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..."Educando el cuerpo humano, para mejorar la calidad de vida

a través de la actividad física"

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PRESENTACIÓN

La Facultad de Educación Física y Ciencias de Deporte de la Universidad Autónoma de Chihuahua, en cumplimiento a una de sus funciones sustantivas, ha organizado el XI Congreso Internacional de Educación Física, Deporte y Recreación durante el cual se desarrollaron las líneas temáticas: Actividad Física, Envejecimiento y Obesidad.

En este marco académico se contó con la participación de reconocidos expertos de talla internacional, quienes atendiendo las líneas temáticas señaladas, tendieron un puente de comunicación con cerca de 1500 congresistas, en beneficio de los profesionales de la cultura física en general.

Paralelo al desarrollo del Congreso, se llevaron a cabo los trabajos del IV Simposium Euroamericano de Ciencia y Tecnología de la Red Euroamericana de Actividad Física, Educación y Salud, en la cual orgullosamente participa la Universidad Autónoma de Chihuahua, a través de la Facultad de Educación Física y Ciencias del Deporte, así como la Universidade Federal do Rio Grande do Norte, (UFRN) Brasil; Universidade de Tras-os-Montes e Alto Douro, (UTAD) Portugal; Universidade Tecnica de Lisboa (UTL) Portugal; Universidade Da Coruña, (UDC) España; Universidad de Murcia, (UM) España; Università degli Studi di Verona, (UNIVR) Italia; Universidad Metropolitana de Ciencias de la Educación, (UMCE) Chile; y la Universidad de Playa Ancha de Ciencias de la Educación, (UPLACED) Chile.

Como resultado del desarrollo del congreso referido, se presenta en este documento la memoria que recoge las conferencias magistrales, los trabajos libres y el objetivo de los talleres que se impartieron durante los días 14,15 y 16 de mayo del 2007, la información

que se presenta ha sido revisada, organizada e integrada por un grupo de editores de nuestra facultad, de tal forma que la presentación lleva una secuencia en cuanto a su contenido y formato.

El producto académico que usted va a leer, tiene un valor intelectual y práctico ya que las distintas exposiciones orales y que aquí se presentan por escrito fueron desarrolladas por expertos de clase mundial, de tal forma que el aporte teórico que representa esta memoria, constituye un referente obligado para quienes tengan como objeto de estudio en general al hombre en movimiento.

Dr. Jesús Jasso Reyes.

ÍNDICE

RED EUROAMERICANA DE ACTIVIDAD FÍSICA, EDUCACIÓN Y SALUD (REAFES): UNA VISIÓN HACIA EL FUTURO	1
EL PAPEL DE LA EDUCACIÓN FÍSICA EN LA PROMOCIÓN DE ESTILOS DE VIDA ACTIVOS Y SALUDABLES.....	5
EFFECTOS DE LA ACTIVIDAD FÍSICA SOBRE LA ESTRUCTURA Y LA FUNCIÓN CORPORAL EN EL ADULTO MAYOR.....	13
COMPARISON AMONG AGE, MENOPAUSE TIME, BODY MASS INDEX AND PHYSICAL ACTIVITY IN POSTMENOPAUSAL WOMEN	24
ADAPTED MOTOR ACTIVITY, LIMITING FACTORS AND EFFECTS OF PHYSICAL TRAINING IN THE ELDERLY.....	32
LA OBESIDAD INFANTIL EN CHILE: OPULENCIA PELIGROSA.....	41
ENTRENAMIENTO CONTINUO VS INTERVÁLICO EN LA MEJORA DE LA RESISTENCIA DE SUJETOS MODERADAMENTE ACTIVOS	49
MORFOLOGÍA Y CAPACIDAD DE SALTO VERTICAL DE VOLEIBOLISTAS UNIVERSITARIOS EN DOS ETAPAS DE ENTRENAMIENTO.....	60
EFFECTOS DE UN PROGRAMA DE YOGA SOBRE PARÁMETROS DE RIESGO CARDIOVASCULAR EN MUJERES ADULTAS ACTIVAS.....	69
ANÁLISIS DE LA ACTIVIDAD MUSCULAR SEGÚN LA POSICIÓN DEL CICLISTA. ESTUDIO DE UN CASO.....	73
PERFIL ANTROPOMÉTRICO DEL BOXEADOR JUVENIL HIDALGENSE.....	79
SOMATOTIPO POR POSICIÓN DE JUEGO EN FUTBOLISTAS DE SOCCER SEMIPROFESIONALES	88
EFFECTOS DE UN PROGRAMA DE ACTIVIDAD FÍSICA PERSONALIZADO CON ORIENTACIÓN NUTRIMENTAL EN MUJERES CON SOBREPESO Y OBESIDAD.....	92
PREVALENCIA DE SOBREPESO Y OBESIDAD EN UNA ESCUELA PRIMARIA DE CULIACÁN, SINALOA. MÉXICO	99
FORMACIÓN DE CONOCIMIENTOS, HABILIDADES, ACTITUDES Y VALORES EN LA CLASE DE ACTIVIDADES FÍSICO-DEPORTIVAS DE PREPARATORIA.....	106
COMPARACIÓN DE LA ESTIMACIÓN DE LA ADIPOSIDAD MEDIANTE LA MEDICIÓN DE PLIEGUES CUTÁNEOS Y OTROS INDICADORES ANTROPOMÉTRICOS VS. DEXA (ABSORCIOMETRÍA DE ENERGÍA DUAL DE RAYOS X) EN JÓVENES DEPORTISTAS.....	114

