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Variations of Lower Limb Exercises to Increase Explosive Leg Power in Soccer

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ABSTRACT

Previous studies have found much of the effect of exercise on increasing the explosive power of leg muscles. However, research investigating variations in lower extremity muscle training forms to increase the explosive power of soccer players' leg muscles still needs to be completed. Therefore, references are needed to provide a fuller understanding and more effective solutions in designing training programs to increase the explosive power of leg muscles in soccer players. This study aimed to investigate the effect of various forms of lower extremity muscle training on increasing the explosive power of the leg muscles in soccer players. This study aims to provide a complete understanding of the types of exercises that are most effective in increasing the explosive power of the leg muscles, as well as to provide more effective solutions in the design of specific training programs for soccer players. Thus, this research should contribute to developing more optimal training methods and improving athletes' performance. This study uses the literature review method using a comprehensive strategy, such as searching for articles in the database of research journals. The databases used are Pubmed/MEDLINE, Scopus, Web of Science and Embase. The data used are the latest data from the last five years. Thus, recommendations of still very effective exercise variants can be recommended to trainers as a basis for creating training programs. Based on the analysis of research data, it has been found that strength training can increase the explosive power of the leg muscles. However, the study results showed that plyometric training was more effective than strength training in increasing explosive leg muscle power in soccer players. Therefore, a variation of plyometric exercises should be introduced to increase the explosive power of leg muscles in soccer players.

Keywords: variations, lower limb muscle, explosive power, soccer

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INTRODUCTION

Football is a game that requires good physical abilities throughout the body. Physical conditions such as stamina, strength, speed, flexibility and the interrelation of other basic physical conditions play an important role in improving player performance (García-Pinillos et al., 2015; Markovic et al., 2020; Ozbar, 2015; Stares et al., 2015; Suud et al., 2022). A particularly important aspect of football is the explosiveness of the leg muscles, which is a combination of strength and speed. The explosive power of the leg muscles has direct implications in the game of football, such as increased running speed, ability to kick the ball, ability to change direction and ability to jump (Çımenlı et al., 2016; Mohammad & Mashhoot, 2021; Ozbar, 2015; Rawte et al., 2021; Thomas et al., 2009). One form of exercise that can be used to increase the explosive

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power of the leg muscles is plyometric exercise. Plyometric training effectively increases muscle strength (Aloui et al., 2020; Thomas et al., 2009) and positively impacts football playing skills (Ali & Israa Abdulridha Younus, 2021).

Special exercises are needed to target the muscles of the lower limb to increase the explosive power of the leg muscles. The leg muscles are a component of the lower limb that must be strengthened, and its explosive power increased. In this context, exercises aimed at developing the muscles of the lower limbs are paramount. The muscles of the lower extremities include the muscles of the thighs, calves and feet. By training these muscles in a consistent and targeted manner, soccer players can increase the explosive power of the leg muscles. This is important because the explosive power of the leg muscles has a direct relationship with the ability to run fast, change direction, jump and perform powerful kicks (Buchhheit et al., 2010; Guo & Qiao, 2023; Hammami et al., 2019; Kosni et al., 2022).

Research on variations of lower extremity muscle exercises to increase the explosive power of leg muscles is still sparse. However, it is important to include a variety of exercises in the design of an exercise program. One of the studies dealing with variations in lower extremity muscle exercises was done by Oleh (Hammami et al., 2018). This study showed a significant change in the explosive power of the leg muscles following variations of these exercises. However, this study was published five years ago, so further research is needed to update the information.

In the context of soccer players, it is important to include various exercises to train the lower extremity muscles and increase the explosive power of the leg muscles. By introducing variety into the training program, players can experience different stimuli regularly. This helps prevent muscle saturation and provides a more effective stimulus for developing explosive power. By applying the principles of varied training in the training program, football players can achieve optimal development of explosive power in the leg muscles. This will help improve their performance in various aspects of the football game, such as speed, strength, agility and technical skills.

METHODS AND MATERIALS

This research used a literature review method with a comprehensive search strategy of various research journal databases such as Pubmed/MEDLINE, Scopus, Web of Science and Embase. Inclusion criteria in this study were international journals published within the last five years, i.e. 2023, journals that discuss lower extremity strength training exercise variations, and involve participants of average age 18 to 26 years old, men and women. who are in good health, not participating in other studies and are not currently injured.

Exclusion criteria for this study include local journals and journals that do not have a good reputation. The searches were conducted using the keywords "Lower Limb", "Plyometrics", and "Exercise Variation". In the search results, a total of 40 articles matching these criteria were found, and of these, eight articles that met the search objectives, subject relevance and relevant results were analyzed. Deeper.

