Estrada-Marcén, N.; Redondo-Laencina, P.; Casterad-Seral, J.; Cid-Yagüe, L. (2021) Laterality Treatment in Rhythmic Gymnastics: Research Based in Coaches. Revista Internacional de Medicina y Ciencias de la Actividad Física y el Deporte vol. 21 (84) pp. 479-500. Http://cdeporte.rediris.es/revista/revista83/artlateralidad1161.htm
DOI: https://doi.org/10.15366/rimcafd2021.83.005

LATERALITY TREATMENT IN RHYTHMIC GYMNASTICS: RESEARCH BASED ON TRAINERS

TRATAMIENTO DE LA LATERALIDAD EN GIMNASIA RÍTMICA: ESTUDIO CENTRADO EN ENTRENADORAS Y ENTRENADORES

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UNESCO code / Código UNESCO: 5801 Educational theory and methods / Teoría y métodos educativos
European Council Classification / Clasificación del Consejo de Europa: 5. Didactics and methodology / Didáctica y metodología 12. Motor learning / Aprendizaje motor

Recibido 24 de junio de 2019 **Received** June 24, 2019
Aceptado 6 junio 2020 **Accepted** June 6, 2020

ABSTRACT

The factors on which human laterality depends have been studied for many years, and no conclusive result has been established so far. Sport is an area in which it is often intended to make changes in the laterality of athletes. We found studies that state that lateral dominance can be changed through training and the application of techniques for modifying motor behavior (Bilbao & Oña, 2006). We were looking to obtain an overview of the treatment of laterality in the training of Rhythmic Gymnastics, based on the opinions and experiences of coaches. A questionnaire was designed to collect information, with 83 coaches participating. The analysis describes the treatment that Rhythmic Gymnastics trainers give to laterality. The use of contralateral members favored by coaches

is relatively frequent (60%), but usually does not produce changes on the skillful side.

KEYWORDS: laterality, lateral dominance, rhythmic gymnastics, trainers, gymnasts.

RESUMEN

Durante muchos años se han estudiado los factores de los que depende la lateralidad humana, no habiéndose podido establecer ningún resultado concluyente hasta el momento. El deporte es un ámbito en el que frecuentemente se pretenden realizar cambios en la lateralidad. Encontramos estudios que afirman que la dominancia lateral se puede cambiar mediante el entrenamiento y la aplicación de técnicas de modificación de la conducta motriz (Bilbao & Oña, 2006). Pretendemos obtener una visión general del tratamiento de la lateralidad en el entrenamiento de la Gimnasia Rítmica, basado en las opiniones y experiencias de entrenadoras y entrenadores. Para la recogida de información se diseñó un cuestionario, participando 83 personas. El análisis permitió describir el tratamiento que en el entrenamiento de Gimnasia Rítmica se da a la lateralidad. El uso de los miembros contralaterales propiciado en el entrenamiento es relativamente frecuente (60%), pero no suele producir cambios en el lado hábil.

PALABRAS CLAVE: Lateralidad, dominancia lateral, Gimnasia Rítmica, entrenadoras, gimnastas

1. INTRODUCTION

Many authors have defined the concept of "laterality" over time. The first authors who addressed the issue reached two different approaches: quantitative and qualitative. An example of a quantitative approach is that of Pieron in 1968 (Lerbet, 1977) which explains the predominance of one side of the body over the other regarding hands and eyes, differentiating between right-handed / left-handed and manual / ocular. Harris, in 1961 (Lerbet, 1977), provides another definition, which is predominantly quantitative but is also qualitative in terms of skill, defining laterality as the preferential use and higher skills of one side of the body over the other, affecting not only hands and eyes, but also lower limbs. As an example of a qualitative definition we have the one proposed by Hildreth in 1949 (Lerbet, 1977), which states that laterality depends on the degree of skill on each side of the body.

Some authors also include other body areas in the definition of laterality such as the ear (Morais & Bertelson, 1975) or even the tongue, such as Subirana in 1952 (Lerbet, 1977). Additionally, subsequent authors began to include in the term "laterality" the concept of "cerebral hemispheres". According to Ortigosa (2004), laterality is the result of the process of lateralisation, that is, an evolutionary development through which the predominance of one part of the body over the other is defined.

According to Broca in 1865 (Mayolas Pi, 2003), the functional superiority of one side of the body over the other is determined by the predominance of one of the cerebral hemispheres and not by education. He denominates this hemisphere the "dominant hemisphere" and explains that, due to the intertwine of nerve fibres running from the cerebral cortex to the spinal cord, this hemisphere will be the opposite to the one on the dominant side of the body. Later on, the concept of dominant hemisphere fell into disuse, changing to hemispheric specialisation. According to Martin (1979) all the different parts of the brain interact and motor control is not located in just one of the hemispheres but in both, providing both of them information to movement.

In 2013, a broad study on neuroimaging by Nielsen, Zielinski, Ferguson, Lainhart & Anderson (2013), found that lateralised brain regions maintain functions such as language and visuospatial processing. Some hypothesis predicted that the dominant hemisphere could depend on personality and cognitive style, but neuroimaging data has not provided any clear evidence about phenotypic differences in the strength of the dominant left or right networks.

