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*Original Article*

# Effect of mental imagery and motor representation strategies on acquisition and retention of shooting skills: a RCT trial

**Amin Amini [1], Sadeq Porali fatide [2], Maryam Salehi [3], Sahar Avazpour [4]*, Abdolkarin ghabelnezam [5]**

1. Assistant Professor, Institute of Artificial Intelligence and Cognitive Sciences, Imam Hossein University, Tehran, Iran.
1 & 5. Instructor of Sports Sciences, Imam Hossein University, Tehran, Iran.
3. PhD student, Motor Behavior, Faculty Physical Education and Sport Sciences, Urmia University, Urmia, Iran
4. Faculty of Educational Sciences, Department of Sports Sciences, Shiraz University, Shiraz, Iran

* **Correspondence:** *s.avazpour.98@gmail.com*

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**Abstract:** Shooters typically make great efforts to strengthen their physical and motor abilities, but are often less aware of the cognitive and psychological factors that affect their performance and skill performance. Therefore, it seems that shooters, especially novice shooters, are not very familiar with the mental skills related to shooting and pay less attention to mental training. However, cognitive training has recently been recognized as one of the basic skills required in perceptual-motor activities. The present study was conducted to determine the effect of training cognitive imaging strategies versus training of motor representation strategies on the acquisition and retention of shooting skills. This randomized controlled clinical trial study was performed on 45 undergraduate military science students with an age limit of 18 to 25 years, studying in the second semester of 1997-98. Subjects were randomly selected from a university of military sciences in Tehran and randomly divided into three groups of mental imagery, motor representation and control using a table of random numbers. The intervention groups received a three-week mental imagery training program, motor representation along with shooting training (five sessions per week). The control group only participated in shooting training. In order to evaluate the performance of shooters in the pre-test, post-test and memorization stages, a SCAT machine was used. Statistical analysis was performed using SPSS20 software and p value less than 0.05 was considered significant. The results of combined analysis of variance showed that both cognitive imaging and motor representation interventions had a significant effect on improving the record of novice military shooters ($P \leq 0.05$). The results showed that although there was no significant difference between motor representation and cognitive imaging groups in the post-test stage, however, a significant difference was observed between the motor representation and cognitive imaging groups ($P = 0.006$) in the retention stage. The results show that cognitive imagery and motor representation interventions can improve the performance of novice military shooters, although motor representation is more likely to be effective than cognitive imagery.

**Keywords:** Cognitive Practice, Motion Control, Motor Behavior, Shooting;



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## 1. Introduction

Cognitive imagery and representation of motor functions have a long history in the sciences of psychology and motor behavior (Skottnik and Linden, 2019). Johann Friedrich Herbart proposed movements related to perceptual effects in early 1825 and suggested that mental training could stimulate related movements (Schack, Essig, Frank, and Koester, 2014). Mental imagery Symbolic browsing is a physical activity without any obvious muscle movement (Hall, Wendy, Rodriguez, & Bayer, 1990). Visualization can be used to learn skills and techniques (specific cognition) or strategy and tactics (general cognition) as well as motivation and emotion management (motivational) (Reilly & Gilbourne, 2003).

On the other hand, motor representation can be created in the form of modeling and simulation training by observing and processing coordinated and skillful behavior to create a proper cognitive image of motor tasks and goals (Antonietti & Colombo, 2011). Mental imagery and motor representation are based on the principle that cognitive patterns govern the regulation of motor commands and the pattern of muscle activity (Hommel, Müsseler, Aschersleben & Prinz, 2001). In fact, according to some perceptual-cognitive approaches, their representation is necessary to control movements (Schack & Ritter, 2009). Although the dynamic systems perspective essentially attempts to explain biological movements without reference to cognitive levels (or internal models) as important features in motion control (Shock, Assig, Frank, & Coster, 2014), Bernštejn (1947) is a complex architecture of control. It considers human movement, which includes "low" levels of involuntary movement to "high cognitive levels" as the basis for movement control. Therefore, the importance of cognitive functions in controlling and learning motor skills should be emphasized (Poppele & Bosco, 2003).

