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THE IMPORTANCE OF MENTAL TRAINING FOR THE EVOLUTION OF INDIVIDUAL PERFORMANCE

Paula Drosescu (a), Beatrice Abalașei (b)*, Cezar Honceriu (c), Florin Petruț Trofin (d)
*Corresponding author

(a)"Alexandru Ioan Cuza" University, 3 Toma Cozma St., Iași, Romania
(b) "Alexandru Ioan Cuza" University, 3 Toma Cozma St., Iași, Romania
(c) "Alexandru Ioan Cuza" University, 3 Toma Cozma St., Iași, Romania
(d) "Alexandru Ioan Cuza" University, 3 Toma Cozma St., Iași, Romania,

Abstract

Mental training is an important component of general training, which contributes to the increase of individual performance and perfecting the execution of motor acts. Its purpose is to form representations with the help of motor intelligence, through which the processed movement, which resembles its design, can be adapted to concrete athletic tasks. Aside from the fact that the adaptation occurs in record time, it also helps find alternatives to the motor situations, which are strategic in an athletic environment, based on motor schemes and ideomotor representations updated in a short time and in agreement with the action. The investigative research that we have initiated aims to highlight the influence of mental training on the athletic performance and identify a formula for mental training that can be applied in the times when the athlete loses focus. The ideomotor technique applied to the subjects was innovative, the results of the research supporting the idea of performance achieved through this type of training, as an important part of the athletes' evolution. After applying the mental training program, the explosive force of the subjects of our research has increased and, moreover, the results can validate the technique of applying this type of intervention in favour of athletic performance.

Keywords: Mental training, visualisation, (self-) motivation, jumps, heart rate.

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1. Introduction

According to Markova (2004), in order to create correct mental representations, it is of help if we use the appropriate words – otherwise it will harm the understanding, and the intensity of the image can help or hinder knowledge. At the same time as the language, the intensity of the mental image can facilitate or hinder knowledge and the learning processes. Mental representations can be true or false, they are "mirrors or signs of nature" that generate formalisation or symbolic structures that have an integrative and socialising role. The vast polysemy of the term 'representation' can direct us to a multitude of phenomena that make it a concept that is hard to identify socially, but which refers to individual, inter-individual, inter-group and ideological processes that interact and provide the larger dynamics that defines reality and makes it accessible to the activity within the microcosm of sports and motor skills. Representations of all kinds are "the product of our actions and communications" (Moscovici, 1984, p. 12), the image that stands at the border between the hostile reality and ourselves. They can be a system of values, notions and practices related to objects, aspects or dimensions of the environment in which we work that allow us to understand the material space and the adjustment of behaviour according to any new variable (Abalașei, 2009). Depending on the context, the representation through the use of motor intelligence is what adapts movement to the situation at hand. Aside from the fact that the adjustment is accomplished in record time, new solutions, strategies or alternatives to the situation in the athletic environment are found – based on the motor schemes and the ideomotor representations that are actualised very fast. According to Horghidan (2000, p. 104), motor intelligence is expressed and works through specific finalisation. The creation of mental images or mental representations is achieved through the implication of each individual sense, as well as all of them combined. The kinetic sense, for example, is the one responsible for the position of the body in space, the presence or the movement that is born through the stimulation of sensitive nerve endings of the muscles, tendons and joints. Representations in the field of physical education and sports are formed by acquiring physical and psychological techniques that lead to the construction of an ideal image of the process to be executed. The nervous system possesses a complex servomechanism resembling a system for automatic chasing of a target, which guides itself towards that target through feedback and stored information. In his opinion, this servomechanism can be programmed to visualise the objective by using mental imagery, steering itself towards reaching the target with a higher efficiency than if using conscious effort or willpower. The brain will process the imagined information as though it came from real experiences, and therefore this will have a similar effect on the brain as real experiences. So, the psychological-neural-muscular theory, stated by Mikicin (2016), says that an event that is imagined with high intensity can trigger neural and muscular reactions that are similar to those of the real experience, due to a series of correlations between the state of attention, of preparation of a response to a certain stimulus (conscious attention), the state of response with heightened attention (automated attention, unconscious attention) and the alpha state. The images produced in the brain transmit impulses to the muscles with the purpose of executing the imagined movements, although the impulses can be so weak as to not produce movement. Some articles in the literature speak of forming neural paths that create a plan, a map that later helps the subject to execute the movement in question. It is this map relying on the cognitive component that forms the basis of sports performance (Pesce et al., 2016).

