142 - INFLUENCE OF TRAINING THE FLEXIBILITY IN PEOPLE WHOSE SHOULDER MOBILITY WERE REDUCED OWING TO SEQUELA OF SPASTIC PARALYSIS AND ITS IMPLICATIONS IN HE RECOVERY PHASE OF THE BREAST STROKE IN CRAWL-STYLE SWIMMING.

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INTRODUCTION

Flexibility is defined in many ways, depending upon the discipline the term is related. This word is derived from the Latin *flectere* or *flexibilis*, meaning *to bend* (ALTER,2001). Concerning to physical education, flexibility may be considered as a motile quality that depends on muscle elasticity and articular mobility, uttered by maximal range of movements necessary to one perfect execution of any elected physical activity, without anatomic lesions. According to the modern directions of American College Sports of Medicine ACSM, flexibility exercises must be fundamental elements in a program of physical activity, maximizing benefits and minimizing risks, taking into consideration general possibilities of the practitioner and his particular objectives (POLLOCK et al, 1998 in ARAUJO & COELHO, 2000). Them, an adequate training program for flexibility helps to increase the length of the unity muscle-tendon and to release the tension of the muscles enrolled (FARINATTI,2004). People with cerebral spastic palsy develops a permanent hypertonia, witch reduced the range of articular movement, leading to the necessity of an extra excessive effort to its realization (BOBATH,1984). Swimming is prophylactic and therapeutic, caracterized as a not traumatic physical activity (MARTINS, 2005). Its regular practice implies in cyclical movements against water resistance, witch can be associated to an increase in movement range and a modification in the degree of flexibility (CATTEAU & GAROFF, 1990). To parsons with some kind of physical handicap, swimming seems to be a most adequate sportive practice, for exercises are more easy to be performed with the body immerse in water. In cerebral palsy, it can liberate the movements restricted by the muscles. (TSUTSUMI et al,20904). According to COSTA & DUARTE (2000), swimming applied to handicapped is the individual capacity to master the water element, movig independent and safely under ad over the water, by using al his functional residual capacity, and respecting his limitations. COSTA & DIARTE (2000) says that a regular swimming practice enhances muscle functions, lowering the frequency of spasms and relaxing, and also alleviating muscle and articular pain, witch helps in maintaining and/or increasing articular movement range. According with CATTEAU &GAROFF (1990), in the aerial phase of the breast stroke in crawl-style swimming, a swimmer with less muscle flexibility would have to perform a greater rotation of the body, his arm havig to realize a movement longer than a swimmer with more flexibility. Them, taking into consideration these theoretical information, the main objective of this study is to demonstrate if there exists an increasing in the articular range during the aerial phase of the breast stroke in crawl-style swimming, in persons with cerebral spastic palsy, submitted to an specific flexibility training directed to the shoulder joint.

MATERIAL AND METHODS

The sample was composed of two swimmers having spastic tetraparesia (sequelae of cerebral palsy), and with major limitations in the legs. One of them (A) was a woman of 22 yr. The other (B) was a male, 20yr. Both had at least six months of swimming training.

They had swimming classes of 40 minutes in Nucleo de Apoio à Natação Adaptada de Santo André (NANASA), twice a week. They accepted to participate in the research, and signed an informed consent. Although the sample is very small, witch impairs statistical analysis, it is generally accepted that utilization of individuals is the best way to understand the effects of training in clinical research (SANDWEISS in CRUZ, 2003). Angular measures were made with the Sanny fleximeter, witch offers more confidence owing to the angle indication, wich is done by gravity effect. This minimizes interpretation errors. The angular scale was developed with one degree increments, from one up to 360 degrees, forwards and backwards, to facilitate visualization. The equipment does not need periodical regulation or adjustment, another reason to chose this tool for measurement. Data were collected from april to june of 2008. The fleximeter was utilized in the following way:

- To evaluate shoulder abduction, the fleximeter was fixed in anterior part of the arm, between shoulder and elbow-joint, the swimmers laid down with the legs flexed.
- To evaluate shoulder flexion, the fleximeter was fixed in the lateral part of the arm, between shoulder and elbow-joint, the swimmers laid down with the legs flexed
- To evaluate internal rotation of the shoulder, the swimmers performed external rotation of the shoulder followed by abduction. The fleximeter was fixed in lateral part of the fore-arm and the swimmer performed internal rotation of the shoulder.