Numerous studies in the last decade have demonstrated the usefulness of mental training in early learning, execution, and even in the stage of mindfulness (Bridge, Harold, & Holmes, 2012; and Pearson, Naselaris, Holmes & Kosslyn, 2015) and its effectiveness in improving skills performance. Movement has been confirmed in both beginners and experienced people (Murphy, 1990). However, the use of mental training seems to be related to the performance and protocols used by athletes. Few studies have been conducted in this regard (Antoniti and Colombo, 2011).

According to the internal modeling hypothesis, internal imaging skills are intertwined with the performance of motor skills (Driskel, Cooper, & Moran, 1994). In motor representation, images are useful because they provide an opportunity to observe the cognitive consequences of a situation, while representation, verbally or abstractly, cannot reveal them at this rate (Dennis, 1985). Images also help the person to manipulate the elements of a situation cognitively, because cognitive images require less memory load than other representations, thus enabling the elements to be converted directly and quickly (Cumming Williams, 2012). Thus, with a little creativity, the search for similarities and differences and the identification of connections between distant realities are facilitated by cognitive images that are sensitive to symmetries and structural organizations (Shepard, 1978). These cognitive images allow the individual to modify the data in order to simulate more flexibility for the changes that will occur in reality (Kaufman, 1985). In addition, cognitive imagery allows the individual to reorganize the way in which he or she depicts the situation so that he or she can perform more productively (Pearson, Nazlaris, Holmes, & Koslin, 2015).

On the other hand, the visual representation of information visually can identify and process objective and abstract concepts in the mind by observing a visual form, thus allowing the simultaneous display of different elements of a situation and thus facilitates the identification of relationships between different elements. (Lübbutiler and Marx, 2003). motor representation also allows the individual to observe actual operations and physical changes, to process them cognitively, and to present an internal representation that is consistent with the outside world. With motor representation, cognitive images represent objective objects or events that will be applicable in the real environment (Lupi and Antoniti, 2000). Therefore, motor representation can also contribute to the creative process and make the performance more flexible, because it is easily convertible and useful for combining several elements in a new motor concept (Antoniti, Serrana and Scafidi, 1999; and Barolo, Massini and Antoniti, 1990).

Therefore, since mental training can be considered as one of the main components of executive readiness for any shooter (Amini, Vaez Mousavi and Naji, 1397), it is necessary to evaluate different protocols in this field and the most appropriate ones to affect performance and learning. Identify and be selected. Therefore, the present study was conducted to determine the effect of training mental imagery strategies versus training of motor representation strategies on the acquisition and retention of shooting skills.

## 2. Methods

The present study is a randomized controlled clinical trial study that was conducted in the field. The statistical population of the present study included all military students in the academic year of 1997-98 who were considered novices in shooting skills and had no history of formal training and shooting professions and participation in military operations and shooting in real conditions. They were upright and physically and neurologically healthy, and in the end none of the participants were familiar with teaching mental imagery and motor representation strategies.

After finding the participants with the mentioned characteristics in the target population, all subjects were selected using the available sampling method. The sample size of the research based on G-Power software with effect size=0.5, group number of groups=3 and statistical power=0.95 and significance level or 5% alpha for composite analysis of variance, estimated 15 subjects in each group became. After collecting demographic characteristics (age, height, weight and sports history) (Table 1) and examination by a physician, exercise was allowed. There was no statistically significant difference between the three groups in terms of age, height, weight and history of shooting skills. By comparing the frequencies and means, the possible interfering variables were the same.



