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ORIGINAL ARTICLE

# Randomized controlled resistance training based physical activity trial for central European nursing home residing older adults

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## ABSTRACT

BACKGROUND: Nursing home residing older adults often experience fear of sickness or death, functional impairment and pain. It is difficult for these older adults to maintain a physically active lifestyle and to keep a positive outlook on life. This study evaluated the changes in quality of life, attitude to aging, assertiveness, physical fitness and body composition of nursing home residing elderly through a 15-week organized resistance training based physical activity program.

METHODS: Inactive older adults living in a state financed nursing home (N.=45) were randomly divided into two intervention groups and a control group. Both intervention groups were assigned to two physical activity sessions a week, but one of these groups also had weekly discussions on health and quality of life (Mental group). Data on anthropometric measures, fitness performance, as well as quality of life and attitudes to aging survey data were collected. Due to low attendance rate 12 subjects were excluded from the analyses. Statistical analysis included Paired Samples t-tests and Repeated Measures Analysis of Variance.

RESULTS: Both intervention groups significantly improved their social participation, and their upper- and lower-body strength scores. Also, subjects in the Mental group showed improvement in agility fitness test and certain survey scales. No positive changes were detected in attitude towards aging and body composition measures in any groups. The *post-hoc* results suggest that Mental group improved significantly more than the Control group.

CONCLUSIONS: Regular physical activity with discussions on health and quality of life made a more meaningful difference for the older adults living in nursing home than physical activity alone. Due to the fact that all participants were influenced by the program, it is suggested to further explore this area for better understanding of enhanced quality of life.

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**Key words:** Motor activity - Health status - Quality of life - Homes for the aged.



The population of older adults, age 60 years or older is increasing at a rapid pace in most of the developed countries. This is also the case in Hungary, where older adults comprise about one-fourth of the total population and this ratio is expected to grow to 29.4% by 2050 and 31.9% by 2060.[1] At the same time the population of Hungary decreased from 10.7 million in 1980 to 9.9 million in 2011.[1] Accordingly, it is currently a particular challenge to handle the issues related to the aging nation, as well as the social- and health-care.

Physical and mental functions of older adults slow down with the decrease of general adaptability of the

human body.[2] Older adults often experience negative emotions that may lead to social and emotional isolation, feeling of loneliness and even depression.[3] Lacking systematic interventions, these negative social, mental and psychological influences may impact older adults' health status and quality of life (QOL).[4] Decreasing levels of health and life satisfaction may cause fading perspectives on future life activities, prospects and hopes.[5] The extent to which these changes influence daily activities is mostly determined by lifestyle, nutrition, attitude towards aging, and participation in social activities.[6] Living an active lifestyle and regularly participating in social events can considerably decrease the risks for certain illnesses and psychological disorders.[7] Furthermore, regular physical activity can substantially contribute to the improvement of older adults' emotional, fitness and physical conditions and thus positively impact quality of life.[8, 9] Evidence has shown physical, psychological and mental benefits of those elderly who participate in regular physical activity.[10, 11] In addition, older adults may experience improved coordination,[12, 13] and positive impacts on concentration and life satisfaction.[14] Physical activity may also be effective in preventing falls and reduce the fear of falling.[15]

Despite the known benefits of regular exercise, most of older adults in many communities are not involved in any organized physical activity programs.[16] Several common barriers have been identified that prevent older adults to exercise regularly, including perceived health problems and pain,[17] lack of time and motivation,[18] and weak social support.[19] In addition to these barriers, older adults living in nursing homes face particular challenges when considering participation in physical activity programs. Nursing home residing older adults have been shown to be more functionally impaired, more regularly perceive pain, and often fear death, which make it challenging to engage in exercise programs and to keep a positive outlook on life.[20] In addition, family members can hardly provide ongoing social support to their nursing home residing relatives. Therefore, it is mostly the nursing home staff who can encourage physical activity participation and program attendance that aim healthy active living.[21]

