132 - THE INFLUENCE OF PHYSICAL ACTIVITY EVALUATED BY ELECTROMYOGRAPY IN THE INCIDENCE OF FALLS IN OLDER ADULS FROM THE CITY OF CAMPO GRANDE (MS)

MARIANA DE OLIVEIRA, VERA LÍCIA BARUKI,
DANIEL ANTONIO DE OLIVEIRA, CARLOS ALEXANDRE HABITANTE.
UNIDERP - Universidade para o Desenvolvimento do Estado e Região do Pantanal / Campo Grande (MS) / Brasil.
mazinhaoli@yahoo.com.br

Introduction

Brazil is a country which population has been aging very quickly. Presently, the elderly population is over 15 million people (the total population is about 170 million inhabitants). In 20 years, this number will reach 32 million. (RASO et al., 1997a).

The age-related neuro-muscular changes have been named as sarcopeny by some authors. These changes include the reduction of alfa motor- neurons, motor units and muscular fibers. Conversely, muscular strength decreases, mainly in the lower body. This fact leads to a reduction in walking speed, reduction in balance, reduction in the capacity to go upstairs and it also makes it difficult getting up from a sitting position. These negative aspects contribute to a reduction in the level of performance of several everyday activities (RASO et al., 1997a; 1997b; 1997c).

Studies demonstrate that strength training may augment elderly people's agility, by helping these people perform several movements and improving their capacity to stay upright. By doing so, these people would be able to carry out everyday tasks without being subject to falls and bone fractures (MONTEIRO et. al. 1999). Significant advancements in biotechnology related to bioinstrumentation has cast new light into the experimental and clinical investigation field concerning human performance. According to CHAFFIN et al. (2001), a recent but very important advancement in occupational biomechanics happened in the bioinstrumentation field. This advancement is connected to the acquisition of data and analysis.

the gadgets developed, the electromyograph deserves special attention. It has been acknowledged as a reliable, efficient and validated method to register the electric potential of muscular fibers, enabling further interpretation of the physiological status of the muscles. (PORTNEY, In: O'SULLIVAN e SCHMITZ, 1993).

Clinically speaking, the electro diagnosis allows the assessment of traumatic and neuro-muscular changes, providing us with precise and valuable information about the extension of muscular capacity loss. This information is essential to confirm the diagnosis, set the goals of treatment and interventions. (ORTOLAN, 2002).

Objective

Evaluate the influence of physical activity assessed by electromyography in the occurrence of falls in elderly citizens from the city of Campo Grande (MS).

Materials and procedures

Study population

The volunteer sample comprised 70 older adults from both genders. 34 subjects were sedentary, and frequented Centro Comunitário Maria Aparecida Pedrossian. Their ages ranged from 60 to 81 (mean 69,3, SD 7,3). The other 40 subjects exercised 3 times per week, an hour a day and frequented Centro comuntário Do Horto Florestal in the city of Campo Grande. Their ages ranged from 63 to 84 (mean 71,5, SD 5,6).

Body mass index (BMI)

The Body Mass Index (BMI) was used to assess the body composition of the subjects. A FILIZOLA scale was used to determine the body weight and a stadiometer was used to determine the height of the subjects. All subjects were weighted and measured on their bare feet and before breakfast.

incidence of falls

The subjects received a questionnaire to determine the incidence of falls. They were asked to remember if they had fallen during the 12 months that proceeded the data collection.

Electromyography

An eight-channel electromyograph produced by EMG SYSTEM do Brasil was used to determine the muscles electrical activity. Four bipolar channels were connected to 2 superficial and disposable electrodes produced by MEDTRACE , which totalizes 08 electrodes per sampling. The electrodes were placed on the corneous layer of the epidermis, on the muscles rectus femoris and vastus medialis, tibialis anterior and gastrocnemis. After finding the motor spot of the muscle, the placing of the electrodes was standardized by putting it 2 cm upwards the spot.