**Table 1.** Demographic characteristics of the subjects in three groups

| variable | Age (years) | Height (cm) | Weight (kg) | Shooting history (months) |
|---|---|---|---|---|
| cognitive imagery Group (n= 15) | 19.8±3.7 | 172.70±7.13 | 71.07±9.86 | 8.54±6.82 |
| motor representation group (n= 15) | 21.3±2.21 | 174.32±5.22 | 72.24±3.13 | 7.28±2.46 |
| control group (n= 15) | 20.12±2.02 | 173.13±8.54 | 72.13±11.32 | 7.93±4.35 |

First of all, during the experiment, the scope of the shootings was determined for the volunteers and their familiarity and justification for the experiment and the method of work were discussed. Explain all the steps and safety justifications to them, and hand over the weapons they were supposed to fire to them for inspection so that they do not have any problems during the test. During the study, subjects were prohibited from taking any painkillers or sleeping pills and were asked to refrain from any shooting activity or practice outside of the present study. The scores of the answers are added and the level of competitive trait anxiety is obtained.

After observing all the above points, written consent was obtained from the participants. Competitive anxiety questionnaire was also used to assess participants' competitive anxiety. In this test, participants are asked special questions about how they feel before the competition. The validity of the test was determined by Martens (1997) with the test-retest method as 0.98 and studies conducted in Iran found the validity of the test appropriate (Mohsenpour, 2002; Shafizadeh, 2000).

Also, to collect data from two researcher-made questionnaires including personal identity such as height, weight, and a history of exercise and the questionnaire (1997) the ability to visualize motor imagery in both visual andsensory levels was used to determinete level of imagery ability of participants The footsteps and narrations of Akbarzadeh, Zareian, Siavashi, Moghadam (1397) have been evaluated and accepted (73% and 77%).



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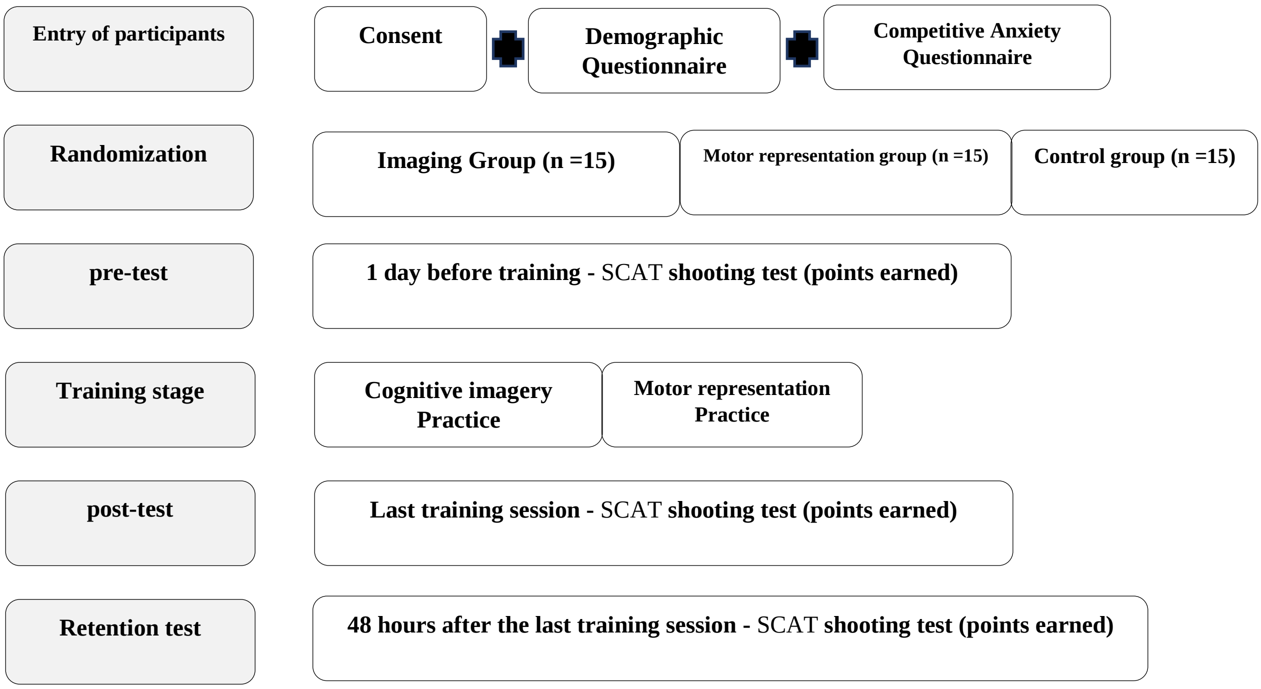


