

# NERVE STRENGTH AND ITS RELATIONSHIP TO SPECIFIC MUSCLE STRENGTH AND THE PERFORMANCE OF FLOOR MOVEMENTS BY ARTISTIC GYMNASTS

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## ABSTRACT

*During the last decade, sports have witnessed significant and noticeable development in various sporting competitions, and this development is not a matter of coincidence or randomness, but rather has come as a result of great efforts, whether collective or individual, by those in charge of sports fields and competitions.*

*Scientific research in the field of sports is one of the most important effective ways to develop players and sports in general. The game of gymnastics has relied on this research significantly and significantly. Among these researches is physiological research, which is largely concerned with the state of the body's functional systems and the developments that occur in them. This study aimed to identify the relationship between nerve strength, the special muscle strength, and the performance of floor movements for artistic gymnastics players, as well as to identify the nerve strength and the performance of floor movements for artistic gymnastics players. The researcher assumed that there is a significant correlation between nerve strength and the special muscle strength for female artistic gymnastics floor movements players. The researcher also assumed There is a significant correlation between nerve strength and the level of performance of ground movements.*

*Hence the importance of this research through the importance of nerve strength, as we find it to be the primary influence on stimulating muscle fibers and thus producing special muscle strength in order to achieve a very high level of skill performance and strong and good achievement, which gives the research great benefit to coaches in codifying training loads and adjusting them to suit the player.*

*The sample was chosen by the researcher in a deliberate manner, and her research sample was selected from the national team players from the artistic gymnastics and floor movements category (women), as the number of players was (4) and they represent the community of origin (100%), and (1) of the players was excluded. To conduct a reconnaissance experiment on it.*

**Keywords:** *Nerve, strength and muscle strength.*

## INTRODUCTION

During the last decade, sports have witnessed significant and noticeable development in various sporting competitions, and this development is not a matter of coincidence or randomness, but rather has come as a result of great efforts, whether collective or individual, by those in charge of sports fields and competitions. Gymnastics is one of the important Olympic competitions, because of its very great importance in terms of the huge amount of medals achieved in tournaments and the many benefits for its practitioners. Therefore, those working on it sought to give ideas and effort for the purpose of increasing development and raising its technical, tactical and legal level.

Scientific research in the field of sports is one of the most important effective ways to develop players and sports in general, and the game of gymnastics has relied on this research in a significant and significant way. Among these researches is physiological research, which is largely concerned with the state of the body's functional systems and the developments that occur in them, as it is one of the most important indicators. What reflects the functional state of the neuromuscular system is the individual's ability to master the most important motor skills that serve the competition, as well as those characterized by speed and motor coordination.<sup>1</sup>

Hence the importance of this research through the importance of nerve strength, as we find it to be the primary influence on stimulating muscle fibers and thus producing special muscle strength in order to achieve a very high level of skill performance and strong and good achievement, which gives the research great benefit to coaches in codifying training loads and adjusting them to suit the player.

## Research problem

We notice that there is development in the game of gymnastics, but that there are some things that still need continuous studies and research in order to continue the processes of development and development for sports teams and clubs, and the game of gymnastics is one of the competitions in which it depends on the level of skill performance as well as on special muscular strength. Which the players produce in harmony with the performance. The researcher noticed that there is a clear weakness in the skillful performance of floor movements, especially during competitions and tournaments. The researcher attributes the reason for this to the weakness of the nerve strength of the players, which leads to a rapid imbalance in the players while performing the movements. Therefore The researcher studied nerve strength and its relationship to specific muscular strength, which affects the athletes' performance of floor movements.

## Research objectives

1. Identifying the relationship between nerve strength, specific muscle strength, and the performance of floor movements by artistic gymnasts.
2. Identify the strength of the nerve and the performance of floor movements for artistic gymnasts.

## Research hypotheses

1. There is a significant correlation between nerve strength and the specific muscle strength of female floor movements players in artistic gymnastics.
2. There is a significant correlation between nerve strength and the level of performance of ground movements.

## Research field

- Human field: The players of the national artistic gymnastics team are women
- Time range: 1/7/2024 to 3/3/2024.
- Spatial field: National Gymnastics Team Hall - Baghdad.

## Research Methodology

The methodology is important in scientific research, because it gives value to the research and results because it is strongly and closely linked to the method that the researcher follows in his research. The method is "the intellectual step that researchers take to solve a specific problem in their research."<sup>2</sup> Since scientific research has determined the majority It is one of the approaches that is compatible with the nature of any scientific problem that the researcher must study, which gives researchers the freedom to choose the approach that is compatible with the research problem.

