141 - PILATES METHOD IN RESPIRATORY MUSCLES STRETCHING

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1. INTRODUCTION

The muscle stretching is a resource used either in rehabilitation programme as in sportive activities, being useful in lesions prevention and flexibility increase, acting, however, in tonus decrease and muscle spasm (MORENO, 2007). It's a therapeutic maneuver to increase the soft tissues length that is made smaller (MACHADO, 2010).

One of the more modern techniques used in physiotherapy and in other health areas is Pilates method. This method uses in an intense way the respiration, and therefore can alter respiratory muscles strength. The individual respiratory reeducation interferes directly in the respiratory muscle work and action. Pilates method consists of a serie of physical exercises and promotes the muscle reequilibrium (ANDRADE, 2010).

Differently of the other skeletal muscles, the respiratory muscles work successively and in diseases presence can cause pulmonary function changes (FACIOLLI, 2010). These muscles present a good response to physical training and as the Pilates method works with respiratory coordination and muscle strengthening its application in respiratory diseases patients can promote important responses in pulmonary function.

This method suggests to provoke changes in the muscle involved with respiration and, consequently, changes in respiratory muscle strength, however, till the present moment, it wasn1t found any study investigating the influence of this method over the respiratory responses. This way, the aim of this study was to evaluate the benefits that the Pilates method promotes in respiratory function.

2. METHODS

The research is characterized as a study almost experimental with quantitative approaching. It was carried out in the Integrated School Clinic at Faculdade Santa Maria (FSM) in October of 2012. The Participants were distributed in two groups: (a) eutrophics and (b) overweight/obesity, in the totality of 46 participants. The ones who participated of the research were young adults with ages from 18 to 30 years, eutrophics and overweight/obesity, of both sexes. The volunteers that didn't present postural dysfunction and respiratory disease were excluded

After the Ethic and Research Committee (ERC) liberation was carried out a visit in the classrooms of a higher school private institution with the aim to explain the objectives and methods of the research to the students, invited to participate. To the ones who demonstrated interest in participating of it, was scheduled a day for the evaluation of the respiratory function and exercises execution. All the participants signed a Free and Informed Consent Term. The research followed all the precepts of the 466/2012 Resolution and was approved by the Ethic and Research Committee of Faculdade Santa Maria under the protocol nº 07878812.4.0000.5180.

In the research the volunteers were submitted to a unique session of respiratory muscle stretching that had a 30 minutes duration, being carried out two evaluations, one before and one after the exercises. In this evaluation, the respiratory muscle strength, slow vital capacity, current volume and minute volume were measured.

For the personal information collection and pulmonary function evaluation was used a manovacuometer with measures that varies from -300 to +300 cmH2O (wika); a Ferraris ventilometer (Wright Mk8, Spire); meter (ISP- Instituto São Paulo); digital Balance (Welmy Industria e comercio LTDA); Therapeutic Ball and an evaluation form elaborated by the researched ones. The respiratory muscle strength was evaluated according to Bellinetti (2006). The vital capacity, minute volume, current volume and respiratory frequency were evaluated according to Paisani et al. (2005) recommendations..

The stretching was carried out based on Pilates method with the ball help. The muscles exercised were: scalene, sternocleidomastoid, trapezius, latissimus dorsi, serratus, external and inner intercostal. The exercises are described in the literature. Five exercises were adopted to be done only one time during 30 seconds each.

The data were registered in the form of data bank of the informatics program SPSS Statistics for Windows®, 20.0 version, and analyzed through the descriptive and inferential statistic uni and bivariate.. A confidence level of 95% and 5% of significance ($p<0,05$).

3. RESULTS

46 patients participated of the study, compounding two groups: eutrophics (58,7%) and with overweight/obesity (41,3%). Initially, regarding to the eutrophic group, was verified a medium age of 23+2,70 years, medium height of 1,63+0,06m and median weight of 61,07kg. Consequently the medium BMI of this group was of 22,69+1,24kg/m2. The overweight/obesity participants group, by the time, presented medium age equivalent to 23,32+3,65 years, medium height of 1,69+0,10m and medium weight of 82,37+14,38kg. This way, the medium BMI of this group was of 28,60+2,97kg/m2.

To measure the participants muscle strength previously and lately a serie of stretching exercises, and also the respiratory function, was used two types of comparisons: (1) the intra-groups comparison, in which is evaluated the results obtained before and after the stretching series in participants of the same group, using, for that, the Student t test; and (2) an inter-group comparison, in which is evaluated the group 1 scores (eutrophics), confronting them to the group 2 (with overweight/obesity). For this analysis, was used the Student t test for independent samples.

Examining separately the groups was verified an increase of the muscle strength (Pimax and Pemax) in a significant statistically way in both groups. Confronting the groups, was verified that they differ also in a significant way according to statistical criteria, being the higher values of Pimax and Pemax presented after a stretching serie and in the participants with overweight/obesity. These information are detailed in Table 1.

