ABSTRACT: Introduction: The purpose of this study was to verify the differences between flexibility and body mass index (BMI) in contemporary dance and classical ballet ballerinas. Materials and Methods: The sample was of 22 ballet dancers of Thais Muller Studio Dance at Santa Maria city / RS, in the age bracket of 13 to 16 years, divided into 2 groups of 11 dancers, paired by age: contemporary dance practitioners and classical ballet practitioners. In the evaluation were the anthropometric data (stature, weight, lower limbs length measures) and the flexibility indexes. The angular flexibility was measured through goniometric (flexion, abduction and hip external rotation), and the linear, Sitting Reaching Box Weels, which evaluates the posterior muscle chain flexibility. The BMI has been obtained by weight/stature². Descriptive statistics (mean, standard deviation), test of normality of the data and t test for independent samples were used for the data analysis. 5% of Significance was used. Results: Despite all the ranges of motion were higher in the classical ballet practitioners group, only the abduction movement had statistically significant differences between the two groups. There were no differences in the BMI. Discussion: The groups were similar concerning BMI, and classical ballet practitioners are more flexible.

Keywords: flexibility, BMI, ballerinas, contemporary dance, classical ballet.
INTRODUCTION

The dance is an art that is developed in the space and in the time, expressing sensibility through the physical movement, in harmonious way or not, according to the interpretation and the aesthetics of expression. It is a sequence of gestures, steps and physical movements with musical rhythm that expresses affective states and, as closer to the perfection the dance becomes, less we distinguish its elements (effort, gravity, body, muscular strength, objects, sound).

Much has been spoken on the history of the dance, its creations, its creators and its dancers, but somewhat is known as to the morphological and functional aspects of them. It is known that most of the activities of daily life require a relatively normal degree of flexibility. Nevertheless, certain activities related to sports, like gymnastics, ballet, diving or karate, demand more flexibility to reach superior performance.

To define flexibility is not an easy task, since it involves several concepts of different areas, representing conflicting situations when considered in a clinical, athletic or pedagogic extent. Many authors, like Corbin and Fox, Achour Jr., Weineck and Barbanti Cattelan, mention it as a synonym of articular mobility because it involves the movement on articulations of spacious form in all the directions. Others define flexibility as the physical quality responsible for the execution of large-amplitude volunteers movements, inside the morphological limits, without tension unsuitable for the unity muscle-tendon junction, what depends so much on the muscular elasticity how much of articular mobility.

To speak on flexibility is so, to refer to the biggest arches of possible movements in the involved articulations. Since the practice of the dance demands the complete use of the articulate arches specifically involved in its gestures, the performance of high profit is very difficult, if not impossible, without being in use of a good level of flexibility in the muscular pawned segments.

The figure of the dancer has value in the artistic appreciation as a critical expected, with aesthetic and cultural preestablished judgments. The aesthetics of the dancer depends on his technical and artistic performance, which is the expression of the dimensions, proportions, compositions and the forms of his body, which defines a specific physical profile.

According to the above affirmations, the objective of this study is to check if there are differences among the flexibility and the body mass index (BMI) between ballerinas of contemporary dance and classical ballet.

MATERIALS AND METHODS

This study was appreciated and approved in the Comissão de Ensino, Pesquisa e Extensão (CEPE) and Comitê de Ética em Pesquisa of the Centro de Ciências da Saúde da Universidade Federal de Santa Maria (CEPE-CCS/UFSM) CAAE:0047.0.246.000-05 (25/07/2005).

The sample used in the study was obtained with intentional form and for accessibility composed by 22 ballerinas of the Stúdio de Dança Thais Müller, from the city of Santa Maria - RS, in the age group from 13 to 16 years. This one was divided in 2 groups of 11 ballerinas, matched by age: Group 1 (practicing of contemporary dance); and Group 2 (practicing of classical ballet).

The exclusion of dancers of the masculine sex was due to the anatomical, physical composition and flexibility differences that exist between the sexes, and for the feminine sex be a majority.
in the population of the dancers from the Stúdio de Dança Thaís Müller.