The analysis was standardized by using the muscle electrical signals emitted during the period through which the feet touched the platform in locomotion. The mean of the electrical signals during the whole locomotion process was observed, since the moment the subject's ankle touched the platform until the moment the last touch on the platform happened, using the distal region of the feet.

Statistical analysis

The results were expressed as a mean ± mean standard deviation. In order to compare the mean of the results, the Duncan multiple-range test was applied, using (p £ 0,05) as significance level.

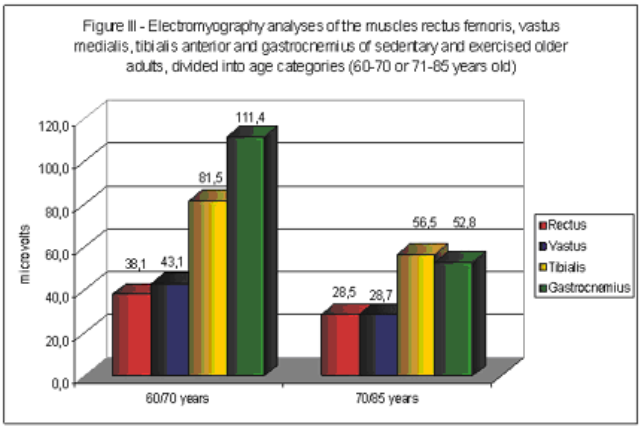
Results

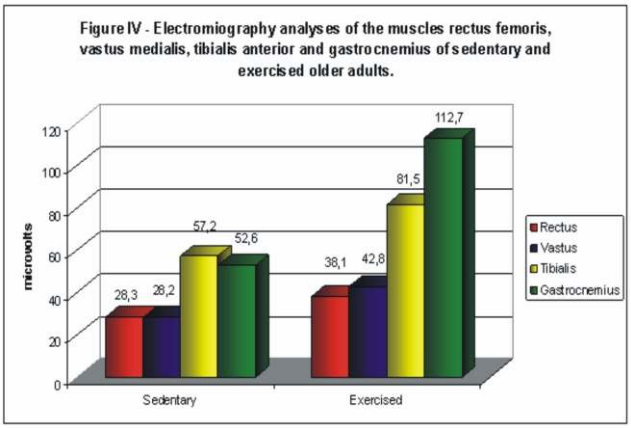
Table I - Body composition evaluation through the Body Mass Index (BMI) of sedentary (n=34) and exercised older adults (n=47)

	Eutrofic– BMI<25	Overweight and obesity BMI >25
Sedentary	06 – 18%	28 – 82%
Exercise	16 – 34%	31- 66%

Table II - Fall incidence for sedentary (n=25) and exercised (n=47) older adults during 12 months.

	Reported falls	Did not repot falls
Sedentary	15- 60%	10- 40%
Exercised	09- 19%	38- 81%





DISCUSSION

It has been a long time since Man started developing researches on the human body, in an attempt to understand how it normally works, the alterations brought by pathologies and the aging process. However, not until the beginning of this century were there so many consistent studies concerning the human aging process, thanks to the increasing number of elderly citizens all over the world . This is the most important demographic change observed in the majority of countries (CORRÊA, 1996; UCHÔA e COSTA, 1999). Brazil has been going through the same process likewise. This process could be described as a proportional elderly population increase compared to the total population. The life span increases due to fecundity and mortality coefficient falls. It is also connected to the improvement of life conditions (housing, diet, lifestyle) and to the science advancements, which makes early diagnosis and treatments possible. Vaccines and medicines have contributed as well. (AGOSTINI, 2000).

These factors also influence in the population profile, mainly when it comes to mortality and morbity. In the past, infections and illnesses caused by parasites were the main concern. Today, these ailments have been replaced by non-transmissible chronic diseases, such as arteriosclerosis, hypertension, diabetes, osteoporosis, just to name a few (MONTEIRO, 2000).

