61 - FLEXIBILITY AND NUTRITIONAL STATUS OF PRACTITIONERS AND NON-PRACTITIONERS OF RHYTHMIC GYMNASTICS IN THE YIELD PHASE

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doi:10.16887/88.a1.61

1 INTRODUCTION

Rhythmic Gymnastics is a sport practiced only by women, a sport that gathers rhythmic steps with movements and handling of specific instruments, according to the regulations of each competition. Gymnasts are looking for high yield, aiming to achieve maximum performance and many athletes win international titles before they become adults, going through an intense training program. (FERNANDES; MENEZES.NOVAES,2012; SILVA et al, 2016; CAÇOLA, 2017).

The training of the specific elements and the physical abilities that are required by Rhythmic Gymnastics seek greater technical and artistic improvement of movements to perform in individual and group competitions. This sport requires great motor coordination capacity, aerobic and anaerobic resistance, agility, explosive strength and flexibility, to execute and validate the technical and artistic movements of the sport. (SANTOS et al, 2016; NEVES; PERIN; RICIERI; ULBRITCH,2012).

Maintaining a good level of flexibility in all joints is necessary to achieve a proper life quality. In routine and recreational activities of young people a satisfactory joint mobility is important for a good execution of the movements. (OLIVEIRA; SANTOS; SILVA, 2005).

A good nutritional condition is essential for health balance and good sports performance. Controlled feeding and physical activity combined can help improve the genetic potential for growth and development. Children who actively participate in physical activities have their needs increased, due to growth, maturational development, maintenance of tissues, intellectual activities, in addition to training. (JUZWIAK; BISSOCHI, 2014).

Since the Rhythmic Gymnastics training makes great efforts to increase the articulation amplitude, does a group of girls of the same age who do not practice the modality have large differences in levels of flexibility when compared to those who practice? Which articulations present the greatest difference between the two groups? Therefore, the goal of this study was to compare the nutritional status and flexibility of practitioners and non-practitioners of Rhythmic Gymnastics from the city of Cascavel, state of Parana/Brazil, in the age range of 9 to 16 years old.

2 METHODS

This paper has been approved by the Committee of Ethics and Research with human beings from the University Assis Gurgacz – FAG in agreement with resolution 466/12 which deals with research with humans in Brazil, under the Technical Opinion number 2.031.067. A descriptive and comparative study made with a group of girls, practitioners of Rhythmic Gymnastics and non-practitioners of Rhythmic Gymnastics.

The experimental group was formed from the population of girls who practice Rhythmic Gymnastics (25 girls) and the control group was formed after handing out a hundred and twenty Consent Terms in two public schools, to girls in the 4th year of elementary school and in the 2nd year of high school in hopes of reaching a minimum of 50 participants creating a ratio of 1 to 2 with the experimental group, 60 of those girls had their parents sign the Terms, all of the 60 were evaluated and 9 of them were not excepted because they were not in the established age range, in that case 51 girls were selected. Both groups were formed with girls from the city of Cascavel – PR/ Brazil.

The individuals were classified by flexibility and nutritional status. Flexibility was verified by the application of the "Flexitest" in order to get the total flexibility index which corresponded to the sum of kinesiological scores obtained from 20 different movements. Each one of these movements is measured in a crescent and discontinuous scale of whole numbers from 0 to 4. The measurement is done by obtaining the maximum point of extent and posterior comparison with evaluation maps.

The classes of flexibility described in the "flexitest" were: very small (ankylosis) (<20); small (21 to 30); negative medium (31 to 40); positive medium (41 to 50); big (51 to 60) and hypermobility (>60). Nutritional status was classified as: low weight (Body Mass Index < 18,5); normal (18,5 ≤ BMI ≤ 24,9); overweight category I (25,0 ≤ BMI ≤ 29,9); overweight category II A (30,0 ≤ BMI ≤ 34,9); overweight category II B (35,0 ≤ BMI ≤ 39,9) and overweight category III (BMI ≥ 40,0).

The assessed quantitative characteristics were: age in years, body mass in kilograms, stature in meters, body mass index, and kinesiological scores of flexibility movements described per: ankle flexion (AF), ankle extension (AE), knee flexion (KF), knee extension (KE), hip flexion (HF), hip extension (HE), hip adduction (HA), hip abduction (HAb),trunk flexion (TF), trunk extension (TE), lateral trunk flexion (LTF), wrist flexion (WF), wrist extension (WE), elbow flexion (EF), elbow extension (EE), shoulder extension with posterior adduction (SEPA), posterior shoulder extension (PSE), lateral shoulder rotation (LSE), medial shoulder rotation (MSR) and total flexibility index (TFI), which corresponded to the sum of all 20 scores described.

