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**ORIGINAL ARTICLE**

# The impact of imagery on the performance and cognitive ability in the elderly

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## ABSTRACT
**Background:** In the future, aging becomes one of the problems of society and the problems of the country's health care system and brings many costs in the health care sector.
**Purpose:** This study examines the effect of imagery on performance and cognitive ability in the elderly. The research method is quasi-experimental with a pretest-posttest design. 40 older adults were selected and divided into experimental and control groups. The subjects in the experimental group performed imagery for four weeks following the pretest.
**Methods:** Data were analyzed using the analysis of covariance.
**Results:** Findings showed that imagery improves the performance and cognitive ability in the elderly.
**Conclusion:** In general, imagery may improve performance and cognitive abilities in the elderly.
**Keywords:** Imagery, Performance, Cognitive Ability, Aging

## INTRODUCTION
According to the World Health Organization definition, the elderly refers to people over 60 years old. At this time, 40 million Iranians are young and reach middle age and old age in the next few decades.[1] Therefore, in the future, aging becomes one of the problems of society and the problems of the country's health care system and brings many costs in the health care sector. The purpose in the elderly life is longevity and survival and their quality of life.[2] Therefore, various interventions may reduce aging-related deterioration.[3]

Aging has a significant effect on cognitive and metacognitive processes and increases the likelihood of cognitive impairment by affecting cognitive function.[4] Cognitive abilities refer to neural processes involved in the acquisition, processing, storage, and utilization of information.[5] Human cognitive processes have evolved due to the need to solve complex ecological problems and social guidance. Cognitive abilities link behavior and brain structure and include a wide range of abilities, including planning, attention, response inhibition, problem-solving, multi-tasking, and cognitive flexibility. On the other hand, Metacognition can be considered a general aspect of cognition involved in all cognitive activities. Thus, Metacognition is any knowledge or cognitive process that contributes to evaluating, monitoring, and controlling cognition. The purpose of the interventions is to improve the learning skills and abilities of the participants.[6,7] Imagery is one cognitive intervention that is significantly effective in changing the physical-emotional-spiritual dimensions. Imagery has two internal-external forms.[8,9] This technique can modify patients' symptoms with phobias and depression and reduce stress, anxiety, lowering blood pressure and controlling pain, increasing motivation, improving relaxation, increasing control over personal life, and improving relationships. This technique is even helpful in helping people quit smoking.[10] Thibaut[11], McCaffrey and Lynn[12], Yadolahzadeh[13], studied guided imagery and concluded that guided imagery is very effective in treating depression.

There is a great deal of consensus among researchers and sports psychologists about the usefulness of imagery, but a question arises on its usefulness in various situations. On the other hand, imagery is different for different people, purposes situations.[14] Athletes use and experience motor imagery in most sports situations, but they do this psychological skill to achieve distinct goals. Undoubtedly, the successful execution of any exercise requires the control of the fundamental components in that exercise. In this regard, various factors of imagery have been identified and studied. One of the essential components is the duration of the imaged motor skill with the actual skill. When specific instructions for a particular motor skill are not available, the speed at which a skill is mentally rehearsed is correlated with its actual duration. Theoretically and empirically, the similar duration between the actual execution and the imagery of that motor skill has been confirmed; That is, the period of imagery must be correlated with the time it takes to perform the same motor skill.[15] Therefore, this study examines the effect of imagery on performance and cognitive ability in the elderly.

## METHODS
The research method was quasi-experimental with a pretest-posttest design and a control group. 40 sedentary older adults (over 60 years old) were selected as a sample and randomly divided into experimental and control groups (20 people in each group). After obtaining consent, they were asked to administer the Cognitive Ability Questionnaire and the static Balance Test. the Persian version of the Sharpened Romberg test (reliability of 0.91 with eyes open and 0.77 with eyes closed) was used with closed eyes collect static balance data. The Sharpened Romberg test is used to measure static balance. For this purpose, the barefoot subject stands on a flat surface, placing the upper foot in front of the non-dominant foot so that the front foot's heel touches the toe of the back foot.