According to UCHÔA e COSTA (1999), as we grow older, our motor performance declines. It may be attributed to the aging process itself, diseases, lifestyle or the combination of these factors. Strategies of intervention that reduce the reaction time include the opportunity to carry out a certain task, stimuli intensity augment, the use of a task that the individual is familiar with and a physically active lifestyle.

The decline of all the human body systems have direct effects when it comes to postural control. A decrease in the speed at which information is conduced and responses are processed justify this fact. These factors are described as fundamental in the third-age fall mechanisms (CORRIVEAU *et al.*, 2000).

The fall is a result that comes from total postural balance loss, related to sudden insufficiency of neural and osteo-articular mechanisms related to posture maintenance. These insufficiencies result from alterations caused by senescence and senility (RODRIGUES & CASAGRANDE, 1996). Falls have been regarded as an important watershed in an elderly person's life, seeing that it may bring restrictions to his / her life, such as minor grazes, locomotion restrictions, difficulties carrying out everyday activities, loss of functional independency and even social reclusion, which causes the elderly person's quality of life to decrease (HOBEIKA, 1999). These alterations are also responsible for high expenses with institutions morbity and mortality indexes.(UCHÔA e COSTA, 1999).

The incidence of falls increases exponentially as we grow older due to the fact the multiple failure of the organic systems is connected to the physiological aging of the body. The fact that older adults may probably fall sick more easily and its connection to fall events are responsible to the incidence of falls as well (PERRACINI, 2000).

The fall etiology is multi-factorial, and it is mostly connected to a sum of external factors, related to fitness and external factors, related to environmental conditions. The investigation of these factors have been intensified in order to establish the factors that trigger the event.

Today, all over Brazil, social programs that assist the elderly have been broadly advertised and put into practice in an attempt to better the elderly's quality of life. Physical activities have been effectively applied in order to reeducate the sensorial and motor strategies connected to balance and muscular strengthening so that the risk of falls is minimizes (SHUMWAY-COOK *et al.*, 1997).

It is widely known that physical activity in the third age brings many satisfactory effects concerning the neuromuscular, metabolic and psychological aspects. Furthermore, it plays an important role when it comes to prevention and treatment of some pathologies. It is known that physical activity helps lessen psychological suffering, besides boosting one's self esteem, giving the person the chance to socialize with others and improving one's cognitive functions(PICKLES, 1998). Though being older than the participants in the sedentary group, the exercised older adults were less subject to falls, which highlights the beneficial effects of physical activity as an efficient way to maintain functional capacity during the continuous aging process.

In our study, the older adults with ages ranging from 60-70 featured more electrical muscular activity if compared to older adults with ages raging from 70-85. These results match previous investigations, that consider the aging process as a natural physiological phenomenon of the human body, which could be characterized as being a progressive process resulting from a collection of alterations verified in the body, involving psychological, biological and pathological aspects (PICKLES *et al.*, 1998).

It can be inferred from the results that the cultivation of a physically active lifestyle may minimize the effects of the aging process in functional capacity and motor autonomy, by preserving a great deal of motor units and as a consequence, reducing the incidence of falls when comparing sedentary and physically active individuals.

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Mariana de Oliveira (autora)
R. Flávio de Matos, 36 / Bairro Monte Líbano / CEP 79100-000 / Campo Grande (MS) Fone: (67) 9229 2340
mazinhaoli@yahoo.com.br

THE INFLUENCE OF PHYSICAL ACTIVITY EVALUATED BY ELECTROMYOGRAPY IN THE INCIDENCE OF FALLS IN OLDER ADULS FROM THE CITY OF CAMPO GRANDE (MS)