INGESTA DIETÉTICA ESTIMADA POR: FRECUENCIA DE CONSUMO Y REGISTRO DE TRES DÍAS EN ESTUDIANTES ADOLESCENTES.....	127
EVALUAR LA POSTURA CORPORAL AL INGRESO A LA ESCUELA PRIMARIA. UNA PROPUESTA EDUCATIVA.....	135
SISTEMA DE HIPERMEDIA PARA EL AUTOAPRENDIZAJE ASISTIDO POR COMPUTADORA. VERSIÓN 1.0. - DESARROLLO TECNOLÓGICO -.....	141
INCREMENTO EN EL PESO, CIRCUNFERENCIA DE CINTURA Y ACTIVIDAD FÍSICA LEVE EN ESTUDIANTES UNIVERSITARIAS	152
PERFIL ANTROPOMÉTRICO DE ESTUDIANTES DE LICENCIATURA EN DANZA CONTEMPORÁNEA.....	158
NIVEL DE ACTIVIDAD FÍSICA, ESTADO NUTRICIO Y OBESIDAD ABDOMINAL EN DOCENTES DE LA ESCUELA SUPERIOR DE EDUCACIÓN FÍSICA-UAS	165
CARACTERIZACIÓN DE LA ALIMENTACIÓN DE EQUIPOS DE VOLEIBOL UNIVERSITARIOS.....	170
EFFECTO DE UN PROGRAMA DE EJERCICIO AEROBIO EN ADULTOS CON DIABETES MELLITUS TIPO 2 E HIPERTENSIÓN ARTERIAL	177
RELACIÓN DE LA ANTROPOMETRÍA CON EL RENDIMIENTO DEPORTIVO EN LEVANTADORES DE POTENCIA DE CLASE MUNDIAL.....	181
ACTIVACIÓN FÍSICA Y ALIMENTACIÓN SOBRE LOS LÍPIDOS SANGUÍNEOS EN MUJERES DE 40 A 55 AÑOS.....	189
ESTUDIO COMPARATIVO DE COMPOSICIÓN CORPORAL EN PERSONAS CON SÍNDROME DE DOWN DE DOS LOCALIDADES DE LA REPÚBLICA MEXICANA.....	196
ANOREXIA INDUCIDA POR ACTIVIDAD EN UNA RATA ALBINA	200
ANÁLISIS DE LOS ESTILOS DE ENSEÑANZA UTILIZADOS POR LOS PROFESORES DE EDUCACIÓN FÍSICA DEL NIVEL PRIMARIA EN LA CIUDAD DE CHIHUAHUA.	211
EFFECTOS DE ALGUNOS FACTORES DE AUTORREGULACIÓN SOBRE CALIFICACIONES ESCOLARES.....	221
CREENCIAS DE COMPETENCIA Y LA PARTICIPACIÓN EN ACTIVIDADES FÍSICAS EN ESTUDIANTES UNIVERSITARIOS.....	222
RECREACIÓN Y LA ACTIVACIÓN FÍSICA	229
TALLER DE DETERMINACIÓN E INTERPRETACIÓN DEL LACTATO DURANTE EL EJERCICIO	230
FACTOR DE TRANSFERENCIA	234