While different types of intervention programs may have positive effects in community residing older adults [22] and exercise based interventions can elicit positive changes in the physical dimensions.[23] Interventions can be even more beneficial when physical activity programs incorporate psychological or mental components.[24, 25] However, little evidence exists on the benefits of combined physical activity and mental interventions when applied to older adults in nursing home settings.[26] Also, the complex health and quality of life problems regarding nursing homes have been overlooked.[27, 28] This gap is especially apparent when looking at the multifaceted effects of physical activity program in relation to fitness, body composition, quality of life, attitude to aging and assertiveness. The number of studies focusing on physical activity as related to aging, attitude towards aging and quality of life among nursing home residing older adults is minimal in Central Europe.[29] Therefore, the aim of this study was to examine the changes in quality of life, attitude to aging, assertiveness, physical fitness and body composition in nursing home residing older adults after a 15-week intervention that combined resistance training based physical activity with mental health sessions.

## Materials and methods

### *Sample*

The Unified Institution of Medical and Social Care of Győr City was selected to conduct this study. A total of 135 older adults reside in this institution. While this is the only nursing home facility in the city of Győr, the quality of the facilities, accommodation, and services — mainly due to financial constraints — are rather low, similarly to other state financed nursing homes in other cities. Most of older adults have no relatives or visitors, thus they live in a closed environment with repetitious daily routines. One important criterion in selecting the sample was that inactive older adults living in this nursing home were required to safely perform all physical activities. The sample was selected in two stages: 1) based on the approval by the institution's general practitioner, and 2) a minimum score of 15 was required on the Mini-Mental State Examination (MMSE) Test. After the screening process, 45 older adults ($M_{age}$±SD: 77.17±10.42 years) were approved to participate in the study and were randomly assigned to one of three groups: 1) an experimental group that performed age and skill appropriate resistance training twice a week for 45 minutes (Training); 2) a second experimental group that complemented the training activity with

weekly lectures and discussions on aging and quality of life (Mental); and 3) a Control group that participated in no physical or mental training. Inclusion criteria for the experimental group participants required a minimum 90% attendance in the intervention activities. Subjects violating this requirement were not included in the data analyses. Accordingly, data were analyzed on a total of 33 subjects, to include 11 Training group subjects ($M_{age}$±SD: 79.64±7.96 years), 11 Mental subjects ($M_{age}$±SD: 75.35±11.91 years), and 11 Control subjects ($M_{age}$±SD: 76.51±1.47 years).

The safety and well-being of the experimental subjects were top priorities throughout the intervention. For safety considerations all exercise sessions were held indoors. The study followed the guidelines of the Helsinki Declaration:[30] the Unified Institutions' ethical committee approved the study protocol and written informed consent was obtained from all subjects. All participants in all three groups were inactive prior to the study; therefore, exercises for the experimental subjects were carefully selected. The program was designed by exercise specialists to lead to success and positive experiences, and to allow subjects to use the applied activities in their everyday lives following the intervention. Exercise sessions were conducted in individual and group settings and incorporated small portable equipment (balls, bean bags, tubes and light weights). The intervention primarily targeted to improve muscular strength and power, but other activities to improve flexibility, balance, and coordination were also included. The applied exercises were age and skill appropriate for the subjects and were always supervised by an exercise specialist, assisted by a physical therapist and other support personnel from the institution. Undergraduate students from a leisure program of the local university were also involved in the intervention to provide social support for the subjects. Three to four students attended each session and assisted the older adults with their activities, also providing individualized motivation. The Mental group performed the same exercise program as the Training group, but also attended one lecture or group discussion each week. The topics of these lectures are summarized in Table I.

TABLE I.—*Topics for lectures and discussions used in the Mental group.*

| Weeks | Topics |
|---|---|
| 1-2 | Health, aging, uncertainty and autonomy |
| 3-4 | Healthy active living, social interactions and family |
| 5-6 | Emotion, death/dying, loss and growth |
| 7-8 | Attitude towards aging and intimacy |
| 9-10 | Physical activity, fitness and pain |
| 11-12 | Physical activity, nutrition, weight and BMI |
| 13-14 | Sensory abilities and assertiveness in various situations |
| 15 | Aging and future |

*Data collection*

A pre- and post-test design was used where all subjects were tested before and immediately after the 15-week intervention. Assessment procedures used the following items:

