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PLYOMETRIC EXERCISES TO INCREASE STRENGTH, RESISTANCE AND POWER AS A PREVENTIVE METHOD OF PATELOFEMORAL PAIN SYNDROME IN FOLK DANCERS

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Abstract: Folk dance dancers express themselves through the use of all body elements, highlighting the lower and upper limbs, in addition to the precision of each one to develop the dance's own skills; Despite this bodily adaptation, it is vital to prevent overexertion in the structures involved. Good physical condition is essential to meet the demands that the discipline implies; in addition, physical well-being plays an essential role in preventing injuries to the structures used in dance, which affect performance and reduce the physical condition of dancers. These injuries have a greater incidence in the lower limbs, thanks to the high impacts they receive during dancing. The knee joint complex acts dynamically when executing dance movements, however, these are usually not suitable for supporting the joint, triggering a series of biomechanical alterations that manifest themselves through performance-limiting symptoms. Patellofemoral pain syndrome is a common condition in folklore dancers due to the overload of the joint during activity, having a multifactorial origin such as: poor alignment of the segments, previous trauma or muscle weakness. Strengthening the knee flexor-extensor muscles has been shown to have an important impact on improving the syndrome. The increase in muscular capacities can be carried out through different methods. The application of plyometric exercises allows dynamic and effective physical work in the development of capabilities such as strength, power and resistance in folk dance dancers, therefore providing care to the structures involved, providing greater efficiency during the dance, favoring their long-term physical performance.
Keywords: Folk dancers, plyometric exercises, patellofemoral syndrome.

INTRODUCTION

The discipline of folk dance implies, for its practitioners, particular mechanical demands, forcing the body to use it as a tool of expression when developing different capacities, impacting this process of adaptation to specific structures of the body such as the joints of the lower limbs, especially the knee.

Patellofemoral pain syndrome "is defined as retro or peripatellar pain aggravated by at least one activity that loads the joint in flexion" (Jara Cánovas et al., 2020). The presence of such syndrome in folklore dancers is usually associated with a multifactorial condition, of which the overload suffered by the joint stands out, poor alignment of the structures of the lower limb and even weakness in the muscles responsible for the movements of the leg. knee.

The approach to muscular work allows us to develop capabilities that will give correct alignment of the structures, thus enhancing the muscle groups responsible for knee flexion and extension, for example, "strengthening the quadriceps is considered the essential pillar in the process. "rehabilitation of anterior knee pain, this is because it improves patellar tracking, homogenizing loads at the joint level." (Jara Cánovas et al., 2020). Within these capacities, strength, resistance and power are distinguished, which when developed, intervene as a prevention method for the mechanical demands of dance; "Strengthening the quadriceps muscles seems to lead to a decrease in patellar-femoral overload, with a consequent improvement in pain and function." (Gómez Palomo et al., 2017), creating protection of the joint and avoiding alterations that trigger patellofemoral pain syndrome.

There are different methods with which a muscular approach can be carried out to enhance its capabilities, however, plyometric exercises are "a specific method of preparation

aimed at the development of explosive muscular strength and the reactive capacity of the neuromuscular system" (Trujillo Chávez et al. al., 2023).

These exercises have a level of adaptation based on the muscle groups that you want to work and enhance, functioning as a tool for good physical preparation while avoiding injuries.

The prevention of muscular imbalances in folk dance dancers, especially in the muscles of the lower limbs, allows us to maintain good physical condition of the joint structures, obtaining optimal development of the discipline and increasing physical performance, as well as resistance. physical for the periods of time that are demanded.

PATELOFEMORAL PAIN SYNDROME

Patellofemoral pain syndrome is a direct condition of the knee joint that is defined as:

> "Retro or peripatellar pain aggravated by at least one activity that loads the joint in flexion, associated with additional but non-essential criteria such as: crepitus or sensation of oppression during flexion, sensitivity to palpation of the articular facets, mild joint effusion and pain when sitting or standing up." (Jara Cánovas et al., 2020).

This syndrome shows symptoms that directly impact the activities of those who suffer from it by representing constant discomfort in the movements of this joint.

INCIDENCE

Patellofemoral pain syndrome can appear at any age if the joint is constantly overloaded, however it has a prevalence that stands out: "It appears especially in the second and third decades of life, that is, in adolescence and adulthood. youth." (Gómez Palomo et al., 2017). Its prevalence in this period of life may be due to the fact that the activities practiced, such as sports or recreational activities, imply a physical demand with a greater impact on the joints of the lower limbs, favoring the appearance of the syndrome.

CAUSES

This syndrome is mostly considered to have a multifactorial origin, however, it is mentioned that: "Within the pathophysiology, it is considered an overload injury, where the structural unit of the tissue is damaged or exceeded in its capacity for reparative response, leading to to pain and increased joint stress" (Jara Cánovas et al., 2020). Overload to the joint can occur based on activities that require greater demand on such a structure. This can lead to constant stress on the components, exceeding the repair levels of the same tissue, leaving the emission of pain as a protective mechanism to avoid the overload that is being given to the area.

There are various factors that can lead to an overload of the joint, but the vast majority result from its poor use or the mechanical demands placed on it. It is stated that: "several risk factors have been described, such as overuse or overload, poor alignment, previous trauma, abnormal travel or traction of the patella, an alteration of tissue homeostasis and even a certain psychological profile" (Gómez Palomo et al., 2017). These risk factors may occur due to the activities that are practiced throughout the day, as in the case of folk dance, it is an activity in which factors such as overload, poor structural alignment due to the techniques, that are practiced and constant trauma to the joint.