ABSTRACT

Between 1960 and 1980 there was a 33% fall in fecundity in Brazil. This brings as a result, in a medium range, a growth in the elderly population and also a decrease of physical capacities related to the performance of everyday tasks. The objective of this study was to evaluate the boy composition, fall incidence during12 months and the myoelectrical activity of the muscles rectus femoris and vastus medialis, tibialis anterior and gastrocnemis of 34 sedentary subjects, mean age 69,3 ± 7,3 and 40 subjects that exercised 3 times per week, an hour a day, mean age 71,5 ± 5,6. The Body Mass Index (BMI) was used to evaluate the body composition. A questionnaire was applied to determine the fall incidence during 12 months and an eight-channel electromyograph produced by EMG SYSTEM do Brasil was used to determine the muscles electrical activity. Results show that exercised individuals are less subject to overweight and obesity (66% vs 82%) falls (19% vs 60%) than those belonging to the sedentary group. Furthermore, the exercised group presented more electrical activity in all the muscles studied (rectus femoris 38,1v vs 28,3v; vastus medialis 42,8v vs 28,2v; tibialis anterior 81,5v vs 57,2v and gastrocnemis 112,7v vs 52,6v). Results also suggest that an active lifestyle minimizes the neuromotor system deterioration, reducing the motor unit loss and physical capacities, which leads to less falls and to the preservation of older adults' autonomy.

Word-key: Myoelectrical Activity; Falls; Physical Activity.

L'INFLUENCE D'ACTIVITÉ PHYSIQUE ÉVALUÉE PAR ELECTROMYOGRAPY DANS LA FRÉQUENCE DE CHUTES DANS PLUS VIEUX ADULS DE LA VILLE DE CAMPO GRANDE (MLLE)

RÉSUMÉ

Entre les années 1960 et 1980, le taux de fécondité de la population brésilienne a diminué 33%. La diminution du rythme de naissance a comme résultat l'augmentation proportionelle de la population âgeé, ayant comme conséquence la diminution des capacités physiques, fonctionelles et de l'autonomie de la population. L'objectif de ce travail a été evaluer, pendant 12 mois d'observation, la composition corporelle, l'incidence de chutes et l'activité mioéléctique des muscles droit fémoral, vaste médial, tibial précédent et gastrocnémique de 34 personnes sédentaires, avec la moyenne d'âge 69,3 ± 7,3 ans et 40 personnes soumises à des activités physiques 3 fois par semaine pendant 1 heure, avec moyenne d'âge de 71,5 ± 5,6 ans. Ils ont été utilisé l'indice de masse corporelle (IMC) pour l'évaluation de la composition corporelle, du qustionnaire pour l'indication des chutes dans une période de 12 mois et d'un élétromiographe de huit canaux (EMG System du Brésil) pour l'analyse mioélectrique. Les résultats ont démontré une moindre incidence de poids excessif et obésité (66% contre 82%) et de chutes (19% contre 60%) entre les personnes soumises à des activité physique lorsqu'on compare avec le groupe sédentaire. D'ailleurs, le groupe soumis à des activités physiques a présenté une plus grande activité mioéléctrique dans tous les muscles étudiés (droit fémoral 38,1v contre 28,3v; vaste médial 42,8v contre 28,2v; tibial précédent 81,5v contre 57,2v et gastrocnémique 112,7v contre 52,6v). Les résultats démontrent qu'un quadre de vie actif minimise la détérioration du système neuromoteur. En plus, il diminue la perte d'unités motrices et de la capacité fonctionnelle,

réduise le nombre de chutes et préserve l'autonomie de personnes âgées.

La mot clef: l'activité mioéléctique ; chutes; activités physiques.