Table 1: Evaluation of participants muscle strength previously and after an stretching serie.

Variables	*Groups*	*Pre-Stretching*	*Post-Stretching*	*p*
Pimax	Eutrophia	-75,19±43,00	-112,96±59,27	<0,001
	Overweight/ obesity	-126,84±57,54	-157,89±68,27	0,007
	p	0,001	0,02	-
Pemax	Eutrophia	68,52±22,31	96,67±26,45	<0,001
	Overweight/ obesity	88,42±38,04	113,16±33,34	<0,001
	p	0,05	0,06	-

Legend: Pimax: maxim inspiratory strength; Pemax: maxim expiratory strength.

Comparing initially the eutrophic group, was verified an increase statistically significant for the variables: CV, MV, and SVC. For the overweight/obesity patients group, the increase was only significant for the SVC variable.

For the inter-groups comparison, by the time, wasn't verified statistically significant differences among the participants' performances for the variables: CV, RF e MV, either previously or lately to the stretching series. For the variable SVC, on the other hand, were observed differences among the groups, and, as in the previous results, the greater scores were presented after the stretching serie and by the overweight/obesity participants (see descriptive and inferential data on table 2).

Table 2: Ventilometry evaluation of the participants previously and after the stretching series, for two control groups

Variable	*Groups*	*Pre-Stretching*	*Post-Stretcbhing*	*p*
CV	Eutrophic	801,63±302,47	936,19±389,35	0,02
	Overweight/obesity	1016,79±536,16	971,84±428,81	0,59
	p	0,12	0,77	-
RF	Eutrophia	15,70±2,70	16,30±2,99	0,24
	Overweight/ obesity	15,74±3,99	15,74±3,57	1,00
	p	0,97	0,56	-
MV	Eutrophic	11925,93±4313,89	14444,44±5911,74	0,004 *
	Overweight/ obesity	15368,42±8111,79	14736,84±6126,82	0,60
	p	0,10	0,87	-
SVC	Eutrophic	3459,26±803,48	4437,04±974,44	<0,001 *
	Overweight/ obesity	4984,21±1663,08	6057,89±1715,06	<0,001 *
	p	<0,001 *	<0,001 *	-

Legend: VC: current volume ; RF: respiratory frequency MV: minute volume; SVC: slow vital capacity

4. DISCUSSION

Pilates method constitutes the body alignment as function of an adequate respiration during the exercises that may reach various benefits, like increase of strength and muscle control, improving the respiratory capacity, increasing the energy, diminishing muscle pains, correcting postures, among others (BERTELE, 2008), differing this way of other types of resisted exercises (JESUS, 2012).

The Pilates method offers to the patient a respiratory re-education and a better ventilation and pulmonary perfusion that consequently improve the tissue oxygen nutrition (BRUNELLI, 2009).

The maximum expiration is carried out through the abdominal muscles that proved their activation during the execution of Pilates method exercises, mainly the rectus femoris, justifying therefore the muscle strength and expiratory flux increase in this method practicing (JESUS, 2012).

The changes in respiratory mechanics generally are due to the excessive shortening of the inspiratory muscles and the main causes of this shortening are: neuropsychic aggressions (stress), visceral mass volume increase, inadequate posture, respiratory pathologies, muscle weakness and aging (BARROS, 2005).

The muscle strength is changed when the muscle is in shortening status. When a muscle loses its normal flexibility, occurs a change in length- tension relation, making it mot able to produce an adequate tension peak, developing a weakness with retraction (MORENO, 2007).

The trunk anterior and posterior stretching exercises contribute in the optimization of the forced expiration maneuver, promoting the expiratory muscle biomechanics improvement (JESUS, 2012). The respiratory muscles stretching and thoracic mobility exercises can modify the chest elasticity and increase the respiratory muscles strength, improving consequently the forced vital capacity (MORGENSTERN, 2005). This fact can be observed in the significant increase of inspiratory and expiratory muscle strength of both groups, as well as the SVC increase.

In this research we observed a significant increase of SVC, MV and CV in the eutrophic group, that can reflect a possible improvement in these patients respiratory mechanics as result of a more efficient chest wall displacement (CUNHA et al., 2005).

5. CONCLUSION

According to the results obtained and compared between the data of pre and post evaluation, we concluded that the stretching with Pilates method applied in the respiratory muscles, showed a good result in the research participants respiratory function performance. The better results were found in inspiratory muscle strength, expiratory muscle strength and SVC.

Due to the benefits of stretching in respiratory function, the method can be considered an extra tool for health professionals when talking about the respiratory system therapeutic, and might be investigated its application in patients with pneumopathy.

