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**PERCEPTIONS AND BENEFITS OF STATIC AND DYNAMIC STRETCHING IN DANCERS: QUALITATIVE AND QUANTITATIVE ASPECTS****PERCEPÇÕES E BENEFÍCIOS DO ALONGAMENTO ESTÁTICO E DINÂMICO EM DANÇARINOS: ASPECTOS QUALITATIVOS E QUANTITATIVOS**Francesca D'Elia<sup>1</sup>, Gaetano Altavilla<sup>1</sup>, Giovanni Esposito<sup>1</sup>, Sara Aliberti<sup>1</sup> and Gaetano Raiola<sup>1</sup><sup>1</sup> University of Salerno, Fisciano-SA, Italy.**RESUMO**

O presente estudo investigou os efeitos benéficos induzidos em dançarinos pelos dois tipos de protocolo de alongamento: alongamento estático e dinâmico, a fim de elevar a estética das figuras e posições corporais ao mais alto nível. Os sujeitos foram 20 jovens bailarinas divididas em dois grupos: Grupo DS (n = 10), que realizou alongamento dinâmico, e Grupo SS (n = 10), alongamento estático, ambos por seis meses. Uma pesquisa, com o objetivo de avaliar as percepções sobre os benefícios induzidos pelo tipo de alongamento realizado, e um Teste Sentar e Alcançar, foram administrados às bailarinas para avaliar aspectos qualitativos e quantitativos da flexibilidade. Um teste t de amostras independentes foi realizado para avaliar as diferenças na flexibilidade entre os grupos DS e SS antes e depois de seis meses, e um teste exato de Fisher para analisar suas percepções sobre os benefícios induzidos por dois protocolos de treinamento. O resultado foi estatisticamente significativo após seis meses e quatro associações foram encontradas (P <0,05). O alongamento dinâmico trouxe maiores University of Salerno (UNISA), Fisciano-SA, Italy benefícios tanto qualitativa quanto quantitativamente. A partir dos resultados do estudo, foi possível afirmar que os bailarinos em termos de benefícios induzidos e satisfação com o resultado de desempenho alcançado, preferem o alongamento dinâmico.

**Palavras-chave:** flexibilidade, dança, alongamento, percepções, benefícios.**ABSTRACT**

The present study investigated the beneficial effects induced on dancers by the two types of stretching protocol: static and dynamic stretching, in order to elevate the aesthetics of the figures and body positions to the highest level. The subjects were 20 young female dancers divided into two groups: Group DS (n=10), which performed dynamic stretching, and Group SS (n=10), a static stretching, both for six months. A survey, with the aim of assessing perceptions about the benefits induced by the type of stretching performed, and a Sit and Reach Test were administered to the dancers to assess both qualitative and quantitative aspects of flexibility. An independent samples t-test was performed to assess the differences in flexibility between DS and SS group before and after six months, and a Fisher's exact test to analyse their perceptions on the benefits induced by two training protocols. Result was statistically significant after six months and four associations were found (P <0.05). Dynamic stretching brought greater benefits both qualitatively and quantitatively. From the results of the study, it was possible to state that dancers in terms of induced benefits and satisfaction with the performance result achieved, preferred dynamic stretching.

**Keywords:** flexibility, dance, stretching, perceptions, benefits.**Introduction**

Dance requires a high level of performance in terms of strength and motor control with the execution of harmonious movements consistent with the musical sequence<sup>1</sup>. These movements have an intimate beauty related to the aesthetic form of the figures and positions that are taken in space. In order to raise the aesthetics of the figures and body positions to be assumed to the highest levels, an attempt is made to raise the levels of flexibility and articulation of the entire body and in particular of the shoulder blade-humeral girdle and of the hip<sup>2</sup>. This happens because these joints complete with the torso the expressive potential of the body with static and dynamic positions and figures tending to the maximum extensibility and presence in space<sup>3</sup>. To obtain these conditions, it is necessary to carry out functional activities with intense periods of strength development and maximum motor control with alternating periods of muscle stretching<sup>4</sup>. Therefore, in the planning of the educational-training activities of dance, the muscle stretching methodology to be used is also of considerable importance.