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According to Buck, Hutchinson, Winter and Thompson (2016), the mental motor schema formed with the help of mental training can raise the efficacy of the execution – after they analysed self-efficacy of two groups participating in a research focused on the improvement of athletic performance through this alternative method.

2. Problem Statement

Sports training is increasingly complex. This leads to the athlete's mental approach, often this component making the difference between the winner and the loser. For this reason, we want to study aspects related to the mental component of sports training.

3. Research Questions

The hypothesis of the paper resides in identifying if:

- mental training influences athletic performance;
- we can find a formula of mental training that can be applied in the break of a game or at any time when the athlete loses focus.

4. Purpose of the Study

We wish to prove that, if mental training is performed correctly, it can be later used as a means for the (self-) motivation of the athletes, for example: it can be used prior to the start of the competitions, but also in the breaks between sets or rounds.

5. Research Methods

The subjects consisted of a group of 40 students from the Physical Education and Sports Faculty, divided into 2 subgroups of 20 people each. Of the 40 subjects, 13 were female and the rest of 27 were male. The subjects were classified into 2 groups: group A included 6 female and 7 male students who were professional athletes, and the rest, up to 20 people, was made up of students who were not professional athletes. Group B consisted only of students who were not involved in performance sports: 7 females and 13 males. Practicing performance sports was the sole criteria for directing the subjects into one of the two groups. The two groups, A and B, had to follow slightly different protocols. The protocol for Group A was the following: the subjects underwent the initial testing – each of them performed three jumps of each of the following types: squat jump, counter movement jump and free jump (details below); we then applied the POLAR Pro Team device (details below); a 30-minute mental training session (details below); second testing for all three jumps (executed in the same order as the previous time); a 15-minute mental training recall session; third (final) testing: the subjects executed the jumps while being reminded the key-words that they had identified during the mental training session. The protocol applied to Group B was: the subjects underwent the initial testing – each of them performed three jumps: squat jump, counter movement jump and free jump (details below); we then applied the POLAR Pro Team device (details below); a 30-minute mental training session (details below); second testing for all three jumps (executed in the same order as the previous time).

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We differentiated the sessions, because our intention was: to observe whether one session of mental training could significantly increase the amplitude of the jumps; to observe whether there were improvements in the amplitude of the jumps when two sessions of mental training were applied. A brief discussion of the methods used for testing: The three types of jumps that we used were: Squat Jump (SJ): the test focuses on evaluating the explosive power of the lower limbs. The recording of the jump (its height) is done through the use of Just Jump; Counter Movement Jump (CMJ): the test focuses on evaluating the elastic explosive power of the lower limbs. SJ measures the concentric contraction power of the extensors of the knees. The particularity of this jump consists in the starting position: standing with the knees bent at 90°, and this must be maintained for one second – which implies an isolate isometric contraction, unlike the CMJ, which measures the contracting power of the same muscle groups – but in this case, it is an eccentric contraction that is immediately followed by a concentric one, which leads to a higher power due to the elastic energy of the muscles; Free Jump (FJ): the test focuses on evaluating the elastic explosive power in the legs.

The words used were not special in any way, their sole purpose was to connect the conscious mind to the unlimited potential of the subconscious mind that is accessed in a state of relaxation. The words, once heard, become triggers for the individual performance.

6. Findings

As we mentioned in the description of the methods, the difference between the two groups – A and B – resides in the fact that the subjects from group A had one extra 15-minute session of mental training. Given the multitude of values and in order to make the study data easier to follow, we analysed, for each subject, the difference between the values obtained for the jumps, i.e.: the value of the second jump – the initial value; therefore, in the tables included in the work, we have SJ2-SJ1, SJ3-SJ2, CMJ2-CMJ1, CMJ3-CMJ1 and FJ2-FJ1, FJ3-FJ1 (Table 01), while 3, 2 or 1 stand for the third, second or initial jump.