EVALUACIÓN MULTIDIMENSIONAL EN DEPORTES DE CONJUNTO	238
NUTRICIÓN Y ACTIVIDAD FÍSICA	242
APLICACIÓN, REVISIÓN E INTERPRETACIÓN DE TESTS PSICOLÓGICOS USADOS EN INVESTIGACIONES DE RENDIMIENTO DEPORTIVO.....	245
MOTIVACIÓN PARA EL CAMBIO	252
CONSTRUCCIÓN Y APLICACIÓN DE ENCUESTAS POR MEDIO DE UNA COMPUTADORA.....	256
GUÍA PRÁCTICA DE ACTIVIDADES FÍSICAS, DEPORTIVAS Y RECREATIVAS.....	258
IMPORTANCIA Y VALOR DE IDENTIFICAR, MANEJAR Y CONTROLAR EMOCIONES EN UNO MISMO Y EN LOS DEMÁS, PARA EL LOGRO DE OBJETIVOS Y METAS PERSONALES	265
TALLER DE ACTIVIDAD FÍSICA PARA LA SALUD.....	273
STOP RESISTING, LET'S GET IN SHAPE	278
EL ENTRENAMIENTO DE LA COORDINACIÓN COMO BASE DEL FÚTBOL MODERNO.....	280
MASAJE DEPORTIVO	290

ADAPTED MOTOR ACTIVITY, LIMITING FACTORS AND EFFECTS OF PHYSICAL TRAINING IN THE ELDERLY.

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ABSTRACT.

The project "*Health is in the Movement*" was created in 1989 in the city of Verona as a first attempt to define a model of health promotion through exercise in the elderly. The project was subsequently developed among an increasing number of towns in the provinces of Verona and Trento and at present involves more than 5000 individuals aged ≥ 60 . *Health is in the Movement* is a wide plan structured in different actions which are targeted to all old people (healthy, sick, frail) living in communities as well as in nursing homes. Its specificities are in the characterization of physical activity as a tool for health and in the close and synergic relationship among the main components enrolled in the programming: clients, health and exercise experts and officials.

Key words:

Elderly, physical activity, community-based program

In recent years, the international literature (1,6) has reported a several pieces of evidence on the benefit given to elder people by means of special physical training programs. Such effects include both the improvement of motor individual capacity and the prevention and treatment of a great number of common chronically-degenerative pathologies. Such efforts notwithstanding, spontaneous motor activity in elder population is hitherto not sufficient, and the participation to practical physical exercise inadequate. This attitude is partially due to the lack of circulation of well defined motor activity programs, which often stimulates the arising of sporadic initiatives or even the total lack of proposals. Some significant experience does exist at National or International level that deserves consideration and moreover would represent a useful example for the development of such initiative at National level.

Since 1989, our group in Verona started a promotional motor activity in the elderly named "*La salute nel movimento*" (*Health is in the movement*) (7,8). The project started in Verona and then spread through several others municipalities and towns nearby, reaching about 5000 people between 60 and 93 years of age participating in motor well controlled and monitored activity programs.

"*La salute nel movimento*" is a general plan where the actors are public institutions on the territory (municipalities, health departments, preventive health departments and where available, geriatric units).

The motor activities were designed and accomplished by instructors with a University Degree in Physical Education with specific formation in teaching physical activity for the elderly.

A Centre of Motor Sciences (CeBiSM), associated with three different Universities in Verona, Trento and Brescia, has the scientific responsibility of the monitoring all initiatives for the project and the development of special experiments in the area of motor Sciences as well in medical Sciences. The general structure takes in consideration the organisation of different kinds of motor activity for the elderly in autonomous condition, promoting courses of motor and sport education in the gym and in the swimming pool, as well as for elder people institutionalised in assisted structures (Day care centres, protected houses and so on) (9) by the organisation of daily physical activity strictly related with the rescue of some motor skills.

The medical control of courses is based on two levels of intervention: the sanitary and the evaluation check up. The reason for the control is strictly bound to the physical activity in order to identify both possible risk factors and functional capability in each subject, in order to guarantee the best physical activity. On the basis of the initial screening supported by a questionnaire that is given to all subjects interested in the physical activity program, the elderly who require an additional evaluation visit are then checked by general medicine doctors.

An important commitment is addressed to the activities of health education for the elderly (conferences and discussion groups) and formation as well as specific updating for class teachers and health personnel collaborating to the various phases of control. Finally the project "*La salute nel movimento*" has been characterised in the latest years for its constant research activity regarding the physiological and medical aspects by means of the study of the effects of the physical activity on the elderly, as well as the techniques and teaching methods of physical exercise for the elderly, developing specific programs and evaluation criteria of motor performance.

