The Effect of Visual External Focus of Attention by Using Motion Guidance® Device to Developing Balance Among Practicing Women Aged 55-65 Years

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Abstract

The purpose of this paper is to knowledge the effect of using the external focus of attention-EFA technique by using the visual stimulus and using the (Motion Guidance-MG®) tool to develop balance and reduce the risk of falling versus using the internal focus of attention. The researchers used the experimental approach by designing the control and experimental groups. The research sample consisted of women practicing sports in the Iraqi Hunting Club, with (12) women at the age of (55-65) years, and they were divided into two groups, each of which consisted of (6) women. The experimental group used the external attention focus by using the visual stimulus, while the control group used the internal attention focus. The arithmetic mean for the research sample in measurements of height, weight and age was (163.50 ± 5.02 cm) (83.36 ± 12.59 kg) (58.93 ± 2.76 years) respectively. The research tests were determined by the 4-Stage Balance Test of the Centers for Disease Control and Prevention-CDC functional reach test. The exercises continued for a period of (8) weeks, at a rate of (3) times a week, and within the evening training period of one hour. The statistical bag (SPSS.V26) was used to obtain the search results. The researchers concluded that the use of visual external attention focus had a significant effect on the balance and functional reach tests, and its superiority over internal attention focus. As well as the effectiveness of using the laser motion guidance tool in developing balance and reducing falls.

Keywords: External focus of attention, internal focus of attention, virtual focus, Motion Guidance, balance, risk of fall, elderly

Introduction:

Body balance means the ability to maintain stability and control the body's movements and strength, and it includes a combination of physical fitness, compatibility and the work of sensory receptors, and balance refers to kinetic awareness in the sense of the ability to maintain control and balance of the body during the performance of various physical activities. And body balance means the state in which the musculoskeletal system is in perfect harmony and balance, allowing for effective movement and reducing the risk of falling and injury, especially in the elderly, as well as improving and enhancing physical fitness, athletic performance and physical activity, and increases compatibility, and improves the quality of life. The goal of the developed countries' efforts to increase health-related physical fitness and encourage physical activity and abandon inactivity is to maintain a disease-free society, as lack of physical activity in general increases inactivity, especially among the elderly, which leads to obesity, which is associated with dozens of Diseases being the main cause of most non-communicable diseases such as cardiovascular diseases, type 2 diabetes, musculoskeletal diseases and cancer. Which saves countries a lot of huge sums that must be spent to treat these diseases. And that one of the factors in the occurrence of injuries in the elderly is the fall as a result of poor balance, which is one of the important issues that face a great challenge in dealing with it as the world is on the verge of a gradual increase in aging (Thomas et al., 2019). The age distribution of the world's population is constantly changing. The increase in the number of elderly people and the simultaneous decline in the number of young people are common factors throughout the world.

(Peters et al., 2010).

Balance is the process by which a body maintains its stationary or moving position. Balance results from the interaction of internal processes and the influence of external forces on the body (Moxley et al., 1999). External forces include anything outside the body while internal processes deal with anything inside the body, specifically the physiological and psychological ones (Clark., 2004). Balance is necessary for many activities of daily living, and changes in the ability to balance negatively affect and increase the likelihood of falls during these activities. Therefore, therapists and specialists must be able to accurately assess balance and weakness to determine who may be at risk of falling (Isles et al., 2004). In addition, that with age, a general deterioration occurs in a number of devices, including the kinetic and sensory systems, which negatively affect the processes of controlling posture and balance. (Lords & Ward, 1994). That is, elderly people who are (65) years old or more are at risk of falling at a rate of once a year (Gillespie et al., 2003). In one of the scientific studies, poor balance was identified as a major risk factor for falls in the elderly over the age of (75) years, and falls among the elderly is common in society and that a simple clinical evaluation can determine the elderly who are more at risk of falling (Tinetti et al., 1988). Falls during pregnancy are also common in pregnant women, who are more likely to fall and fall injured than non-pregnant women (Inanir et al., 2014). According to a large study, the rate of falls during pregnancy is: (26.8%) (Dunning et al., 2003). This rate is similar for women over the age of 65 (29%) (Butler et al., 2006). Poor balance results from lack of physical activity and weight gain. Obese individuals, especially those with a concentration of belly fat, may be more likely to fall than individuals with less body fat (Corbeil et al., 2001).

