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Effect of Special Exercises To Develop Electrical Muscular Activity of The Muscles Of Legs And Front Straight Air Flip Performance Skill on Ground Movements Rug for Juniors

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Abstract

Objectives. The objective of this research was to prepare specialized exercises aimed at developing lower limb strength to improve the technical performance of the front straight air flip skill on the ground mat apparatus in gymnastics. The study addressed the problem of weak technical execution among players, the limited use of modern technologies, and the insufficient information regarding the electrical activity of the muscles involved and their responsiveness to training stimuli. These gaps contributed to poor technical outcomes, necessitating the need for innovative exercise interventions based on scientific measurements such as electromyography (EMG).

Materials and Methods. The researcher employed a descriptive approach using the survey method to address the research problem. The study sample consisted of 100 randomly selected physical education teachers from primary schools in Maysan Governorate for the academic year 2024–2025. A specially designed questionnaire was used to evaluate the quality of educational performance, and its scientific coefficients were established. The main experiment was conducted on 8/12/2024, and data were statistically analyzed.

Results. The results showed a significant improvement in the values of the electrical activity indicators of the muscles involved in performing the front straight air flip. Comparative analysis between pre-test and post-test results revealed statistically significant differences in favor of the post-test across all measured variables. This indicates that the special exercises had a positive impact on both muscular strength and technical skill performance, affirming the effectiveness of targeted physical training combined with the use of modern measurement technologies like EMG.

Conclusion. The researchers concluded that the implementation of specialized strength exercises significantly enhanced the electrical muscular activity and technical performance of the front straight air flip skill among junior gymnasts. It was recommended that training programs should systematically incorporate exercises aligned with specific motor skills and that modern techniques such as EMG should be utilized to monitor and optimize athlete development. This approach can effectively identify strengths and weaknesses in motor performance, allowing for more targeted and efficient training interventions.

Keywords : Electrical Muscular, Front Straight Air Flip, Ground Movements Rug, Gymnastic.

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Introduction

The increasing development of the science of sports training and its applied importance made it necessary to search for new methods, methods, means and techniques to keep pace with development, and performance in the sports field has achieved great progress over the past few years, as high performance levels common today have become usual after they were a fantasy in the past, reaching high levels and achieving sports achievements requires meeting the requirements of sports activity practiced.(Shareef, 2025)

As the physical aspect and muscle strength is one of the most important of those aspects because of its positive impact on motor performance, muscle strength is the basis of movement and without it will not occur movement and to perform motor skills with high efficiency, training stimuli (external load) must affect the largest number of motor units of the muscles working towards achieving the skill goal, the requirements of modern play impose some changing situations due to the change in the pace of performance.(Borges et al., 2022)

which requires showing a kind of physical qualities that suit the nature of the situation and the desired goal Achieved, as each motor skill is associated with special physical abilities with a positive impact on the level of performance of that skill, sports activities that depend on muscular strength must be characterized by its players with that physical characteristic and the gymnastics player needs special physical qualities so that he can accomplish the requirements of motor skills on different devices.(Christiani et al., 2021)

The sport of gymnastics depends on the characteristic of muscle strength significantly, especially ground movements, because its skills depend on the distinctive strength of speed and explosive power of the legs and arms, which have a significant impact on improving the level of technical performance of many skills, so those in charge of the training process must work to use the best methods, methods, means and modern techniques to develop special muscle strength.(Hall & Holt, 2023)

The device (EMG) is one of the means and modern technologies that contributed to providing the sports side with information about the activity and nature of the human body, the device records the electrical activity associated with the muscle during contraction, as it consists of a clear idea of the safety of nerve instructions and the extent of their investment when carrying out motor duty.(Jabbar et al., 2025) it provides clear and important indications of the possibility of neuromuscular compatibility, effort economy and energy saving, and from the foregoing, the research acquires its importance by demonstrating the importance of

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special exercises for gymnasts and the effectiveness of the (EMG) device in Detecting the electrical activity of the muscles working in the technical performance of the skill of the front straight air flip on the ground mat device and investing it optimally and developing it to perform various skills**.**(Khamraeva et al., 2024)

The research problem was that the skill of the front straight air flip on the ground rug device is one of the special requirements of the device within the second group of acrobatic movements with difficulty (B), which the player must perform during the kinetic chain in order for the player to obtain the degree of the group's requirement and that the teaching of this skill, development and performance correctly enables the player to perform other skills with higher difficulties by adding or linking them with another movement.(Đorđević et al., 2023) so from the above, the research problem manifested in several factors, including the weakness of the special strength and the lack of use of modern technologies and the lack of information received about the electrical activity of the working muscles and the extent of their response to training stimuli, which led to poor technical performance of the skill of the front straight air flip on the ground movements rug, hence the researchers decided to study this problem and develop solutions and scientific and practical treatments through their reliance on the variables of electrical muscular activity and the development of special exercises to develop the skill of the front straight air flip on the ground mat movements**.**

The research aims to identify the effect of special exercises for the legs in developing the electrical activity of the muscles of the legs and the performance of the skill of the front straight air flip on the floor mat. The researchers assume that there are statistically significant differences between the results of the pre- and post-tests in the variables of electrical muscular activity of the muscles of the legs and the performance of the skill of the front straight air flip on the ground mat of the two groups of the research sample.