The distinctive features of the project can be identified as: a) the strict relationship among different sectors (organizational, medical, didactical and formative); b) the understanding of all dimensions (physical, psychological and social) in any kind of taken initiative; c) the strong finality of all activities towards a vision of health promotion by means of physical activity.

In our project special attention is also devoted to research in order to continuously update the intervention and to create an immediate link between researcher and physical education teachers. Two recent area of study focused on the limiting factors to extend training adaptation in ageing. Aerobic mechanisms and frail elderly were taken as a paradigm of what it is possible to modify in aged people when correct training process has applied.

Study 1: Central and peripheral limitation to aerobic training

The effects in healthy elderly subjects of cycle ergometer or arm ergometer training on peak oxygen consumption (VO_{2peak}) and ventilatory threshold (VT), were studied. The aim was to determine the benefit of each training modality on specific and cross exercise capacity. The cross-effect was also evaluated as an index of the central nature of the adaptive response to training. Eighteen non-smoking healthy males (age 69 ± 5 yr; body mass 77 ± 8 kg) were randomly assigned to three groups, performing an arm cranking (ARM) or a cycloergometer (CYC) training (12-week, 30 min, 3 times/week) or no training (control, C). Before and after the training period, subjects performed an incremental test to exhaustion both on the ergometer on which they trained (specific test) and on the other ergometer (cross test). Respiratory variables were measured breath by breath and heart rate (HR) was recorded. Peak oxygen consumption (VO_{2peak}), ventilation (VE_{peak}), oxygen pulse (O_{2peak}) and heart rate (HR_{peak}) were averaged over the last 10s of exercise. Following training, while HR_{peak} remained unchanged, significantly higher W_{peak} , VO_{2peak} , VE_{peak} and O_{2peak} were obtained in both training groups, on both ergometers. The amplitude of the increase in W_{peak} , VO_{2peak} and O_{2peak} was significantly higher for specific than for cross tests ($\sim 19\%$ vs. $\sim 8\%$ in CYC; $\sim 22\%$ vs. $\sim 9\%$ in ARM, $p < 0.01$) while the increase in same test condition was similar. No change was observed in the C group. In Figure 1 the results indicate that aerobic training brought about with different muscle masses, produce similar improvements in maximal and submaximal exercise capacity. Roughly half of such improvements is specific to exercise mode, which reveals peripheral adaptations to training. The other half is non-specific since it influences also the alternative exercise modality, and it is probably due to central adaptations.

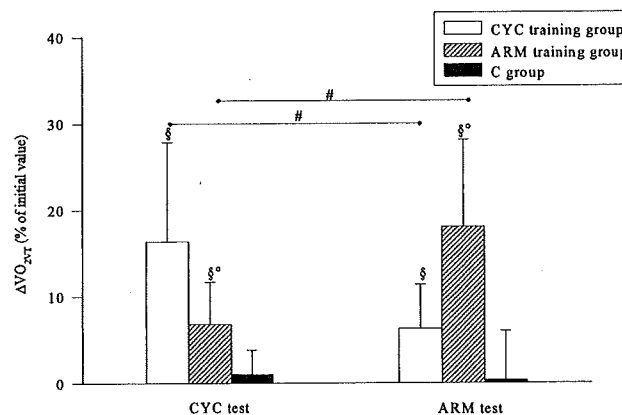


Figure 1. Percent increase (mean \pm SD) in oxygen consumption at ventilatory threshold (ΔVO_{2VT}) measured during incremental cycling test (CYC test) and arm cranking test (ARM test), in cycling training (CYC), arm cranking training (ARM) and control (C) groups, after the 12-week training program. Statistically significant differences: § vs. C; ° vs. CYC training group; # between ARM and CYC test in each training group.

Study 2: Home exercise program for frail elderly.