Stretching is an aspect that should not be underestimated<sup>5</sup>. A flexible body is essential to be able to dance: many positions or steps are extremely difficult to perform according to dance standards without the necessary flexibility<sup>6</sup>. There are different ways to stretch muscles<sup>7</sup>. The most popular methods to improve flexibility and joint mobility are static and dynamic stretching, combined with each other without a particular preference for one of the two, especially in relation to anthropometric parameters and age<sup>8</sup>. Static stretching is the most popular and widespread in dance. It consists of maintaining a stretching position for at least 30 seconds. According to a previous study<sup>9</sup>, 30-second duration is an effective amount of time to sustain a hamstring muscle stretch in order to increase range of motion (ROM). No increase in flexibility occurred when the duration of stretching was increased from 30 to 60 seconds or when the frequency of stretching was increased from one to three times per day<sup>8</sup>. However, going into the dance room and performing static stretching exercises as a warm-up leads to muscle and joint problems. Performing this type of stretching before a workout may compromise the success of the latter, as it tends to slow down the muscle response, preventing a fast contraction<sup>10</sup>. It can cause joint instability and injuries that could be avoided with a proper warm-up before class<sup>11</sup>. Many people tend to use "stretching" and "warm-up" interchangeably, when in fact they are two completely different moments. The warm-up is used to raise the body temperature and prepare the body for work, thus passing from the resting phase to the physical activity phase<sup>12</sup>. Stretching, on the other hand, is used to lengthen the muscle: it is in fact a loosening phase that serves to counteract muscle stiffness and tension<sup>13</sup>. An example of static stretching in dance is the split. Dynamic stretching is another type of stretching used in dance, which has overtaken the practice of ballistic stretching. The latter was popular years ago, but today it is considered very harmful, as it can cause stiffening of the muscle given by excessive rebounds and strains beyond the normal range of the joint<sup>14</sup>. Dynamic stretching differs in that you do not go beyond the maximum joint range: the movements are controlled and not rebounded, so you gradually manage your opening. Graduality consists in slowly repeating a series of movements and then increasing their extension and speed. An example in dance is the "grand battement en cloche". This type of stretching is perfect before a workout or in the highlights of the activity.

Various authors have compared various types of stretching. Some have found that dynamic stretching has greater applicability for improving performance than static stretching<sup>15</sup>. Others have concluded that active stretching is more time efficient than static stretching and involves fewer complications to produce effects on flexibility<sup>16</sup>. Passive stretching has been shown to significantly improve hamstring flexibility compared to the active stretch group<sup>16</sup>. Previous study also found that the dynamic oscillatory stretching technique was more effective in improving hamstring flexibility and perceived pain than the static stretching technique<sup>17</sup>. It is also usually suggested to promote a combined warm-up protocol consisting of static and dynamic stretching as an effective warm-up for dancers<sup>18</sup>.

One of the most widely used tests to assess flexibility in dance is the Sit and Reach Test. This test measures the flexibility of the lumbar and posterior thigh muscles and can be useful in assessing the functional capacity of the legs<sup>19,20</sup>. The assessment allows not only to understand one's level of performance<sup>21</sup>, but also to plan a proper protocol, based on one's goals and demands of the choreography. Along with the quantitative evaluation, we should also associate the qualitative one, related to perceptions<sup>22</sup>, which are important to understand the type of training that is taking place, the benefits and the differences with other training protocols. This study also intends to consider athletes' perception of the two types of stretching as well as the results deriving from the Sit and Rich Test. No previous studies have considered this before.

The problem concerns the indeterminacy of the beneficial effects induced on dancers by the two types of stretching regardless of the actual data of improvement in flexibility. It is

important, in this regard, to investigate both qualitative and quantitative aspects of stretching in dance<sup>23</sup>.