Thus, this study uses a literature review method by conducting an exhaustive search of several leading research journal databases. Inclusion and exclusion criteria were used to select the journals according to the research topic, and an analysis was carried out on eight articles meeting these criteria, taking into account the research objectives, the adequacy of the subject and the relevant results of each article.

RESULTS AND DISCUSSION

The results of the study illustrate its main findings. The results and discussion are presented systemically, and only the results of the data/information are related to the research objectives. The discussion in the research article explains the results obtained from the research. The authors compile, analyze, evaluate, interpret and compare the results of the latest findings with existing research findings. Authors must pay attention to the consistency of articles from title to bibliography.

Data collected in tables/figures must be accompanied by narrative text and presented in a form that is easy to understand. Refrain from repeating the data presented in tables and figures at length. Complete the existing table/figure by writing the source below each table/figure in 10-point. Existing tables or figures are presented with sufficient explanations and include numbers and titles. The number and title of a table are placed above, while the number and title of a figure are placed below. Complete the existing tables and figures by writing the source under each table/figure. The table is created without a vertical border. Here's an example table and figure:

Table 1. Ilustration

NO	Author	Sample characteristics	Research design	Protocol	Result
1	(Ortiz et al., 2021)	The study sample consisted of 80 healthy, active subjects who were divided into four muscle working groups: concentric, eccentric, concentric-eccentric, and isometric.	Eksperiment	In the dynamic working group, four sets were performed with each set consisting of 12 repetitions. Between sets, rest for a minute. Meanwhile, for isometric work, it is performed for six seconds with a rest of 20 seconds. This research lasted 12 consecutive days.	The increase in speed at a distance of 06 meters was greater in the male group. During this time, the women's group experienced an increase in jump power, vertical jump, and horizontal jump.
2	(Loturco et al., 2019)	This study involved twenty-three male footballers under the age of 20 from the same team. All players have at least six years of professional football experience. The average age of the players was 18.3 ± 0.7 years, with an age range of 18 to 19 years. The average height of the players is 178.3 ± 5.4 cm and the average body mass (BM) is 71.5 ± 6.5 kg. These players regularly participate	Eksperiment	The squat jump exercise is performed three times a week. Group A exercised with a training dose of more than 20% of the optimal power load (OPL). On the other hand, group B exercised with a training dose less than 20% of the optimal power load (OPL).	The OPL squat jump based training program, separately or in combination, can be used to increase the explosive power of football players

		in regional youth tournaments in Brazil.			
3	(Fischetti et al., 2019)	In this study, twenty-eight adult female soccer players were randomly selected and divided into two groups. The first group is the control group (CG) composed of 14 people with an average age of 26.7 ± 5.3 years. Meanwhile, the second group was the plyometric (PG) group, which also consisted of 14 people with an average age of 26.5 ± 6.9 years.	Eksperiment	Interventions are carried out during the season. The two groups, namely the control group (CG) and the plyometric group (PG), carried out technical and tactical exercises as well as joint matches. However, the CG group followed a regular football conditioning training program, while the PG group followed a plyometric training program. No strength training was performed by either group. The plyometric training lasted 12 weeks, three days a week, and included hurdle jumps, high jumps and horizontal jumps.	The results of this study indicate that plyometric training has a positive impact on the explosive power of female soccer players. In particular, there was a significant increase in jumping ability and running speed with a change in direction. These components are important factors in football that require strength to succeed. Therefore, plyometric training can be a valuable component in the training programs of female soccer players to improve their performance on the field.
4	(Fischerova et al., 2021)	34 female footballers who play in Ekstraliga (age: 22 ± 5 years old; height: 167 ± 5 cm; weight: 60 ± 8 kg)	Eksperiment	The participants were divided into an experimental group and a control group, each consisting of 17 people. The control group received football training combined with 2 additional weight training sessions (50% 1RM load) 3 times per week. The experimental group, in addition to soccer training, also performed 2 weight training sessions per week (50-85% 1RM load).	The results of the present study indicate that a short six-week training program comprising general football exercises and strength training performed twice a week with gradually increasing loads during the preparatory period can significantly improve the parameters of strength and jump of the lower limbs of soccer players. This information can be valuable at the training stage in the area of training specific soccer skills.