According to recent data, Italy has reached first place as the oldest country in Europe. In fact, data from the last national survey (ISTAT, 2004) certify that the Italian life expectancy has doubled over the course of the last century reaching 77.4 years for men and 82.3 years for women. A considerable percentage of the more aged part of the population is composed of the "frail elderly." A frail elderly person shows visible signs of advanced ageing along with the natural consequences of reduced functionality. This already fragile state is further compromised due to the fact that these persons often suffer from many pathologies and they are thus forced to multiple drug therapy. Moreover frail subjects are often alone with a limited autonomy making a fall or an otherwise common illness sufficient to lead to a permanent disability and a complete loss of autonomy necessitating full-time assistance and care. Numerous studies agree that many transformations due to the ageing process can be contained and even delayed by a continuous physical activity program. In fact, some research has confirmed that physical activity, not only positively affects the muscular, cardiovascular and respiratory systems, but is also capable of stopping progressive bone loss, of recovering artery elasticity and of stimulating cognitive function.

Based on these findings, a collaboration between our Laboratory and the Social Care Service of the town of Rovereto has been set up to promote physical activity in long-term care centres. Until now, older frail citizens still living at home have been excluded from these projects. The majority of these persons are included in Home Assistance Service (SAD) while they are classified as frail elders due to their reduced or almost nonexistent mobility. The Home Exercise Program (HEP) was addressed to this population. The HEP is an intervention that stimulates spontaneous and habitual mobility on a daily basis and starts with the initial guidance of a kinesiology expert which is gradually taken over by a SAD care giver or family member.

Gathering information from the international literature on home-based exercise research reveals encouraging and positive results and our purpose was to implement this program in the organization of the SAD including regular physical activity among its outcomes and providing the utilisation of simple, small-sized equipment that could be placed easily in subjects' homes. Subjects to be admitted to the study were selected following criteria regarded health status:

1. Absence of a deterioration of cognitive function which could prevent the completion or comprehension of the HEP.
2. Absence of current acute pathologies (infective diseases, recent cardiac ischemia, cachexia or recent cancer chemotherapy).
3. Absence of disabled chronic pathologies (severe heart disease, unstable angina, uncontrolled hypertensive condition).

The final subject pool consisted of 20 elderly persons who were randomly assigned to either the exercise group who participated in the HEP or the control group who continued their usually lifestyle. The average age of the subjects was 85 years-old, with ages ranging from 71 to 96.

Assessments:

Every subject in the exercise and control groups completed a test assessment taken at the beginning and after completing four months of the HEP under the supervision of the same researcher.

Functional abilities:

- ADL - Index of Independence in Activities of Daily Living (*Katz et al., 1970*)
- IADL - Index of Independence in Instrumental Activities of Daily Living (*Lawton & Brody, 1969*): two scales of functional evaluation; the first scale measures the ability to perform activities such as dressing, walking and bathing; the second scale measures the ability to take medicine and use the telephone and money.

Physical measurements:

- Performance Oriented Assessment of Balance: a scale used to evaluate static and dynamic balance (11)
- Performance Oriented Assessment of Gait: a scale used to evaluate gait (12)
- Up & Go Test: a test used to assess functional mobility (13)
- Chair Sit and Reach Test: a test used to assess lower body flexibility (14)
- 30s Chair-Stand Test: a test used to assess lower body strength (15)

The Home Exercise Program:

The HEP was designed from our previous experience and research in frail elderly people living in long-term care centres in the Rovereto area. The HEP consisted of eight simple and progressive exercises which were to be done on a daily basis. One objective of the HEP was to maintain or improve functional ability, specifically locomotion (walking), transfer (from bed, chair and toilet), balance and flexibility. Other objective was to establish a gradual change of lifestyle in the subjects, allowing them to return to performing activities of daily living and also to activities requiring mobility. Consequently, the HEP aimed to gradually reduce the intervention of the exercise specialist permitting the subjects to continue the exercises autonomously with the support of a SAD care giver.

The program was divided into two phases:

Phase 1 – After obtaining subject consent, exercise was introduced gradually: each subject received an illustrated exercise instruction booklet, a calendar to monitor the adherence to the program; an elastic band and a tennis ball, necessary for the exercises. Subjects were given detailed instruction on how to do the exercises correctly and when to take necessary breaks. Some information was also given about

proper breathing techniques. This phase lasted two months during which kinesiology expert went regularly to the subjects' homes two times a week some times with the presence also of SAD care giver.

Phase 2 – During this phase, the care givers became directly involved. Their goal was to gradually take over the responsibility of helping the subjects do the exercises from the kinesiologists. This phase also lasted two months. During the first month, the specialist reduced the home visits to once a week; the second month the home visits were reduced to twice a month. Eight out of the ten subjects in the exercise group completed the HEP, whereas two left the study due to health problems. The subjects showed to be very compliant to the program, and the data collected from the assessments indicated an improvement on all the parameters investigated (See Figure 2).