To characterize these scores, a comparison of average rankings between the classes of Rhythmic Gymnastics was done using the non-parametric Mann-Whitney test, with approximation for the normal distribution and continuity correction of 0.5 (SNEDECOR, COCHRAN, 1989). The nullity hypothesis tested was the equivalence of average ranking (μR) between Rhythmic Gymnastics classes (H0: μR PRATITIONER = μR NON-PRACTITIONER) against the bilateral alternative hypothesis (Ha: μR PRACTITIONER μR NON-PRACTITIONER).

Descriptive analyzes between the rhythmic gymnastics classes, the flexibility response (Very Small, Small, Negative Medium Positive Medium, Big and Hypermobility) and the nutritional status classes (Low Weight, Normal, Overweight Category I, Overweight category II A, Overweight Category II B and Overweight Category III) were carried out using frequency charts. The comparisons of age average, body mass, stature and body mass index were performed using Student's t-test for independent samples.

A 5% level of significance was adopted in all hypothesis tests.

3 RESULTS

Table 1 shows quantity (n), weight, height and body mass index of girls, practitioner and non-practitioner of rhythmic gymnastics from the city of Cascavel-Paraná.

Table . Average and standard age, weight end stature deviation

Rtyhmic Gymnastics	n	Age	Weight	Stature	BMI
Practitioner	25	11,84(2,29) [a]	37,68(10,30) [b]	1,45(0,11) [b]	17,70(2,61) [b]
Non-practitioner	51	12,00(2,08) [a]	48,88(10,89) [a]	1,56(0,09) [a]	19,81(3,43) [a]

Source: Elaborated by the authors. *n = number of observations; Means followed by different letters in the column differ from each ot her, according to t test, in a 5% level of probbity.

As a result, it was found that half of the non-practitioner girls were classified as having an average positive flexibility index (50.98%), according to the flexitest, and only 1 girl (1.96%) reached the level of hypermobility. On the other hand, 92% of the practitioner girls had total flexibility index in hypermobility.

Table 2 shows the scores for each joint movement evaluated in the flexitest. In five of the movements the athletes did not show significantly higher levels, among the twenty ratings, compared to non-practitioners, the movements were: knee flexion KF, wrist flexion WF, wrist extension WE, elbow flexion EF and elbow extension EE.

Table 2. Kinesiological average scores of movements of practitioners and non-practitioners

Flexibility	Rythmic Gymnastics		p-valor[1]
	Practitioners (n = 25)	Non-Practitioners (n = 51)	
Ankle Flexion	2,44 (2,46)	1,76 (2,46)	<0,0001
Ankle Extension	3,00 (3,47)	1,86 (3,47)	<0,0001
Knee Flexion	3,72 (2,26)	3,33 (2,26)	0,0041
Knee Extensio	3,44 (3,09)	2,47 (3,09)	<0,0001
Hip Flexion	3,88 (3,92)	2,25 (3,92)	<0,0001
Hip Extension	3,76 (4,13)	2,16 (4,13)	<0,0001
Hip Adduction	3,64 (3,42)	2,55 (3,42)	<0,0001
Hip Abduction	3,84 (4,18)	2,29 (4,18)	<0,0001
Trunk Flexion	3,96 (5,20)	1,75 (5,20)	<0,0001
Trunk Extension	4,00 (3,50)	2,61(3,50)	<0,0001
Lateral Trunk Flexion	3,76 (3,81)	2,57 (3,81)	<0,0001
Wrist Flexion	2,52 (2,22)	2,31(2,22)	0,1182
Wrist Extension	2,56 (2,41)	2,18 (2,41)	0,0077
Elbow Flexion	2,76 (2,96)	2,61(2,96)	0,3881
Elbow Extension	3,00 (2,48)	2,47 (2,48)	0,0003
Posterior Shoulder Aduction	3,96 (3,27)	2,71 (3,27)	<0,0001
Sholder extension with Posterior Aduction	3,76 (3,34)	2,67 (3,34)	<0,0001
Extensão posterior de ombro	3,00 (3,12)	1,94 (3,12)	<0,0001
Lateral Sholder Rotation	3,20 (3,56)	1,90 (3,56)	<0,0001
Medial Sholder Rotation	3,72 (3,74)	2,45 (3,74)	<0,0001
Total Flexibility Index*	67,92 (47,17)	46,84 (47,17)	<0,0001

Source: Elaborated by the authors *Significance probability according to the Mann -Whitney test, a 5% level of probability; *TFIPRACTITIONERS: Hypermobility; *TFINON - PRACTITIONERS: Average Positive; Values in parenthesis: standard deviation.