The swimmers were evaluated when seated down, with column and legs stabilized. During evaluations, the swimmers were oriented to realize the movements analyzed and had the shoulder joint stabilized by the observer, that evaluated the movements by passive stretching.

During the classes, the swimmers were submitted to four stretching exercises specific for the shoulder joint (figures 1 and 2), passively realized by a professor. These exercises were performed in the beginning of the classes, each of one were done three times, during thirty seconds each.

Figure 1: Flexibility trainning during the classes (photo showed with the swimmer consent)

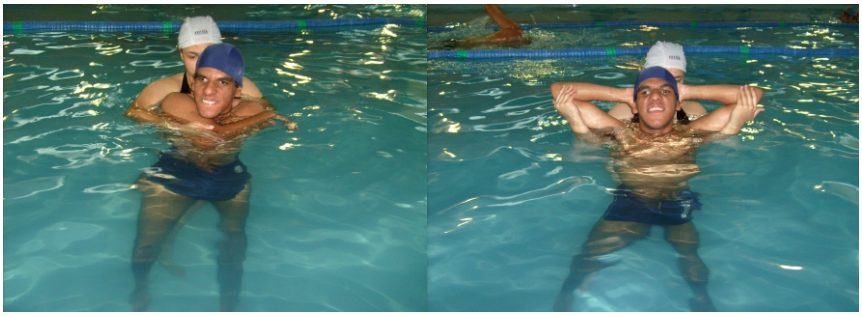
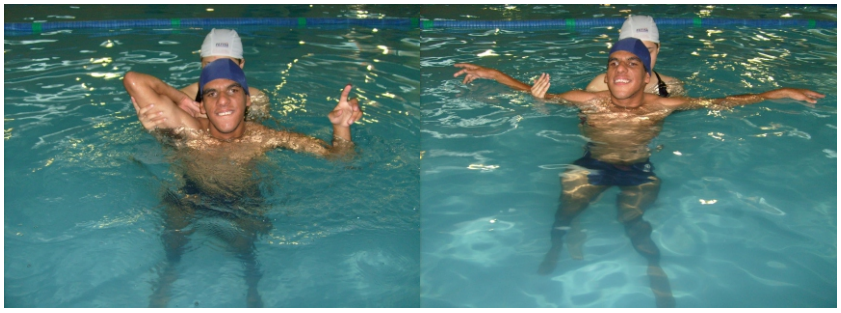


Figure 2 Flexibility trainning during the classes (photo showed with the swimmer consent)



RESULTS

Tables 1 to 3 show data collected from the swimmers, before and after trainning.

Table 1 Shoulder abduction range variation

	1ÿ avaliation (02/04/2008)		2ÿ avaliation (27/06/2008)	
	right	left	right	left
Swimmer A	127ÿ	120ÿ	131ÿ	123ÿ
Swimmer B	111ÿ	113ÿ	118ÿ	122ÿ

Table 2: Shoulder flexion range variation

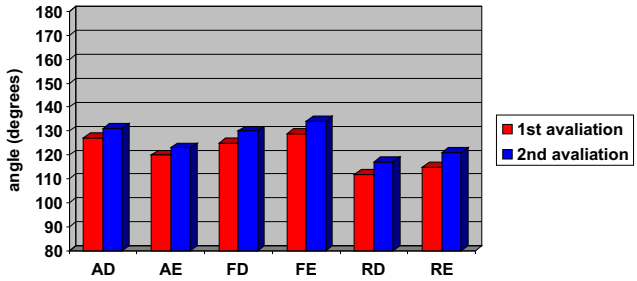
	1ÿ avaliation (02/04/2008)		2ÿ avaliation (27/06/2008)	
	right	left	right	left
swimmer A	125ÿ	129ÿ	130ÿ	134ÿ
swimmer B	161ÿ	164ÿ	166ÿ	169ÿ