According to Ocklenburg et al. (2017), although lateralisation is a fundamental principle of the organisation of the nervous system, its molecular determinants are mostly unknown. In humans, the asymmetry of the genes in the cerebral cortex has been considered for many years as the basis of body laterality. However, human fetuses show considerable asymmetries in arm movements before the motor cortex is functionally linked to the spinal cord, thus seeming more probable that the asymmetries of the spinal gene expression form the molecular basis of the hand.

The different authors who have studied laterality also propose different classifications for it. One of them is the one by Ortigosa (2004), which mainly distinguishes between homogeneous and non-homogeneous laterality. In other classifications, the concept of “forced laterality” arises, referring to a change in the lateral dominance of the person by external imposition or force, usually affecting mainly the hand. An example would be a left-handed child who is forced to use his right hand when doing his schoolwork, although these situations seem to be becoming uncommon.

In this way, numerous studies show that it seems possible to modify the laterality of a person through training and motor learning. Some strategies for the treatment of the change in trend of motor laterality are positive reinforcement, feedback, and the extinction of unwanted behaviour (Bilbao & Oña, 2006). Considering all of the above, we know that sport is an area where constant motor learning takes place, thus offering an optimal environment to apply techniques aimed at modifying motor behaviour and changing the laterality of athletes. In addition, in many sports, having one laterality or another, or even being ambidextrous, is a determining factor in performance.

In the specific case of Rhythmic Gymnastics (RG), there is a great diversity of treatments for lateral dominance of gymnasts. As it is a discipline with a great artistic component, many trainers choose to train the non-dominant side of the gymnasts in order to increase team evenness and visually achieve a more harmonious choreography and obtain a higher score in this section. Others prefer to focus on training the dominant side, leaving aside the non-dominant one, in order to achieve greater specificity and greater performance in specific actions, which, a priori, would also help to score more points in the competition. Furthermore, some of the apparatus used in RG require handling with a single hand (ball, hoop and ribbon) while others require the use of both hands, either because they have two ends (rope) or because there are two individual implements (clubs). In addition, regarding mono-lateral apparatus, until the start of this new Olympic period, the RG Code of Points (Fédération Internationale de Gymnastique, 2016) required that the choreography must have a 50-50 balance of elements performed with each hand, which on many occasions was not accomplished.

In this sport there are two types of competition: individual and in a team, and it is possible that the same gymnasts who compete individually, are also part of a group. In the individual competition there is a tendency towards a specialisation or preference for one of the sides of the body (left-handed or right-handed), on which the gymnast works more insistently in order to improve performance in the shortest possible time.

Then, the problem arises when this individual gymnast, highly specialised just in one side, has to be part of a team. It is possible that not all gymnasts in the team are specialised in the same side of their body. The use of the gymnast's dominant side of the body to perform a technical element common to all the other gymnasts in the team or the handling of the apparatus by each of them with a different hand, may be a handicap to the artistic score of the exercise, since the symmetry in the choreography will be reduced. However, if one or more gymnasts in the team are forced to change the side in which they are specialised in order to increase visual harmony, it can also imply a deterioration in final performance, since, in theory, they will be less skilful than if they used their natural laterality.

In RG, the greater development of one side of the body versus the other is common. When these differences exceed certain limits, they can cause imbalances in the physical development of the gymnasts, causing in some extreme cases elongations of up to 3 centimetres in the lower limb which is mostly used, pelvic torsion or lumbar scoliosis (Lisitskaya, 1995). These extreme disparities are generally a consequence of erroneous work, and as they are usually identified late, correcting them becomes difficult (Batista, Bobo, & Ávila-Carvalho, 2015).

All this makes lateral dominance in RG a very interesting research topic, besides existing very few previous studies. Our aim is to know the treatment of laterality given to gymnasts by trainers.

2. METHODOLOGY

A descriptive quantitative methodology was used, carrying out a cross-sectional study based on the sample.

Once the objectives of the study were established, a questionnaire was created and used for the collection of data, data processing, and analysis, following the guidelines established by Campos Izquierdo, Martínez del Castillo, Mestre Sancho & Pablos Abella (2007). It was a self-administered online questionnaire. Due to the lack of validated questionnaires on this topic in the bibliography, both for RG and for any other sport, the questionnaire used was of our own design. It was based on studies on the subject (Bilbao & Oña, 2006; Mayolas Pi, 2011; Squadrone, Gallozzi & Pasquini, 1995), as well as on a semi-structured interview to five active trainers in order to establish the key aspects of the study and the nature of the questions. The questionnaire was designed for this purpose based on the subject of study and the objectives established. This tool was used to ask questions to a sample of the population studied in order to produce quantitative descriptions of various aspects aimed at achieving the objectives of the research itself. Both open-ended questions (paragraph and short answer) and closed-ended questions (check boxes, drop-down and multiple selection) were used in the questionnaire, as well as questions that contrasted the fulfilment of the inclusion criteria.

