112 - PHYSICAL EXERCISE TO OBTAIN PHYSIOLOGIC GAIN IN AN ELDERLY LADY: CASE STUDY.

CASTILHO JÚNIOR, NEIDO
MIRANDA, MARCELO FERREIRA
Universidade Católica Dom Bosco (Dom Bosco Catholit University), Campo Grande-MS
neidojr@alanet.com.br
marcelom3@ucdb.br

INSTRUCTION

The so called elderly population has increased considerably in the last decades. This world phenomenon has reached Brazil, being affected by the migratory process which has transformed the country into urban and aging (Veras, 1987). The importance of the old age group makes the professionals in the health area suggest ways to meet that population´s needs (Prado and Sayd, 2004). One of the most commonly chosen ways is physical activity, which is known as preventive and healing, improving life quality through psychosocial and physiologic benefits.

The paper studied a case through research. A 73 year old lady was observed, interviewed, evaluated, given exercises and re-evaluated so as to find a suitable methodology to improve or maintain physiologic response through physical activity. The subject of the research presents features easily found in individuals belonging to this age group such as poor agility, syphotic posture, slower walking pace and slower response to stimuli. She has physical activity through walking and keeps healthy eating habits, without excesses.

In order to prescribe training and punctuate the evolution of physiologic parameters, interviews, physical evaluation and tests were used. One of the concerns was to combine the improvement of physical aptitude with activities known as “pleasurable” by the subject. After all, physical aptitude and pleasure are inseparable parameters in order to devise a physical activity plan for physiologic gain in populations which do not have a performance goal (Castilho Júnior, Miranda, 2005).

An evaluation was carried on every three months, when the parameters which guided the training were renewed. The results presented in each evaluation followed a very interesting path, leading to important conclusions.

AGING AND THE BODY

The aging process reduces the height because of the spinal cord shortening, through collapse or compression of the vertebral pulp nucleus. The back muscles weakening, senile osteoporosis and vertebral osteoarthritis lead to kyphosis, which contributes to height reduction (Matsudo, Matsudo and Barros Neto, 2000).

Weight is a good parameter to analyze an elderly person especially if it is abnormally higher or lower. Obesity is related to the increase of cardiovascular diseases and diabetes, whereas the opposite is related to the increase of cancer incidence as well as breathing and infectious diseases (Matsudo, Matsudo e Barros Neto, 2000).

The skeleton system aging is directly related to osteoporosis. The lengthened shortage of calcium in one's diet, the decrease of estrogen levels and lack of physical exercise cause osteoporosis (Lanzillotti et al, 2003). The capacity of bone mass replacement decreases with aging, what determines an average of 1% loss per year (Smith, Sempos and Purvis, 1981, apud Haywood and Getchell, 2004).

The aging of the muscle system causes problems concerning the elderly person and everyday activities due to their compromised mobility. One of the biggest causes of this compromising is “sarcopenia”, which affects the old person's competence because of the fragility state they are in (Shepherd, 2003). A lot of the loss of strength due to aging is related to the selective atrophy of muscular fibers, type II (Fleck, 1999).

The aging of the cardiovascular system is related to the decrease of heart capacity to adapt o a high workload. Such decrease is related to the degeneration of the heart muscle, reduction of elasticity and alterations in the fibers of the heart valves. It is known that an active lifestyle determines better quality of the cardiovascular system in the old age (Haywood, Getchell, 2004).

The total lung capacity has little alteration, although the vital capacity decreases, the residual volume increases, the expiratory volume decreases, the anatomic dead space increases, the lung diffusion capacity decreases and there is reduction of maximum expiratory ventilation. (Matsudo, 2000 and Shephard, 2003).

There is a reduction of hormones, dendrites, synapses, neurotransmitters and myelin in an individual at an old age. The consequences of the physiologic changes are quite varied and range from the weaker performance of cognitive tasks to lower quality of movements in everyday or leisure activities (Haywood, Getchell, 2004).