The absolute values have individual significance; from the point of view of the study, we were more interested in seeing whether there were any differences between the jumps, how many of the subjects showed an increase in the number of centimetres following a mental training session and whether repeating the session would bring an increase in the value of the jumps.

Table 01. Summarised data

	SJ 2-SJ 1		**CMJ2-CMJ1**		**FJ1-FJ2**	
	Group A	**Group B**	**Group A**	**Group B**	**Group A**	**Group B**
Average value of jumps	0.1 cm	0.52 cm	0.53 cm	0.98 cm	0.3 cm	0.05 cm

The data showed better values for group B, although group A was the one who included the professional athletes, and their initial values were slightly superior, as can be noticed in Table 02.

Table 02. The average values for the initial testing in all three jumps

	SJ1		**Difference***		**CMJ1**	
Group A	40.21 cm		41.77 cm		47.88 cm	
Group B	40.17 cm	0.04 cm	40.23 cm	1.54 cm	47.21 cm	0.67 cm

*Difference: The average score for SJ/CMJ/FJ jumps in group A; the average score for SJ/CMJ/FJ jumps in group B

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The situation is somewhat unexpected, but the explanation that we have identified relates to the fact that the subjects who practice professional sports expect the improvement of their results to depend solely on the training, and are not used to rely on mental training. The subjects in group B had no particular expectations, they were curious regarding what was happening and approached the testing as a game – all these being premises for the learning and evolution process (Bănică, 2009; Drosescu, 2009). The values obtained by subjects in groups A and B for the initial test and the second test, for all three jumps, are shown in Table 03.

Table 03. The average values for the initial testing in all three jumps

	SJ1			**Difference***			**CMJ1**		
	Group A	**Group B**		**Group A**	**Group B**		**Group A**	**Group B**	
Results*	No. of subjects	No. of subjects		No. of subjects	No. of subjects		No. of subjects	No. of subjects	
+	**10**	**13**	57.5%	**8**	**12**	50%	**10**	**6**	40%
0	**1**	**1**	5%	**2**	**1**	7.5%	**1**	**3**	10%
-	**9**	**6**	37.5%	**10**	**7**	42.5%	**9**	**11**	50%

*Positive results: at the second testing, the score was higher than at the first one; *Result is 0: the same score was obtained at both tests for the jump; *Negative results: the value of the second jump was lower than that of the initial jump.

For the SJ jump, of the 40 subjects included in the study, 23 (57.5%) obtained positive results in the second testing, 2 (5%) did not see any change, while 15 (37.5%) achieved a less good result than in the first testing. For the CMJ jump, of the 40 subjects included in the study, 20 (50%) obtained positive results in the second testing, 3 (7.5%) did not see any change, while 17 (42.5%) achieved a less good result than in the first testing. The FJ jump was executed with higher values in 20 (40%) cases, 4 subjects (10%) did not see any modification, while 20 (50%) achieved a less good result than in the first testing. From the above data, we can observe firstly that, in the cases of SJ and CMJ jumps, the mental training session has added centimetres to the initial value. For FJ, the increase in the value of the jump was smaller than that for SJ and CMJ. Also from Table 03, we can see that there are subjects who have recorded, in variable percentages (37.5%, 42.5%, 50%, respectively), a smaller jump following the mental training session and, moreover, the results underline the importance of mental training for athletic performance. We consider this aspect normal because: not all subjects resonate with a technique like this; it was the first time when they were participating in such a process, and their curiosity did not allow them to relax and to execute the guided commands; there were a few cases when the subjects were very tired and fell asleep during the process; the mental capacity to coordinate and control their own mind and to let themselves be guided into such a process is not often tapped into for those whose thought structure is more analytical. In group A, we included the subjects practicing professional sports. Our observations based on these data are as follows: for each of the three categories of jumps, there were subjects who have improved their performance, both males and females; the percentile distribution of the subjects in group A has varied greatly, from 33.33% (females, FJ3-FJ1) to 83.33% (females SJ3-SJ1) for result columns 1 through 6; the average gain in centimetres is obvious in males: 0.78 cm for SJ, 1.56 cm for CMJ, 1.63 cm for FJ. Compared to the males, the females showed better averages for SJ (2.20 cm) and CMJ (2.16 cm), but a lot of weaker results for FJ (-0.55 cm)

