127 - NEUROMUSCULAR DEVELOPMENT IN A SUBJECT WITH CEREBRAL PALSY IN A PROGRAM OF RESISTED EXERCISES

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Introduction

The Cerebral Palsy (CP) is characterized as a set of permanent symptoms of non-progressive lesions resulting from a lesion in the motor control areas of the brain that may have originated before, during or after birth and that is manifested as a loss or decrease in the control over the voluntary muscles. Although the lesions may not be progressive, the clinical picture alters with the development of the nervous system and the child's growth (BOBATH, 1976; DOWNIE, 1987; ZUCHETTO et al 1994; TREVISAN et al 1994).

There are three main categories that correspond 90% of the CP cases: spastic (lesions of the pyramidal system of the motor cerebral cortex) 65%; athetosic (lesions of the extrapyramidal system of the basal ganglia) 20%; ataxic (lesions of the cerebellum and the cerebral stem) 5%. There are others 3 types (tremor, rigidity and diatonic) that are rare and they constitute the 10% that remains of its totality (BOBATH, 1976; SHERRIL, 1986).

The brain lesion contributes to the development of abnormal reflexes in the majority of individuals, resulting in difficulty in coordinating and integrating basic movements, motor delays in the activities that involve balance, rhythm, spatial orientation beyond the postures habits (MARQUES, 2005).

In a study comparing children with normal development with paralyzed cerebral, Mancini (2002) observed some differences in the performance of functional activities. The degree of difficulty of the functional activities in the two groups was significantly different in 50% of the evaluated item. This result indicates that the same functional item presents a level of complexity differentiated in the two groups, representing a bigger challenge for children with CP.

The presented injuries modify the quality and the quantity the movements to be executed, demanding compensatory strategies to increase the stability to articulate, to limit the degrees of freedom or to allow that the motor system quickly answers for disturbances of the way (IWABE, 2003).

Teixeira-Salmela (2003) presents new evidences to existing literature setting up resistance exercises as an alternative viable and insurance to improve the functional performance of chronic hemiplegics patients. Measure of the velocity of the gait have been used as indicative of the performance, independence, capacity of accomplishment of social and functional activities, demonstrating itself, sensible and trustworthy to detect changes in the motor performance, independent of the functional level of the individual.

The normal neuromuscular mechanism is liable to a great area of motor activities respecting the limits of the anatomical structure, of evolutionary level and the neuromuscular answer inherent and previously known. The innumerable combination of movements used for the normal individual to support the necessities of life has been acquired through well established evolutionary standards and though many learning situations that require physical effort and ability. The normal neuromuscular mechanism becomes integrated and efficient without the conscience of individual functioning of the muscle, reflex action and a great number of other neurophysiological activities. The variations occur in relation of coordination, force, rhythm of movements and resistance, but they do not hinder the adequate reactions to normal necessities of life (VOSS, 1987; HALL, 2001).

The force tests can be applied in the scientific inquiry, in cases where the knowledge of levels of force of the subject in situations of pre-test and post-test is necessary and the proper training prescription of research protocol. The study of this variable is also important training prescription when a number of repetitions or a percentage of a maximum repetition (%1RM) is established to determine an objective (PEREIRA, 2003).

Objective

The aim of this research was to verify the development of muscular resistance in a subject with CP.

Methodology

This research was carried through with a subject with CP with athetosic quadriplegic, male, 30 years old. The collection of data was carried through in the Center of Sports of the Federal University of Santa Catarina (CDS/UFSC) during twenty weeks. For determination of the parameters of muscular resistance in pre-test and post-test was used the maximum force test having as reference the maximum number of eight repetitions and its corresponding load.

This type of test was chosen because the subject presented little familiarity with the exercises and for the difficulty in carrying through definitive movements in the equipment, having to carry through some adaptations.

For verification of the asymmetry and posterior analyses, the tests had been filmed.

Results

To characterizing of the subject had been used data of anthropometry and muscular resistance tests. The results will be presented, in its bigger part, in table form, which will be referred in discuss.

Anthropometrics data:

Corporal Weight	48 kg
Height	166 cm

Table 1 - Biceps Flexion Rep. (x) Pre (kg) Post (kg) Rep. (x)

Left			Right		
Pre (kg)	Post (kg)	Rep. (x)	Pre (kg)	Post (kg)	Rep. (x)
5	8	6	5	7	4

In table 1 are presented data to the test of biceps flexion. For this exercise, a bigger difficulty in accomplishment in the Right Superior Member (SM) in relation to Left SM was verified, agreeing to the analyzed filmings. Analyzing the tests carried through before the beginning of the program in relation to carried through after the 20 weeks of trainings, was evidenced an increase of 3 kg for the left SM and of 2 kg for the right side. Thus, increases of 60% of the load for the left side and of 40% for the right side were observed for the

same number of repetitions.