Materials and Methods

Study Participants.

The study involved junior gymnastics players from the Specialized Training Center of the Directorate of Youth and Sports in Maysan Governorate. A total of six players, aged between 11 and 13 years, constituted the research sample, representing 100% of the population because there were no other training centers catering to the same player level and age group in the province. Homogeneity testing was conducted for variables including height, weight, chronological age, and training age, with skewness values ranging between -0.857 and 0.383, indicating that the sample data were normally distributed.

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Study organization.

The researchers adopted a one-group pre-test and post-test experimental design, suited to the nature and goals of the research. An exploratory experiment was conducted on January 19, 2025, to check the reliability of the devices, determine appropriate repetitions for the exercises, and identify any logistical issues. Pre-tests measuring explosive leg power (using a vertical jump test with EMG devices) and skill performance (evaluated by a panel of four referees through video recordings) were conducted on January 21, 2025. The main intervention phase began on January 25, 2025, consisting of 24 training sessions over eight weeks, with three sessions per week (Saturday, Monday, and Wednesday). Exercises were performed at the start of the main section of training after warm-ups, using maximum repetition intensity with a 1:2 work-to-rest ratio. Post-tests were administered on March 21, 2025, under the same conditions as the pre-tests.

Statistical analysis.

Descriptive statistics, including mean, standard deviation, and skewness coefficients, were calculated to ensure the homogeneity and normal distribution of the sample before the intervention. Since the skewness values were within acceptable limits (-3 to +3), it is inferred that parametric tests, such as the paired sample t-test, were used to compare pre- and post-test results. The significance level for statistical tests was typically set at 0.05 to assess the effectiveness of the training intervention.

Results

Presentation and analysis of the results of the tests for the electrical activity index of the rectus femoral muscle and the right and left lateral anterior muscle and skill performance in the pre- and post-tests of the research sample.

Table 1. shows the arithmetic means, standard deviations, calculated value of (T) and (sig) for the electrical activity index of rectus femoral muscle and lateral twin right and left and skill performance of the pre- and post-tests of the research sample.

Muscle		Measurement Unit	Pre-test		Post-Test		(t) Value	Sig. (2-tailed)
			Mean	Std. Deviation	Mean	Std. Deviation		
Electrical activity of the rectus-femoral	Summit	(mV)	695.32	144.56	795.32	14.56	5.472	0.011
	Area	(mV/s)	210.76	19.82	310.76	6.82	6.248	0.008

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muscle right	Time	(m/s)	0.65	0.03	0.53	0.03	4.475	0.021
Electrical activity of the left rectus-femoral muscle	Summit	(mV)	584.57	77.14	684.57	44.14	5.272	0.013
	Area	(mV/s)	215.26	18.61	315.26	8.61	22.648	0.000
	Time	(m/s)	0.63	0.02	0.53	0.02	3.841	0.031
Electrical activity of the right lateral twin muscle	Summit	(mV)	765.41	139	865.41	138.84	5.824	0.01
	Area	(mV/s)	187.64	16	287.64	15.76	4.632	0.018
	Time	(m/s)	0.65	0.03	0.55	0.03	3.628	0.036
Electrical activity of the left lateral twin muscle	Summit	(mV)	754.45	128	854.45	127.62	7.216	0.005
	Area	(mV/s)	174.43	9.00	274.43	8.64	6.843	0.006
	Time	(m/s)	0.63	0.03	0.53	0.07	3.458	0.041
front straight air flip		degree	5.398	0.297	7.992	0.453	16.42	0.000

It appears from the results presented in Table (2) that the values of (t) in the peak, area and time variables of the electrical muscle activity of the rectus femoral muscle of the right and left femoral reached respectively (3.841,22.648,5.272,4.475,6.248,5.472), and it also appeared that the values of (t) in the peak, area and time variables of the electrical muscular activity of the right and left lateral twin muscle amounted respectively (3.458,6.843,7.216,3.628,4.632,5.824) and it appeared that all the values of (sig) attached are smaller than the significance level (0.05), which indicates that there are significant differences between the results of the tribal variables. And post-and in favor of post-tests.