The arms are crossed on the chest, and the palms are on the shoulders of the opposite side. This test is performed with the eyes open and closed. The score is based on the duration at which each subject can maintain with eyes open and closed[16]

The Cognitive Questionnaire (Folstein, 1975) was used to assess various cognitive functions. This questionnaire was designed and developed by Folstein et al. for a brief examination of cognitive status and is the most common tool for screening cognitive abilities. This questionnaire examines the cognitive status in 11 dimensions: temporal orientation, spatial orientation, immediate recall, attention, delayed verbal recall, naming, repeat, three-step instructions, reading, writing, and copying.[17] Foroughan et al.[18] reported that this tool has good reliability and validity (0.87 and 0.89, respectively).

The course of treatment was 3 days a week and lasted for 4 weeks. The elderly in the experimental group were present in the quiet and suitable room prepared for this purpose at 4-8 pm for imagery. The elderly lay down on a suitable bed with their eyes closed. The duration of the intervention in each session was 15 minutes. The first 5 minutes of relaxation exercises, such as respiratory relaxation techniques, were used to increase relaxation and comfort, and concentration, and perform the relevant imagery. They were asked to imagine sitting in a wheelchair. Next, there were told to continue imagery by getting up from the chair and walking 3 meters to the pre-determined goal (wall) without pausing to turn around and return and sit on the chair. The person was then asked to try to do this more quickly and skillfully in each imagery period. A stopwatch calculated the duration of imagery. The collected data were described by calculating the mean and standard deviation and plotting the classification table. Kolmogorov-Smirnov test and analysis of covariance were used to analyze the data and test the research hypotheses.

## RESULTS

Descriptive statistics of demographic characteristics are presented in Table 1. Mean and standard deviation of age, height, and weight of participants in experimental and control groups were 62.5 ± 4.2 and 61.1 ± 3.15, 164.4 ± 4.78 and 163.4 ± 2.67, 72.21 ± 8.55 kg and 71.1 ± 9.01 kg. The Kolmogorov -Smirnov test results showed that the data distribution was normal (p> 0.05).

After examining the hypotheses, analysis of covariance was used for intergroup comparison. The results of these analyzes are presented in Table 1.

Table 1- Results of analysis of covariance

| Variable | Source | sum of squares | DOF | F | Sig. | eta squared |
|---|---|---|---|---|---|---|
| Static balance | Pretest | 65.7 | 1 | 124.15 | 000.0 | 28.0 |
| | Group membership | 304.22 | 1 | 452.41 | 000.0 | 42.0 |
| Cognitive ability | Pretest | 74.4 | 1 | 541.14 | 000.0 | 24.0 |
| | Group membership | 54.19 | 1 | 14.52 | 000.0 | 52.0 |
| Temporal orientation | Pretest | 134.5 | 1 | 41.4 | 000.0 | 12.0 |
| | Group membership | 22.51 | 1 | 41.61 | 000.0 | 61.0 |
| Spatial orientation | Pretest | 25.2 | 1 | 55.11 | 000.0 | 18.0 |
| | Group membership | 54.18 | 1 | 24.42 | 000.0 | 32.0 |
| Immediate recall | Pretest | 54.3 | 1 | 54.12 | 000.0 | 08.0 |
| | Group membership | 87.17 | 1 | 24.41 | 000.0 | 25.0 |
| Attention | Pretest | 24.2 | 1 | 48.11 | 000.0 | 11.0 |
| | Group membership | 65.17 | 1 | 11.38 | 000.0 | 32.0 |
| Delayed verbal recall | Pretest | 28.2 | 1 | 7.12 | 000.0 | 14.0 |
| | Group membership | 36.17 | 1 | 25.37 | 000.0 | 32.0 |
| Naming | Pretest | 29.2 | 1 | 42.10 | 000.0 | 14.0 |
| | Group membership | 87.16 | 1 | 65.25 | 000.0 | 24.0 |
| Repeat | Pretest | 28.3 | 1 | 28.11 | 000.0 | 12.0 |
| | Group membership | 84.16 | 1 | 24.33 | 014.0 | 29.0 |
| 3 step instruction | Pretest | 09.3 | 1 | 89.10 | 000.0 | 16.0 |
| | Group membership | 28.17 | 1 | 26.25 | 021.0 | 47.0 |
| | Pretest | 09.3 | 1 | 52.11 | 000.0 | 17.0 |
| | Group membership | 24.17 | 1 | 02.32 | 014.0 | 53.0 |
| Reading | Pretest | 87.2 | 1 | 84.12 | 000.0 | 12.0 |
| | Group membership | 09.14 | 1 | 21.32 | 024.0 | 33.0 |
| Writing | Pretest | 76.2 | 1 | 24.11 | 000.0 | 10.0 |
| | Group membership | 32.14 | 1 | 18.41 | 035.0 | 34.0 |
| Copying | Pretest | 74.1 | 1 | 87.13 | 000.0 | 13.0 |
| | Group membership | 79.14 | 1 | 08.17 | 04.0 | 45.0 |