As the body ages, the absorption of carbohydrate becomes slower (Fibusch and Rolt, 1982, apud Shephard, 2003), and there is poor absorption of iron (Young and Urban, 1986, apud Shephard, 2003), calcium (Gumby and Morley, 1995, apud Shephard, 2003), Vitamin B_1 (Korhs and CzajkaNarins, 1986, apud Shephard, 2003) and Vitamin B_{12} (Bidlack and Wang, 1995, apud Shephard, 2003).

There is a substantial reduction in the old person's liver, but the liver function is partially affected and there are no relevant consequences. However, it is worth mentioning that individuals presenting a heart condition or drinking problems might suffer considerably due to the partial reduction of liver activity (Morris and helpers, 1991 apud Shephard, 2003).

The kidneys become smaller reaching up to 70% of their maximum size in young adults (McLahan, 1987, apud Shephard, 2003).While exercising, the elderly person has difficulty in correcting mineral and water unbalance problems (Macias, Bondia and Rodriguez Commes, 1987, apud Shephard, 2003), besides having difficulty in correcting acidosis (Macias and helpers, 1983, apud Shephard, 2003).

There are evidences showing that the immune system is preserved until the old age. However, in the late phase of the aging process there are failures in the cell immune reactions, which increase the risk of tumors and development of self-immunity (Shephard, 2000).

Aging causes lower efficiency of hormonal regulatory systems, which causes difficulty in keeping homeostasis while exercising (Shephard, 2000). The growth hormone stays stable and increases more than in young people with the stimulus given by the exercise. In elderly people there is a prevalence of diseases related to alterations in the thyroid gland. The gonadal hormones decrease as one grows older and some people have to replace these hormones to combat muscle weakening and osteoporosis. The insulin levels stay normal but there is a higher incidence of type II diabetes. The elderly person may not use insulin as effectively as a young one, which may bring difficulty in mobilizing energy during the physical exercise (Shephard, 2000).

METHODOLOGY

The subject of this research was firstly observed while taking her habitual walk when the following measurements were made: heart rate in rest, in effort and after effort and blood pressure during and after effort. The site where the subject usually exercises is a 435- meter paved track surrounding sports courts and a green area near the place where she lives. The

subject was interviewed systematically, being asked about personal data, medical records, time availability, level of independence, reasons for doing physical exercise, leisure activities, everyday activities, relationship with friends and family, favorite physical activity and previous experience with sports.

After the initial observing process and the following interview, a physical evaluation and tests were conducted. Those included measuring of heart rate in rest, blood pressure, body weight, height, skinfold according to Jackson and Pollock's protocol of three women's folds, waistline, hipline, measuring of VO2Max through mile test, measuring of muscle strength of upper limbs using Rikli and Jones´s protocol (1999) adapted to the use of 4-kilo dumbbell (Matsudo, 2000), measuring of muscle strength of lower limb through the chair lifting test in 30 seconds, Rikli and Jones's protocol, measuring of flexibility through the sitting and reaching out test, measuring of agility through the “Shuttle run” test (Stanziola and Prado, 1995, apud Matsudo, 2003), measuring of static balance through test with visual control, according to Willians and Greene standardization, 1990 (Matsudo, 2000), measuring of general mobility through normal and maximum walking speed and chair lifting speed tests described by Willians and Greene in 1990 (Matsudo, 2000). The evaluation of the functional capacity was included in the tests measuring the capacity of rising from the ground, test measuring speed while putting on socks, and putting on and tying tennis shoes laces (Matsudo, 2000).

After the evaluation of the aptitude level functional capacity, the aerobic training and body building training were prescribed, considering the subject's preferences, availability and needs as well as the resource availability.

The first task was to teach her to walk using intensity programmed and controlled by frequencimeter. The chosen intensity encompassed a target zone of 50% to 60% of the maximum spare heart rate. The walking time was about an hour as usual. After the first month of aerobic activity, 100 meters of trotting were added each week. This trotting was done taking turns with the walking, that is, at each 435-meter lap the 100-meter trotting was added weekly. At the end of the first three months, 800 meters of walking had been substituted by 800 meters of trotting.

At a certain point, we observed that the research needed some work on coordinating movements of lower and upper limbs. This work would be necessary for the quantification of the aerobic work not to be limited by the apparent difficulty in increasing the walking or even trotting speed. For this reason she was assigned a segmented global coordination training, as well as walking and running educational activities.