Table 3: Shoulder internal rotation range variation

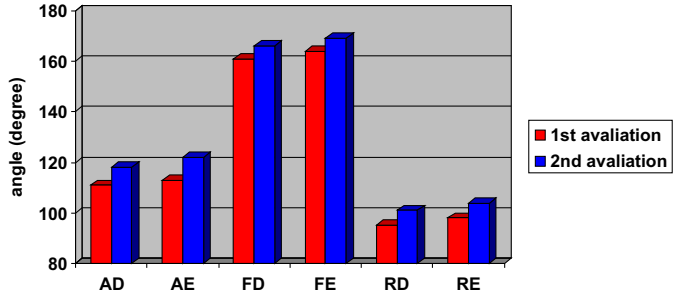
	1ÿ avaliation (02/04/2008)		2ÿ avaliation (27/06/2008)	
	right	left	right	left
Swimmer A	112ÿ	115ÿ	117ÿ	121ÿ
Swimmer B	95ÿ	98ÿ	101ÿ	104ÿ

In the graphs below, results before and after training are compared: AD = right shoulder abduction, AE= left shoulder abduction; FD = right shoulder flexion; FE = left shoulder flexion; RD = right shoulder internal rotation; RE = left shoulder internal rotation.

Graphic 1: Shoulder range variations before and after training, swimmer A.



Graphic 2: Shoulder range variations before and after training, swimmer B .



DISCUSSION

As sample is very small, only a qualitative analysis was performed. From graphics 1 and 2, we can note an increasing in the flexibility degree, each degree resulting in important improvement in movement range. The exercises of stretching chosen had a finality to increase the flexibility of the main muscles enrolled in the shoulder joint movement, in the recuperation phase of the crawl-style swimming, mainly the deltoid and the braquial triceps. The movements studied were chosen based in the main movements

done by the shoulder joint during this phase of the breast stroke: abduction, internal rotation and flexion. The passive method of flexibility training seems to be more adequate to this purpose, because, according to ARAÚJO & COELHO (2000), there exists a tendency of the swimmers not to perform correctly the movements in witch they find difficulties, either for fear of pain or for a not adequate knowledge of the limits of muscle lesion, so that the training is better performed by an experienced person. FARINATTI (2004) says that every method of stretching increases flexibility, but variations in methods of training may lead to different final results and, greater the muscle stimulus duration, greater the increasing of flexibility (apart from the number of trials), for a greater time of muscle tension results in greater increases in movement range of the articulation enrolled. FARINATTI (2004) concludes that the effect of the number of trials is subordinated to the duration of stimulus, ideally of 30 seconds. Usually, persons that are spastic and tetraparethic, having major limitations in legs, do rehabilitation mainly in the more damaged extremities, some times not paying attention in extremities less affected by disease. This is a mistake, because the lesions could aggravate with time, influencing directly the daily activities that need these extremities, in our case, the arms. According to ARAÚJO & COELHO (2000), the benefits of a supervised flexibility program are transferred to daily activities, allowing to a sensation of wellbeing and confidence. This was reached because of the great flexibility of the muscles, witch leads to more flexible articulations: even persons with small movement range show a positive and quick evolution with treatment. Even though a relation between success in swimming and flexibility is still to be proved by research, it is believed that flexibility plays an important role in swimming, allowing application of a propulsive effort for longer time, facilitating the recovery of the arms in order to not disturb horizontal alignment of the body and reducing energy expenses to increase swimming velocity, by reducing intramuscular resistance to movement. It is concluded that increasing the range of movement of the shoulder joint brings a lot of advantage to swimmers. (MAGLISHO, 1999).

CONCLUSION

Analysis of data obtained allows to conclusion that both swimmers showed a significant increase in shoulder flexibility, resulting in greater range of movement of the shoulder joint witch contributed directly in the recuperation phase of breast stroke in crawl-style swimming. Before the training of flexibility, these swimmers showed greater difficulty in elevating the elbow in recuperation phase, resulting in a submerse recuperation of the breast stroke. After 3 months training flexibility, either the results of the fleximeter measures or the facilitation in the elevation of the elbow (now out of the water, economizing energy) allows to conclude that flexibility training was highly effective in optimize the breast stroke. Besides that, the swimmers related an increasing in shoulder range movements, witch helps the realization of some daily routine activities, by reducing the pain produced by movement and caused by shortening of the muscles enrolled in the main shoulder movements.