**Figure 1.** Diagram of different stages of clinical trial



After selecting the subjects, based on homogeneity in terms of the level of shooting ability, the subjects were randomly divided into three groups of 15 people with the help of a table of random numbers: mental imagery, motor representation and control. After organizing the participants in three groups and filling out the consent form to participate in the research, the task was explained to the participants with all the points and details. Then, a pre-test was performed on all three groups under the same conditions and by a SCAT device during the shooting. All shots were fired at 5 yards from a distance of 10 meters. In the test stages, the participant fired 20 shots with the weapon to which the SCAT machine was attached, and their scores were recorded. In the last training session, immediate retention test (post-test) and 48 hours after that, delayed retention test similar to pre-test was held. Participants did not receive any feedback, either verbal or augmented, except for visual feedback.
As mentioned, a SCAT machine was used to evaluate the shooting performance. To perform the SCAT shooting test, the subjects were asked to be present in military uniform 20 minutes before the test and to do their best to show the best performance while shooting. The specimens were placed in the firing line and the shooting started with the start command. Each of the shooters was allowed to fire ten shots to aim the weapon, but the score was not recorded. Then, in a maximum of 20 minutes, they fired 20 shots with the weapon to which the SCAT machine was attached.
The SCAT device is a tool for analyzing shooting performance, made exclusively in Russia and has two software parts (version 602) that can be installed on a computer and a hardware part including an optical sensor that can be installed on a weapon, a target control unit and an electronic target that can be installed at four to twelve. Shooter meters and interface wires. This device displays the target image on the monitor and at the same time shows the oscillation direction of the weapon on the monitor with the help of an optical sensor installed on the weapon. By pulling the trigger, the location of the hypothetical shot is engraved on the monitor, and then immediately information about the various performance scales of the same shot, such as points earned, shooting accumulation score, shooting rhythm stability, shooting circle diameter, aiming stability, accuracy Shooting, average speed of oscillations of the weapon head and its horizontal and vertical component, average stopping time of the hand on the target, deviation from the center of the target range at the moment of firing, stability on the target center (10) and (10.5), stability on the center of the range Indicates (10) and (10/10), that in the present study, only the points obtained were considered. In this study, subjects used an individual weapon of war. Then they participated in training protocols.



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Participants in the cognitive imagery and motor representation groups received training in cognitive imagery and motor representation strategies at 3 weeks and 5 one-hour sessions per week, respectively. During this period, the control group did not perform any special exercises.

cognitive imagery Exercise: Participants performed imaging exercises in a quiet room without any disturbing factors. Before starting the cognitive imagery exercise, High Manxman relaxation method was performed in order to increase the relaxation and concentration of the group members and to make the necessary preparations, and then two stages of 20 shooting attempts were imaged.

The type of reporting form was adapted from the article by Lewis, Gilt, Texts, Don, Collett (2008) to control participants' compliance with the interveners after the sessions of motor cognitive imagery. At the end of sessions 1, 6 and 11, participants were asked to re-explain the nature of the mental images, to follow the instructions of the pilot design, and whether or not they used illustration outside of the practice sessions. At the end of the form to control the use of cognitive imagery, participants were asked to rate themselves using a scale, 1 (without mental imagery) to 6 (clear cognitive imagery), and finally the quality of the images they were able to visualize. Were determined.

at the beginning of each session, the participants closed their eyes and stretched their legs, and after pulling some deep breaths and slowly drawing, the text of the mental imagery, which was available and under the supervision of the relevant expert and then tried in sentences (room temperature, firing), all distracting attention, was performed by tape recorder and afterward the subjects performed 20 shots in a way that lasted 4 - 5 minutes. in the acquisition phase, the recorded voice was used to visualize the mental imagery for the mental imagery group in which the manner of performing it was presented as a recipe for all participants. the visualization protocol, which was presented before the practical implementation and through the tape recorder to the subjects: close your eyes, imagine yourself in a situation that is the most convenient mode to shoot you, start shooting, imagine your shot at the bull 's center.