Research on static balance showed that after controlling the effect of pretest, the effect of group on static balance is statistically significant, meaning that there is a significant difference between the level of static balance of the experimental and control group in the posttest.

Also, the results of research on cognitive ability and its subscales showed that after controlling the effect of

pretest, the effect of the group on cognitive ability and subscales of temporal orientation, spatial orientation, immediate recall, attention, delayed verbal recall, naming, repeat, three-step instructions, reading, writing, and copying are statistically significant. This means a significant difference in the level of cognitive ability and its subscales in the experimental and control groups in the posttest.

## DISCUSSION

This study examined the effect of imagery on performance and cognitive ability in the elderly. Findings showed that imagery improves the performance and cognitive ability in the elderly. Regarding the biological explanations related to imagery, we can mention the nervous system's structure and how it is affected by mental exercises. The nervous system of vertebrates generally consists of three parts.[19] Motor skills are controlled through different areas of the nervous system. Learning sports skills in the early stages is done voluntarily by organizing and forming new movement patterns by the central nervous system. In addition to learning through mental practice, learning can also be achieved through observation.[20] Subsequently, in the later stages and by the (physical or mental) rehearsal of the same motor skill, the skill is performed without conscious attention and an autonomous system. Automatic execution reduces mental and physical effort and thus improves the execution process. Transferring motor skills from the central nervous system to the autonomic system, resulting in excellent motor function, is mediated by physical or mental exercises. Imagery is a mental skill that plays a vital role in transferring the motor program from the conscious to the unconscious system and thus improving motor performance.[20]

The usefulness of imagery in improving motor performance is attributed to the overlap of brain centers related to imagery and actual performance. According to this hypothesis, the time spent imagining and performing the movement can be interpreted based on the overlap of the involved brain areas.[20] Furthermore, various researches and observations have shown that imagery activates the planning and motion readiness processes more than the executive processes. Among the structures involved in the imagery process, we can mention areas such as the secondary motor region, cerebellum, basal ganglia, primary motor cortex, and frontal areas.[21-23]

According to Jacobson's neuromuscular theory, mental training of a movement increases activity because the generated electrical activity below the threshold is not possible as a result of the actual execution of that motor skill; this suggests that imagery (especially internal imagery) leads to the activation of neural pathways used in the actual execution of the skill; or other words, imagery is essentially a weak version of physical activity. Imagery also facilitates the implementation of motor skills by encoding movements in the brain. In other words; Mental training by creating a motor program in the system

The central nervous system leads to developing a brain agenda for the proper execution of movements.[24] Furthermore, according to the theory of symbolic learning, mental training through storing motor information facilitates the recall of skills when performing the motor skill.[24-26]

## CONCLUSION

In general, imagery is the simplest type of exercise available to everyone, everywhere, and anytime. According to the present study results, imagery may improve performance and increase cognitive ability in the elderly.

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