## The research sample

The appropriate selection of the sample for any research is one of the most important things that researchers must take into account, as it is the most important part that represents the original research community on the basis of which

researchers conduct their work. It collects its research data and research information from the sample of the original community, in order for the researcher to reach accurate data. In his research, the researcher must choose the sample intentionally, and it was selected from the players of the national team for artistic gymnastics, category (women), where the number of players was (4) and they represent the community of origin (100%), and one (1) player was excluded from the players. To conduct a reconnaissance experiment on them.

### **Tools, devices, and means of collecting information**

- Arab and foreign references.
- Tests and measurements.
- Questionnaire form.
- Ground movements rug.
- Whistle number (1).
- Swiss-made electronic stopwatch.
- EMG nerve and muscle mapping device, made in Germany, model 2017.

### **Exploratory experiment**

The researcher conducted a reconnaissance experiment on 1/10/2024 on one (1) player from the national gymnastics team. She was chosen randomly and then excluded from the research sample. This experiment aims to determine the accuracy and validity of the measurements and tests related to the research and to know and identify the negative aspects. And to avoid them, which can occur during the study experiment and to find alternatives, as well as to identify the positive aspects that can be strengthened and enhanced, as the exploratory experiment is considered an initial experimental study that researchers conduct on a small sample of their research before starting the research and choosing the research methods and tools.<sup>3</sup> In addition, the exploratory experiment also included all measurements and tests related to the researcher's research.

The results of the exploratory experiment demonstrated the safety of the equipment used in the research. When conducting the exploratory experiment, the researcher took into account the necessity of "it having the same conditions and conditions as possible as those of the main experiment so that its results can be taken into account".<sup>4</sup>

### **Conduct field research**

#### **Tests used in research**

The researcher surveyed many scientific sources, scientific research and experiments, and in addition to the researcher's scientific and field experience, a number of tests were determined, which are as follows:

1. Nerve strength test (sensory amplitude).
2. Side jump from a platform for 15 seconds.

#### **First: Nerve strength test (sensory amplitude)**

- The purpose of the test: to measure the response of the sensory nerve.
- Tools used: two recording leads - an alarm lead - a computer screen - a measuring tape.
- Test description: The experimenter places the gripping electrode around the wrist of her hand, and we also place the recording electrodes of the device, which is composed of two rings. The first ring, which represents the active electrode, is placed on the index finger of the first phalanx, and the reference electrode is placed on the second phalanx of the same finger. We place an electrical conductive material on the two rings of the device. We place the stimulation electrode, which consists of an anode and a cathode, on the front side of the forearm above the wrist above the nerve. Each player is given (12) seconds of electrical stimulation, after which a sensory amplitude wave appears on the screen of the device, whose speed is estimated at (60 m/s). The sensory amplitude wave has two criteria that the researcher used in her research:
  1. Calculating arousal (the time between the alert and the start of the wave)
  2. Calculate the distance between the active loop recording electrode and the stimulation electrode, and take the mean for the tester to be less than 120 mm/m.

#### **Second: Test the side jump from the terrace (15 seconds):**

- The aim of the test: to measure the speed-related strength of the leg muscles.
- Tools: Table, electronic stopwatch.

- Performance method: The experimenter stands next to the terrace in a position of readiness for the side jump. From standing at a signal to start, the experimenter jumps sideways from the terrace and also jumps back to the place. The experimenter continues to repeat the jumping process for (15) seconds.
- **The conditions :**
  1. It is not allowed to stop while performing the test.
  2. The tester is allowed to perform simple repetitions before the test.
  3. The experimenter is allowed to move forward and backward during the performance.
- Recording: The experimenter records the number of correct repetitions within (15) seconds.

**Scientific foundations of tests**

1. **Test stability:** Reliability in a test means the degree of consistency that the used measurement method can apply. It also means the extent of consistency of the test or the extent of accuracy with which the test measures the phenomenon being measured. It can also be said that the extent of accuracy and consistency of the measurements obtained in what the test measures .<sup>5</sup> depends on the idea of re-applying the test to the same sample individuals and under the same conditions again as possible after a period of time of 5 days has passed, as it was found that the tests have high stability.
2. **Honesty:** There are many ways to find the validity coefficient, so the researcher used self-validity, which is called the reliability index for the test, “which means the validity of the experimental scores in relation to the real scores that have been freed from the impurities of chance errors.”<sup>6</sup> This type of honesty is one of the most appropriate types of honesty for the research topic, as it was found that there is high validity in the tests used in the research.
3. **Objectivity:** It means that the test is not affected by changing the arbitrators, or that the test gives the same results regardless of who is conducting the arbitration, that is, freedom from bias or fanaticism and not introducing personal factors of the tester or arbitrator, such as his opinions, whims, and personal inclinations.