The participants in the sample were contacted in different national and regional competitions of RG, they were informed about the purpose of the study and they were requested data to receive the survey. The questionnaire was converted into a website format using the online application *Google Forms*, included in the *Google Drive* office suite. This enabled the fast and easy distribution as well as an easy access system that favoured participation, just by clicking on a link. This link was sent to them together with a brief introductory message explaining the purpose of the study, the characteristics of the questionnaire, and the inclusion criteria. A check box was included prior to the questionnaire for the participants to give their informed consent for the treatment of the data for research purposes. The questionnaires were sent both by e-mail and the messaging app Whatsapp, depending on the contact data provided.

Results processing

The answers obtained in the questionnaire from *Google Forms*, were automatically collected and organised using Microsoft Excel software. Subsequently, the data was transferred to the SPSS statistical package version 19.0 in order to analyse it. A descriptive analysis of the data was carried out, obtaining frequencies and percentages, or means and standard deviations, depending on the nature of the data. In some cases, the *χ^2 test of Pearson* was applied to verify the independence of two variables, for a significance level of 5%. Bar charts and pie charts created by using Microsoft Excel were used to present certain results more visually.

Sample Profile

The population under study were active RG trainers, working at any level of federated competition in Spain. No specific ages, years of professional experience, or academic training aspects were taken into account as inclusion criteria. The objective was to learn about the training sessions with respect to the use of the right or the left side of the different body segments, and its influence on the development and affirmation of laterality.

Eighty eight responses to the questionnaire were obtained, 5 of which were discarded for containing incomplete questions. Among the 83 people who were finally selected to make up the study sample, there were 82 women and just 1 man, so the term "trainers" will be considered female from now on. This sample cannot be considered representative since 1159 trainers were federated by the Royal Spanish Gymnastics Federation at the moment of the fieldwork.

The average age of the sample was 21 ± 6, and the average years of experience as trainers were near 3.

3. RESULTS AND DISCUSSION:

Firstly, it is noteworthy that 100% of the trainers who completed the questionnaire had previously been athletes in this discipline. Figure 1 shows the maximum level at which they competed.

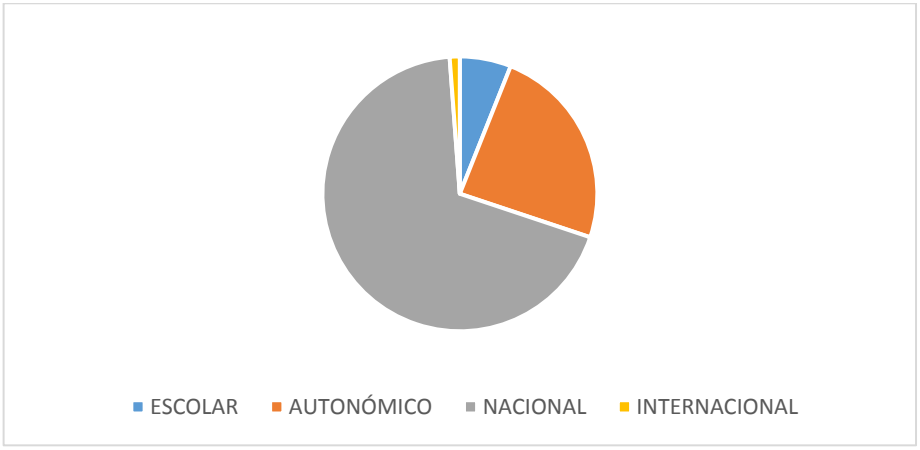

Figure 1: Maximum level at which they competed as gymnasts (n = 83)
*ESCOLAR; SCHOOL LEVEL / AUTONÓMICO; REGIONAL LEVEL/ NACIONAL; NATIONAL LEVEL/ INTERNACIONAL; INTERNATIONAL LEVEL

A series of questions about their experience as gymnasts in relation to the treatment of their laterality were included in the questionnaire. When asked if they had ever had their laterality changed in any specific aspect related to sport during their life, and if this change had been permanent over time or not, there were more trainers who answered that they did suffer a change in laterality (60%), but, within this subgroup, for only 28% of them this change meant that their non-dominant side became dominant.

The 50 trainers who experienced some change in their laterality were asked to explain their personal experience regarding this topic by means of an open-ended question. These are some of the most interesting and most repeated answers:

- Some participants were forced to change their laterality due to an injury, without specifying injuries or in which body segments.

- Several trainers explained that having been forced to handle the apparatus with their non-dominant hand had helped them to use both hands with equal dexterity.

- Others stated that they were left leg dominant and their teammates were all right leg dominant. Thus, after training their non-dominant side to equal the rest of their team, they became more skilled using the right leg.

- Sometimes the same as in the previous point occurred but with manual laterality, related to apparatus technique.

- One of the most interesting cases was that of a coach who explained the following: “I am innately left leg dominant. When working in a team I had to use my right leg mainly. It was a little more uncomfortable for me, but it suited me well in order to compensate. My performance was still better when using my left leg, so during the season when I worked individually I used my dominant side again.” This is a striking case of a gymnast who trained and competed for half a year using her dominant leg and for the other half of the year the opposite one.

From here on, their experience as gymnasts was put aside and we focused on analysing the results of their work as trainers.