Table 2 - Triceps with free weight

Left			Right		
Pre (kg)	Post (kg)	Rep. (x)	Pre (kg)	Post (kg)	Rep. (x)
4	5	6	3	5	7

Table 3 -Triceps with low knob equipment

Left			Right		
Pre (kg)	Post (kg)	Rep. (x)	Pre (kg)	Post (kg)	Rep. (x)
9	11	4	7	9	5

Tables 2 and 3 present the referring data to the exercises of triceps extension, being in table 2 carried through with free weights and in table 3 in low knob equipment. As much with free weight as in the equipment, different of the exercises for biceps, it was not possible to carry through the test with the same load for both sides in the first tests. However, in the post-test with free weights the subject equaled loads. For the left side, it had an increase of 1 kg in the load with free weights and 2 kg in the equipment, representing an increase of 25% and 22% respectively. To right side, the increase was 2 kg to both exercises (with free weights and in the equipment), representing 66% and 28% respectively. An adaptation for the accomplishment of the test was necessary since the wheelchair did not come close the sufficient of the knob, a rope was used then.

Table 4 - Shoulder Abduction

Left			Right		
Pre (kg)	Post (kg)	Rep. (x)	Pre (kg)	Post (kg)	Rep. (x)
5	6	6	7	5	6

Table 4 shows the referring data to the exercise of shoulder abduction which the subject had an increase of 1 kg for both SM, for the same number of repetitions. Thus, an increase of 20% in the load for left side and 25% for the right side.

Table 5 - Hip Flexion

Repetition during 1 minute		
	Pre	Post
Left	14	27
Right	10	25

Table 5 shows the referring data to hip flexion. It had a great increase in the number of repetitions for pre-test and post-tests. It was the exercise that had the bigger increase proportionally for the number of repetitions: 92% for left Inferior Member (IM) and 150% for the right IM. As was shoes, were found difficulties in carrying through exercises of inferior members, therefore the dysfunction are accented. Thus, the only carried through test was of hip flexion and this one followed the verified asymmetry in data presented in previous tables until then.

Discuss

An aspect that should be emphasized is that the principles of the resistance training must be applied to all the types of people, deficiency carriers or not. This should be applied for force training as well, perceiving that existed more similarities than dissimilarities for the training of any subject, even if this subject has certain physical atony (MORRIS, 1984).

The results are similar to joined ones for IWABE (2003) that, although the similarity in the dysfunction between the cerebral paralysis of same type, it observed alteration of muscular tonus, with bigger intensity in the inferior members, as one of the most frequent signal in children with cerebral paralysis.

The asymmetry, characteristic of the cerebral paralyzed ones, was well characterized in such a way in the pre-test and post-test, as well as in the filmings. It is standed out that the asymmetry presence did not hinder the profits in the measures of functional performance. The neuromuscular development do not have with main purpose changes in characteristic symmetry of these individuals, but significant improvements in measures of functional performance. In a similar study, however with chronic hemiplegics, the joined results were significant profits of speed of march (38.2%) and ability to go up stairs (20.9%), but without alteration in the values of symmetry (TEIXEIRA-SALMELA, 2005).

Thus, an evolution was observed during the lessons, independent of the asymmetry. The activities had had duration of 20 weeks and are presented in Table 6:

Table 6 - Exercises and its load during trainin

	Beginning		4 weeks		8 weeks		18 weeks	
	Duration / Repetitions	Load (kg)	Duration / Repetitions	Load (kg)	Duration / Repetitions	Load (kg)	Duration / Repetitions	Load (kg)
ALO	5 - 7 minutes	-	5 - 7 minutes	-	5 - 7 minutes	-	5 - 7 minutes	-
ERG	5 minutes	-	6 minutes	-	6 minutes	-	6 minutes	-
CDD	10 rep.	2	12 rep.	2	-	-	-	-
ROL	5 rep. each side	-	7 rep. each side	-	7 rep. each side	-	7 rep. each side	-
FQ	10 rep.	½	12 rep.	½	12 rep.	½	12 rep.	1
TPB	2 x 10 rep.	7	2 x 12 rep.	7	2 x 12 rep.	7	2 x 12 rep.	9,5
PAL	2 x 10 rep.	12	2 x 12 rep.	12	2 x 12 rep.	12	2 x 12 rep.	14,5
ABD	-	-	-	-	2 x 10 rep.	-	2 x 15 rep.	-
LOM	-	-	-	-	2 x 20 rep.	-	-	-
AMI	-	-	-	-	-	-	2 x 12 rep.	1

ALO = Stretching; ERG = Paddle Ergometer; CDD = Cross Dorsal Decubitus; ROL = Rolling; FQ = Hip Flexion; TPB = Triceps Low knob Equipment; PAL = Superior Members High Knob Equipment; ABD = Abdominal; LOM = Lumbar; AMI = Inferior Members Abduction.