The establishment and development of muscular strength contributes to enhancing the requirements of achievement (Neamah & Altay., 2020). Which is based on neuroadaptation (Hameed & Altay., 2019). The risk of falls and related injuries in the elderly can be reduced through physical activities that improve strength, balance and coordination (Wolf et al., 1996) (Verfaillie et al., 1997). As a study showed, (Verfaillie et al., 1997) showed a significant improvement in balance and gait in previously inactive elderly individuals who participated in a 12-week program of strength and balance training versus those who performed strength exercises only. I also found a study (Wolfson, 1992). That aerobic exercise and balance exercises reduced the possibility of falling by (50%) in healthy individuals over the age of 90 years. In addition, a study (Ince et al., 2023), which was conducted on women with knee osteoporosis and ages (40-70) years, showed that balance and sensory exercises for the body may have positive effects on moving balance and pain. Single and double task exercises also significantly improved static and dynamic balance and activity-dependent balance confidence in older adults with spinal stenosis (Karagül & Kartaloğlu., 2023). Weak lower extremity strength may also increase the risk of falls in the elderly. A study (Judge et al., 1993) showed that strengthening the lower extremities by using walking and postural control exercises (balance) would improve balance in healthy women aged (62-75) years, thus reducing the risk of falls and associated injuries.

Physical activity has been shown to reduce the incidence of falls in the elderly (Sherrington et al., 2010). In addition, high levels of physical activity generally reduce morbidity and mortality rates and the risk of falling in the elderly by a rate ranging between (30-50%). (Bembom et al., 2008) (Battaglia et al., 2010). In particular, strength and balance exercises have been identified as appropriate methods to reduce the risk of falls in the elderly, and because balance is the basis for the ability to stand and move, so balance training must have an important role in preventing falls. (Melzer & Kaplanski, 2004). Finally, one of the important systematic review studies showed the effect of physical activity programs to develop balance and prevent falls in the elderly, to an improvement in balance by (16%-42%) due to the use of various balance exercises. (Thomas et al., 2019).

The scientific development and the digital revolution that we live in imposed changes in the methods of training physical activity, so the use of modern devices and tools has become a necessity in order to improve training and in order to obtain the best results with the least possible time and effort, and accordingly, the available training tools facilitate and direct work optimally More precisely, the Motion Guidance® is a training tool designed to provide visual feedback of desirable or unwanted movement on any part of the body.

This tool aims to define and control the movement, which works to increase the compatibility between the working muscles of the body by defining a point and working on stability on it throughout the duration of the exercise. As working with the presence of instantaneous visual feedback can improve performance and in balance positions, whether static or moving, as the presence of optical guidance will

neutralize the path of movement and thus the possibility of maintaining the path of movement and directing it simultaneously, which generates neural adaptation in order to improve balance It is one of the tools that focus attention externally.

As the study (Sherman et al., 2021) indicated an increase in the activity of the cerebral cortex and an improvement in balance (one-sided test) as a result of the use of internal focus, somatosensory focus, and visual focus (using laser kinetic guidance), and that the best results were using the visual focus. As the visual focus led to an increase in the activity of the cerebral cortex associated with cognitive, kinetic, sensory, physical and visual processing, and the attention directed towards the goal with a visual focus leads to functional increases in brain activity compared to the self-focus directed internally, which improves balance better. In addition, one of the short review studies showed that (15) studies out of (18) studies, with a rate of (83.3%), confirmed the effectiveness of visual external focus in improving balance compared to studies that included both internal and external focus or focus. Instructions can also be about focus. External attention is generally useful as a way to improve postural control and balance. (Park et al., 2015).

Also, with the advancing age of individuals, their ability to successfully re-weight sensory input diminishes, which leads to an increased risk of falling. About his body, he may improve sensory integration for postural control when visual input conflicts with somatosensory and vestibular sensory input. The current findings may be useful to clinicians and researchers in developing strategies to improve sensory mechanisms for the development of balance. (Ma & Wright, 2022). The study (Chiviacowsky & Wally., 2010) aimed to investigate whether the instructions that stimulate the focus on external attention are better than the internal focus and that they affect differently on the balance of the elderly, males and females, with an average age of (69.4) years, and the results showed superiority for the external focus group of attention in homeostasis and in the task of maintaining it.

As for the study (Wulf & Park., 2001), it aimed to identify the preference of focusing attention in balance training and maintaining it, and it was implemented on (17) university students of both sexes using the focus of internal attention (by focusing on the feet), and the focus of external attention (By focusing on the marks placed in front of the feet) and using the balance measuring device, and the results showed the preference of the external attention focus group in performing the balance and maintaining it after (3) days.