Motor representation exercise: In this study, the meaning of motor representation was to use the position of the body and the movements of the fingers. The training of this method was done through modeling. Participants were told to pay attention to the movements of the trainer's fingers and the position of the body when firing. Exercises were shown at different angles. Participants were told to pay close attention to the movements of the fingers and the position of the body, and how the instructor used them in space. Participants were in turn asked to stand at the firing point (unarmed) and fire as the instructor did. Participants were told that their movements and body shape did not have to be the same as those of a trainer. They can do whatever they want. It is important that thoughts are in harmony with movements and the body; That is, use posing to express thoughts and to shoot and find the best shooting mode to understand yourself.

For statistical analysis in this study, mean and standard deviation were used as descriptive statistics. Before analyzing the data, Kolmogorov-Smirnov test was used to examine the natural distribution of data and Leven test was used to compare the variances. The results of the Kolmogorov-Smirnov test should show the natural distribution of the data, and according to the statistics of the Leven test, the equality of variances can be ascertained. After examining the natural distribution of data and equality of variances, two-way analysis of variance with repeated measures on the time factor was used as an inferential statistic to examine the intra-group and inter-group differences in the acquisition stage. Repeated tests based on the estimation of marginal means were also used to determine the location of differences for intra-group and inter-group factors. One-way ANOVA was used to match the groups in the pre-test stage and the analysis of the findings in the retention stage. Data analysis was performed using SPSS software version 20. In addition, for all hypotheses, a significance level of P 050.05 has been considered.

## 3. Results

Table 2 shows the performance results of the groups in the shooting test during the different stages of the test.

**Table 2.** Average distribution and standard deviation of shooting of groups during different stages of the test

| Group | Control | | Motor representation | | Cognitive imagery | |
|---|---|---|---|---|---|---|
| level | Standard deviation | average | Standard deviation | Average | Standard deviation | Average |
| pre-exam | 3.46 | 6.15 | 4.28 | 5.37 | 3.80 | 5.25 |
| After test | 7.39 | 10.72 | 5.30 | 41.75 | 6.02 | 35.12 |
| Note | 9.77 | 8.82 | 6.71 | 37.43 | 4.83 | 30.25 |





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As you can see in Table 2, by examining the difference in the mean improvement of the shooting of the groups, it is clear that in the post-test stage, the participants in the group had motor representation (41.75) and mental imagery (35.12) compared to the control group (10.72) Had better performance. In addition, as you can see in Table 2, the conditions in the retention phase are more in favor of the motor representation group, so that the difference in mean performance in the retention phase compared to the pre-test phase for the motor representation group (32.06) is greater than in the group. He had mental imagery (25.00). In other words, in the retention stage, the motor representation group maintained its better performance in the post-test stage, somewhat better than the other groups, and had better stability. Figure 2 shows the progress of the subjects in all three groups. As can be seen in Table 2 and Figure 2 and based on descriptive statistics, the motor representation group and the mental imagery group performed better than the control group in the post-test stage as well as in the memorization stage. Also, in the retention stage, the performance of the motor representation group was better than the performance of the cognitive imagery group.



