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Original article

INCIDENCE OF INJURIES IN RHYTHMIC GYMNASTICS

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Abstract*

Aim. The paper aims to analyze the situation of the rhythmic gymnastics injuries in Romania as a consequence of wear produced in the training through the very large number of repetitions of biomechanically difficult elements required by the Score Code.

Methods. We applied between October 2016 and April 2017 a questionnaire with 10 questions to legitimate athletes practicing rhythmic gymnastics in the clubs participating in national and international competitions in our country.

Results. The 30 athletes of our research aged 12-13 years present approximately equally injured present ankles and spine (lumbar level).

Conclusions. This study can be a support for the specialists in the field to develop training plans that do not lead to injuries of the athletes in order to avoid mistakes in choosing the means and methods of learning, consolidating and improving the elements with high risk of injury.

Keywords: rhythmic gymnastics, injuries, questionnaire

Introduction

Changes to the Code of Point over time have led to major changes in training techniques by finding optimal means so that athletes can achieve the high level elements in competition execution.

The gymnasts perform a lot of elements in an exercise that demand the backbone exaggeratedly at the lumbar spine (dynamic elements with and without rotation, pirouettes, balance elements), elements that require the knee joint (during pirouettes), and the shoulder joint (difficult grips outside the visual range).

The wear of these joints in the training is very high because the elements in an exercise are repeated individually but also in combinations until a stereotype is reached.

The combination of low gymnast weight, extreme flexibility movements and repetitive stress / tension on the musculoskeletal system during intensive training are potential risk factors for injuries.

It is necessary to investigate the prevalence and etiology of rhythmic gymnastics accidents, given the physical and emotional impact that they have on the athletes.

Whiting and Zemicke (1998) define injury as "damage caused by physical trauma, supported by body tissues", the definition being difficult to apply in the investigation of sports injuries. A more comprehensive definition is given by Rice (1989) who describes sports injuries as "a medical

condition resulting from sports activity that causes a limitation or restriction of participation in the activity or for which medical treatment has been received".

As a rule, injuries fall into two categories: acute and chronic. The evolution of acute injuries is usually severe and short-lived, with a sudden onset (Micheli, 1984; Baxter-Jones, Maffuli, & Helms, 1993).

In contrast, chronic injuries are described as having a slow evolution, the symptoms gradually settling, ultimately acting much more destructively - long-term injuries (Micheli, 1984; Baxter-Jones et al., 1993). Without adequate recovery, microtrauma stimulates an inflammatory response, which in turn leads to localized damage to the area. Repeated fractures, tendencies, are examples of chronic injuries.

By identifying the mechanisms of producing an injury, one can then find the cause-effect relationship (Micheli, 1984).

Girls start practicing rhythmic gymnastics at younger ages (4-5 years), their body being exposed to intense physical training before puberty. Thus, excess tissue lesions and muscle imbalance that surrounds the joints (International Federation of Sports Medicine, 1990). In addition, rapid puberty growth is a vulnerable period for this type of injury.

The attractiveness of programs adapted from aerobics consisted in the fact that we worked on

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music with objects and a new device. (Damian M., Popa C., Popa C., 2015)

Schootman et al. (1994) suggests that excessive pressure applied to growing bones at this pubertal age could stop bone growth. It has also been suggested that the backbone is the most vulnerable site for injuries because growing bone parts are exposed to both movement pressure and strong muscle contractions.

Purpose

Most movements performed by rhythmic gymnasts require an excessive range of motion, these being the technical requirements of this sport. It is possible that the technical elements established by the International Gymnastics Federation contribute to some of the injuries. The present paper aims to find out if there is a relationship between the technical requirements mentioned above and the injuries of athletes, thus seeking to recommend some changes to the regulation to reduce the prevalence of injuries.

In rhythmic gymnastics, girls fight for perfection. Repeatedly, the realization and improvement of their abilities accomplishes this. Therefore, the repetitive nature of sport is the hypothesis of placing gymnasts at increased risk of injury.

In a study on rhythmic gymnastic injuries, conducted by Hutchinson (1999), the prevalence of lumbar pain was documented on 7 gymnasts over a 7-week period

Hutchinson (1999) found that 86% of gymnasts reported pain during the study period. This indicated that the group of girls has an increased risk of producing lumbar spine injuries.

Methods

Results of the research and their discussion

We applied between October 2016 and April 2017 a questionnaire with 10 questions to legitimate athletes practicing rhythmic gymnastics in the clubs participating in national and international competitions in our country. The study was addressed to 30 gymnasts of 11-13 years, junior to third category.

Athletes have a 6.5 year training in rhythmic gymnastics. Takes training 3 hours a week for 6 days. Generally the heating part lasts between 20 and 30 minutes, the technical training part lasts between 1 hour and 30 minutes and 2 hours, and the physical training takes between 45 minutes and 1 hour.

Most gymnasts (n=27) have as a dominant part the right side of the body: the right hand, the right leg, the pivotal rotation is also done on this side. The 30 completed questionnaires were processed and interpreted.