A review study aimed to ascertain the effect of intentional focus (internal or external) on the form of movement, kinetic, or muscular activity data. The results showed that external focus often leads to better performance results that are not directly related to changes in movement style. (Werner & Federolf., 2023). Attempts have been made to manufacture training devices for balance, as a study (Naser & Hadi., 2021) concluded that an electronic device was manufactured to develop balance among athletes.

Accordingly, the importance of research is determined by the use of non-traditional patterns in training the character of balance in women aged (55-65) years due to the need to develop exercise or training strategies that can enhance balance in the elderly, and may reduce the risk of falling, as well as using a tool and motivating the trainees to perform better by creating a spirit of challenge and determination.

Research objective:

Knowledge the effect of using the external focus of attention-EFA technique by using the visual stimulus and using the (Motion Guidance-MG®) tool to develop balance and reduce the risk of falling versus using the internal focus of attention.

Research methodology and field procedures:

Research Methodology:

The researchers adopted the experimental approach by designing the control and experimental groups.

Community and sample research:

The research sample consisted of women practicing sports in the Iraqi Hunting Club, with (12) women at the age of (55-65) years, and they were divided into two groups, each of which consisted of (6) women. The arithmetic mean for the research sample in measurements of height, weight and age was (163.50 ± 5.02 cm) (83.36 ± 12.59 kg) (58.93 ± 2.76 years), respectively. The homogeneity of the research sample was tested with the torsion coefficient, and it was found that its value ranged between (±1), which indicates the homogeneity of the research sample. The research tests were determined based on the four-stage balance test (The 4-Stage Balance Test). (Southerland et al., 2021) of the Centers for Disease Control and Prevention (Centers for Disease Control and Prevention-CDC), Functional reach test. (Weiner et al., 1993). The performance of experimental trials of the tests was taken into account without causing

fatigue to the research sample, and an emphasis on adherence to the terms of implementation of each test. (Alkazaly & Altay., 2023).

The pre-test was implemented on the research sample, followed by applying the proposed balance exercises using the laser motion guidance tool (Motion Guidance®). On the experimental research group, while the control group performed the same exercises, but without the use of laser guidance, and the implementation of the exercises continued for a period of (8) weeks by (3) times a week. Within the evening training period of one hour, balance exercises were implemented at the beginning of the training unit to ensure that fatigue did not occur. The exercises used included exercises from standing positions, squatting, walking, and using balls (Swiss Ball). Large and medium sizes and balls (BOSU balance ball) Cando Balance Disc Stepping boxes with heights of (15) cm, and Balance Pads .It was emphasized that all exercises were performed correctly in terms of body position, limbs, head position, and the duration of the exercises, and the gradation of the difficulty of the exercises was taken into account from easy to difficult. The same flight and registration was taken into account by the same person in all tests with the presence of two assistants, in addition to taking into account the correct performance of the test. To obtain the search results, the statistical bag (SPSS.V26) was used, and the laws of the arithmetic mean, standard deviation, and t-test were used for the independent and non-independent samples.

Results and discussion:

Table (1) shows the arithmetic mean and standard deviations in the kinetic tests in the pre and post-tests.

Variables	Measuring unit	Pre-test				Post-test			
		Experimental		Control		Experimental		Control	
		arithmetic mean	standard deviations	arithmetic mean	standard deviations	arithmetic mean	standard deviations	arithmetic mean	standard deviations
Functional reach	cm	32.000	1.732	33.286	3.039	40.286	1.890	33.571	3.207
Balance	Second	39.143	2.410	37.857	4.259	69.571	18.591	46.714	5.314

Table (2) shows the difference of the arithmetic mean, its standard deviation, the calculated (t) value, the significance of the differences, and the percentage of development between the results of the pre and post-tests in the kinetic tests of the experimental group

Variables	Measuring unit	difference of the arithmetic mean	difference of the standard deviation	T value calculated	Level Sig	Type Sig	percentage of develop %ment
Functional reach	cm	-8.286	1.976	-11.094	0.000	Sig	25.894
Balance	Second	-30.429	17.980	-4.478	0.004	Sig	77.735

Degree of freedom (6 - 1 = 5). Significant at the error level (0.05) if the error level is less than (0.05)

Table (3) shows the difference of the arithmetic mean, its standard deviation, the value of (t) calculated, the significance of the differences, and the percentage of development between the results of the pre and post-tests in the kinetic tests of the control group