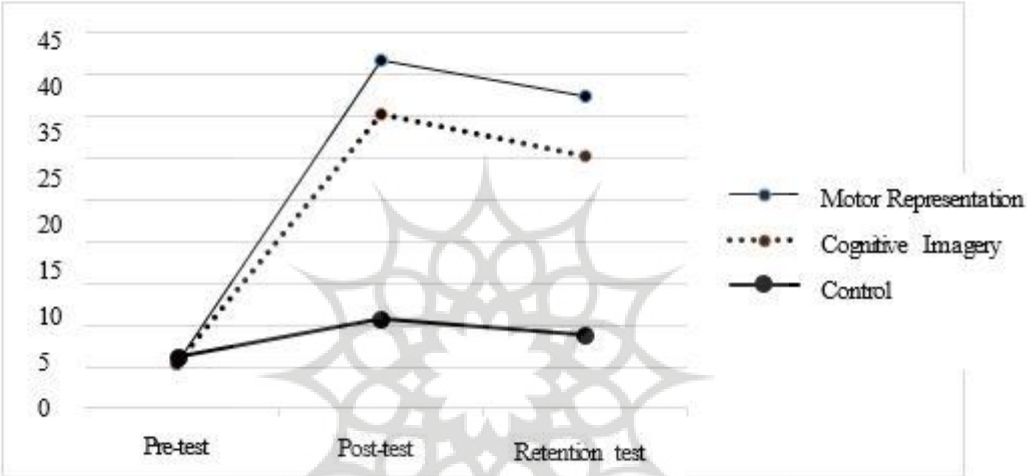


**Figure 2.** The rate of performance of different groups in the stages of performance and retention

Before examining the differences between groups in performance and retention stages, one-way analysis of variance was used to test the homogeneity of groups in the pre-test stage. The results of one-way analysis of variance showed that there was no significant difference between the groups according to the test statistics (F = 0.51, P = 0.45). Table 3 shows the shooting results of the participants in the acquisition stage by repeated measures factor analysis of variance test.

**Table 3**. Findings of factor analysis of variance with repeated measures related to shooting results in the acquisition phase

| Variable / Factor | Total squares | df | Average squares | F | Sig |
|---|---|---|---|---|---|
| Test steps | 137.51 | 1 | 1023.521 | 10.190 | 0.001* |
| group | 52.50 | 2 | 26.75 | 20.26 | 0.001* |
| Test stages × Group | 132.67 | 2 | 9.33 | 1.96 | 0.30 |
| Error (test) | 298.31 | 21 | 104.68 | | |
| Error (group) | 438.3 | 21 | 43.51 | | |

As the results of the table above show, there is a significant difference between the test steps factor (P = 0.001). To observe a significant difference between the test steps, Tukey's follow-up test was used. The results of Tukey's follow-up test showed a significant difference between pre-test and retention (P = 0.001) and post-test and retention (P = 0.001). In addition, as shown in Table 3, there is a significant difference



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between the groups (P = 0.001). Tukey's follow-up test was used to determine the location of differences between groups. The results of this test show a significant difference between the motor representation and control group (P = 0.001) and the cognitive and control group (P = 0.001); But there was no significant difference (P = 0.086) between motor representation and cognitive imagery. Table 4 shows the results of shooting performance with one-way analysis of variance in the retention phase.

**Table 4.** Results of ANOVA test in retention stage

| Variable | Total squares | df | Average squares | F | Sig |
|---|---|---|---|---|---|
| Intergroup | 157.58 | 2 | 48.72 | 32.04 | 0.001* |
| Intergroup | 137.35 | 21 | 7.01 | | |
| Total | 294.93 | 23 | | | |

significant at the level of α<0.05



As can be seen in Table 4, there is a significant difference between the groups in the retention phase. Tukey's follow-up test was used to observe significant differences between groups. The results of Tukey's follow-up test showed a significant difference in retention between the groups of motor representation and cognitive imaging (P = 0.006), the group of motor representation and control (P = 0.001) and also between the groups of cognitive and control imaging (P = 0.001). it shows.

## Discussion

The aim of this study was to investigate the use of mental imagery and motor representation strategies to improve the performance of novice military shooters; Another goal was to examine the differences in the effect of teaching mental imagery and motor representation strategies. Overall, the results show that cognitive imagery and motion representation can have a significant effect on a record of novice military snipers firing. This finding is consistent with most previous studies on the effectiveness of cognitive imagery and motor representation in athletic motor activities; The results of Towell (2010) study on athletes showed that they have made progress in different functional dimensions in a heterogeneous way.