Until this new Olympic period, the RG Code of Points required in the handling of the apparatus a balance (50-50) between the dominant and non-dominant hand in individual RG exercises. The results obtained when asked if, as trainers, they fulfilled that requirement when designing the performances, are presented in figure 2:

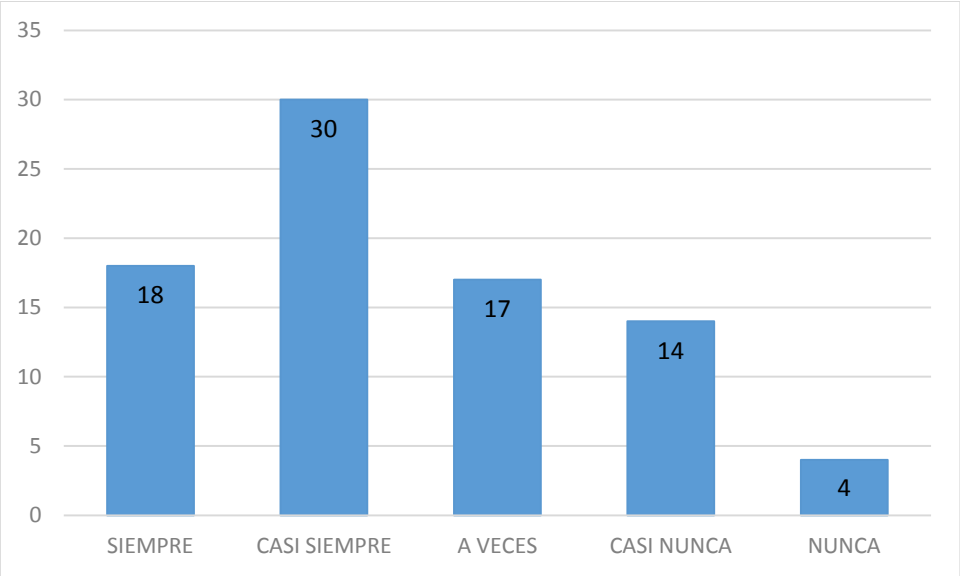

Figure 2: Frequency of the compliance with the “50-50” standard in performances
*SIEMPRE; ALWAYS / CASI SIEMPRE; ALMOST ALWAYS / A VECES; SOMETIMES / CASI NUNCA; ALMOST NEVER / NUNCA; NEVER

Despite the fact that the sum of the "always" and "almost always" columns represents 57.8% of the total sample, there is still a large number of trainers who only meets this standard "sometimes" or "almost never". No previous studies exist that help us explain these results, but we think it could be due to the fact that it is very difficult for a gymnast to be clearly balanced in her exercise between handling the apparatus with the left hand and the right hand. Therefore, despite the fact that disregarding this rule of the Code could lead to a lower score, a bad performance with the non-dominant hand could mean an even greater loss of points, so following the rule would not be worth the risk.

Regarding the workout routines provided by coaches, figure 3 shows how often they require their gymnasts to work with the same number of repetitions for right and left sides, in both body technique (BT) and apparatus technique exercises (AT).

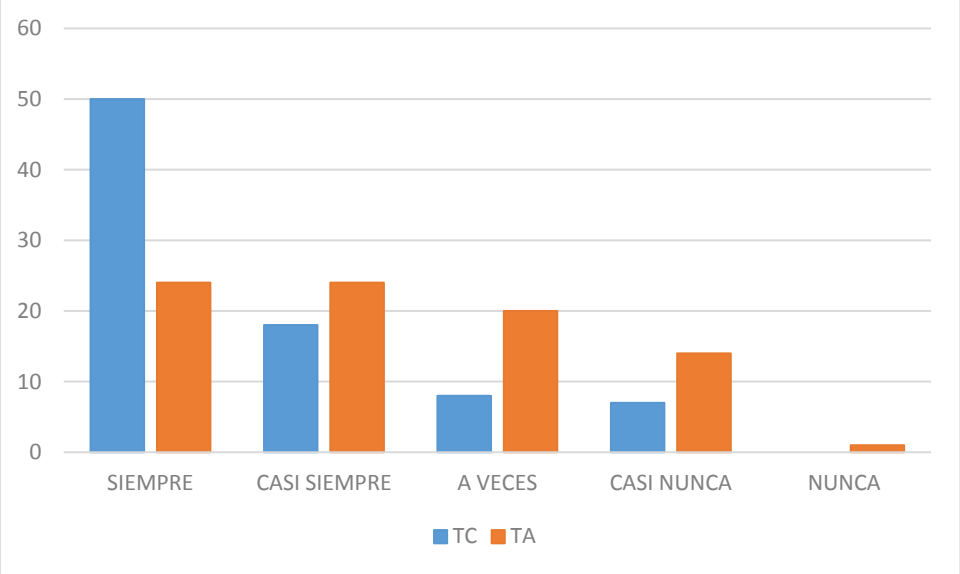

Figure 3: Frequency with which trainers require their gymnasts to carry out the same number of repetitions with both right side and left side, both in Body Technique (TC) exercises and in Apparatus Technique (TA) Exercises.
*SIEMPRE; ALWAYS / CASI SIEMPRE; ALMOST ALWAYS / A VECES; SOMETIMES / CASI NUNCA; ALMOST NEVER / NUNCA; NEVER

It is evident that a higher percentage of coaches consider compensatory training in BT more important than in AT, since in BT the majority of the sample (60.2%) chooses the option of “always”, while in AT the options are more evenly distributed. A statistically significant positive correlation was found ($r = 0.408$; $p = 0.000$) between BT and AT. That is, the trainers who most often demand the same number of repetitions for both sides in BT, will also do the same in AT.