After the period of 4 weeks for adaptation, it was increased intensity of the series increasing for 12 the number of repetitions in the exercises of cross, hip flexion, triceps in low knob equipment and SM high knob equipment and for 7 in rolling.

The criterion for the increase of intensity was established as when the instructor and the subject understood that the exercises would be easy to be carried through.

After more 4 weeks, it was decided to increase two exercises in the series: Abdominal and Lumbar, following the same

criterion for increase of volume of exercises, when the instructor and the subject understood that the series started to be easy of being carried through. In the following lesson, it was realized that was not possible to carry through all the exercises proposed in view of the available time. Therefore, exercise with free weight for superior members was removed for understanding that it had other exercises for this segment yet.

Lacking 2 weeks for the post-test, the intensity was increased again, it suffered modifications and it was remained until the post-test. It is observed that, independent of the results of the tests, it had a progression in the carried through exercises, with increase of loads and repetitions. This probably happens because of the increase of the muscular force, beyond to an adaptation to the exercises, improvement in the coordination implying in development of the stabilizing muscles, agonist and antagonists.

Conclusion

It was verified a significant improvement in all muscular groups worked.

Because of the asymmetry observed and the differences found in force pre and post-test, it is suggested the necessity of a battery of preliminary evaluations for this kind of subject making possible the accomplishment of a work differentiated, based in the proper characteristics of each paralyzed cerebral.

It is also considered, adaptations in the musculation equipments, using equipments that propitiate access and adjustment in function of the characteristic.

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NEUROMUSCULAR DEVELOPMENT IN A SUBJECT WITH CEREBRAL PALSY IN A PROGRAM OF RESISTED EXERCISES

The aim of this research was to verify the development of the muscular resistance in a subject with Cerebral Palsy that participates in a program of resisted exercises during 40 sessions. The pre-test and post-test of maximum resistance, having as criterion the maximum of eight repetitions and its respective load was been used as control. The finding results show a significant improvement in all muscular groups worked and the necessity of appropriate devices for subjects with Cerebral Palsy.

Key Words: Cerebral Palsy, Resisted Exercises.

DEVELOPPEMENT NEUROMUSCULARIE D'UN SUJET VICTIME D'UNE PARALYSIE CEREBRALE PARTICIPANT AU PROGAMME D'EXERCICE DE RESISTANCE

L'objectif de la recherche était de verifier le developpement d'un sujet victime d'une paralysie cérébrale participant au progamme d'exercice de résistance. A été réalisé un contrôle pré et post test de la résistance maximum du sujet qui devait réaliser 8 répétitions maximum sur son chargement respectif. On constate une amélioration significative sur toutes les zones musculaires travaillées et on constate également la nécessité d'appareils appropriés pour sujets avec paralysie cérébrale.

Most-Clés: Paralysie Cérébrale, Exercices Résistés

DESARROLLO NEUROMUSCULAR EN UN SUJETO CON PARÁLISIS CEREBRAL EN UN PROGRAMA DE EJERCICIOS RESISTIDOS

El objetivo de esta investigación fue verificar el desarrollo de la fuerza en un sujeto con parálisis cerebral participante de un programa de ejercicios resistidos durante 40 secciones. Fue utilizado como control pre y pos test de la resistencia maxima que tenía como criterio realizacion de ocho repeticiones máximas y su respectiva carga máxima. Se verificó una mejora significativa en todos los grupos musculares trabajados y la necesidad de aparatos y dispositivos apropiados para las personas con parálisis cerebral.

Palabras Claves: Paralis Cerbral, Ejercicios Resistidos.

DESENVOLVIMENTO NEUROMUSCULAR EM UM SUJEITO COM PARALISIA CEREBRAL EM UM PROGRAMA DE EXERCÍCIOS RESISTIDOS

O objetivo desta pesquisa foi verificar o desenvolvimento da resistência máxima em um sujeito com paralisia cerebral participante de um programa de exercícios resistidos durante 40 sessões. Foi utilizado como controle o pré e pós-teste de resistência máxima que tinha como critério a realização de oito repetições máximas e sua respectiva carga. Os resultados encontrados demonstraram uma melhora significativa em todos os grupos musculares trabalhados e a necessidade de aparelhos que sejam mais apropriados aos sujeitos portadores de paralisia cerebral.

Palavras Chave: Paralisia Cerebral, Exercícios Resistidos.