Among the causes of this syndrome, it is possible to list some that involve instability of the knee joint, causing a biomechanical alteration that promotes this condition; however, muscle imbalance is one of the main causes that are found. That is why it is mentioned that:

> "The strength deficit when performing knee extension has been included as an important predictor of RDS, so that the biomechanical properties of the vastus medialis oblique and the vastus lateralis of the quadriceps are altered in this pathology." (Gómez Palomo et al., 2017).

Muscle weakness represents an important factor, since muscular action is of vital importance in the stability of the joint, and if this action is seen diminished or inhibited, the structures will be subjected to greater work, which represents more stress between them.

COMPLICATIONS OF PATELOFEMORAL PAIN SYNDROME IN FOLK DANCE

In the discipline of folk dance, physical demands will be essential to obtain good results of expression. For this, it is necessary that the dancers maintain an adequate physical condition for this activity. It is stated that: "Good physical condition is key when it comes to reducing the risk of injuries, improving performance and guaranteeing a long career as a dancer. A healthy dancer is one with a state of physical and mental "well-being." (Llinás Malvido et al., 2021). A dancer in good physical condition is one who is able to meet the demands of the discipline at an adequate level without harming her body.

The discipline involves a series of movements learned during grueling hours of physical training during which dancers are prone to injury because:

> "As it is a physical job, with many hours of training, many injuries occur. The main factors are the lack or poor application of technique and muscle weakness, but we find more causes such as, for example, the tools used when dancing." (Corrales Valero et al., 2017)

These risk factors can be located individually in dancers or collaboratively, creating a panorama of greater susceptibility to suffering a major injury, the more factors are found.

In folk dance, patellofemoral pain syndrome represents a constant condition among dancers, even Gómez Palomo mentions that: "SDR is the overuse injury that most affects people who practice ballet and the prevalence is higher in the technically disciplined more demanding, classical ballet" (Gómez Palomo et al., 2017). This tells us that in dance with high mechanical demands the syndrome may be present, causing a considerable limitation in the performance of the activity, affecting physical performance.

PLYOMETRIC EXERCISES

Plyometrics is a technique used, above all, in physical training in sports, which highlights that:

> "Since the 70s and 80s of the 20th century… the plyometric method has been assumed as the methodology to produce neuromuscular adaptation that facilitates fast and powerful movements, based on improving the reactive capacity of the neuromuscular system" (Quetglas González et al., 2012).

The function of this method is based on its principle of rapid contractions with muscle elongations, allowing a dynamic recruitment of muscle fibers and thus forcing the muscle to develop different capacities together.

BENEFITS FOR DEVELOPING PHYSICAL ABILITIES

The practice of plyometric exercises promotes the development of basic physical capabilities such as strength and speed, in addition to resistance capacity, which is why it is stated that: "Plyometrics is a method of reactive strength training, used to improve performance. sports, increase speed" (Trujillo Chávez et al., 2023). This improvement in capabilities allows athletes to perform better in their activity as they have prepared the

muscles for the mechanical demands of the discipline.

Regarding the fundamental principle of performing plyometric exercises, it is mentioned that: "loads of relatively low inertia are used, in this case it is the acceleration that increases, having the effect of developing explosive strength" (Quetglas González et al., 2012). The development of explosive strength allows for a more dynamic and powerful muscular action in the face of various resistances, without losing the main action of supporting and stabilizing other body structures. "The particularity that characterizes the exercises in the plyometric method,

> "It is given that the muscular tension generated during their execution is achieved through a sudden stretch at the moment in which the body, or the falling implement, is stopped." (Quetglas González et al., 2012).

Plyometric exercises help activate the central nervous system by highly stimulating fast-twitch muscle fibers. Therefore, it stands out that: "it represents a specific preparation method aimed at the development of explosive muscular strength and the reactive capacity of the neuromuscular system" (Trujillo Chávez et al., 2023). This promotes a better muscular response in explosive activities, preventing major injuries such as in cases where the structures have not been adapted to these reactions.

CHARACTERISTICS AND SELECTION OF EXERCISES

The exercises chosen to activate the knee flexor-extensor muscles are the following:

Stair exercises:

1. Jumps opening and closing the legs; inside and outside the ladder.
2. Jump forward, 1 to the left, return to the center, 1 to the right, return to the center and repeat.
3. On one side of the staircase, you enter and exit with one foot at a time in each square until you walk completely.

Grid Exercises:

1. I jump forward, to the center, back and back to the center.
2. Diagonal jumps front and back.
3. From the center, jump towards an outside square and jump clockwise, then counterclockwise.

CONCLUSIONS

The suggested plyometric exercises activate the flexo-extensor muscles of the knee through an explosive force reaction that encourages the development of resistance and muscular power, thus preparing the body for the demands of the muscles. These exercises can be part of the warm-up moment prior to dancing practice to improve the dancer's performance and create an improvement in the biomechanical adaptation of the patellofemoral joint.

The muscle enhancement obtained in the lower limbs thanks to the application of plyometric exercises, provides greater stability in the knee, in addition to providing a better distribution of loads in moments of impact when performing folk dance, significantly reducing damage to the joint, preventing the development of the symptoms of patellofemoral pain syndrome.

The ease of application of these exercises allows them to be adapted to folk dance dancers of different ages, favoring the introduction of a multidisciplinary field in the approach of this population, such as the intervention of sports physiotherapy in the care of physical well-being and the prevention of the appearance of patellofemoral pain syndrome in dancers.

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