The groups of practitioners and non-practitioners were also evaluated by nutritional status, according to the classification of the World Health Organization - WHO (1995). In the experimental group (practitioners) the results appeared in only two classifications, underweight and normal, more than half (68%) of the girls were in the first classification, underweight. However, the non-practitioners (control group) had a small percentage in a third classification, overweight grade I, 7.84%, in relation to the other results, which were mostly in the normal classification (56.86%), this percentage is insignificant.

In tables 03 and 04 the relations between classes of flexibility and classes of nutritional status of practitioners and non-practitioners of RG, can be visualized respectively.

The experimental group (practitioners) presented results in only two classifications in both variables, the highest percentage for flexibility was framed in the hypermobility index, 94.12% of the first group (underweight).

Table 3. Percentage and standard deviations of the flexibility levels according to classes of nutritional status based in the Body Mass Index in practitioners of Rhythmic Gymnastics.

Nutritional Status [2]	Flexibility [1]						Total
	VS	S	NM	PM	B	H	Frequency
LW	0 (0)	0 (0)	0 (0)	0 (0)	5,88 (5,88)	94,12 (5,88)	17
N	0 (0)	0 (0)	0 (0)	0 (0)	12,50 (12,50)	87,50 (12,50)	8

Source: Elaborated by the authors. 1VS: very small (<20); S: small (21 a 30); NM: negative medium (31 a 40); PM: positive medium (41 a 50); B: big (51 a 60); H: hypermobility (>60); 2LW: low weight (IMC < 18,5); N: normal (18,5 ≤ IMC ≤ 24,9); OCI: overweight category I (25,0 ≤ IMC ≤ 29,9);OCII A: overweight category II A (30,0 ≤ IMC ≤ 34,9); OCII B: overweight category II B (35,0 ≤ IMC ≤ 39,9); OCIII: overweight category III (IMC ≥ 40,0).

In the control group (non-practitioners), the highest percentages of flexibility independent of the nutritional status classification were in the average positive index.

Table 4. Percentage and standard deviations of the flexibility levels according to classes of nutritional status based on the Body Mass Index in Non-practitioners of Rhythmic Gymnastics

Nutritional Status [2]	Flexibility [1]						Total
	VS	S	NM	PM	B	H	Frequency
LW	0 (0)	0 (0)	5,56 (5,56)	61,11 (11,82)	27,78 (10,86)	5,56 (5,56)	18
N	0 (0)	0 (0)	20,69 (7,66)	41,38 (9,31)	37,93 (9,17)	0 (0)	29
OGI	0 (0)	0 (0)	0 (0)	75,00 (25,00)	25,00 (25,00)	0 (0)	4

Source: Elaborated by the authors.

4 DISCUSSION OF RESULTS

The data found for this research correspond to the hypothesis Ha: μR PRACTITIONER μR NON-PRACTITIONER in relation to the variable flexibility. According to the age average the samples are equated between practitioners and non-practitioners of Rhythmic Gymnastics, and for variables, height, body mass and BMI, non-practitioners present higher and statistically significant mean values.

According to yield, flexibility is of the utmost importance for success in Rhythmic Gymnastics, the latest updates of the Olympic cycles have a greater focus on the technical aspects and sequence of elements, which reinforces the importance of flexibility (LANARO FILHO; BÖHME, 2001; SIMÕES et al, 2016; KARLOH et al, 2010).

The results of the total flexibility index presented by the practitioners in this research show that the training of this physical capacity is being performed with excellence in the Training Center of Rhythmic Gymnastics of the city of Cascavel, since only two gymnasts were under classified in comparison with the others due, possibly, to time spent practicing the sport, however, in spite of that, the two athletes have great flexibility.