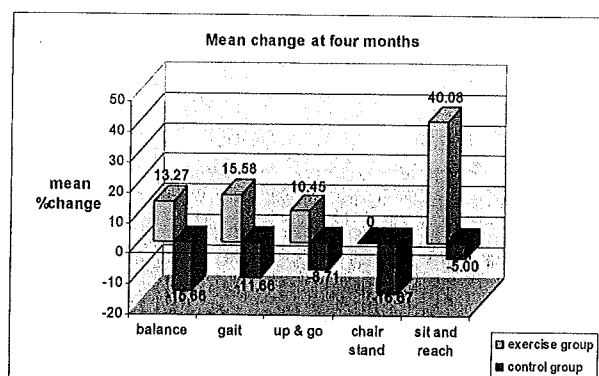
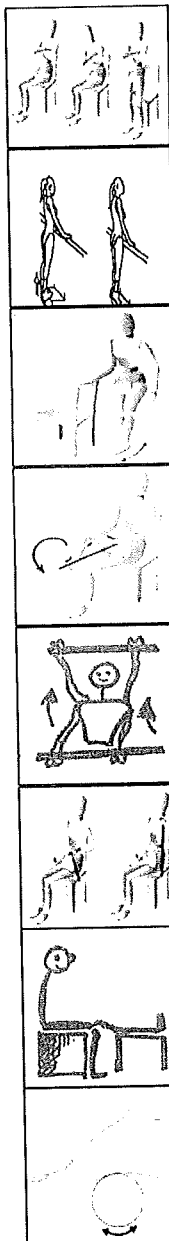


Figure 2. Percent mean changes (post vs.pre intervention) in the different tests.

The exercise group improved their Performance Oriented Assessment of Balance and their Performance Oriented Assessment of Gait scores by 13.27% and 15.58% respectively. Their Up & Go Test times were reduced by 10.45%, but their best result was a 40.8% improvement in lower body flexibility measured by the Sit and Reach Test. The control group scores, conversely, showed a general worsening at each motor capacity that reached a significant level for Chair Stand and Balance. It should be noted that HEP was not effective in modifying the level of lower limbs strength, a result that we obtained in previous study by using machine based program (2). This suggest that a certain amount of muscle stimulation is needed to improve muscle performance even in frail elderly.

The scores obtained on the ADL and IADL revealed a maintenance and in some cases an improvement in autonomy by the exercise group. Out of the measured parameters the care giver reported an improved agility and autonomy by the exercise group when performing daily activities such as walking around the house, bathing and dressing. On the other hand, the ADL and IADL score declined for some subjects in the control group.

Table 1. The program exercises



Get up from a chair without using your arms. Begin with 5 repetitions and add more every day until you can do 15.

Rise up on your toes. Begin with 5 repetitions and add more every day until you can do 15.

Lift your leg (from front to back). Begin with 5 repetitions and add more every day until you can do 15.

Put the elastic band under your foot and use your hand to hold it near your chest. Move your leg in a bicycle motion. Begin with 5 repetitions and add more every day until you can do 15.

Raise the stick above your head. Begin with 5 repetitions and add more every day until you can do 15.

Put the elastic band under your thighs and stretch it upwards with your arm. Begin with 5 repetitions for each arm. Add more repetitions every day until you can do 15.

Hold this position for 10 seconds for each leg. Increase the time gradually to 30 seconds.

While sitting down, roll the ball under each foot for 15 seconds. You can also try this exercise in a standing position.

The results of the study indicate the feasibility of an exercise home-based program which can be part of the services delivered by the municipality to the older citizens.

They also confirm that attaining a regular physical activity level allow to help these frail elderly in stimulating their functional abilities and, in many cases, they are able even to improve their mobility, positively influencing their quality of life.

A post-experimental phase is planned to start which will include a greater number of participants; the specific number will be fixed depending on variables influencing the manageability of the initiative.

The exercises will be done by the elders themselves and will be checked by the care givers under kinesiologist supervision for approximately one hour a month.

In conclusion, the take home lesson of the described experience, tends to consolidate our belief that the main task of Verona school, lays in the formation of teachers. They must be capable to interact with the elderly on the basis of their scientific and relational skills. Such teachers will have to be formed at the several Faculties of "Scienze Motorie" established in Italy since 1998.

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