The body building work was done at the “Raquetes sports center” which provides some equipment for muscular exercises, that is, free weighs, ankle weighs, mats, a step and supine bench.

In the first three months the strategy focused on the adaptation to muscular work, development of heart and breathing capacity, development of body control ability and walking and trotting skills. The muscular work was based on repetition with load below the one the subject could stand and a wide variety of exercises aiming the development of resistance and ability to ordinate the movement. In the beginning major muscle groups were prioritized, alternating the segment at each exercise. The other muscular groups were gradually introduced in the program. The muscular workload was increased as the control over the movement happened, always obeying criteria so as not to exceed a limit and meet the objective of the work, which was mainly adaptation. The work of developing abilities was done through exercises on body recognition and development of rhythm, balance, rolling, walking, trotting, running and jumping.

The second trimester started with a reevaluation in the same way done in the first one. The muscular training continued taking turns with segment in which the load was gradually increased as the subject responded to the effort positively. The work of skill development was gradually suppressed since the necessary response to the execution of bodybuilding and aerobic exercises had already been given. The aerobic work developed following the same criteria of the first trimester. Therefore, at the end of this period the total trotting rose to 2000 meters. However, from 1000 meters of trotting the subject started to add 100 meters a week to one of the laps in which she already trotted. The intensity changed to a target zone including a range of 55% to 65% of the maximum spare heart rate.

In the third trimester there was a reevaluation following the same pattern of the two others. The strategy of the muscular work changed as far as intensity and volume are concerned. The new strategy tried to emphasize the increase of load with decrease of volume. The perfect execution of the movements continued to be a criterion to determine intensity. The aerobic work suffered minor alterations such as keeping the trotting total distance (mileage). However, she executed 400 meters at each even numbered lap and altered the intensity to a target zone of 50% to 70% of the maximum spare heart rate.

The fourth trimester went on naturally with the work evaluation following criteria similar to the one used in the third period. The muscular and aerobic work followed criteria which considered the subject's motivation as well as the stability and evolution of the results up to that specific moment. a fifth evaluation was performed following exactly the same parameters of the former ones, aiming to close the data analysis of a one-year-long research period.

RESULT AND DISCUSSIONS

The number of protocols was considered big, reaching twenty two. The results found in the five evaluations are described on Table 01 and demonstrate the evolution of the measuring procedures during the one-year research period.

It can be observed that the heart rate in rest (RHR) dropped slightly, being stabilized after the fourth evaluation. The behavior of VO2max is the same as the RHR, in an inversed way. The information demonstrates that the subject has gradually achieved higher heart and breathing efficiency, which improved her recovering capacity through a better capacity to transport and use oxygen.

During a year of training, the subject's height increased one centimeter. The strengthening of the muscles of the backside of the trunk and of the abdomen, and the general strength gain determined a decrease in the kyphosis, which probably caused the increase in the height. This increase is qualitatively important because it has proved that a natural condition in elderly people was reverted.

The lean mass decreased significantly from 66.16% to a stable level of 74.5% after one year. The body fat percentage followed an inverse path moving from 33.84 % to stable 25,5%. It was observed that the great evolution in the body composition is not reflected in the results found in weight and BMR. The weight and height did not suffer relevant alterations and that determined the linear format for the BMR.

The training has increased the strength of the lower and upper limbs. The flexibility has also increased although there was no specific work to develop it. This fact may suggest the relationship between these valences, according to Cyrino et al, 2004.