— the Hungarian version of World Health Organization's Quality of Life Questionnaire (WHOQOL-OLD) with acceptable validity and reliability measures [31] examining older adults' perception of life in relation to their goals, expectations and concerns.[32] The Hungarian version aims to measure the same outcomes through the same division of questions as the English language international version through a questionnaire consisted of 24 items with the following sub-scales: Sensory abilities (SAB), Autonomy (AUT), Past, present and future activities (PPF), Social participation (SOP), Death and dying (DAD), and Intimacy (INT).[33] Subjects are asked to respond to questions describing various aspects of quality of life and rate their responses using a five-point Likert Scale, with 1 describing the lowest and 5 the highest quality of life. Overall, the strengths of the WHOQOL-OLD include its systematic and multicultural applicability as well as its direct reliability on the subjects' individualized perceptions.

— the Attitudes to Aging Questionnaire (AAQ) also used a five-point Likert Scale (1-5) to measure aging from the aspect of life-long development, values and quality of life.[34] The AAQ assesses the impact of service provision and of different health and social care structures on personal attitudes. An overall attitude score and three sub-scale scores were collected. The three sub-scales reflect on three different aspects of aging: psychosocial losses (PL) assessing if older adults view aging as a negative experience involving psychological and social loss; physical change (PC) that focuses on items related to health, exercise and the experience of aging itself; and psychological growth (PG) that has an explicitly positive focus on gains in relation to self and to others during the aging process.[34] The Hungarian

version of AAQ uses the same sub-scales and has high validity and reliability scores;[35]

— physical fitness status was measured by selected items from the Fullerton Functional Fitness Test, which has high validity indicators for older adults.[36, 37] This test is suitable to measure older adults' physical performance and fitness level such as strength, flexibility, and agility or dynamic balance. The following procedures were used in the current study:

— lower body muscular strength/endurance: a 30-second chair test measuring the number of stands with arms folded across chest (repetitions);

— upper body muscular strength/endurance: a 30-second arm curl measuring the number of biceps curls holding a dumbbell (women 2 kg, men 3.5 kg dumbbell) (repetitions);

— lower body flexibility: a chair sit-and-reach test measuring hamstring flexibility of one extended leg. The test is a measure of distance between the big toe and tip of middle finger in a reach-for-toe position (cm);

— upper body flexibility: the back scratch test measures the distance between one hand reaching over shoulder and the other hand pointing up at the middle of back. The test is a measure of distance between the tips of the middle fingers (cm);

— agility, dynamic balance: 2.5-meter up-and-go test measuring time from seated position walking around a cone and returning to a seated position (seconds);

— anthropometric data: weight, height, BMI were measured. Body composition of the subjects was also assessed. The body composition in relation to body fat percent (F) (%), visceral fat area (VFA), ($cm^2$) and fat-free body mass (FFM), (kg) was estimated by Inbody720 bioelectrical impedance spectroscopy;

— the Rathus self-reporting instrument was applied, which is the most widely utilized instrument in various fields of study to measure subjects' assertiveness and social abilities in interpersonal situations.[38] In the 30-item Rathus questionnaire (RS) subjects are asked to respond to statements indicating their agreement to typical assertive and non-assertive behavior descriptions. Responses are graded by a 6-point scale (+3 indicating strong agreement to described character to -3 indicating strong disagreement to described character) and the overall scores can range between +90 and -90. Higher scores describe higher level of assertiveness. The Hungarian version with acceptable reliability and validity scores consists of five factors: Uncertainty (UN), Expression of Emotions (EM), Self-efficacy (SE), Saying No (SN) and Personal Participation in a Relationship (PPR).[39] These items are identical to the original (English version) of RS. As such, the Hungarian version of RS measures the same assertiveness scale with the same items as the English version of RS.

*Statistical analysis*

The data of pretest were submitted to tests of normality (Kolmogorov-Smirnov Test Z) and homogeneity in order to confirm the similarity of the groups. Furthermore, the randomly created three groups were compared and contrasted with a hypothesis test and found no significantly differences ($P>0.05$ in all cases). All the above analyses led us to the conclusion that the sample three groups are to be considered homogeneous.