– this is explained by the difference in muscle mass between the two sexes; the average gain in centimetres has small overall values, which makes it statistically insignificant – the statistics was computed with the help of the GraphPad Prism 6 software; even though the values are not statistically significant, we believe that a gain of even 1 cm (for example) can make the difference between winning a medal or not.

The data that we present are obtained after only 30 minutes of mental training and a 15-minute recall session – of the total 45 minutes, the visualisation itself lasting only about 16-17 minutes; another aspect brought forward by the data in the table relates to the competitive spirit and the manner in which the subjects have responded to the challenge of this study: columns 7 through 12 show the average (in centimetres) for the difference between the value of the third jump and the value of the second jump: 1.24, 1.67 and 0.87 cm for males and 0.72, 0.13 and 0.21 cm for females. We interpret this increase in centimetres in the third testing, compared to the second one, for each of the three jumps (SJ, CMJ, FJ), as being the effect of self-motivation once they saw that after the first session of mental training they have achieved progress, which has led to better participation and more intense work in the 15-minute session. The statement is reflected in the number of subjects who have obtained improved results in the third jump: 11 subjects for SJ, 13 for CMJ and 8 for FJ; and in females, 5 for SJ, 3 for CMJ and 4 for FJ. We wish to underline these data as the numbers of 11 and 13 subjects are calculated out of a total of 14 males, and the numbers 5 and 4 are out of a total of 6 females.

Table 04. The summarised data for Group A

Column											
1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**	**10**	**11**	**12**
14 Males			**6 Females**			**14 Males**			**6 Females**		
The value of the difference between the final and the initial sets of jumps						**The value of the difference between the final and the second sets of jumps**					
SJ3-SJ1	CMJ3-CMJ1	FJ3-FJ1	SJ3-SJ1	CMJ3-CMJ1	FJ3-FJ1	SJ3-SJ2	CMJ3-CMJ2	FJ3-FJ1	SJ3-SJ2	CMJ3-CMJ2	FJ3-FJ1
5.08	1.02	3.05	4.32	5.59	7.37	1.02	0.00	1.27	1.52	2.29	0.51
4.57	6.35	1.52	1.02	2.29	1.52	1.02	0.51	-2.03	-0.51	0.00	2.54
3.30	1.78	1.02	3.05	3.81	-8.13	4.06	4.06	2.29	0.00	1.27	2.29
2.79	2.29	0.76	3.30	2.79	-0.76	0.76	3.56	3.05	2.79	-0.25	0.51
2.54	2.29	5.84	2.54	-0.25	-0.76	2.54	0.51	-1.78	0.25	-1.52	-3.30
5.59	6.35	-0.25	-1.02	-1.27	-2.54	0.25	1.52	-2.79	0.25	-1.02	-1.27
1.02	0.76	-1.78				1.02	2.29	1.52			
1.52	-2.29	0.51				1.02	3.05	-2.79			
-2.54	4.83	3.81				4.57	0.51	-1.78			
-1.27	2.03	-2.54				1.78	2.54	6.35			
-1.52	-1.02	5.08				3.81	-0.51	3.56			
-2.54	-0.76	1.52				-1.52	0.76	3.05			
-3.30	-0.51	1.52				-0.51	0.51	3.30			
-4.32	-1.27	2.79				-2.03	4.06	-1.02			
Average value in centimetres											
0.78 cm	1.56 cm	1.63 cm	2.20 cm	2.16 cm	-0.55 cm	1.27 cm	1.67 cm	0.87 cm	0.72 cm	0.13 cm	0.21 cm
Number of subjects who achieved positive results – Group A											
8	9	11	5	4	2	11	13	8	5	3	4
Percentage equivalent of the number of subjects who achieved positive results – Group A											
57.14%	64.29%	78.57%	83.33%	66.67%	33.33%	78%	92.85%	56.14%	83.33%	50%	66.66%