Table 01
Result of measurement and tests

Measurements and tests	1st eval.	2nd eval.	3rd eval.	4th eval.	5th eval.
Resting heart rate (bpm)	71	68	65	62	62
Arterial Pressure (resting)	110 x 75	110 x 70	110 x 70	110 x 70	110 x 70
Body Weight (Kg)	62	61,75	61	61,40	61
Height (cm)	156	156,5	156,6	157	157
BMR (Kg/m²)	25,48	25,21	24,87	24,91	24,75
Perc. of body fat (%)	33,84	29,6	27,84	25,7	25,5
Perc. of lean weight (%)	66,16	70,4	72,16	74,3	74,5
Waist perimeter (cm)	82	80	79,5	79	79
Hip perimeter (cm)	96	95	96	95	95
Waist / hip rate – WHR	0,85	0,84	0,83	0,83	0,83
VO2 MAX (ml.Kg.min)	19,76	22,91	26,19	28,30	28,4
Upper limb strength (repetitions)	13	14	17	19	19
Lower limb strength (repetitions)	10	12	15	16	16
Flexibility (cm)	16	17	19	23	24
“Shutlle Run” (sec)	22”90	22”29	19”06	17”98	18”01
Static balance (30 sec)	15”	17”	30”	30”	30”
Normal walking speed (sec)	05” 65	05”15	4”95	4”70	4”71
Maximum walking speed (séc)	03” 01	02”92	2”71	2”54	2”53
Chair lifting speed (sec)	01” 65	01”52	1”10	00”84	00”83
Rising from the ground (sec)	09” 68	08”76	7”93	5”80	5”75
Putting on socks (sec)	10” 01	09”22	8”15	6”90	6”85
Putting on tennis shoes and tying shoelace (sec)	25” 90	24”86	22”89	21”70	21”71

The waist-hip rate rose, being stabilized after the third trimester. In this case study the subject doesn't present any chronic or degenerative disease. Therefore the improvement in this rate reinforces the possibility of never having any disease caused by a bad ratio between the waist and hip measures.

The normal walking speed, the maximum walking speed and the speeds measured while rising from the ground, lifting a chair, putting on socks, putting on tennis shoes and tying shoelaces has improved. It is then demonstrated that the subjects's capacity to deal with everyday activities improved, leading to independence.

There was a reduction in the performance at the “shuttle run” test, which represents evolution in agility. The increase of strength and speed and the improvement in coordination may have determined the gain.

FINAL CONSIDERATIONS

The elderly lady studied used to take walks regularly without professional guidance but had since the beginning showed a positive attitude towards the implementing of a physical exercising program.

The choice of the activities included in the training and their organization concerning volume and intensity were directly or indirectly controlled by the subject's motives and observed condition. And this certainly represented a positive factor influencing her success and sticking to the prescribed training.

The results of the evaluations were positive, even considering that some of them remained stable in the second half of the research period. After all, reaching a stable condition can be understood as again to someone who is in a declining process.

Regular evaluations, objective prescription and flexible application in which the loads were rearranged according to the needs shown during the training period constituted one more evaluation process, providing point correction of the program's mistakes.

The physiologic gains demonstrated that physical exercise is very important to an elderly person's life quality. We concluded that although the subject had some physical activity and looked younger than 73, we managed to make her more apt to perform tasks and have independent control of her routine through the physical exercising program.

REFERENCES

CASTILHO JÚNIOR,N., MIRANDA, M. F. **Physical aptitude and leisure from the perspective of active life quality:** An analysis of individuals having physical activity without professional guidance.. Foz do Iguaçu: FIEP Bulletin, v. 75. Special Edition - Article II. p. 530-533. 2005. ISSN-0256-6419.

CYRINO, E. S., OLIVEIRA, A. R., LEITE, J. C., PORTO, D. B., DIAS, R. M. R., SEGANTIN, A. Q., MATTANÓ, R. S., SANTOS, V. A. **Comportamento da flexibilidade após 10 semanas de treinamento com peso.** São Paulo: Revista Brasileira de Medicina do Esporte, v. 10, n. 4, p. 233-237, 2004.

FLECK,S. J., KRAEMER, W. J. **Fundamentos do treinamento de força muscular.** Porto Alegre: Artmed, 1999.

HAYWOOD, K. M., GETCHELL, N. **Desenvolvimento motor ao longo da vida.** 3ª edição. Porto Alegre: Artmed, 2004.

LANZILLOTTI, H. S., LANZILLOTTI, R. S., TROTTE, A. P. R., DIAS, A. S., BORNAND, B., COSTA, E. A. M. M. **Osteoporose em mulheres pós-menopausa, cálcio dietético e outros fatores de risco.** Campinas: Revista de Nutrição, n. 16, v. 2, p. 181-193, 2003.