Variables	Measuring unit	difference of the arithmetic mean	difference of the standard deviation	T value calculated	Level Sig	Type Sig	percentage of develop %ment
Functional reach	cm	-0.286	0.488	-1.549	0.172	Non sig	0.856
Balance	Second	-8.857	2.734	-8.570	0.000	Sig	23.396

Degree of freedom (6 - 1 = 5). Significant at the error level (0.05) if the error level is less than (0.05)

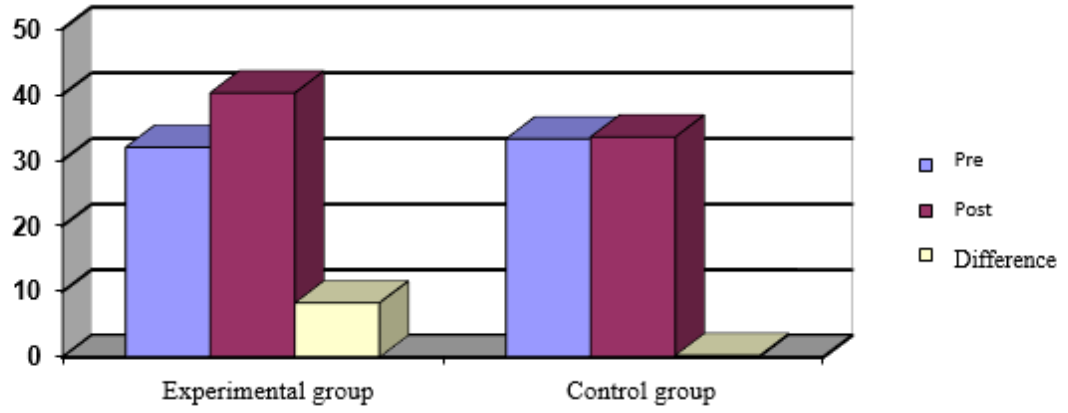

Figure (1) shows the arithmetic mean and the difference between the results of the pre and post-tests for the experimental and control groups in the functional reach test

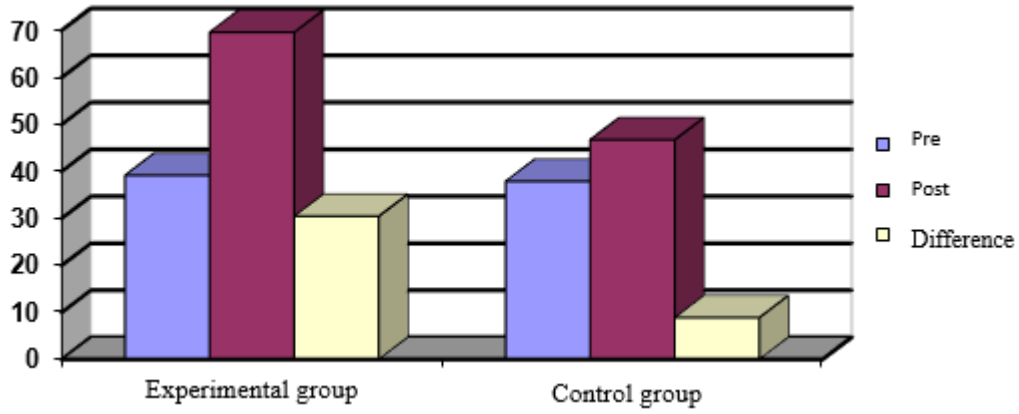

Figure (2) shows the arithmetic mean and the difference between the results of the pre and post-tests of the experimental and control groups in the functional reach test

Table (4) shows the arithmetic means, standard deviations, the calculated (t) value, the level of error, and the significance of the differences between the two research groups in the kinetic tests in the post-test

Variables	Measuring unit	Experimental		Control		T value calculated	Level Sig	Type Sig
		arithmetic mean	standard deviations	arithmetic mean	standard deviations			
Functional reach	cm	40.286	1.890	33.571	3.207	4.772	0.000	Sig
Balance	Second	69.571	18.591	46.714	5.314	3.128	0.017	Sig

Degree of freedom (6 + 6 - 2 = 10). Significant at the error level (0.05) if the error level is less than (0.05)

Discussion

From Table (2), it is clear that the significant differences between the results of the pre and post-tests in the experimental group in skill tests and in favor of the post test at the error level (0.05), and the percentage of development reached (8.690, 6.480, 6.419%), respectively. From Table (3), it is clear that the differences between the results of the pre and post-tests in the control group were random in skill tests, all at the error level (0.05), and the percentage of development was (0.452, 0.692, 1.146%), respectively. Table (4) shows the significant differences in the results of the post-test between the control and experimental groups in all skill tests, in favor of the experimental group at the error level (0.05).