Also in relation to BT and AT, the sample is asked about a specific situation: all the components of a RG team have the same dominant side, except one that is the opposite. They are asked if they would change the laterality of this gymnast to improve the evenness of the team.

If the answer is contextualised for the performance of body difficulties, the percentage of trainers who would try to change the laterality of a gymnast in order to improve team evenness in BT would be 46%, versus 54% who would not. And if the situation is contextualised in relation to laterality when handling the apparatus, the percentage of trainers who would try to change the laterality of a gymnast in order to improve team evenness in AT is 49%, versus 51% who would not. In both cases, there is a fairly similar number of trainers who would and would not change the laterality of a gymnast for the benefit of team evenness, both in BT and AT.

The trainers who answered “no” to the previous questions were asked to explain the tactics they would use to prevent the differences in laterality among the gymnasts in the team from being a handicap in the artistic value of the exercise. These are the strategies that are mostly repeated or those that we have considered of greatest interest:

- BT strategies:

- Make the gymnast with different laterality perform a different difficulty than the rest.

- Use type 1-4 formations, allowing the gymnast to perform the elements with her dominant side, placing her in the opposite direction or in the centre, so the performance seems symmetrical.

- Place her strategically throughout the performance and design the choreography based on this gymnast.

- Use original formations in which the gymnast with a different laterality is visually aesthetic.

- Perform difficulties in cannon or in different directions.

- AT strategies:

  - Place her strategically throughout the performance and design the choreography based on this gymnast.

  - Take advantage of her laterality to create an original and interesting exchange.

  - Use type 1-4 formations, so that the difference seems symmetrical.

  - In exchanges, be careful that two gymnasts with different laterality do not perform a throw opposite to each other, since the apparatus could collide.

  - Find apparatus handling movements that are just as beautiful performed with either side.

  - Perform throws in cannon, in different directions or times by subgroups 1-2-2.

In this case, there are also several coaches who state that they would change the laterality of the gymnast with different lateral dominance in some particular moments. For example, in simple apparatus handling movements or in the dance steps, adapting the movements of the apparatus to those that the gymnast with different laterality could perform properly using her non-dominant hand.

After knowing the opinion of the sample regarding laterality changes in BT and AT and after making them consider the subject, they were asked if, in conclusion, they considered it appropriate to change the laterality of a gymnast in order to obtain better results. The sample is still divided between "yes" and

"no", with practically similar percentages: 52% would change it, compared to 48% that would not change it.

The 43 participants (52%) who answered affirmatively, were also asked at which competitive levels they would make these changes in the laterality of their gymnasts or if they would do it at any level. Thirty three percent of the sample would make the changes at any level, while 9% would make them starting at the lower levels and 14% starting at the State/Regional level. It should be noted that 44% of the subgroup that answered "yes" to the change in laterality, stated that they would only do so starting at the State/Regional level, that is, at a fairly high competitive level. The reason for this could be that, at this level, the results become more relevant than at earlier levels. Thus, the trainers will try to achieve higher scores in competition, paying even more attention to evenness, coordination, symmetry and rapport between their gymnasts. Since the gymnasts are at a fairly high level, it is also possible that the change in laterality becomes easier. In theory, gymnasts will be more skilful at this level than at lower levels and will have more hours of training in order to improve movements with their non-dominant side.

The entire sample was asked again on whether or not they would make a change in the laterality of a gymnast at any age. Seventy five percent of the sample answer that they would not do it at any age. Some of the categories are considered to be more convenient than others for these changes. Since each trainer was allowed to mark more than one age option, these are the answers in each category:

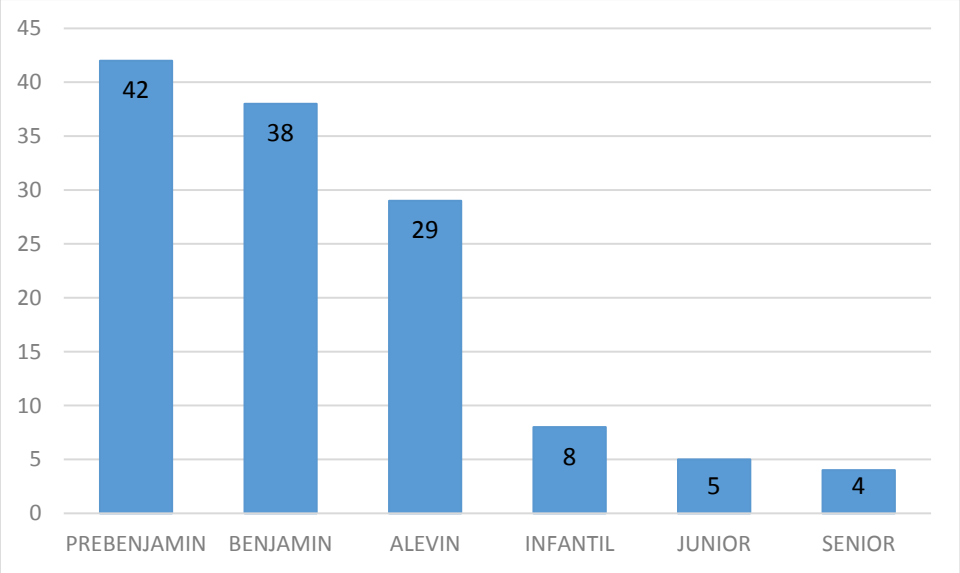

Figure 4: Categories in which trainers consider change in lateral dominance of their gymnasts appropriate