MATSUDO, S. M. M. **Avaliação do idoso** Física & Funcional. Londrina: Midiograf, 2000.

MATSUDO, S. M., MATSUDO, V. K. R., BARROS NETO, T. L. **Impacto do envelhecimento nas variáveis antropométricas, neuromotoras e metabólicas da aptidão física.** Brasília: Revista Brasileira de Ciência e Movimento, v.8, n.4, p. 21-32, 2000.

MATSUDO, S. M., MATSUDO, V. K. R., BARROS NETO, T. L., ARAUJO, T. L. **Evolução do perfil neuromotor e capacidade funcional de mulheres fisicamente ativas de acordo com a idade cronológica.** São Paulo: Revista Brasileira de Medicina do Esporte, v. 9, n. 6, 2003.

PRADO, S. D., SAYD, J. D. **A pesquisa sobre envelhecimento humano no Brasil:** grupos e linhas de pesquisa. Rio de Janeiro: Ciências & Saúde Coletiva, v.9, n.1:57-68, 2004.

SHEPHARD, R. J. **Envelhecimento,** atividade física e saúde. São Paulo: Phorte, 2003.

VERAS, R. P., RAMOS, L. R., KALACHE, A. **Crescimento da população idosa no Brasil:** Transformações e conseqüências na sociedade. São Paulo: Revista Saúde Pública, 21(3), 225-33, 1987.

PHYSICAL EXERCISE TO ABTAIN PHYSIOLOGIC GAIN IN AN ELDERLY LADY: CASE STUDY
ABSTRACT

The searched one is a 73 years old lady, physically active, that used the daily walk, with no professional orientation, as preferred activity. The research used forms of daily pre-evaluation, evaluation, training and re-evaluation to each three months, during a whole year. In the daily pre-evaluation, we tried to identify the lady's objectives, limitations and preferences. The identification allowed the choice of evaluation standards, training and re- evaluation. The evaluation followed an established physically apt individual criterion, in which the antropometrics variables and the functional capacity had been evaluated. Some tests followed usually standards, others had been extracted of the roll of tests applied for the CELAFISCS, in third age individuals. The prescription of the training followed the parameters established through the daily pre-evaluation and evaluation. The preference of the searched lady were aerobic work and body-building. The chosen place for the aerobic work was the "Belmar Fidalgo" square, next to her home, and the chosen one for the body-building work was "Academia Raquetes", whith a small structure for body-building, composed of free weight, cushions and an horizontal weight-lifting bank. The reevaluations had been executed each three months, showing a significant evolution in the first moth, but just a significative evolution and equal evolution or stabilization in the following trimesters. The analysis of the information leaded us to a conclusion in which an adequate method of physical activity in a person of third age can result in improvements, perceived through the evolution or in the stabilization of the rates.

Activité physique comme moyen d'obtenir des bienfaits chez des seniors.
Étude de cas.
Résumé

Cette étude est centré sur une dame âgée de 73 ans, physiquement active, qui pratique la marche quotidiennement sans l'aide d'un professionnel. Elle a été soumise à des préévaluations, à des évaluations, à des entraînements et à des réévaluations, tous les trois mois, pendant un an. À la préévaluation on a cherché à identifier ses objectifs, ses limitations et ses préférences. L'identification de ses objectifs a favorisé le choix des modèles d'évaluations, d'entraînements et de réévaluations. On a évalué ses variables anthropométriques et sa capacité fonctionnelle, selon les critères destinés aux individus physiquement aptes.

Des tests ordinaires et ceux utilisés par le CELAFISCS pour les personnes âgées ont été employés. La prescription de l'entraînement a obéi aux paramètres établis par la préévaluation et l'évaluation. La personne observeé a manifesté sa préférence pour les activités aérobiques et la musculation.

Elle a décidé de pratiquer les exercices aérobiques près de chez elle, sur la place Belmar Fidalgo. Quant à la musculation, elle a choisi de le pratiquer au club Academia Raquetes, qui ne possède qu'une petit équipement pour la musculation, composé de haltères, de tapis d'exercice et de bancs dorsaux.