The requested information was intended to provide information about:

1. Body area where the gymnast has been injured,
2. The moment of injury,
3. The movement or the element that caused the injury,
4. Cause of injury,
5. The diagnosis received
6. Treatment
7. Recovery period
8. Percentage of physical training during training
9. Percentage of technical training during training
10. The percentage of exercises in physical training for the different body segments and muscle groups

Tabel no.1 - Answers to the questionnaire

The rugged segment	The movement / element that caused the injury	Possible causes	Diagnosis	Recovery period
Thigh/ the pelvic belt	-mobility exercises	* overload * lack of attention, strain * insufficient preparation	Micro-tears that have scratched	-2 months -2 weeks
Arms	-fall -cartwheel on one hand -hit by apparatus	* distraction * inadequate work area	Fracture	-4 weeks

Ankle	-jumps landing	* genetics * distraction * inadequate work area * lack of strain	Sprain Extension of ligaments Fracture	-3 weeks -2 weeks -4 weeks
	-pirouette			
Knee	-pirouette	* lack of strain	Tendonitis Cross-ligament stretching	-1 week -rest in gypsum apparatus for 10 days
	-jumps			
Back	-extensive extension	* insufficient preparation	Muscle contract	-1 week massage
	-gripping the ball with the legs on slow backward overturning	*lack of mobility * overload *scoliosis	Scoliosis Muscle tension	-resting, avoiding back extension movements
	-pirouette			
	-balance with trunk backward at horizontal position or below			

After applying the questionnaire we could see that the most affected body area of the athletes included in our research is the lower limb area,

especially at the ankle. We also notice that the injury occurred at the time of the training (especially in the second part), the most often invoked reason being lack of attention.

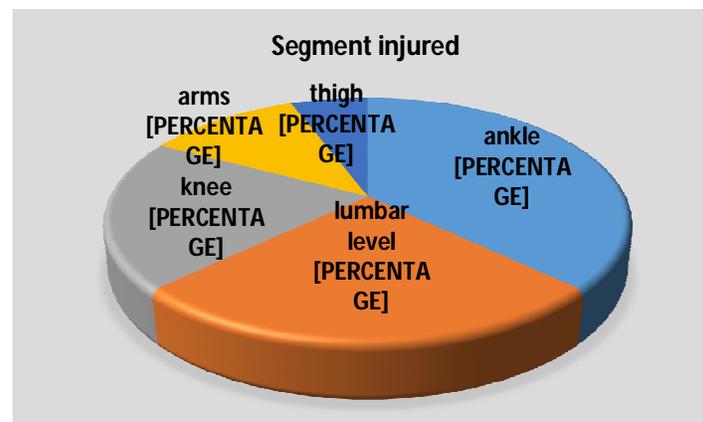


Fig no.1. – Percentage of injuries by body segment

We believe that this is due to the large number of steps and jumps, turning elements made by gymnasts. So we noticed that the majority elements that resulted in injuries in this body segment are jumping (80%).

The next segment with a high incidence of injury is the back, especially the lumbar region. The moment of injury is similar to the one described above - in the training also in the second part.

The elements that led to injury to gymnasts are related to the extensive extensions executed at ground level or those for the execution of the jumps.

The same percentage as the number of injuries was recorded for those in the upper limbs and those at the knees. Among the reasons that caused these injuries, the gymnasts invoked the achievement of the elements on inappropriate surfaces and lack of attention.

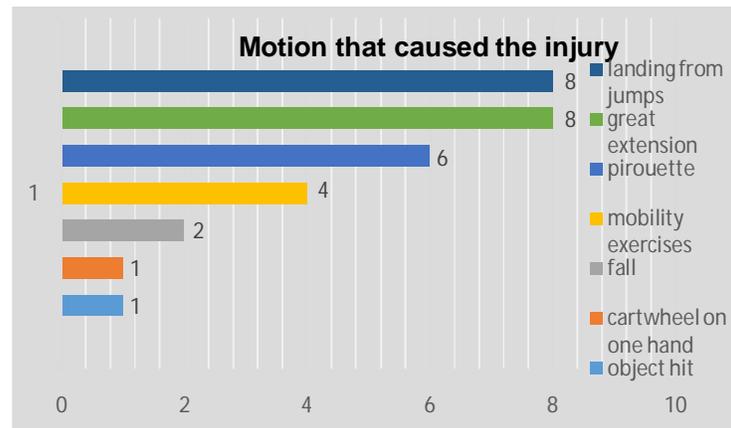


Fig no.2. – Motion that caused the injury

The fewest problems were reported in the thighs, on the back (2 injuries) during exercise exercises (1 case) and outside the training room (1 case).

The most common conditions have been found to be muscle contractions in the back, most

gymnasts (n = 6) have such contractions at this level, followed by ligament stretching at the ankle and knee (n = 3), second degree twists (n = 3), two fractures, one in the left wrist, the other at the ankle, tendinitis, muscle microarrays and metatarsal overload.