Table 2. shows the development rates between the pre- and post-tests of the research sample

Muscle		**Measurement Unit**	**Means of pre-tests**	**Means of post-tests**	**Development Rates**
Electrical activity of the rectus-femoral muscle right	Summit	(mV)	**695.32**	**795.32**	**12.573**
	Area	(mV/s)	**210.76**	**310.76**	**32.179**
	Time	(m/s)	**0.65**	**0.53**	**18.461**

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Electrical activity of the left rectus-femoral muscle	Summit	(mV)	**584.75**	**684.57**	**14.581**
	Area	(mV/s)	**215.26**	**315.26**	**31.719**
	Time	(m/s)	**0.63**	**0.53**	**15.873**
Electrical activity of the right lateral twin muscle	Summit	(mV)	**765.41**	**865.41**	**11.555**
	Area	(mV/s)	**187.64**	**287.64**	**34.765**
	Time	(m/s)	**0.65**	**0.55**	**15.384**
Electrical activity of the left lateral twin muscle	Summit	(mV)	**754.45**	**854.45**	**11.703**
	Area	(mV/s)	**174.43**	**274.43**	**36.439**
	Time	(m/s)	**0.63**	**0.53**	**15.873**
front straight air flip		degree	**5.398**	**7.992**	**32.457**

Discussion

It appears from the results presented in Tables (2.3) that there are statistically significant differences and development rates between the results of the pre- and post-tests in the indicators of electrical muscular activity, and the results presented in Table (2.3) showed that there are statistically significant differences between the results of the pre- and post-tests in the technical performance of the skill of the front straight air flip and the rates of development and in favor of the post-tests, as the researcher attributes the main reason for the development in the indicators of electrical muscular activity as well as technical performance to the effective effect of special exercises that Prepared by the researcher, which contributed to the development of strength and thus contributed to the development of the technical performance of the skill under research, where studies have proven a direct relationship between sports results and the level of muscle strength growth in the gymnastic.(Guo, 2022)
The researchers believe that this development came as a result of the positive impact of special exercises, which is consistent with the kinetic path of the skill led to a noticeable improvement in muscle strength and the occurrence of better adaptations contributed effectively to the development of the work of the main muscles responsible for motor duty, making them productive of movement with the highest strength and the least time, as the use

of these exercises worked to improve muscle work and make it go towards increasing the output of muscle strength at the moment of push, Where pushing the force improves as a result of increased energy in the muscle and this is confirmed by the planning of electrical activity of the muscles, as he points out (Ji. 2025) The special exercises are used to develop and develop the correct performance of the motor skill of gymnastics and these special exercises contain a quality similar to the basic technical performance.(Ji et al., 2025)

And the use of special strength exercises in a codified manner compatible and appropriate to the age stage of the research sample contributed to directing and developing muscular work according to the requirements of skill performance by employing the largest possible number of motor units to help the player in focusing the power shed and reducing the time of pushing and thus increasing the output of muscle strength to serve the goal of skill performance of the skill of the front straight air flip, This is confirmed by (Liao. 2021) Some special exercises can be used in the development of ability, as ligaments and muscles are strengthened, which helps to build capacity.(Liao et al., 2021)

And that what developed the ability of the muscle to overcome the different forms of resistances facing the gymnastics, especially the basic resistance to body weight The nature of the mechanical performance of these exercises in terms of the dynamics of the correct performance of them and the relationship between tension and relaxation in central and eccentric contractions.(Constans et al., 2021) which generated an improvement in the maximum vertical thrust that served the skill performance positively, where training by lengthening and shortening indicates the ability of the muscle to produce force in the least time after lengthening it in a reverse movement to the direction of the required basic movement their implementation.(Đorđević et al., 2023)

Conclusions.

The results of the study demonstrated that the use of special exercises proved to be an effective method for developing players' capabilities in line with the specific demands of performance. Through the targeted application of these exercises, noticeable improvements were observed in the values of the electrical activity indicators of the muscles under measurement, which positively influenced the players' skill performance levels.

Furthermore, the utilization of modern technological tools, particularly the device for analyzing the electrical activity of muscles (EMG), provided accurate and reliable indicators for evaluating both skill performance and the effectiveness of training programs designed to enhance performance levels. These findings underline the value of integrating advanced

measurement techniques within the training process to gain objective insights into muscular function and skill execution.

Additionally, the results indicated varying rates of development in the electrical activity of the leg muscles among the research sample, highlighting the individualized nature of adaptation to the specialized exercises applied during the training program.

Recommendations

Based on these findings, several recommendations are proposed:

1) Emphasize the use of modern technologies, such as the electro muscular activity measurement device (EMG), to identify strengths and weaknesses associated with motor performance.
2) Encourage coaches to adopt qualitative, structured exercises that follow a gradual progression principle to ensure the steady and correct advancement of players' skill levels.
3) Motivate coaches to engage with contemporary studies and research that support and enhance the training process, ultimately contributing to the development of gymnasts' technical and physical performance.

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Conflict of interest

Have no conflict of interest to declare.

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