Les évaluations faites au premier trimestre ont dèmostré une évolution significative, et une égale évolution ou une stabilisation aux trimestres suivants.

L'analyse des informations nous a mené à la conclusion suivante: une méthode adéquate d'activité physique chez les seniors peut avoir comme résultat des bienfaits perçus tout au long de l'évolution ou même de la stabilisation des indices.

Mots-Clé: Activités physiques, seniors et bienfais.

EJERCÍCIO FÍSICO HACIA LA OBTENCIÓN DE BENEFÍCIO FISIOLÓGICO EN ANCIANA: ESTUDIO DE CASO.
COMPENDIO

La persona investigada es una señora de 73 años de edad, fisicamente activa, que se utilizaba de la caminata diária, sin orientación profesional, como actividad preferida. La investigación hizo uso de formas de preevaluación, evaluación, entrenamiento e reevaluación a cada trimestre, durante un año. En la preevaluación, se buscó identificar sus objetivos, limitaciones y preferencias. La identificación propició la elección de padrones de evaluación, entrenamiento y reevaluación. La evaluación siguió un criterio establecido para el individuo fisicamente apto, en el cual fueron evaluadas las variables antropométricas y la capacidad funcional. Algunos testes fueron los padrones conmumente utilizados, otros fueron extraídos del rol de testes aplicados por los CELAFISCS, en individuos de la tercera edad. La prescripción del entrenamiento siguió los parametros establecidos a través de la préevaluación y evaluación. La preferencia de la investigada recayó hacia el trabajo aeróbico y el fisioculturismo. El sítio escogido para el trabajo aeróbico fue la plaza "Belmar Fidalgo", cercana a su domicílio, e la escogida para el fisioculturismo fue la "Academia Raquetes", que posee una pequeña estructura para el fisioculturismo, compuesta de pesa libre, colchonetas e banco de supino. Las reevaluaciones fueron ejecutadas a cada trimestre y demonstraron un progreso significativo en el primero y igual progreso o estabilización en los trimestres subseguientes. El análisis de las informaciones hizo llegar a la conclusión de que un método adecuado de actividad física en una persona de la tercera edad puede resultar en mejorías, percibidas a través de la evolución en la estabilización de los índices.

PALABRAS CLAVE: Ejercício físico, Anciano y Benefício fisiológico.

EXERCICIO FÍSICO PARA OBTENÇÃO DE GANHO FISIOLÓGICO EM IDOSA: ESTUDO DE CASO.
RESUMO

A pesquisada é uma senhora de 73 anos de idade, fisicamente ativa, que utilizava a caminhada diária, sem orientação profissional, como atividade preferida. A pesquisa utilizou formas de pré-avaliação, avaliação, treinamento e reavaliação a cada trimestre, durante um ano. Na pré-avaliação, procurou-se identificar seus objetivos, limitações e preferências. A identificação propiciou a escolha de padrões de avaliação, treinamento e reavaliação. A avaliação seguiu critério estabelecido para indivíduo fisicamente apto, no qual foram avaliadas as variáveis antropométricas e a capacidade funcional. Alguns testes foram os padrões comumente utilizados, outros foram extraídos do rol de testes aplicados pelo CELAFISCS, em indivíduos da terceira idade. A prescrição do treinamento seguiu os parâmetros estabelecidos através da pré-avaliação e avaliação. A preferência da pesquisada recaiu para trabalho aeróbio e musculação. O local escolhido para o trabalho aeróbio foi a praça "Belmar Fidalgo", próxima a sua residência, e o escolhido para a musculação foi a "Academia Raquetes", que possui pequena estrutura para musculação, composta de peso livre, colchonetes e banco de supino. As reavaliações foram executadas a cada trimestre e demonstraram evolução significativa no primeiro e igual evolução ou estabilização nos trimestres seguintes. A análise das informações levou a conclusão de que um método adequado de atividade física numa pessoa de terceira idade pode resultar em melhoras, percebidas através da evolução ou mesmo na estabilização dos índices.