The second part of the results of the present study yielded interesting findings. In these results, it was found that over time, the performance of the motion representation group was better than the performance of the cognitive imaging group. In other words, the best training method to improve the shooting record in this study was motor representation training (group 2), although the performance of the mental imagery group was still better than the control group. Although a similar study comparing the effectiveness of cognitive imagery and motor representation was not found by the researcher, these findings are consistent with the results of Antoniti and Colombo (2011) and Skack, Asig, Frank and Koster (2014), Mast, Bertoz and Koslin. (2001) and Shelton and Pipette (2006) are consistent. Most studies have separately confirmed the effectiveness of various cognitive training protocols such as cognitive imagery and motor representation.

However, citing consistent research, it should be noted that there are conflicting results regarding the use of cognitive training by athletes in disciplines with open skills (such as volleyball) or closed (shooting) (Kahlo Hardy, 2001); The results showed that athletes in more skillful disciplines use more motivational-emotional cognitive training (Wiegand, Arvinen Barrow, Scott, Hemings Valley, 2007). Our use of a cognitive practice in shooting skills, which includes a set of closed skills, is another reason for the effectiveness of cognitive training types in shooters' performance.

Cognitive imagery is a cognitive experience characterized by the dramatic activation of a task or scene in the absence of the relevant stimulus. According to analogy theory, cognitive representations have a visual nature that preserves the spatial features of the environment that are cognitively represented. This cognitive experience has many similarities to the experience of visual perception, including motor representation. Cognitive visualization of a scene is accompanied by eye movements that reflect the spatial content of the cognitive image and can show the deformation of this cognitive image compared to the real image, such as asymmetry or reduction in size (Fortasi, Rudd, & Pisla, 2017).

The results related to the effectiveness of cognitive imaging practice and motor representation are in line with Holmes and Collins (2001) theory in the form of Patelp's theory. In this theory, it is assumed that improvements in motor tasks performed should occur



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not only for real-time imaging practice, but also for control groups (Holmes and Collins, 2001).

Driscell, Cooper, and Moran (1994) stated in a study that motion imagery is more effective in learning activities that have more cognitive components, which confirms the greater effectiveness of motor representation training. In the early stages of learning and when a beginner is about to learn a new movement, it is necessary to become familiar with all the stages of skill implementation. Exercising more and spending more time to practice the skill more accurately helps to provide the necessary information about the cognitive aspects of the skill.

Cognitive imagery and motor representation During the skill learning process, such as shooting, which has a high cognitive load, a complete and comprehensive view of these aspects is provided and thus helps to store and recall skills. This factor can indicate the effect of cognitive imagery and representation. Consequently, implement and learn new skills (Driskel, Cooper, & Moran 1994).

When a shooter is cognitively reviewing a movement program in the early stages of learning and trying to correct incorrect and inappropriate techniques, it is best to use movement imagery and representation. With the help of imagery and representation of movement in the early stages of learning, a shooter can focus on specific aspects of movement and solve movement problems and perform the skill better (Connolly, 1984).

In this study, the effect of homogenization, which states that cognitive imagery is better than representation of motion, especially leads to better performance in the actual execution that follows. Coincidentally, the opposite was true of the results of the motion representation exercise. It can be said that this result is related to the nature of the task in question, which is almost a difficult task, and the illustration was difficult for the participants, as well as the skill level of the participants who were beginners in shooting. Look at the coach and imitate his behavior so that they can visualize in their minds. However, research has shown that motor imagery and representation have beneficial effects on improving the accuracy of movement and coordination of body movements, which can improve and improve the learning of motor skills (Rogers, 2006). In general, it can be said that in beginner military shooters, performing motor representation exercises in the first priority and cognitive imaging in the second place leads to focusing more attention on the cognitive components of movement and thus improving performance; Therefore, it can be said that when learning shooting skills, it is better to use motion representation first and then cognitive imagery.