PREBENJAMÍN (6-8 years old) / BENJAMÍN (8-10) / ALEVÍN (9-11) / INFANTIL (11-13) / JUNIOR (13-15) / SENIOR (OVER 15)

The graph shows the clear fall of the line as we advance categories. In this way, the categories in which the laterality of a gymnast would be changed most frequently would be *prebenjamín* (6-8 years old) and *benjamín* (8-10 years old). Thus, the results suggest that the trainers consider laterality changes at an

early age more appropriate. These results are in line with Gesell's Maturational theory of 1958 (Gil Madrona, Contreras Jordán & Gómez Barreto, 2008) in which he states that learning depends on development. That is, new learning will be more easily acquired during the stages of development (infancy and childhood). Thus, if we include a change in laterality at a stage in which the child is still developing, it will be much easier for her to assimilate and adapt to this new learning, than if we do it later.

When the sample was asked about which changes of laterality occur more frequently in RG, whether hand or foot changes, the number of trainers who believe that hand changes in laterality occur more frequently is almost similar to those who think that foot changes are most frequent (figure 5).

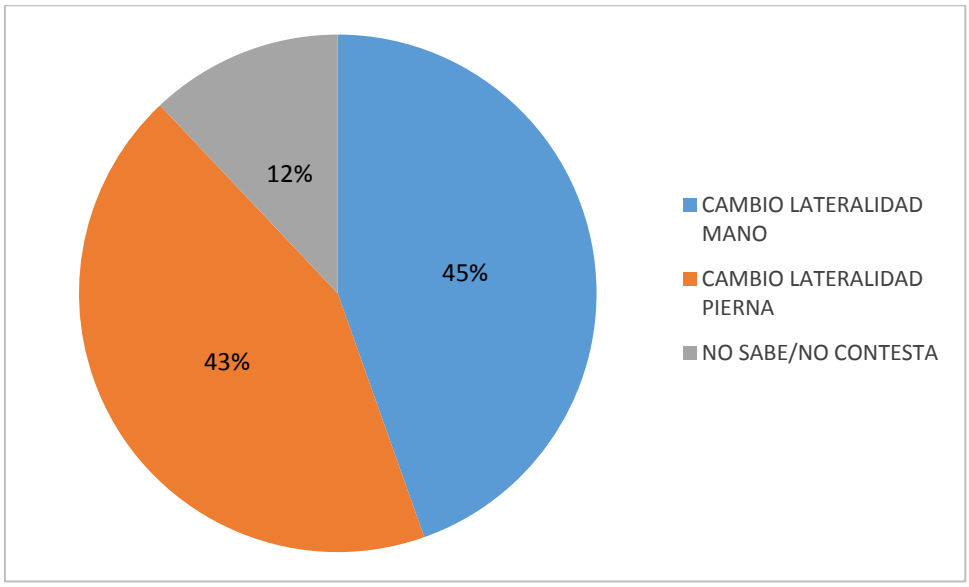

Figure 5: Most frequent changes of laterality in RG according to trainers
HAND CHANGES / FOOT CHANGES / DK-NA

In addition, figure 6 analyses whether these changes are more frequent right-to-left or left-to-right, both for hands and feet.

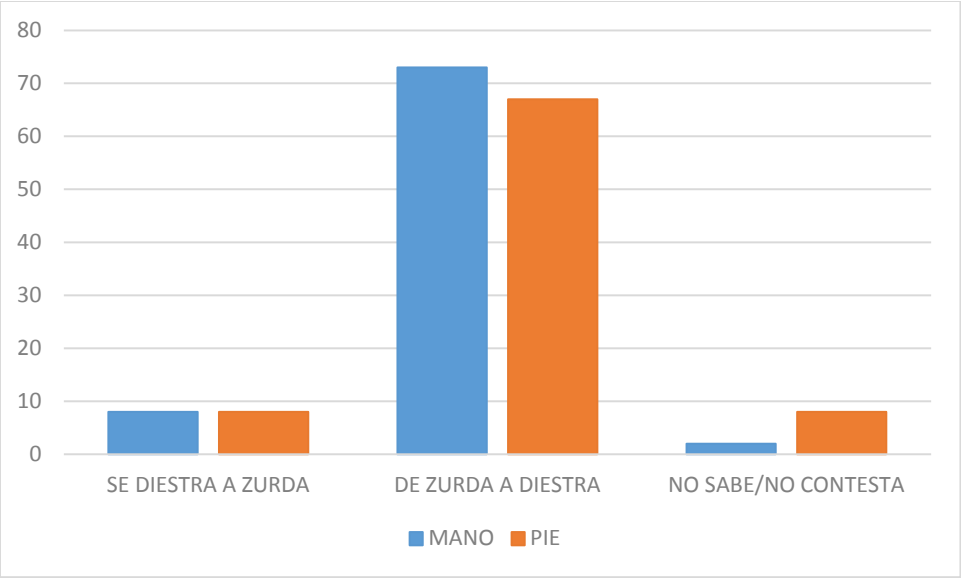

Figure 6: Frequency of the different laterality changes mentioned according to trainers
RIGHT TO LEFT / LEFT TO RIGHT / DK-NA
HAND FOOT