Therefore, the aim of this study is to verify the relationships and/or associations between the effects of the two stretching protocols (static and dynamic), the flexibility data of the lumbar region and hamstrings and the benefits induced to the dancers in terms of satisfaction.

## Methods

### Sample

The present study was designed to describe the characteristics of 20 young female dancers (age, mean  $\pm$  standard deviation [SD] = 20.6  $\pm$  1.4 years old) randomly assigned in two groups of 10, according to methodology used: Group DS (Dynamic stretching) and Group SS (Static stretching). The inclusion criteria for young dancers was five years of training experience, whereas the exclusion criteria were no history of injuries in the last year. Written informed consent was obtained from all participants. Data were stored and processed anonymously. A detailed description of anthropometric characteristics of dancers is shown in Table 1.

**Tab. 1** - Anthropometric characteristics (Mean  $\pm$  SD, n=20)

Variables	DS (n=10)	SS (n=10)
Age (years)	20.6 $\pm$ 1.4	19.3 $\pm$ 1.7
Height (cm)	1.62 $\pm$ 3.5	1.63 $\pm$ 3.2
Weight (kg)	55.2 $\pm$ 2.4	54.5 $\pm$ 2.2
BMI (kg/m <sup>2</sup> )	21.03	20.5

Source: authors

### Procedures

The research method was mixed because it consisted of two distinct experimental procedures that integrate the paths to achieve the goal. It consisted of:

- 1) Parametric experimental procedures to establish whether there was a significant increase in pre- and post-training flexibility data (between the two groups) as a null hypothesis ( $H_0$ ) or if there was a significant increase in pre- and post-training flexibility data (between the two groups) as an alternative hypothesis ( $H_1$ ).
- 2) Non-parametric experimental procedures to establish the intrinsic significance of the perception induced by the dancers in terms of satisfaction and satisfaction with the result.

### Training protocol

DS group performed for 6 months a dynamic stretching, which consisted of performing a series of movements in a slow and controlled manner, and then increasing speed and range of motion. Specifically, the protocol was composed of:

- Exercises (for example Demi-plié and grand plié, Battement tendu, Rond de jambe par terre, Battement fondu, Battement frappé, Battement Développé, Grand battement jeté) at the barre, in the center and in diagonals.

SS group instead performed for 6 months a static stretching, which consisted of stretches characterized by the absence of springing and the position maintained over time without feeling too much pain. Specifically, the protocol was composed of:

- Exercises in which a stretch position has been held and maintained for a maximum of 30 sec x 3 (front split, legs spread against the wall, etc.).

All subjects performed a warm up structured as usually practised on classical dance. The warm up consisted of 3 min of light free running (intensity range 25–35% VO<sub>2</sub>max). Then, each group performed their stretching session according to the assigned methodology, and finally they were reunited together to perform the rest of the lesson in the same manner.

### *Data Collection and test procedure*

For qualitative evaluation, a survey with the aim of evaluating perceptions on benefits induced by the type of stretching performed was prepared with Google Form and administered to dancers at the end of two experimental protocols. Specifically, the questions were the following:

- 1) Have you found significant benefits during the proposed activity? No / yes.
- 2) At the end of the training session, did you notice significant improvements in your muscle flexibility compared to the initial condition? No / yes / yes, but not very high.
- 3) Do the results you have obtained come close to those you have imagined / expected? Definitely no / definitely yes.
- 4) Will you continue to practice the type of stretching you have been subjected to in the future? Probably not / probably yes.
- 5) Would you also recommend others to practice this activity you have been subjected to? Absolutely not / absolutely yes.

For the quantitative evaluation, the sit and reach test was administered to the whole sample before and after 6 months. The goal of this test was to measure the flexibility of the lower back and hamstrings. A coach and a box with a millimeter rod were needed to perform the test. The procedure consisted of:

- Sit with your legs extended forward and your feet pushing against the box;
- The coach placed the ruler on the box and brought the zero towards the fingertips;
- The athlete leaned forward slowly and held the position of maximum stretch for 2 seconds.