When we analysed the results, we noticed another aspect useful to our study: the percentage of those who achieved improved results in all jumps was 35%. One of the females included in the study obtained negative results in both the second and the third jump due to muscle soreness after the training session she had had prior to our study.

Table 05. The percentage distribution of the subjects according to the gain in centimetres for the second jump and the final one in the SJ, CMJ, FJ sets

	All 3 jumps		**2 jumps**		**One jump**		**Negative results**	
	M	**F**	**M**	**F**	**M**	**F**	**M**	**F**
Positive results	5	2	4	2	5	1	-	1
	35%		30%		30%		5%	

Throughout the mental training sessions, we monitored the cardiac frequency with the help of the POLAR Pro Team device. Statistical calculations in the GraphPad Prism 6 software led to the conclusion that there were statistically significant differences, as can be seen in Figure 01.

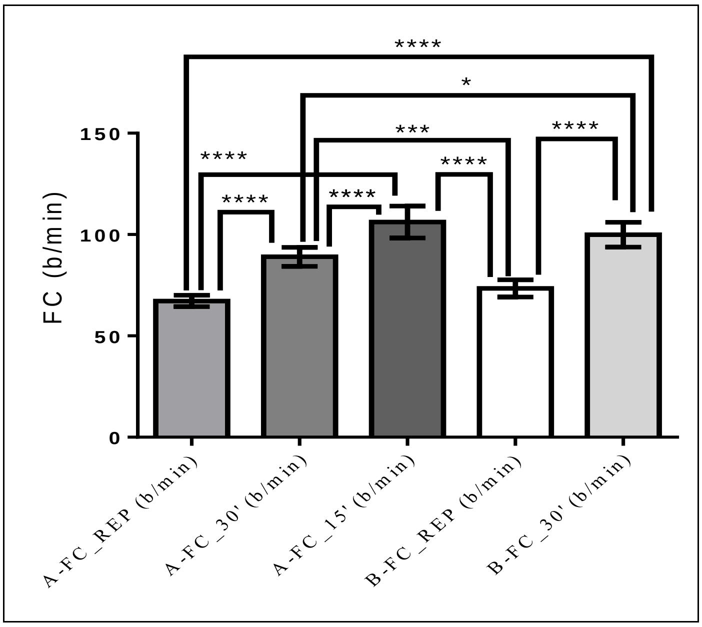

Figure 01. The degree of significance of the evolution of cardiac frequency (FC) throughout the study (the average ± the standard deviation)

A-FC REP (beats/minute) – the value of the average and the standard deviation for the cardiac frequency at rest for group A; A-FC_30' (beats/minute) – the value of the average and the standard deviation for the cardiac frequency at rest for group A throughout the 30' mental training; A-FC_15' (beats/minute) – the value of the average and the standard deviation for the cardiac frequency at rest for group A throughout the 15' mental training; B-FC_REP (beats/minute) – the value of the average and the standard deviation for the cardiac frequency at rest for group B; B-FC_30' (beats/minute) – the value of the average and the standard deviation for the cardiac frequency at rest for group B throughout the 30' mental training.

The difference between the data series can be evaluated with the help of p, whose values can range as follows: $p \leq 0.05$(*), $p \leq 0.01$(**), $p \leq 0.001$(***) or $p \leq 0.0001$(****). The increase in the number of stars expresses a higher, more statistically significant difference.