There is a clear predominance of left-to-right shifting versus right-to-left shifting, both for feet and hands. These results seem reasonable, since approximately only 10% of the population is left-handed (Zurita et al., 2010). For this reason, in a RG team, there are usually fewer left-handed gymnasts than right-handed, and therefore, it is easier to change the laterality of the former, since they will be fewer.

They were also asked about which laterality they thought most advantageous for a gymnast who is more specifically dedicated to individual RG. Eighty four percent believed that being right or left handed is irrelevant, 12% thought that right-handedness is more advantageous, and only 4% that left-handedness is better. From these results it can be deduced that there does not seem to be a more favourable lateral dominance for the practice of individual RG. However, for certain other sports, to have a specific dominant laterality is considered advantageous (Grouios, 2004). For example, Hageman (2009), states that there is an over-representation of left-handers in most direct competition interactive sports, with respect to the number of left-handers in the overall population. In the case of individual sports, a specific laterality does not seem to be advantageous at a tactical level.

Finally, figure 7 shows how the vast majority of the sample thinks that it is possible to achieve the ambidexterity of a gymnast for certain techniques.

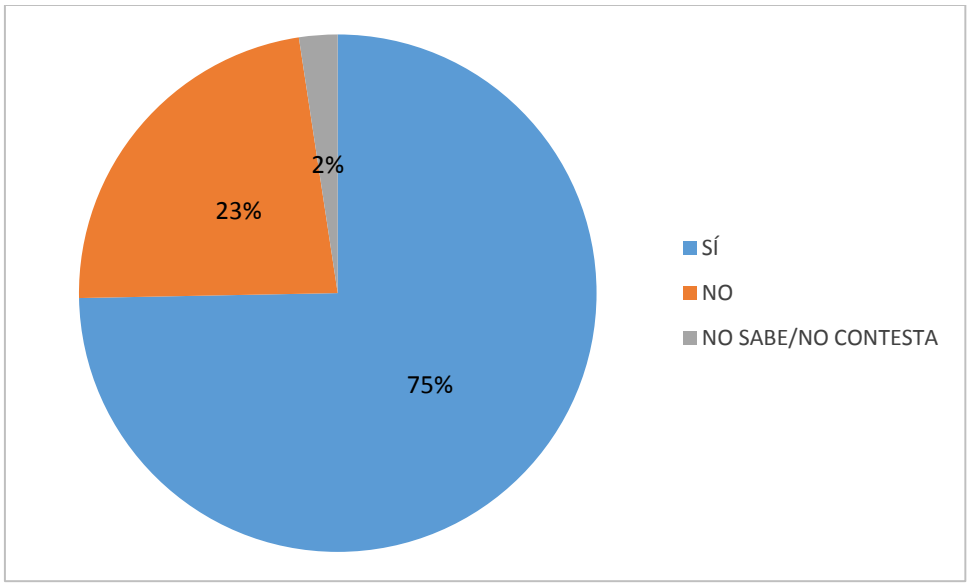

Figure 7: Frequency of response of the trainers when asked about the possibility of achieving the ambidexterity of a gymnast
YES / NO / DK-NA

4. CONCLUSIONS:

Contralateral training in RG gymnasts promoted by their trainers is relatively common (60%). This training is usually aimed at specific actions, and it does not usually produce the change of the dominant side (72% of the trainers who had their laterality changed, kept their dominant side).

Most of the laterality changes in RG arise from injuries on the dominant limb or from the need to reach an evenness between gymnasts in the same team.

Trainers use more frequently the same number of repetitions for both sides in BT (60%) than in AT (29%). The trainers who most often demand the same number of repetitions for both sides in BT, will also do the same in AT.

There is no clear criteria among the trainers when it comes to changing the laterality of the gymnasts in BT in order to improve the evenness of the team; 46% would force the change as opposed to 54% who would not. No clear criteria is found in AT either; 49% would do it versus 51% who would not.

When asked if a change of laterality is justifiable in order to reach sporting achievements, we did not find clear criteria either, 52% find it justifiable while 48% do not.

There are strategies used by the trainers to “hide” the different lateral dominance (in BT and AT) of one or more gymnasts in the team.

If they had to change the laterality of some of their gymnasts, most of the trainers would do so starting at a National level and at an early age (6-11 years old).

The sample believes that in RG, left-to-right changes in laterality are more frequent, although regarding gymnasts competing individually lateral dominance seems to be indifferent.

The lack of previous studies may suppose a limitation on this research, since the results cannot be contrasted with other works. On the other hand, as the questionnaire was not validated, the results could present reliability problems.