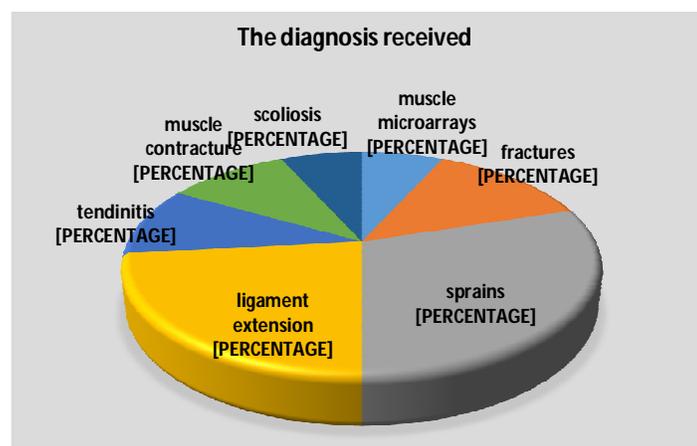


Fig no.3. –The diagnosis received

According to the respondents, most of the injuries occurred during training, respectively 23 of the total of 5 injuries, while only one injury occurred during the competition. The remaining 2 injuries occurred during gymnasts' free time.

Also, most injuries occurred during the second half of the training, which demonstrates gymnast fatigue, lack of attention or even cooling of the tissues.

Comparing the results obtained from the application of the rhythmic gymnastics girls questionnaire in the country with the results of the studies and researches of the specialists in the field we can see that the average time when the gymnastics practice this sport is 6.5 years.

The study "Injuries and Training Recommendations in Elite Rhythmic Gymnastics" conducted by Zetaruk, et al in 2006 on 20 sports for one year led to the following results:

- 85%, representing 17 athletes, reported injuries to the muscle-tendon unit
 - 25%, representing 5 sports reported fractures
 - 80% representing 16 athletes reported back pain or spine fractures in the spine, of which 8 needed complete rest for recovery
 - 5%, representing 1 gymnast suffered a concussion
 - One gymnast suffered a knee injury
 - 45%, representing 9 athletes accused knee pain
- Athletes from our study trained an average of 18 hours / week compared to those in the above study



who trained 26.2 hours / week. The authors of the study concluded that for each additional hour of rhythmic gymnastics weekly, the estimated risk of injury increased by 29%.

Comparing the two studies, we notice that the incidence of injuries is higher in the lower limbs (22 injuries), especially in the ankle (13 injuries) in our case. The moment of injury is during training in the strengthening and refinement of the technique of execution of the elements in the individual exercises.

We consider this to be due to the large number of steps and jumps, return elements made by gymnasts. So we noticed that the majority of the injuries to this body segment are jumping.

Entrails of the ankle occur frequently among gymnasts. Rhythmic gymnastics puts girls at risk for such injuries due to techniques such as jumping and twisting.

The tendency of the foot and ankle is related to repetitive jump techniques performed with all objects, but primarily on the rope.

The fact that the coaches included in our study provide an average of 53.33% of physical training at different times of the year entitles us to affirm that the lack of a muscles that sustains the workout during training is not the source of injuries to athletes.

The studies conducted in 1985 (O'Neill, Micheli) and 1988 (Micheli) show that the athletes involved have 300 minutes / week of physical training. This takes about 1 hour of physical training per day. The study authors concluded that increasing physical training time results in a higher incidence of fractures. Until a certain point, strength and strength exercises reduce the risk of fractures

These results lead us to affirm that the cost-benefit ratio of physical training needs to be further examined and a balance between performance improvement and injury reduction needs to be found.

Responding to the question about the percentage of exercise exercises in physical training for each individual segment, we obtained the following data:

- Increased attention is paid to exercises for lower limb force development (without performing ankle-specific exercises); Coaches propose exercises in an average weight of 35% of the total time spent on physical training;
- The following segment interested is abdomen, especially abdominal muscles (an average of 28.35%);
- Low attention is paid to exercises for the development of back muscles (an average of 25%);
- The least attention is paid to upper limb muscles, for which an average of 11.66% of the

time allocated for gymnasts' physical training is allocated.

However, this information leads us to the conclusion that one of the causes of the increased number of injuries in the ankles and back is due to the precarious muscular support of these sports.

Conclusions

The data processed following the application of the questionnaire determines that:

1. The incidence of injuries in rhythmic gymnastics in Romania is major in the lower limbs
2. The most common injuries are sprains and ligament extension
3. Rhythmic gymnastics coaches in the country do not practice prophylactic exercises during training
4. We have obtained valuable and necessary information to further develop a prophylactic plan for rhythmic gymnastics
5. The presence of a physical therapist in rhythmic gymnastics teams or regular visits to a physiotherapy room can reduce the risk of injuries to athletes

We believe that the realization of this study can be a support for the specialists in the field to develop training plans that do not lead to injuries of the athletes in order to avoid mistakes in choosing the means and methods of learning, consolidating and improving the elements with high risk of injury.

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