7. Conclusion

The interpretation of the data from Figure 01 shows significant information: there is a difference between the average of the cardiac frequency at rest: in group A, 67.2 beats/minute, in group B, 73.4 beats/minute; this difference can be explained by the fact that the first group included the subjects practicing performance sports, which – over time – can lead to a late cardiovascular adaptation to effort, which implies, among other things, a drop in the cardiac frequency at rest; statistically significant values ($p \leq 0.0001$) are recorded in column 1 (67.2 beats/minute) compared to 2 (89 beats/minute) and 3 (106.2 beats/minute), and this can be explained by the fact that, throughout the mental training, if the subject participates and truly lives the experience "as if" (Franz, 2008), associated with all the sensations, then an increase in the cardiac frequency occurs in proportion to the intensity of the imagined workout – the increases in the cardiac frequency also support the previous statements in this study, related to the implication of the participants in the study; between columns 3 and 2, we obtained a significant $p \leq 0.0001$: after the second test, the subjects saw that they could achieve better results and participated more intensely than in the first session: in the 30-minute session, the average of the cardiac frequencies was 89 beats/minute, while in the 15-minute session, it was 106.2 beats/minute; statistically significant values of $p \leq 0.0001$ were also obtained in group B and can be followed on the graph in the form of columns 4 and 5: column 4 (73.4 beats/minute) compared to 5 (99.9 beats/minute) – the significant values are correlated with the data shown in Tables 01, 02 and 03; a reduced, but nevertheless present level of significance – $p \leq 0.05$(*) was achieved between that data in columns 2 and 5, which show the average cardiac frequency throughout the 30-minute session: in group A, the average cardiac frequency was 89 beats/minute, while in group B, it was 99.9 beats/minute, but in both groups, the values are superior to those at rest. The creation and visualisation of representations that are projected outwards provides the basis for mental training and increasing the efficacy and efficiency of movement in performance sports. The three main sensory channels (visual, auditory and kinetic ones) simultaneously convey the messages that activate the apparatus and systems of the body in order to put it in a state of real training, together with the optimisation of the execution of the motor act. The reflection of the motor schema created in the cortex gives major importance to this type of training. After applying mental training, the explosive power of the research subjects has shown positive modifications, these being found in both groups. Even though the statistical significance is lacking, the results can be validated by the small differences between the results of top athletes in international-level competitions. The present study is one of the few that have been conducted in Romania and that includes argumentation expressed in values (centimetres). The technique is used for the first time in this sequence of steps and has the advantage of being easy to apply once it is learned.

References

Abalașei, B. A. (2009). *Reprezentarea socială a violenței în sport*. Iași: Editura Universității "Alexandru Ioan Cuza".

Bănică, L. (2009). *Psihomotricitate, psihopatologie, psihoterapie. Elemente aplicative în kinetoterapie*. București: Editura Fundației România de Mâine.

Buck, D. J. M., Hutchinson, J. C., Winter, C. R., & Thompson, B. A. (2016). The effects of mental imagery with video-modeling on self-efficacy and maximal front squat ability. *Sports, 4*(2): 23. Retrieved from https://doi.org/10.3390/sports4020023

Drosescu, P. (2009). Visualisation techniques in athlete's early recovery after trauma and training. *Journal of Sport Science & Medicine*, 8(11): 18. Retrieved from https://www.jssm.org/suppls/11/invitedspeakers.pdf

Franz, A. (2008). *Medicina psihosomatică*. București: Editura Trei.

Horghidan, V. (2000). *Problematica psihomotricității*. București: Editura Globus.

Markova, I. (2004). *Dialogistica şi reprezentările sociale*. Iaşi: Editura Polirom.

Mikicin, M. (2016*)*. State of mind as a subjective mental sensation results from objective brain activity following neurofeedback-EEG and relaxation trainings. *Acta Neuropsychologica, 14*(1), 17-33.

Moscovici, S. (1984). *The phenomenon of social representations. Social representations* (pp. 3-69). Cambridge, UK: Cambridge University Press.

Pesce, C., Marchetti, R., Forte, R., Crova, C., Scatigna, M., Goudas, M., & Danish, S. J. (2016). Youth life skills training: Exploring outcomes and mediating mechanisms of a group-randomized trial in physical education. *Sport Exercise and Performance Psychology, 5*(3), 232-246.