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ABSTRACT

Flexibility may be understood as the maximal articular range done to perform a movement. In persons with cerebral spastic palsy, there is a restriction in the movement owing to muscle hyper tonicity. Based upon this information, the aim of this study was to verify if specific flexibility training for shoulder joint could result in improvement in articular mobility, during the aerial phase of the chest stroke in crawl-style swimming. The study took into consideration that the shoulder plays a greatest role in optimizing the chest stroke. The sample was composed by 2 swimmers tetraparethic and spastic, with the greatest lesion in the legs. They were training swimming for at least 6 month, one of them a female (swimmer A) an the other, a male (swimmer B). Data were collected in a period of 3 month, and measurements of the angles of the shoulder in abduction, flexion and internal rotation were performed with a fleximeter. Analysis of the performance (quality of the breast stroke) and the angles before and after treatment allowed a conclusion that the intervention was successful. Swimmer A showed increase in flexibility of 3,87% in right and of 3,86% in the left shoulder. Swimmer B showed increase in flexibility of 5,24% in the right and 5,71% in the left shoulder. Besides that, they related reduction of pain produced by the shortening of the muscles, witch accounted for a better performance in routinely daily movements.

Key words: stretching, largeness of movement, swimming

L'INFLUENCE DE LA FLEXIBILITÉ DANS LA FORMATION POUR LES PERSONNES À MOBILITÉ RÉDUITE DE L'ÉPAULE PAR LES SÉQUELLES DE LA PARALYSIE CÉRÉBRALE SPASTIQUE ET SES IMPLICATIONS DANS LE STADE DE LA RÉCUPÉRATION DE LA NAGE LE BRAS DE ROBOT D'EXPLORATION

RÉSUMÉ

La flexibilité peut être considérée comme la capacité maxime d'amplitude articuler réalisée pour l'exécution d'un mouvement. Dans le cas de personnes avec paralysie cérébrale espástique se produit restriction dans l'amplitude des mouvements en fonction de la hipertonie musculaire. Avec ces informations, l'objectif de cette étude est vérifier, à partir d'une formation spécifique de flexibilité pour le joint de l'épaule, a amélioration significative la mobilité articuler du joint pendant la phase aérienne de la braçada de la nage crawl dans personnes avec paralysie cérébrale espástica, donc, dans lui je nage crawl, l'épaule est un des grands responsables par l'otimização de la braçada. L'échantillon de la recherche se compose de deux personnes, avec des caractéristiques de tetraparesie espastique en possédant plus grande compromission dans des membres inférieurs, pratiquants de natation plus de six mois, élève A du sexe féminin, et élève B du sexe masculin. Il rassemble de données a été réalisé dans un intervalle de trois mois entre les mesures et l'instrument utilisé est un appareil, le flexímetre, qui permet que se fasse la lecture des mesures angulaires des mouvements, dans ce cas, mouvements de flexion, abdução et rotation interne du joint de l'épaule. L'analyse des évaluations réalisées avant et après la période de formation rend possible la constatation que l'intervention a été satisfaisante en tous les deux cas en assistant dans l'amélioration de la braçada et, de conséquentement, dans le disloquement de l'élève sur l'eau. Les résultats obtenus dans l'étude démontrent que l'élève L'a présenté une augmentation de 3.87% dans la flexibilité de l'épaule droite et une augmentation de 3.86% dans l'épaule gauche ; l'élève B a présenté une augmentation de 5.24% dans la flexibilité de l'épaule droite et une augmentation de 5.71% dans l'épaule gauche. En outre, selon les élèves eux-mêmes, il a y eu de la diminution des douleurs causées par le raccourcissement musculaire, donc, la relaxation de la musculatura a rendu possible l'amélioration de quelques mouvements réalisés quotidiennement.