The non-practitioners evaluated in this study did not present bad levels of flexibility, however, there was a significant

difference in the results when compared to the experimental group, the overall average of the control group was classified as having a medium positive level of flexibility, 33,33% showed a high level of this capacity. Regarding this issue, Dantas (1999), describes that, flexibility can be influenced by endogenous factors, being: sex, age, biological individuality, somatotype, state of physical conditioning. Based on this information, we can suggest that this part of the sample has a higher degree of physical activity, or may be benefited by the associated biological individuality and somatotype, but this study did not evaluate the variables in question.

The flexibility levels are not balanced in the body, having a degree variation for each joint required and for each movement performed. It is common to find people with maximum and minimum levels of flexibility (ARAÚJO, ARAÚJO, 2000).

The results obtained in the evaluation of both groups show that there may be large differences in flexibility levels for each articulation. In the experimental group, the AF (ankle flexion) movement had the lowest average, 2.44 points, whereas the TE (trunk extension) movement presented the maximum score, confirming the differences in joint amplitude from one movement to another within the same group. The same occurred with the control group, where the AF (ankle flexion) movement also presented the lowest average and the KF (knee flexion) movement brought the highest result, 3.33.

The most requested articulations within the RG modality are: shoulders, hips and spine, which must be especially flexible, indicating that RG requires values above the standard in this physical capacity (SILVA et al, 2016). Practitioners of the sport (experimental group) had the best results in TF (trunk flexion), TE (trunk extension), PSA (posterior shoulder adduction), HA (hip abduction), HF (hip flexion), having reached maximum scale values, with emphasis in other hips, trunk and shoulder movements that also had elevated scores.

For the non-practitioners, the results related to the articulations mentioned before, shoulder, hip and trunk, are relatively low considering all the benefits that good articulation mobility can bring when compared to the study conducted by Paiva Neto; Peres; Oliveira (2006), where only the trunk, hip and shoulder movements were used, not calculating the total flexibility index, the results were superior to those of the present study, emphasizing the TF (trunk flexion) movement, where we found an average of 1.75 points, classified as the lowest result of the group and in the comparative study the value of 2.29 points was reached, exceeding the midline of the protocol, important muscles are used in this movement to ensure good posture and body stability, trunk extensors, knee flexors and hip.

Body composition may also have an influence on flexibility. The accumulation of adipose tissue around the articulations may negatively affect the degrees of flexibility. Therefore, the definition of flexibility in an individual considers anthropometric, cultural, pathological or genetic factors, meaning that their characterization is particular and depend on multiple factors. (MINATTO; RIBEIRO; ACHOUR JUNIOR; SANTOS, 2010).

Contrasting these information, in the present study there were no interferences of the nutritional status variable in the flexibility results, since the values were found in the same TFI (total flexibility index) classifications for all nutritional status classes evaluated, however, most of the evaluated girls fit as LW (low weight) or normal. We cannot say that flexibility is not influenced by the nutritional status, because we did not have samples with significantly high levels for real comparison.

Researchers point out some limiting factors in the research, among these factors we can mention the free time occupation of the girls who participated in the research and also the well detailed monitoring of the practice of any exercise or physical activity of both girls of the RG Training Center (CT) and non-practitioner girls. Therefore, it is suggested, to carry out future studies, to use a greater number of girls on the evaluations and a detailed follow-up/monitoring of physical activity they practice outside the space of the training center or even out of the school environment.

5 CONCLUSION

To sum up it can be concluded that, related to the total flexibility index (TFI), girls practicing Rhythmic Gymnastics present a great superiority when compared to non - practitioner girls, the first group obtained 67.92 points, with a very high level of flexibility (hypermobility) and the second group obtained 46.84 points, classified in a positive average level of flexibility. Regarding the nutritional status variable, the experimental group (practitioners) presented a higher percentage in the low weight class and the control group (non-practitioners) in the normal weight class. The practitioners had higher values in the trunk, shoulder and hip articulations. These information corroborate with the literature, which indicates that these joints are the most requested by the modality.

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Flexibility and nutritional status of practitioners and non-practitioners of rhythmic gymnastics in the yield phase

ABSTRACT: Objective: To compare the nutritional status and flexibility of girls who practice Rhythmic Gymnastics in the age range of 9 to 16 years old from the city of Cascavel/PR. Methodology: A descriptive and comparative study. According to characteristics of flexibility movements described in the “flexitest”, comparison of average rankings between classes of Rhythmic Gymnastics was made by using the Non-parametric test of Mann-Whitney, levels of significance of 5%. Results: Regarding the Total Flexibility Index, the first group (practitioners) got 67,92 points, classified as hypermobility and the second group (non-practitioners) got 46,84 points, classified as Positive Medium level. Conclusion: Girls who practice Rhythmic Gymnastics had great superiority compared to the non-practitioners in the Total Flexibility Index (TFI). The practitioners showed a greater percentage in Low Weight category regarding the Nutritional status, whereas the non-practitioners had greater percentage in Normal Weight category.