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Número de citas totales / Total references: 19
Número de citas propias de la revista /Journal's own references: 2

APPENDIX

Questionnaire for trainers

A questionnaire with a set of 30 simple questions for Rhythmic Gymnastics trainers and ex-trainers is presented below. The objective of this questionnaire is to know how the laterality of the gymnasts is treated in RG, since research in this area is scarce compared to other sports.

Please answer all the questions sincerely, the questionnaire is anonymous.

Thank you very much for your cooperation.

1. **Age**

2. **Gender**

3. **Nationality**

4. **Have you got any training related to sports training? (choose all the options that fit the description)**

   - None

   - Level I Specialist in Rhytmic Gymnastics (Técnico de Nivel I)

   - Level II Specialist in Rhytmic Gymnastics (Técnico de Nivel II)

   - Level III Specialist in Rhytmic Gymnastics (Técnico de Nivel III)

   - Degree in Physical Activity and Sport Science (Licenciado/graduado en Ciencias de la actividad física y el deporte)

   - Degree in Primary Education Teaching– Physical Education (Licenciado/graduado en Magisterio con mención de Educación física)

   - Pre-degree course in TAFAD (Ciclo formativo de grado superior TAFAD)

   - Other

5. **If you marked "other" in the previous answer, please specify which one.**

6. **How long have you worked as a trainer?**

   - Under a year

   - 1-3 years

   - 3-5 years

   - 5-10 years

- 10-20 years

- Over 20 years

7. **In which city have your worked longer as a trainer?**

8. **Have you practised / do you practise Rhythmic Gymnastics?**

-Yes

-No

If the answer is Yes, please, answer the following questions:

9. **Which is the highest level in which you have practised Rhythmic Gymnastics?**

- School level

- Regional level

- National level

- International level

10. **Have any of your trainers forced you to change your innate laterality in any specific aspect? (for example: requiring you to throw and catch or execute a difficulty with your non-dominant side in order to increase team evenness)**

- Yes

- No

- DK/NA

11. **If the answer is yes, has this changed your dominant side in that specific aspect?**

- Yes

- No

- DK/NA

12. **If your laterality has been changed at some point in your life, explain your experience.**

13. **The Code of Points for Rhythmic Gymnastics requires a balance (50-50) in the handling of the apparatus between the dominant and the non-dominant hand, do you design the exercises for your gymnasts so that this is accomplished?**

    - Always

    - Almost always

    - Sometimes

    - Almost never

    - Never

14. **Do you demand the same number of repetitions on the dominant and non-dominant sides of the gymnast in Body Technique?**

    - Always

    - Almost always

    - Sometimes

    - Almost never

    - Never

15. **Do you demand the same number of repetitions on the dominant and non-dominant sides of the gymnast in Apparatus Technique?**

    - Always

    - Almost always

    - Sometimes

    - Almost never

    - Never

16. **If all the gymnasts in a team perform difficulties with the same side of the body except one, would you change the laterality of this gymnast to improve team evenness?**

    - Yes

    - No

17. **If the answer is no, what strategies do you use to prevent this from being a handicap for the artistic value of the exercise? (Example, place the gymnast strategically so the difference seems aesthetic, make her perform a different difficulty...)**

18. **If all the gymnasts in a team handle the apparatus with the right hand except one, who is left-handed, would you change the laterality of this gymnast to improve team evenness?**

-Yes

- No

19. **If the answer is no, what strategies do you use to prevent this from being a handicap for the artistic value of the exercise? (Example, place the gymnast strategically so the difference seems aesthetic, make her perform a different difficulty...)**

20. **In individual performances, what do you think is more advantageous?**

- Right-handedness

- Left-handedness

- Indifferent

21. **Do you consider it appropriate to change the laterality of a gymnast in order to obtain better results in competitions?**

- Yes

- No

22. **If the answer is yes, at all competitive levels or only starting at certain levels?**

- At all levels

- Starting at provincial level

- Starting at regional level

- Starting at national level

23. **If you wanted to change the laterality of a gymnast, would you do it at any age?**

- Yes

- No

24. **If the answer is no, in which categories would you do it?**

- Prebenjamín (from 6 to 8)

- Benjamín (from 8 to 10)

- Alevín (from 9 to 11)

- Infantil (from 11 to 13)

- Junior (from 13 to 15)

- Sénior (over 15)

25. **In Rhythmic Gymnastics, which cases do you consider most frequent?**

- Change in hand laterality

- Change in foot laterality

- DK/NA

26. **In Rhythmic Gymnastics, which changes do you consider most frequent regarding hand laterality?**

- Right to left

- Left to right

- DK/NA

27. **In Rhythmic Gymnastics, which changes do you consider most frequent regarding foot laterality?**

- Right to left

- Left to right

- DK/NA

28. **In Rhythmic Gymnastics, how common do you consider the change of laterality in high competition athletes by the trainers?**

- Very common

- Quite common

- Somewhat common

- Slightly common

- Uncommon

29. **Do you think it is possible for a RG gymnast to reach total ambidextry with the correct training?**

- Yes

-No

- DK/NA

30. **Finally, use this space if you wish to write any assessment, comment or experience regarding laterality in Rhythmic Gymnastics.**

Rev.int.med.cienc.act.fís.deporte - vol. 21 - número 83 - ISSN: 1577-0354