5	(Hoef et al., 2019)	Conducting a Systematic Review and Meta-Analysis of the Effects of Plyometric Training on Soccer-Specific Outcome Measures in Adult Male Soccer Players	Meta-analysis	In this study, a search of articles was carried out in the PubMed, Embase/Medline, Cochrane, PEDro and Scopus databases. Subsequently, a full quality and risk of bias assessment was performed using the Cochrane ROBINS 2.0 randomized trial. After that, a meta-analysis was performed using random effects using Cochrane Review Manager 5.3.	Plyometric training has been shown to be effective in increasing jump height, 20-meter sprint speed, and endurance in adult male soccer players. However, there was no significant increase in strength, sprint speed over other distances, or agility. It is therefore important to consider these results when planning a plyometric training program for adult male soccer players to optimize performance gains.
6	(Ramirez-Campillo et al., 2020)	Of the 7,136 articles initially identified through a database search, 8 articles were eligible for inclusion in the meta-analysis	Meta-analysis	plyometric jumping training (PJT) is performed for at least 2 weeks	This study shows that plyometric jumping training (PJT) is effective in increasing the vertical jump height of female soccer players.
7	(Raya-González et al., 2021)	The sample for this study consisted of 24 elite athletes from Spanish football clubs. Players who met the inclusion criteria were those who had been part of the same football academy for the past 2 years, had attended at least 80% of training sessions over a 10-week period, had at least 4 years of systematic football training experience and had been injury free in the past 2 months. Goalkeepers were not included in this study due to the characteristics of their formation and their role during matches.	A randomized-controlled trial design	For 10 weeks, the intervention group participated in weekly flywheel resistance training sessions	Weekly resistance training behind the wheel can improve the jumping ability and change of direction of elite U16 soccer players over a season.

8	(Pardos-Mainer et al., 2021)	Articles were searched on the electronic database of the National Library of Medicine (PubMed), Web of Science, Google Scholar and SportDiscus from the initial period until October 19, 2020. In this search, only articles in English and Spanish were taken into account.	A systematic review and meta-analysis	Plyometric training offers better benefits than strength training for improving vertical jumps, linear sprints, and change of direction performance in female soccer players.

DISCUSSION

Plyometric training is a method that can be used to increase the explosive power of the leg muscles. This exercise involves all the components of the muscles of the lower extremities. This statement is confirmed by Fischetti et al. (2019) in their study of 12 weeks of plyometric training performed three times per week during the season. The results of this study indicate that plyometric training effectively increases jumping ability and running speed. In their research, Hoef et al. (2019) found that plyometric training can increase jump height, 20-meter sprint speed, and endurance in adult male soccer players. Recent research by Ramirez-Campillo. (2020), which used a meta-analysis research design, showed that plyometric exercises effectively increase vertical jump height in female soccer players. Jump height is used to assess a person's explosive power.

Besides plyometric exercises, there are several other search results. One of them is the research conducted by Ortiz et al. (2021), who divided the research group into four muscle working groups: concentric, eccentric, concentric-eccentric and isometric. This study involved both female and male participants. The results showed that the female group experienced significant increases in jump power, vertical jump, and horizontal jump. Additionally, some studies offer interventions in strength training that have been shown to provide significant results in increasing explosive limb power, just like Loturco. (2019). This study divided the research group into two groups, and each group did exercises with different doses. Group A exercised with a dose greater than 20% of the maximum training load (OPL), while Group B exercised with a dose less than 20% of the OPL. The results of this study indicate that training with a dose of more than 20% OPL can be used to increase the explosive power of soccer players. Additionally, Fischerova et al. (2021) and Raya-González et al. (2021) also intervened with strength training, which confirmed a significant increase in the ability to jump and change direction, as well as an increase in strength and jump parameters in the lower limbs of soccer players. However, fun exercises are more effective in increasing the explosive power of the leg muscles. Pardos-Mainer et al. (2021) confirmed in their research that plyometric training is more effective in increasing the explosive power of leg muscles than strength training.

Several studies suggest that plyometric training effectively enhances the explosive power of leg muscles in soccer players. Fischetti et al. (2019) and Hoef et

al. (2019) confirm jumping ability and running speed improvements. Ramirez-Campillo. (2020), in a meta-analysis, indicates an increase in vertical jump height in female soccer players. Other research, such as Ortiz et al. (2021) and Loturco. (2019) suggests that strength training with specific dosages is also effective. Fischerova et al. (2021) and Raya-González et al. (2021) found increased jumping and agility in soccer players. However, while both types of training are effective, the research suggests that plyometric training is more effective in enhancing the explosive power of leg muscles, as found by Pardos-Mainer et al. (2021). Therefore, plyometric training may be superior in enhancing soccer player performance through improved leg muscle explosive power.

CONCLUSION

The findings of this literature study offer a thorough comprehension of the significance of incorporating a range of exercises, such as functional, plyometric, and fundamental exercises, in a training regimen to boost explosive leg strength. This all-encompassing strategy may offer the greatest advantages when it comes to helping football players perform better on the pitch. Coaches and players can create training plans that are both efficient and tailored to the unique requirements of the football environment by comprehending these training principles.

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CONFLICT OF INTEREST

Author certify that there is no actual or potential conflict of interest in relation to this article.

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