Keywords: Rhythmic Gymnastics; Flexibility, Flexitest.

La flexibilité et état nutritionnel des filles praticiens et des non-praticiens de gymnastique rythmique en phase de croissance

RÉSUMÉ: Objectif: Comparer l'état nutritionnel et la flexibilité dês filles praticiens et des non-praticiens de gymnastique rythmique, allant âges de 9 à 16 ans, dans la ville de Cascavel/PR Brésil. Méthodologie: Étude descriptive comparative réalisée dans une approche transversale. Pour les caractéristiques de “flexiteste” desmouvements de souplesse, la comparaison dês rangs moyens entre classes de gymnastique rythmique a été effectuée à l'aide de le test non paramétrique de Mann-Whitney, a été adopté le niveau de signification de 5%. Résultats: pour l'index complet de flexibilité (ITF) ont été trouvés 67,92 points pour le premier groupe (praticiens), étant une hypermobilité et 46,84 points 'a la seconde (non pratiquant), avec un niveau moyen positif. Conclusion: Compte tenu de 'indice d'une flexibilité totale (ITF), les filles pratiquant de la gymnastique rythimique presente grande superiorité comparativement aux des filles non-praticiens. L”état nutritionnel du groupe de praticiens ont montré le pourcentage le plus élevé dans la légèreté et le groupe des non-praticiens en classe de poids normal.

Mots clés: La gymnastique rythmique; la flexibilité; le flexiteste.

Flexibilidad y estado nutricional de chicas practicantes y no practicantes de gimnasia rítmica en la fase de rendimiento

RESUMEN: Objetivo: Comparar el estado nutricional y la flexibilidad de chicas practicantes y no practicantes de gimnasia rítmica en la franja etaria de 9 a 16 años de edad de la ciudad de Cascabel/PR. Metodología: Estudio descriptivo y comparativo llevado a cabo de forma trasversal. Para características del “flexitest” de movimientos de flexibilidad, a comparación de rangos medianos entre las clases de gimnasia rítmica fue hecha utilizándose el test no paramétrico de Mann-Whitney, fue adoptado el nivel de significancia del 5%. Resultados: Para el índice total de flexibilidad (ITF) fueron encontrados 67,92 puntos para el primer grupo (practicantes), siendo hipermovilidad y 46,84 puntos para el segundo (no practicantes), con nivel medio positivo. Conclusión: En el índice total de flexibilidad (ITF), las chicas practicantes de Gimnasia Rítmica presentaron gran superioridad al compararlas con las chicas no practicantes. En el estado nutricional el grupo de practicantes presentó mayor porcentaje en la clase de peso bajo y el grupo de no practicantes en la clase de peso normal.

Palabras clave: Gimnasia Rítmica; Flexibilidad; Flexitest.

Flexibilidade e estado nutricional de meninas praticantes e não praticante de ginástica rítmica na fase de rendimento

RESUMO Objetivo: Comparar o estado nutricional e a flexibilidade de meninas praticantes e não praticantes de GR na faixa etária de 9 a 16 anos de idade da cidade de Cascavel/PR. Metodologia: Estudo descritivo comparativo realizado de maneira transversal. Para as características do “flexiteste” de movimentos de flexibilidade, a comparação de ranks médios entre as classes de ginástica rítmica foi feita utilizando-se o teste não paramétrico de Mann-Whitney, foi adotado o nível de significância de 5%. Resultados: Para o índice total de flexibilidade (ITF) foram encontrados 67,92 pontos para o primeiro grupo (praticantes), sendo hipermobilidade e 46,84 pontos para o segundo (não praticantes), com nível médio positivo. Conclusão: No índice total de flexibilidade (ITF) as meninas praticantes de Ginástica Rítmica apresentam grande superioridade quando comparadas com meninas não praticantes. No estado nutricional o grupo de praticantes apresentou maior porcentagem na classe de baixo peso e o grupo de não praticantes na classe de peso normal.

Palavras-chaves: Ginástica Rítmica; Flexibilidade; Flexiteste.

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