LA INFLUENCIA DEL EJERCICIO FÍSICO, EVALUADA POR LA ELECTRO MIOGRAFÍA, EN LA INCIDENCIA DE LAS CAÍDAS EN ANCIANOS EN EL MUNICIPIO DE CAMPO GRANDE (MATO GROSSO DO SUL)

RESUMEN

Entre las décadas del 1960 y 1980, se observó en Brasil una caída de un 33 por ciento en la tasa de fecundidad. La disminución en el ritmo de nacimientos resulta, a medio plazo, en el incremento proporcional de la población anciana. Como consecuencia se da la disminución de las capacidades físicas, funcionales y en la autonomía de esa población.El objetivo del estudio fue evaluar la composición corporal, la incidencia de las caídas durante un período de 12 meses y la actividad mioeléctrica de los músculos: recto femoral, vasto medial, tibial anterior y gastrocnemeo en 34 individuos sedentarios en una franja de edad variable de 69,3 ± 7,3 años, y 40 individuos que se ejercitan 03 días a la semana, durante 01 hora al día, en una franja de edad variable de 71,5 ± 5,6 años. Para ello, fueron utilizados los índices de masa corporal (IMC) para la evaluación de la composición corporal, cuestionario recordatorio para la indicación de las caídas en el período de 12 meses y el electro miógrafo de ocho canales de la marca EMG System de Brasil para el análisis mioeléctrico.Nuestros resultados demostraron una menor incidencia de sobrepeso y obesidad (en un 66 por ciento versus un 82 por ciento) y de las caídas (un 19 por ciento versus un 60 por ciento) entre los individuos que se ejercitan cuando comparados al grupo de los sedentarios. Además, el grupo que hace ejercicios frecuentemente presentó una mayor actividad mioeléctrica en todos los músculos estudiados (recto femoral un 38,1v versus el 28,3v; vasto medial un 42,8v versus 28,2v; tibial anterior un 81,5v versus el 57,2v; y el gastrocnemeo un 112,7v versus el 52,6v).Nuestros resultados demostraron que el estilo de vida activa minimiza la deterioración del sistema neuromotor, disminuyendo la pérdida de las unidades motoras y de la capacidad funcional, reduciendo el número de caídas y preservando la autonomía de los ancianos.

Palabra importante: actividad mioeléctrica; Caídas; Ejercicio Físico.

A INFLUÊNCIA DA ATIVIDADE FÍSICA, AVALIADA POR ELETROMIOGRAFIA, NA INCIDÊNCIA DE QUEDAS EM IDOSOS DO MUNICÍPIO DE CAMPO GRANDE (MS).

RESUMO

Entre 1960 e 1980, observou-se no Brasil uma queda de 33% na fecundidade. A diminuição no ritmo de nascimento resulta, em médio prazo, no incremento proporcional da população idosa, com conseqüente diminuição das capacidades físicas, funcionais e na autonomia da população. O objetivo do estudo foi avaliar a composição corporal, incidência de quedas durante 12 meses e a atividade mioelétrica dos músculos reto femural, vasto medial, tibial anterior e gastrocnêmio de 34 indivíduos sedentários, com média de idade de 69,3 ± 7,3 anos e 40 indivíduos exercitados 03 dias por semana, 01 hora por dia, com media de idade de 71,5 ± 5,6 anos. Foram utilizados o índice de massa corporal (IMC) para a avaliação da composição corporal, questionário recordatório para indicação de quedas em um período de 12 meses e um eletromiógrafo de oito canais da marca EMG System do Brasil para a análise mioelétrica. Nossos resultados demonstraram uma menor incidência de sobrepeso e obesidade (66% vs 82%) e de quedas (19% vs 60%) entre os indivíduos exercitados quando comparados ao grupo sedentário. Além disso, o grupo exercitado apresentou uma maior atividade mioelétrica em todos os músculos estudados (reto femural 38,1v vs 28,3v; vasto medial 42,8v vs 28,2v; tibial anterior 81,5v vs 57,2v e gastrocnêmio 112,7v vs 52,6v). Nossos resultados demonstram que um estilo de vida ativo minimiza a deterioração sistema neuromotor, diminuindo a perda de unidades motoras e da capacidade funcional, reduzindo o número de quedas e preservando a autonomia de idosos.

Palavras chave: envelhecimento, quedas, eletromiografia, atividade física.