Mots-Clés: allongement, l'amplitude de mouvement, natation

LA INFLUENZIA DE LA FLEXIBILIDAD EM LA FORMACIÓN DE LAS PERSONAS COM MOVILIDAD REDUCIDA DE HOMBRO POR SECUELAS DE LA PARÁLISIS CEREBRAL ESPÁSTICA Y SUS CONSECUENCIAS EM LA ETAPA DE LA RECUPERACIÓN DE LA NATACION BRAZO DE RASTREADOR

EXTRACTO

La flexibilidad se puede entender como la gama articular máxima hecha para realizar un movimiento. En personas con parálisis espástica cerebral, hay una restricción en el movimiento debido a tonicidad hiperactiva del músculo. Basado sobre esta información, la puntería de este estudio era verificar si el entrenamiento específico de la flexibilidad para el empalme de hombro podría dar lugar a la mejora en movilidad articular, durante la fase aérea del movimiento del pecho en la natación del arrastrar-estilo. El estudio tomó en la consideración que el hombro desempeña un papel más grande de optimizar el movimiento del pecho. La muestra fue compuesta por 2 nadadores tetraparethicos y espásticos, con la lesión más grande de las piernas, practicantes de natación por lo menos 6 meses, una de ellas una hembra (nadador A) a la otra, varón (nadador B). Los datos fueron recogidos en un período de 3 meses, y las medidas de los ángulos del hombro en la abducción, la flexión y la rotación interna fueron realizadas con un fleximeter. El análisis del funcionamiento (calidad del movimiento de pecho) y los ángulos antes y después del tratamiento permitieron una conclusión que la intervención fuera acertada. El nadador A demostró aumento en la flexibilidad de el 3.87% en la derecha y de el 3.86% en el hombro izquierdo. El nadador B demostró aumento en la flexibilidad de el 5.24% en la derecha y el 5.71% en el hombro izquierdo. Además de eso, relacionaron la reducción del dolor producida por el acortamiento de los músculos, bruja explicaron un mejor funcionamiento en movimientos rutinario diarios.

Palabras-clave: alargamiento, amplitud de movimiento, natación.

A INFLUÊNCIA DO TREINAMENTO DE FLEXIBILIDADE EM PESSOAS COM MOBILIDADE DE OMBRO REDUZIDA POR SEQUELA DE PARALISIA CEREBRAL ESPÁSTICA E SUAS IMPLICAÇÕES NA FASE DE RECUPERAÇÃO DA BRAÇADA DO NADO CRAWL

RESUMO

A flexibilidade pode ser entendida como a capacidade máxima de amplitude articular realizada para a execução de um movimento. No caso de pessoas com paralisia cerebral espástica ocorre restrição na amplitude dos movimentos em função da hipertonia muscular. Com bases nessas informações, o objetivo desse estudo é verificar, a partir de um treinamento específico de flexibilidade para a articulação do ombro, se há melhora significativa na mobilidade articular da articulação durante a fase aérea da braçada do nado crawl em pessoas com paralisia cerebral espástica, pois, no nado crawl o ombro é um dos grandes responsáveis pela otimização da braçada. A amostra da pesquisa é composta por duas pessoas, com características de tetraparesia espástica possuindo maior comprometimento em membros inferiores, praticantes de natação a mais de seis meses, aluno A do sexo feminino, e aluno B do sexo masculino. A coleta de dados foi realizada num intervalo de três meses entre as medições e o instrumento utilizado é um aparelho flexímetro, o qual permite que se faça a leitura das medidas angulares dos movimentos, neste caso, movimentos de flexão, abdução e rotação interna da articulação do ombro. A análise das avaliações realizadas antes e após o período de treinamento possibilita a constatação de que a intervenção foi satisfatória em ambos os casos auxiliando na melhora da braçada e, conseqüentemente, no deslocamento do aluno sobre a água. Os resultados obtidos no estudo demonstram que o aluno A apresentou um aumento de 3,87% na flexibilidade do ombro direito e aumento de 3,86% no ombro esquerdo; o aluno B apresentou um aumento de 5,24% na flexibilidade do ombro direito e aumento de 5,71% no ombro esquerdo. Além disso, segundo os próprios alunos, houve diminuição das dores causadas pelo encurtamento muscular, portanto, o relaxamento da musculatura possibilitou a melhora de alguns movimentos realizados diariamente.

Palavras-chave: alongamento, amplitude de movimento, natação.