Before starting the test, 5 minutes of aerobic exercise and 5 minutes of general mobility were performed to prepare the body adequately. The test was performed at room temperature and was repeated twice, with the best result being considered.

### *Statistical analysis*

Anthropometric characteristics of dancers were presented as a mean and standard deviation (Mean  $\pm$  SD). After verifying normality of the data with Shapiro Wilk test ( $P > 0.05$ ) and homogeneity of variances with Levene test ( $P > 0.05$ ), a t-test for independent samples was performed to verify differences in Sit and Reach Test between two groups: Group DS and Group SS. A frequency analysis was performed to explore perception on benefits induced by the type of stretching performed. A Fisher exact test was performed to test the independence between Groups DS, SS and subjective perception on benefits induced by the type of stretching. Statistical significance was set at  $P \leq 0.05$ . Data analyses were performed using Statistical Package for Social Science software (IBM SPSS Statistics for Windows, Version 25.0. Armonk, NY).

## **Results**

### *Preliminary Analysis*

The data was firstly screened for missing values. There were no missing values in the dataset as the lead researcher had ensured all surveys were completed during data collection. The data were then screened for univariate and multivariate outliers, with no outliers found within the sample. Finally, the data were screened for normality. The skewness values ranged from -0.05 to -0.85 and the kurtosis values ranged from -0.23 to 0.74, indicating reasonable normality.

*Inferential statistics*

As show in table 2, the results of the initial evaluation with the Sit and Reach test of the two groups analyzed (Group DS and Group SS) does not show significant different performance ( $P > 0.05$ ) before the administration of each training protocol.

**Table 2.** T-test for independent samples before training protocols between groups

	Levene's test		T-test for equality of means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Standard error difference	95% confidence interval of the difference	
								Lower	Upper
Equal variance assumed	2.958	.103	.452	18	.656	.600	1.32	-2.187	3.387
Equal variance not assumed			.452	14.45	.658	.600	1.326	-2.236	3.436

Source: authors

While the results of the final evaluation of the two groups analyzed (Group DS and Group SS) shows significant different performance, as shown in Table 3.

**Table 3.** Test for independent samples after training protocols between groups

	Levene's test		T-test for equality of means						
	F	Sig.	t	df	Sig. (2-tailed)	Mean difference	Standard error difference	95% confidence interval of the difference	
								Lower	Upper
Equal variance assumed	1.784	.198	6.163	18	.000	6.600	1.070	4.350	8.849
Equal variance not assumed			6.163	15.23	.000	6.600	1.070	4.320	8.879

Source: authors

Therefore, in detail, in relation to the results shown in Table 2, the initial performance of the two groups in terms of flexibility did not show significant differences in the comparison made. After six months of training, using two different protocols, the two groups showed significant differences, in terms of flexibility, as shown in Table 3.

Four significant associations ( $P < 0.05$ ) were found between the two groups and subjective perceptions on benefits induced by type of stretching performed. Chart 4 shows that in relation to questions 1,2,3 and 5 we can reject the null hypothesis according to Fisher's exact test. This means that there is a significant relationship between the two categorical variables, that is, between the type of stretching and the perception of the benefits induced in terms of satisfaction and enjoyment of the result.

**Chart 4.** Fisher's exact test on the relationship between practiced stretching and perception of induced benefits

Variable	Options	Type of stretching		Fisher <i>P</i>
		SS	DS	
1. Have you found significant benefits during the proposed activity?	No	10	0	.029
	Yes	0	10	
2. At the end of the training session, did you notice significant improvements in your muscle flexibility compared to the initial condition?	No	0	0	.029
	Yes	0	10	
	Yes, but not very high	10	0	
3. Do the results you have obtained come close to those you have imagined / expected?	Definitely no	10	0	.029
	Definitely yes	0	10	
4. Will you continue to practice the type of stretching you have been subjected to in the future?	Probably not	7	0	.143
	Probably yes	3	10	
5. Would you also recommend others to practice the activity you have been subjected to?	Absolutely not	10	0	.029
	Absolutely yes	0	10	

