LONGITUDINAL STUDY OF SPORTS INJURIES IN PRACTITIONERS OF AEROBIC GYMNASTICS COMPETITION

INTRODUCTION

Aerobic Gymnastics (GA) as a competitive mode is incorporated in the year 1994 into the International Gymnastics Federation (FIG), being regulated by the Code of Points (CP), documents published by the technical committee of the institution. From then until now, one of the features of the GA to federal level, has been the ongoing regulatory review to which it is subject, in order to achieve better functional structure and a better harmony and coherence among its judges.

This evolution has generated research nationally and internationally that analyze this sport from different perspectives. Thus, several studies agree that the technical requirements that require its practitioners are anaerobic endurance, relative strength, power and explosiveness2,3. Furthermore, due to the high level of sport that exists to-day and the changes the sport itself requires the gymnast is constant difficulties including higher level thus increasing their risk to injury4.

So far, there are four editions of the CP, the first in 1995 (Edition

ABSTRACT

Introduction: Aerobic gymnastics, since its membership in the International Gymnastics Federation, has undergone changes in its regulations. Objective: To analyze the injuries found in Spanish aerobic gymnastics athletes during different editions of the Code of Points. Methods: A descriptive, longitudinal and comparative study was carried out on the epidemiology of injuries in aerobic gymnastics published during different editions of the Code of Points. Results: It highlights that the number of injuries decreased from 156 to 38 last year. This decline has been related to the restriction on the number of difficulties in the exercise and the number of elements to be performed on the floor. However, they have increased the number and value of the difficulties. Conclusions: Therefore, it is concluded that the changes made in the regulations are intended to safeguard the health of athletes and ensure that competition develops at its best artistic and technical aspect.

Keywords: health, prevention, sports.

RESUMEN

Introducción: La gimnasia aeróbica, desde su adhesión a la Federación Internacional de Gimnasia, pasou por mudanzas en sus regulamentos. Objetivo: Analizar las lesiones encontradas nos atletas españoles de gimnasia aeróbica durante las diferentes ediciones del Código de Puntos. Métodos: Realizó-se un estudo descritivo, longitudinal e comparativo sobre a epidemiologia de lesões na ginástica aeróbica publicado durante as diferentes ediciones do Código de Pontos. Resultados: Salienta-se que o número de lesões diminuiu de 156 para 38 no ano passada. Este declínio tem sido relacionado com a limitaçao do número de dificuldades no exercicio e o número de elementos a serem feitos no solo. No entanto, eles aumentaram o número e valor das dificuldades. Conclusões: Portanto, concluiu-se que as modificaçoes feitas nos regulamentos destinam-se a salvaguardar a saúde dos atletas e garantir que a competição se desenvolva no seu melhor aspecto artístico e técnico.

Palavras-chave: saúde, prevenção, esportes.
The most notable changes in the four editions of the CP are shown relative to the difficulty parameter. In the 2009-12 edition there are differences in the number of difficulties that will run the men’s singles (IM) and women’s singles (IF), about mixed couples (PM), threesomes (TR) and groups (GR) (table 2).

In the last two editions (2005-08 and 2009-12) in the value of the difficulties, the number of elements more difficult and reduce the elements with the lowest score and sometimes disappear.

### RESULTS

Based on the inclusion criteria were three works of epidemiology (table 1), but found no work published in the first edition of the CP (1997-2000). We can observe that the number of injuries is greater in the study of Navarro, Vernetta and Martinez and as it descends through the years.

The evolution of the types of injuries can be seen in figure 1, which shows that prevail muscle injuries in the three editions followed by joint and bone injuries falling.

If we analyze the different injury in 2001-04 CP muscle ruptures, in 2005-08 CP equate these and sprains and the CP 2009-12 prevalent strains (figure 2).

On the affected body area shows the high incidence harmful in the lower limbs, but highlights the significant decrease of the upper limb disorders (figure 3).

Studies published in three editions of the CP lesions predominate in the specific technique (figure 4).

#### Table 1. Lists of Studies found.

<table>
<thead>
<tr>
<th>Code of Points</th>
<th>Context</th>
<th>Sample</th>
<th>Number of injuries</th>
</tr>
</thead>
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Table 2. Characteristics of different Code Points.