All the participants agreed to work as volunteers after being informed of the proceedings to be carried out and the signature of the Informed Consent and by their persons in charge.

The evaluation was carried out without prior heating of the ballerinas and it explored anthropometric data (stature, weight, measures of length of the inferior members) and the rates of flexibility. The angular flexibility was measured through the goniometry (flexing, abduction and external rotation of the hip), which registers the amplitude of movement (ADM) in degrees (°), and the linear flexibility by the Box of Sitting and Reaching of Weels, which values the flexibility of the muscular subsequent chain, in centimeters (cm). The choice of the movements was due to the importance of the flexibility of the inferior members for the ballerinas and, for a more extensive analysis, it was selected one movement of each articular axle.

For the evaluation of the angular flexibility, it was asked the ballerinas that they moved the member actively up to his maxim ADM and, in the mensuration of the angular flexibility, the participants were orientated to carry out the flexing of trunk slowly up to his very amplitude and remaining in this position for 2s. All the evaluations were carried out in 2 following days, with similar temperature (20ºC), between 6PM and 7:30PM, for the same researcher, to avoid interference between them.

The BMI was obtained through the formula mass.stature-2, expressed in kg.m-2, according to World Health Organization. For the measure of stature it was used a precision of millimeter tape measure, stuck in the wall without baseboard, and the physical weight was obtained using a digital balance with resolution of 0.1kg.

The data were organized and analyzed with the statistical program SPSS 11.0 for Windows. For the analysis, there was in use descriptive statistic (average, pattern diversion), test of normality (Shapiro-Wilk) and test t for independent samples, in order to test the differences of the averages among the groups. It was adopted a level of signification of 5%.

**RESULTS**

The sample for this study was composed by 2 groups of 11 ballerinas matched by ages: 2 of them were 13 years old, 4 were 14, 3 were 15 and 2, 16 years old, with middle time of dance of 5 years.

The standards of height and weight of the Group 1 were 1.61±0.04m and 52.73±7.02kg, respectively, and, for the Group 2, they were 1.64±0.05m and 53.27±5.64kg. It is important to emphasize that did not exist significant differences about the biotype of the ballerinas, making of this a non-important factor for the study of the flexibility.

In the Table 1 are presented the results found for the BMI and the ones presented in the evaluation of the flexibility for the groups 1 and 2. And, since the data presented normal distribution, making possible the realization of the test t, the signification of the test t for equality of variants (test of Levene) also is introduced in the Table 1.

**DISCUSSION**

While analyzing the BMI, it was possible to see that both groups presented quite near standards, without significant differences between the practicing of contemporary dance and classical ballet. The results of this study go and meet the study of Prati & Prati, which found the BMI of the ballerinas equal to 19.9kg.m-2. The authors still suggest that these are levels of physical composition adapted for practicing of ballet, suggesting that being light comes to the benefit of the development of the techniques, as well as, possibly, to reduce overload in the articulations along the years of practice.

The ballet is considered an artistic demonstration by an anatomical selective criterion, which gives emphasis to the slimness and linearity of the figure, presuming the search for a tall ballerina due to its aesthetic importance and relation with the quality of the technical artistic movements.

Regarding the linear flexibility of the muscular subsequent chain, the ballerinas of both groups presented results superior to the pattern of reference (28 to 29cm), however, inferior to that of classical ballet dancers of the city of Maringá - PR (40cm). By the way, all the ballerinas valued at Maringá had 7 or more years of dance and the participants of the present study presented middle time of dance of 5 years.

