whole, there are significant variances between before and after program in mental imagery abilities. The visual and movement imagery were increased in swimming but was statistical not different in audio imagery. Also, there is improvement in 100m freestyle record.

Figure 1illustrates that difference in spectral maps for young swimmer before mental imagery and after mental imagery program.

Table 1: Participants' swimming characteristics overview

Activity	n	Age (yrs)	Training age (yrs)	Weight (kg)	Length (cm)
Before	6	12.	4.4	54.5	156.1
		±0.95	±0.52	±2.22	±3.87

Table 2: Mental imagery abilities for swimmers

Activity	n	visual imagery	audio imagery	movement imagery
Before	6	7.5	4.0	8.5
After	6	±0.55	±0.0	±0.55
		19.17	4.0	19.67
		±0.98	±0.0	±0.82
Activity	n	visual imagery	audio imagery	movement imagery
Before	6	7.5	4.0	8.5
After	6	±0.55	±0.0	±0.55
		19.17	4.0	19.67
		±0.98	±0.0	±0.82

Table 3: 100m freestyle record for swimmers

Activity	n	100m. freestyle record
Before	6	1.09.83
After	6	±1.94
		1.07.00
		±2.76

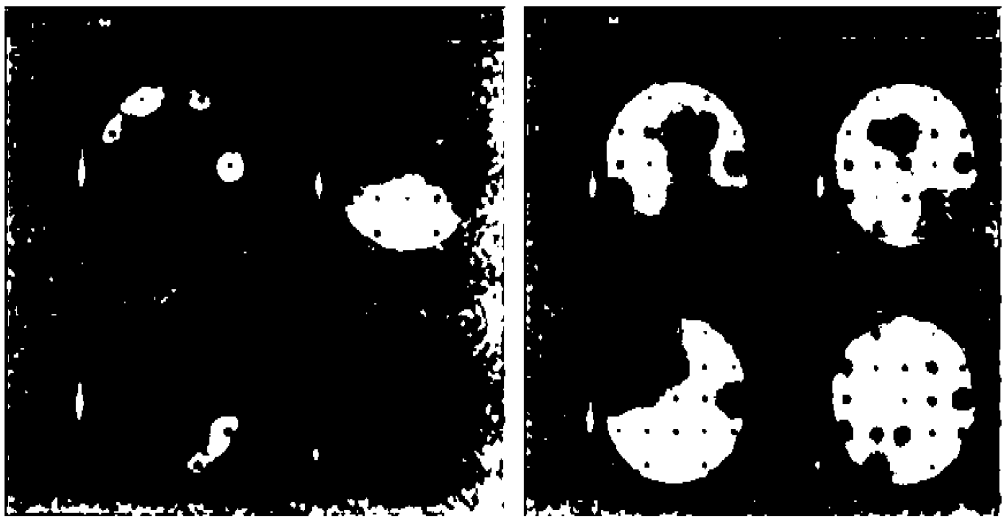

Fig. 1: Spectral map

Table 4: Mental imagery abilities and 100m freestyle record at pre and post -trial for swimmers

		Mean Rank		Sum of Ranks			
Static's Data		---		---			
Variables	N	-	+	-	+	Z Value	Asymp. Sig.
visual imagery	6	0.00	3.50	0.00	21.00	-2.220*	0.026
audio imagery	6	0.00	0.00	0.00	0.00	0.00	1.00
movement imagery	6	0.00	3.50	0.00	21.00	-2.232*	0.026
100m. freestyle record	6	3.50	0.00	21.00	0.00	-2.232*	0.026

*P<0.05

DISCUSSION

The central objective of the present study was to analyze the effect of development some mental imagery abilities on 100m. Freestyle record and brain map for young competitive swimmers age's 12-14years, Similar to results of other studies conducted in participants exercised on Monark Ergomedic 818 cycle for 15-min period. Where, the time effects for EEG activity in the alpha and beta bands in the exercise condition. The beta activity was lower than baseline during the videotape watching and not significantly different from baseline during recovery. The brain activation was changed across time in both the exercise and the non-exercise conditions. EEG beta activity decreased below baseline (i.e., decreased brain activation) during the videotape watching and returned to baseline afterwards. EEG alpha activity decreased and EEG beta activity increased above baseline (i.e., increased brain activation) during the exercise bout and returned to baseline afterwards [18].

This study agree with the previous research (Ahmed A. & Abd el Rahman K. 2001) reported that mental training program leads to improve to improve mental abilities (relaxation, imagery and attention concentration) for water polo and basketball players [1].

Also, this study according with Fontani *et al.* [19] that indicated a progressive modification of the profile of the waves from Test 1 to Test 5 during imagery, showing significant variations of the amplitude of the waves related to the premotor and motor execution periods. Results show that motor imagery can influence muscular abilities such as strength and power and can modify Movement Related Brain Macro potentials, the profile of which potentially could be used to verify the effectiveness of motor imagery training.