<table>
<thead>
<tr>
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<tbody>
<tr>
<td>Element groups</td>
<td>6</td>
<td>4</td>
<td>4</td>
<td>4</td>
</tr>
<tr>
<td>Number of difficulties in routine</td>
<td>16</td>
<td>12</td>
<td>12</td>
<td>10 IM and IF 12 PM, TR &amp; GG</td>
</tr>
<tr>
<td>Elements of difficulty of land</td>
<td>Parts unlimited</td>
<td>Maximum 6</td>
<td>Maximum 6</td>
<td>Maximum 5 IM and IF Maximum 6 PMTR &amp; GR</td>
</tr>
<tr>
<td>Push-up Landings</td>
<td>Parts unlimited</td>
<td>Maximum 2 landings</td>
<td>Maximum 2 landings</td>
<td>Maximum 2 landings</td>
</tr>
<tr>
<td>Landings to split</td>
<td>Parts unlimited</td>
<td>Maximum 2 landings</td>
<td>Maximum 2 landings</td>
<td>Maximum 2 landings</td>
</tr>
<tr>
<td>Level of difficulty</td>
<td>0.1 - 0.7</td>
<td>0.1 - 0.9</td>
<td>0.1 - 1.0</td>
<td>0.1 - 1.0</td>
</tr>
<tr>
<td>Total number of difficulties</td>
<td>211</td>
<td>307</td>
<td>345</td>
<td>357</td>
</tr>
</tbody>
</table>

CP=Code of Points, IM=mens singles, IF=womens singles, PM=mixed couples, TR=triumphes, GR=groups.

DISCUSSION

Over the years some of the changes undergone by the CP have led to a reduction of injuries, such as the limit on landings push-ups or splits. In the study by Navarro, Vernetta and Martínez with the CP 2001-04 the incidence of injuries were 2.6 injuries per athlete. With this same regulation in Australia were recorded 2.18 injuries per athlete. Afterward, Abalo et al. with the CP 2005-08 are 0.63 injuries per gymnast.

These same authors observed the CP 2009-12 0.90 injuries practitioner, indicating a significant reduction of injuries in the last two editions.

Other changes in the rules as the increasing number of elements, the disappearance of items of lesser value and increasing higher value items contribute to increasing demands on the athlete and have more chance of injury by trying to do more complex elements.

All of the works are consistent with other published and have not been studied for not meeting the inclusion criteria in which the lesions are the most abundant type of muscle. This also happens in rhythmic gymnastics.

Unlike dance or gymnastics, where most injuries occur in the lower limbs in the GA lesions are present in the upper limbs. This may be due to the overhead of its structures to perform certain exercises because it is an area of the body that is not adapted to withstand heavy loads and body weight. However, a change in the CP 2 limit the maximum number of elements with push-ups landings has contributed to a decrease of lesions throughout the years.

Another body area affected is the lower limb adductors and hamstrings. Overload problems in these areas is related to the lack of flexibility, strength and repetitive strain, frequency and duration of training, and a poor technique or overtraining.

Injuries occur in different phases of the work of the GA, but in all studies the highest percentage of Lesions are found in the specific technique with different distribution in each of their working sections. This section includes the jumps in the GA group elements are larger and more possibility of difficulty in all editions of different CP, hence the frequency of use by gymnasts.

During the specific technique you learn, develop and mechanized through repetitive techniques, the required elements of difficulty of the exercise and competition. Therefore, the automation of these gestures or elements is what causes high rates of injury in this work phase. In this regard, Torrents indicates that the specific injury, it may be because the training method used in GA is based on repetition, low variability of their exercises and programs are not individualized.

CONCLUSIONS

Aerobic Gymnastics is an artistic and technical sport, but where the material value of the Static and Dynamic Strength, Power (jumps) and flexibility, you should always exist because it is one of the main features that give value and excitement to this sport. Thus, the changes that have been made in the various editions of the regulations have been beneficial for athletes because they have led to a decrease in injuries. Thus gymnasts can develop their full physical and artistic skills in a healthier environment.

All authors have declared there is not any potential conflict of interests concerning this article.

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