From what was mentioned above, the use of optical focus by means of the laser motion guidance tool (Motion Guidance®) led to the development of balance and the functional reach test, which indicates that the experimental research sample has become more stable and balanced and less prone to falling, which leads to major complications that may cause death Sometimes or may be the cause of chronic deformities. In general, the results of research statistics indicate that nearly one in three elderly people suffer from falls every year (American Geriatrics Society., 2001). While the condition of a person who falls at least twice within (6) months is defined as repeated falls. (Tromp et al., 2001).

Exercise in general and balance exercises in particular have substantial effects in enhancing balance and reducing falls. In this regard; (Muir et al., 2010) states that it has been proven that elderly people with poor balance are more likely to fall than elderly people with poor posture control, which confirms the importance of balance training in the elderly.

Also, exercise in general and balance exercises in particular improve neuromuscular compatibility and work to create adaptations for the nervous and muscular systems that enable the individual to maintain the center of gravity of his body within his base of support and thus prevent the dangerous fall process that threatens the elderly, which is one of the most risk factors because of its complications Pathological and psychological conditions that may reach the point of death, as women in general and after the age of forty are at risk of developing osteoporosis, which weakens their bone structure and increases the risk of exposure to pathological complications as a result of falls.

The moral development of the experimental group compared to the control group is mainly due to the nature and method of using balance exercises, as a group of exercises was used with the help of fairly modern and commonly used training methods such as (Swiss Ball) and balls (BOSU balance ball) (Cando Balance Disc), (Balance Pads) step boxes with heights of (15) cm, in addition to the use of static and mobile balance exercises, taking into account the gradient in the difficulty of performance and the provision of a safe environment for training, which removed the fear factor among the research sample and what prompted them to perform the exercises correctly and with high self-confidence.

The researchers also attribute the moral development in the experimental group to the use of the method of focusing visual attention using the Motion Guidance® tool while performing balance exercises, as focusing on a specific goal while performing a balance exercise can enhance the functioning of the nervous system and its compatibility with the muscular system and sense organs. Responsible for the balance of the body, which ensures the arrival of immediate feedback about performance, and is matched by a nervous response to direct correction by the nervous system and in real time, which creates a state of adaptation as a result of repeated responses represented by regular balance training, in addition to that the focus of external attention works to focus muscle effort At a certain point, which allows the muscles to work properly, systematically and non-randomly, in other words, there is greater compatibility in the exercise performed, and this thing is naturally better than the internal focus (on the body and legs). (Parr et al., 2023) states that the internal focus of attention occurs when the individual directs attention resources inward towards controlling movement or the physical sensations associated with it, while the external focus occurs when the individual allocates attention resources towards the results of movement or the effects of movement in the environment.

(McNevin et al., 2003) states that internal focus promotes what is known as "restrictive action", which consists of conscious and elevated control of movements by means of self-regulation, leading to a tendency to restrict the kinetic system and "freeze" degrees of freedom. Whereas the external focus largely focuses on the self-regulatory capabilities of

the kinetic system, allowing for reflexive and automatic or self-control. (Lohse et al., 2011)

The findings of the research with the superiority of the external attention focus group over the internal attention focus group are consistent with many studies that examined the preference of the two focus. One of the comprehensive review studies showed that the external focus facilitates and enhances performance and helps in better learning of skills compared to the internal focus. (Wulf., 2013)

One theoretical explanation for the skillful performance and learning changes resulting from external focus is the restricted action hypothesis (McNevin et al., 2003) (Wulf et al., 2001), which suggests that external focus reduces the level of conscious interference with control processes, allowing the body to act automatically, while inner focus is thought to require more conscious control of control processes that disrupt kinetic skill execution. (Raisbeck et al., 2019)

Conclusions:

- The experimental group used to focus external visual attention achieved significant development in the four-stage balance test and the functional reach test.
- The effectiveness of using the laser motion guidance tool in developing balance and reducing falls.
- Carrying out studies on the preference of focusing internal and external attention in dynamic balance exercises.
- Most of the studies focused on static balance in order to know the preference of focusing attention, which necessitates studying the moving balance with measurements of electromyography (EMG) and knowledge of muscle fatigue, as well as the use of electroencephalography (EEG).
- Few studies address the use of functional magnetic resonance imaging (FMRI) during focusing internal and external attention.
- Generalizing the idea of preferring to focus internal and external attention on other physical attributes such as strength, speed, endurance and agility.

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