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ABSTRACT

Introduction: Pilates method uses in an intense way the respiration, and therefore can alter respiratory muscles strength. Objective: to evaluate the benefits that the Pilates method promotes in respiratory function. Methodology: It treats of a study of a semi experimental type with quantitative approaching. The sample was of 46 young adults, with ages from 18 to 30 years, of both sexes. It was carried out a height, weight, respiratory muscle strength, current volume, minute volume and slow vital capacity verification. Two groups were formed: eutrophic and overweight/obesity. Results: After the stretching were observed significant results in Pimax ($p<0,001$) and Pemax ($p<0,001$) in both groups: in the current volume ($p=0,02$), minute volume ($p=0,004$) and vital capacity ($p<0,001$) in the eutrophic group and only in vital capacity in the overweight/obesity group. ($p<0,001$). Conclusion: Pilates method can be considered an extra tool by health professionals in the therapeutic aspect and might be tested by the person with a pneumopathy.

KEY-WORDS: Stretching. Pulmonary Function. Pilates Method.

MÉTHODE PILATES SUR L'ÉTIREMENT DES MUSCLES RESPIRATOIRES

RÉSUMÉ

Introduction: La méthode Pilates utilise intensément la respiration et peut donc modifier la force des muscles respiratoires. Objectif: Évaluer les avantages que la méthode Pilates promeut dans la fonction respiratoire. Méthodologie: C'est une étude quasi-expérimentale avec une approche quantitative. L'échantillon était composé de 46 jeunes adultes âgés entre 18 et 30 ans des deux sexes. Nous avons déterminé la taille, le poids, la force musculaire respiratoire, le volume courant, le volume minute et la capacité vitale lente. Deux groupes ont été formés: eutrophes et avec surpoids/obèses. Résultats: Après l'étirement des résultats significatifs ont été observés dans la Pimax ($p < 0,001$) et la Pemax ($p < 0,001$) pour les deux groupes; le volume courant ($p = 0,02$), le volume minute ($p = 0,004$), et dans la capacité vitale ($p < 0,001$) du groupe des eutrophes et seulement dans la capacité vitale du groupe des avec surpoids/obèses ($p < 0,001$). Conclusion: La méthode Pilates peut être considéré comme un autre outil par les professionnels de santé sur l'aspect thérapeutique et doit être testée dans patients avec une maladie pulmonaire.

MOTS CLÉS: Exercice d'étirement musculaire. Exercice respiratoire. Force musculaire.

MÉTODO PILATES EN EL ALARGAMIENTO DE LA MUSCULATURA RESPIRATORIA

RESUMEN

Introducción: El método Pilates utiliza intensamente la respiración y puede, así, alterar la fuerza muscular respiratoria. Objetivo: Evaluar los beneficios que el método Pilates promueve en la función respiratoria. Metodología: Esto es un estudio del tipo cuasi-experimental con abordaje cuantitativo. La muestra fue constituida por 46 adultos jóvenes con edad entre 18 y 30 años de ambos sexos. Se determinó la altura, el peso, la fuerza muscular respiratoria, el volumen corriente, el volumen minuto y la capacidad vital lenta. Se formaron dos grupos: eutróficos y sobrepeso/obesidad. Resultados: Después del alargamiento se observaron resultados significativos en la Pimáx ($p < 0,001$) y Pemáx ($p < 0,001$) de ambos grupos; en el volumen corriente ($p = 0,02$), el volumen minuto ($p = 0,004$) y la capacidad vital ($p < 0,001$) del grupo eutrófico y sólo en la capacidad vital del grupo sobrepeso/obesidad ($p < 0,001$). Conclusión: El método Pilates puede ser considerado una herramienta más por los profesionales de la salud en el aspecto terapéutico y debe ser testeado en pneumopatas.

PALABRAS CLAVE: Ejercicio de alargamiento muscular. Ejercicio respiratorio. Fuerza muscular.

MÉTODO PILATES NO ALONGAMENTO DA MUSCULATURA RESPIRATÓRIA

RESUMO

Introdução: O método Pilates utiliza de forma intensa a respiração e pode, assim, alterar a força muscular respiratória. Objetivo: Avaliar os benefícios que o método Pilates promove na função respiratória. Metodologia: Trata-se de um estudo do tipo quase experimental com abordagem quantitativa. A amostra consistiu em 46 adultos jovens com idade entre 18 e

30 anos de ambos os sexos. Foi realizada a verificação da altura, peso, força muscular respiratória, volume corrente, volume-minuto e capacidade vital lenta. Foram formados dois grupos: eutróficos e sobrepeso/obesidade. Resultados: Após o alongamento foram observados resultados significativos na Pimáx ($p < 0,001$) e Pemáx ($p < 0,001$) de ambos os grupos; no volume corrente ($p = 0,02$), volume-minuto ($p = 0,004$) e na capacidade vital ($p < 0,001$) do grupo eutrófico e apenas na capacidade vital do grupo sobrepeso/obesidade ($p < 0,001$). Conclusão: O método Pilates pode ser considerado uma ferramenta a mais pelos profissionais da saúde no aspecto terapêutico e deve ser testado em pneumopatas.

PALAVRAS-CHAVE: Exercício de alongamento muscular. Exercício respiratório. Força muscular.