This study also had some limitations, including the evaluation of participants' performance using the shooting record alone, which is better with other criteria such as shooting aggregation score, shooting rhythm stability, shooting circle diameter, aiming stability, shooting accuracy The average speed of oscillations of the weapon head and its horizontal and vertical components, the average time of stopping the hand on the target, deviation from the center of the target range at the moment of firing, stability on the center of the target and stability on the center of the target area should be examined. Other things that should be considered in future studies are the study of other modes of shooting skills such as sitting, lying down and shooting at moving targets at different distances in order to examine and evaluate more aspects of the actual performance of shooters.

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**فصلنامه رویکرد انسانی در مطالعات ورزشی**

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# تأثیر آموزش راهبردهای تصویرسازی ذهنی و بازنمایی حرکتی بر اکتساب و یادداری مهارت تیراندازی: کار آزمایی بالینی

**امین امینی [1]، صادق پورعلی فتیده [2]، مریم صالحی [3]، سحر عوض‌پور* [4]، عبدالرحیم قابل‌نظام [5]**

۱و۵. مربی علوم ورزشی، دانشگاه امام حسین (ع)، تهران، ایران

۲. عضو هیئت علمی پژوهشکده هوش مصنوعی و علوم شناختی دانشگاه جامع امام حسین (ع). تهران. ایران.

۳. دانشجوی دکترای رفتار حرکتی، دانشکده تربیت بدنی و علوم ورزشی، دانشگاه ارومیه، ارومیه، ایران

٤. دانشکده علوم تربیتی، گروه علوم ورزشی، دانشگاه شیراز، شیراز، ایران

* نویسنده مسئول: s.avazpour.98@gmail.com

**چکیده:** پژوهش حاضر به‌منظور تعیین تأثیر آموزش راهبردهای تصویرسازی ذهنی در مقابل آموزش راهبردهای بازنمایی حرکتی بر اکتساب و یادداری مهارت تیراندازی انجام شد. این مطالعه کار آزمایی بالینی تصادفی کنترل‌شده، بر روی ٤٥ دانشجوی دوره کارشناسی علوم پایه نظامی با محدود سنی ۱۸ تا ۲۵ سال، مشغول به تحصیل در نیمسال دوم ۹۸-۹۷، انجام شد. آزمودنی‌ها به‌طور تصادفی در سه گروه تصویرسازی ذهنی، بازنمایی حرکتی و کنترل قرار گرفتند. گروه‌های مداخله به مدت سه هفته برنامه آموزش تصویرسازی ذهنی، بازنمایی حرکتی را در کنار آموزش تیراندازی (پنج جلسه در هفته) دریافت کردند. گروه کنترل تنها در آموزش تیراندازی شرکت نمودند. به‌منظور ارزیابی عملکرد تیراندازان در مراحل پیش‌آزمون، پس‌آزمون و آزمون یادداری، از دستگاه اسکت استفاده شد. نتایج بررسی تحلیل واریانس مرکب نشان داد که هر دو مداخله‌ی تصویرسازی شناختی و بازنمایی حرکتی تأثیر معناداری بر بهبود رکورد تیراندازان تازه‌کار نظامی داشت ($P\leq۰/۰۵$). نتایج نشان داد که هرچند در مرحله پس‌آزمون تفاوت معناداری بین گروه‌های بازنمایی حرکتی و تصویرسازی شناختی وجود نداشت، بااین‌حال در مرحله یادداری بین گروه‌های بازنمایی حرکتی و تصویرسازی شناختی ($P=۰/۰۰٦$) تفاوت معناداری مشاهده شد. نتایج به‌دست‌آمده نشان می‌دهد مداخلات تصویرسازی شناختی و بازنمایی حرکتی می‌تواند عملکرد تیراندازان تازه‌کار نظامی را بهبود بخشد، بااین‌وجود احتمال اثرگذاری بازنمایی حرکتی بیشتر از تصویرسازی شناختی است.

**واژه‌های کلیدی:** تمرین شناختی، کنترل حرکتی، رفتار حرکتی، تیراندازی؛

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