As it is possible to see in the Table 1, in spite of all the evaluated amplitudes of movement are superiors in the group who practices classical ballet, only the movement of abduction presented statistically significant difference between the two groups, in

**Table 1 - Standard and pattern deviation (sd) of the BMI, flexion of the right (R) and left (L) inferior limbs, external rotation of the right (R) and left (L) limbs, abduction of the right (R) and left (L) limbs, Box of Sitting and Reaching and level of signification of the test “t” (p).**

<table>
<thead>
<tr>
<th></th>
<th>Group 1</th>
<th>Group 2</th>
<th>p</th>
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<tbody>
<tr>
<td></td>
<td>mean</td>
<td>sd</td>
<td></td>
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<tr>
<td>BMI (Body Mass Index)</td>
<td>20.23</td>
<td>2.14</td>
<td></td>
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<tr>
<td>Flexion R</td>
<td>73.27</td>
<td>9.80</td>
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</tr>
<tr>
<td>Flexion L</td>
<td>73.36</td>
<td>10.04</td>
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<tr>
<td>External Rotation R</td>
<td>44.91</td>
<td>9.15</td>
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<tr>
<td>External Rotation L</td>
<td>41.64</td>
<td>7.59</td>
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<tr>
<td>Abduction R</td>
<td>32.18</td>
<td>11.02</td>
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<tr>
<td>Abduction L</td>
<td>31.09</td>
<td>9.23</td>
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<td>Box</td>
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<td></td>
<td>19.92</td>
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<td></td>
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<td></td>
<td>35.94</td>
<td>3.69</td>
<td>0.339</td>
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as well as more beauty on the lines only to reach more stability and the easiness of the movements, extern rotation of the coxofemoral articulation, it was possible not The ballet was based on the conception of while carrying out the elevation of the leg in abduction, the shock between the superior of the head of the femur in contact with the acetabulum, abd. According to the anatomy of the coxofemoral articulation, ADM, which can have contributed to the biggest flexibility of the extern rotation of the inferior members that, in spite of there is the bigger of movements without being limited or a prisoner of determined multiplicity allows to the ballerina an own style using the diversity of patterns, for the hierarchy that it teaches from much early, allow corrections on the angulation of the ballerinas’ face. These codes of patterns, for the hierarchy that it teaches from much early, allow the ballerinas to model even faces, expressions and glances. The ballet was based on the conception of while carrying out the extern rotation of the coxofemoral articulation, it was possible not only to reach more stability and the easiness of the movements, as well as more beauty on the lines. This conception is called en dehors (for out), that can justify the superior ADM of the extern rotation of the ballerinas of Group 2 (classical ballet).

Differently from the formation of the ballerinas of contemporary dance, when, in the classrooms, the pupil has space to be expressed in individualized way, the rhythm and the form of carrying out the exercise - even that very well orientated - come from each one. The classes are not attached to the institutionalized technician, though, in the execution of the exercises, there are very clean and clear movements carried out with great precision and technical quality. The contemporary dance is characterized by the multiplicity of forms and subjects, where there is no one any more pure element, but a vast repertoire of information. This multiplicity allows to the ballerina an own style using the diversity of movements without being limited or a prisoner of determined line or technique, bringing the necessity of release of preestablished forms.

The difference of flexibility of the abduction can be influenced by the extern rotation of the inferior members that, in spite of there is no statistically significant difference, presented superior values of ADM, which can have contributed to the biggest flexibility of the abduction. According to the anatomy of the coxofemoral articulation, of the head of the femur in contact with the acetabulum, where the bigger the extern rotation of the pelvis there is the bigger elevation of the leg in abduction, the shock between the superior part of the lap of the femur and the ceiling of the acetabulum will be familiar in a bigger degree of abduction of the leg, since it will be the previous or inferior part of the lap that will be face to the acetabulum.

In accordance with the results presented in this study, it is possible to conclude that the BMI of the practicing ballerinas of contemporary dance and classical ballet were similar.

As for the rates of flexibility, the group of classical ballet presented superior values for all the evaluated movements, however significant difference was presented only for the ADM of abduction of the inferior members, making the practicing of classical ballet more flexible than those of contemporary dance.

It is possible to suppose that these results are due to the classical technician present more rigid patterns by preestablished forms and the contemporary dance preserve the individuality and the physical anatomy of the ballerina.

REFERENCES