Source: authors

## Discussion

The purpose of this study was to verify the relationships and/or associations between the effects of the two stretching protocols (static and dynamic), the flexibility data of the lumbar region and hamstrings and the benefits induced to the dancers in terms of satisfaction and satisfaction with the result. The results demonstrated that the protocol applied to the DS group produced a greater improvement than that of the SS group, providing as a result a significant performance difference between the two groups, detected with the Sit and Reach Test, and supported by the qualitative analysis, carried out through the Fisher's Exact Test. The increase in flexibility was also supported by specific dance exercises required by the choreographies, which were the same for both DS and SS Group. A typical dance lesson, excluding the initial general warm-up, consisted of three phases: exercises at the barre, including "Rond de jambe," "Grand battement jeté," and other exercises in music that, in addition to technique, also

improved joint mobility, then moderate intensity center floor exercises and high intensity center floor exercises.

According to various studies, both types lead to significant improvements in flexibility<sup>24</sup>. Static stretching has long been used because it involves stress relaxation, which occurs when muscle tissue is held in a fixed position<sup>25,26,27</sup>. However, dynamic, if performed in the correct manner, can also provide the same benefits and improve flexibility without impairing performance. Dancers who performed dynamic stretching stated that they experienced positive benefits, while those who performed static stretching the opposite. The cause of discomfort could be perceived pain during stretching<sup>28</sup>. Perceptions of the improvement in one's muscle flexibility, compared to the initial condition and the type of stretching performed, showed improvements, for both groups, but the group that performed static stretching expected a higher improvement. Due to the stress felt, the dancers probably expected a greater improvement than their peers who performed less intense stretching. If performed prior to exercise, dynamic is very beneficial, especially for the posterior thigh muscles in terms of increased flexibility and reduced stiffness<sup>29</sup>. Additionally, if at higher intensity, it provides additional benefits<sup>30</sup>. The SS group, who performed static stretching, would not recommend performing this practice in the future. Static stretching, especially when timing, both stretching and pausing, is not adhered to, can lead to significant decreases in the ability to perform intense movements due to decreased joint stability and neurological functioning<sup>16</sup>. Finally, there is no relationship between type of stretching and intention to practice it in the future, so dancers may want to continue to perform stretching, regardless of type. This is because flexibility is a key component in dance, a game of patience, perseverance, and determination to meet the choreographic demands placed on performers today<sup>31</sup>.

Despite the innovative contribution to literature, some limitations should be highlighted. First of all, our sample size was relatively small, underlining the need to repeat our survey over a wider range of participants. The second limitation refers to the transversal design used in the research, allowing no inferences of causality. Another limitation was that sex (male x female), sport type (individual x collective) and age group were not investigated. In addition, the number of items in the survey could be expanded by addressing other aspects of stretching and associated perceptions.

In this way, future investigations should continue to explore the relationships between such variables, analyzing and adopting a longitudinal design, with the aim of establishing new evidence about the role of resilience on motivation in the paralympic sports and investigate the relationships between resilience and basic psychological needs satisfaction.

## Conclusions

From the results of the study, it was possible to state that dancers in terms of induced benefits and satisfaction of the performance result achieved, preferred dynamic stretching. In fact, the practice of dynamic stretching, compared to the static one, has given greater results in the measurements relating to flexibility and therefore should be the most suitable for this sport. The perceptions of the dancers also revealed greater satisfaction and pleasure in being subjected to the dynamic stretching protocol even though the dancers themselves did not express differences in preferences for the future in the choice of the type of stretching. A subsequent study with a more representative sample and with a questionnaire with more specific questions on the type of stretching could give further evidence on other aspects related to this practice, but also for a greater awareness of the two types of stretching by the dancers.

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