**Table 1.** Shows the reliability coefficient and validity coefficient for the research variables

Tests	Stability coefficient	Honesty coefficient	Objectivity factor
Side jump test from the platform (15) seconds	0.91	0.98	96 %
Nerve strength test (sensory amplitude)	0.96	0.95	97 %

**Results**

- **View and analyze nerve strength results**

**Table 2.** Shows the means and standard deviations for testing nerve strength among female gymnasts

Tests		Units	mean	STD
Nerve strength of the right arm	Sensory amplitude	Microvolt	11.66	2.3
Nerve strength of the left arm			10.66	2.37

We note from Table (2) that the means and standard deviations of the nerve strength of the right arm were as follows: The mean of the (sensory amplitude) test for nerve strength of the right arm was (11.66) and the standard deviation was (2.3).

We also note from Table (2) that the means and standard deviations of nerve strength in the left arm were as follows: It is good that the mean of the test (sensory breadth) for the left arm of the experimenter reached (10.66) and the standard deviation for the left arm of the experimenter reached (2.37).

- **View and analyze special power results.**

**Table 3.** Shows the means and standard deviations for special muscular strength tests among female artistic gymnasts

Tests	Units	mean	STD
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Special muscular strength test	Side jump test from the platform (15) seconds	The correct number of times	17.66	5.18
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We note from Table (3) that the means and standard deviations for the test of muscular strength and special abilities among female artistic gymnastics players were as follows:

Also, the mean of the test (side-jumping over the terrace for 15 seconds) was (17.66), and the standard deviation for the test of side-jumping over the terrace for (15) seconds was (5.18).

**Discussion**

Discussing the results of the correlation between nerve strength and muscle strength among female artistic gymnasts. The researcher presented the results and analyzed the variables. The research resulted in a significant correlation between nerve strength and the special muscular strength of the players of the national gymnastics team. The researcher attributed this to the fact that nerve strength has a major, influential and effective role in the special muscular strength of the players of the national gymnastics team. Whenever there is high sensory stimulation, that is, sensory-nervous stimulation, it means that there is a large, effective, and strong motor nerve impulse, thus stimulating a large number of muscle fibers to produce large and high muscle force, and this is what was confirmed by the studied research results. The ability of the nervous system to mobilize the largest number of muscle fibers to participate in muscle contraction (however, a portion of these muscle fibers does not participate, 12-18% in the majority of athletes and 35-45% in those who do not practice sports, and this Fibers can be stimulated to participate in muscle contraction (by electrical stimulation).<sup>7</sup> The nervous system controls and controls all these muscle groups to produce the highest and strongest level of personal muscular strength, and this appears at the beginning of every athlete’s training, as we notice the inability of the athlete or athlete to produce maximum muscular strength in the beginning until the system can Nerve coordination of work between different muscle groups. Some studies indicate that the difference in the speed of the nerve impulse leads to a difference in the specific muscle strength and speed produced by two athletes who are equal in weight, muscle mass, and training age.<sup>8</sup>

From here, we infer that motor nerve strength, in addition to sensory nerve strength, has an effective and noticeable role in producing strength and speed in most athletes, as the integrity of the nervous system and nerves is clear evidence of the motor compatibility between the nervous and muscular systems, and thus the production of strength and speed is proportional to the skill performance of the players.<sup>9</sup>

**Conclusions**

1. There is a significant correlation between some nerve strength of the right and left arm and the specific muscle strength of female gymnasts.
2. There is a significant correlation between the specific muscular strength and the level of performance of floor movements among female artistic gymnastics players.
3. There is a significant correlation between the nerve strength of the right and left arm and the level of performance of floor movements among female gymnasts.

**Recommendations**

1. Special tests for nerve strength must be conducted, the aim of which is to determine the components of the training program and special exercises for the nervous system in order to improve and achieve athletic achievement in the game of gymnastics.
2. It is very necessary to conduct neuro-motor tests that serve the training process for other activities.
3. Conducting similar studies and research on other different age groups, with the addition of new variables, with the aim of bringing female artistic gymnasts (sports movements) to the best and strongest levels.

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