However, the values presented in the present study showed improve in record level for 100m freestyle. Where, improved in mental abilities leads to enhance the performance, also mental imagery involves the athletes imagining themselves in a specific environment or performing a specific activity to helps them to modify the technique. So, control in them tension especially during the computation for young swimmers.

Shamon [5] indicated to the mental imagery helps the brain to make motor plan to change special situation, that's explain how the mental imagery develops the performance and promote the skills.

Also, agree with Candice [20] that designated to swimmers were extremely high in both cognitive and somatic anxiety pre-intervention. His study served to demonstrate that cognitive and somatic anxiety scores can be controlled in an effort to eliminate the negative effects of high levels of anxiety.

CONCLUSION

The present study suggests that the brain responds to mental training program. Where, decreased beta wave that appears in brain map with the purpose of control of anxiety and reverse on enhance the record level for 100m freestyle.

With the present study we confirmed the importance of develop of mental abilities in swimming training especially for young swimmers to enhance their performance and control in anxiety which company with competition periods.

ACKNOWLEDGMENT

This work was supported by Dr. Abdel Rahman A. Hassan Prof. nerves and brain medicine in Faculty of medicine Zagazig Univ., Egypt.

REFERENCES

1. Farag, A.A. and A.K. Dabaih, 2001. Effect of mental training program on shooting accuracy and electroencephalograph for basketball and water polo players. Archivos De Medicina Del Deporte, 18: Spain, ISSN 0212-8799.
2. Ahmed, A.F., 2005. Effect of mental imagery and attention concentration program on functional efficiency of central nervous system and some basic skills for soccer youngsters under 14years. Ph.D. Thesis, Faculty of Physical Education, Suez Canal Univ., Port Said, Egypt.
3. Alawy, M.H., 1992. Psychology for competitive and sports training. Dar El -Ma'ref, Cairo, Egypt.
4. Rateb, O.K., 1995. Sports psychology (concept & application). Dar El- Fikr Elaraby, Cairo, Egypt.
5. Shamon, M.A., 1996. Mental training in sports field.Dar El Fikr El Araby, Cairo, Egypt.
6. Shamon, M.A. and A. El Gamal, 1996. The mental training in tennis. Dar El -Fikr Elaraby, Cairo, Egypt.

7. Anan, M.A.,1995. Psychology in sports & physical education (theory, apply and practice). Dar El -Fikr Elaraby, Cairo, Egypt.
8. Rateb, O.K., 1990. Motives of achievement in sports field. Dar El -Fikr Elaraby, Cairo, Egypt.
9. Alawy, M.H., 2002. Psychology for competitive and sports training. Dar El -Fikr, Cairo, Egypt.
10. Alawy, M.H., 1997. Psychology of trainer and sports training. Dar El -Ma'ref, Cairo, Egypt.
11. Abdel Hammed, M.M., 2000. Effect of development attention and imagery on serve style for volleyball players. MD., Faculty of Physical Education, Zagazig University, Egypt.
12. Shamon, M.A., 1982. Movement imagery and relationship with style performance in gymnastic for Egyptian players. J. Faculty of Physical Education, Helwan University, Egypt, 4: 21-29.
13. Quick, A., 1988. A skydiver's guide to mental training. Australian Parachute Federation, Australia.
14. Byra, M., 1982. Effect of mental practice on the performance of motor skills volleyball. Technical J., 7: 52.
15. Cohn, P.J., 1990. Pre-performance routines in sport: theoretical and practical applications. The Sport Psychologist, 4: 301-312.
16. Moustafa, M.R., 2004. Effect of mental imagery program for spiking skill on its performance level and some mental sides for volleyball players less than 17 years. Ph.D. Thesis, Faculty of Physical Education, Suez Canal Univ., Port Said, Egypt.
17. Shamon, M.A. and M. Ismail, 1983. Effect of mental training program on style performance on horse in gymnastic for physical education students. Education J., Cairo, Egypt, 5: 34.
18. Mircea, D., S. Dănoiu and R. Danciulescu, 2001. The aerobic exercise can influence the brain activity, 6th Annual congress of the European college of sport science.15th Congress of German society of sport science, Cologne, Germany, pp: 812.
19. Fontani, G., S. Migliorini, R. Benocci, A. Facchini, M. Casini and F. Corradeschi, 2007. Effect of mental imagery on the development of skilled motor actions. U.S. National Library of Medicine 8600 Rockville Pike, Bethesda MD, 20894 USA.
20. Cates, C.E., 2002. The effect of a mental skills training program on swimmers anxiety levels. 11th world symposium biomechanics and medicine in swimming, Saint-Etienne, France, pp: 195.