After data collection, descriptive statistical analyses were applied to all scales altogether and in the respective three groups. The aim of the descriptive statistical analysis was to understand the characteristics of the variables. Then, Paired Samples *t*-tests were utilized to measure the differences between pre- and postassessments on each individual subscale. Repeated Measures Analysis of Variance (rANOVA) was employed in order to measure the complex changes in the three groups under different conditions. In the course of the procedure the three effects individually and also in combinations were carefully examined. Group Variable contained the variables assessed (number of groups =3; number of variables =27) while Group Time consisted of the two time periods for the two measurements (number of levels =2). Data were analyzed by SPSS for Windows 20.0 statistical program. Alpha level was set at $P<0.05$ in every case of statistical tests.

## Results

For the quality of life questionnaire (WHOQOL-OLD) a trend showed that autonomy (AUT), past, present and future activities (PPF), and social participation (SOP) scores were higher than the values for other items (Table II). Death and dying (DAD) subscale on the other hand had the lowest score. The values of sensory abilities (SAB) and intimacy (INT) were mid-ranged. According to Paired Samples *t*-test both Training and Mental groups significantly improved in the area of social

TABLE II.—*Results of WHOQOL-OLD Test (values range 1-5 for each item).*

| Tests | Time | Training Mean±SD | Mental Mean±SD | Control Mean±SD | Sum Mean±SD |
|---|---|---|---|---|---|
| SAB | Pretest | 2.50±0.716 | 2.43±0.962 | 2.73±1.021 | 2.55±8.90 |
| | Post-test | 2.18±0.867 | 1.93±0.501 | 2.23±1.034 | 2.11±0.815 |
| AUT | Pretest | 2.95±0.430 | 3.82±0.276 | 3.32±0.717 | 3.36±0.609 |
| | Post-test | 2.95±1.048 | 4.11±0.492 | 3.39±1.232 | 3.48±1.062 |
| PPF | Pretest | 3.34±0.392 | 3.73±0.997 | 2.68±1.275 | 3.25±1.029 |
| | Post-test | 3.57±0.389 | 4.11±0.964 | 3.27±1.015 | 3.65±0.886 |
| SOP | Pretest | 3.16±0.625 | 3.73±0.737 | 3.34±0.769 | 3.41±0.731 |
| | Post-test | 3.89±0.626* | 4.52±0.607* | 3.95±0.590 | 4.12±0.656 |
| DAD | Pretest | 2.27±0.693 | 1.75±0.851 | 1.77±0.745 | 1.93±0.781 |
| | Post-test | 1.93±0.852 | 1.30±0.350 | 1.50±0.296 | 1.58±0.604 |
| INT | Pretest | 2.32±1.025 | 2.50±1.508 | 2.32±1.019 | 2.38±1.171 |
| | Post-test | 2.23±1.217 | 2.91±1.617 | 2.68±1.437 | 2.61±1.417 |

*Significantly different from pretest (P≤0.05).
SAB: sensory abilities; AUT: autonomy; PPF: past, present and future activities; SOP: social participation; DAD: death and dying; INT: Intimacy.

TABLE III.—*Results of WHO-AAQ Test (values range 1-5 for each item).*

| Tests | Time | Training Mean±SD | Mental Mean±SD | Control Mean±SD | Sum Mean±SD |
|---|---|---|---|---|---|
| OAS | Pretest | 3.30±0.568 | 3.08±0.335 | 3.17±0.347 | 3.18±,075 |
| | Post-test | 3.40±0.469 | 3.26±0.414 | 3.28±0.176 | 3.31±0.373 |
| PS | Pre-test | 3.27±0.634 | 3.24±0.498 | 3.32±0.377 | 3.28±0.499 |
| | Post-test | 3.44±0.472 | 3.35±0.661 | 3.49±0.351 | 3.43±0.499 |
| PC | Pretest | 3.06±0.631 | 2.91±0.487 | 3.10±0.480 | 3.02±0.524 |
| | Post-test | 3.17±0.587 | 3.16±0.350 | 3.19±0.303 | 3.17±0.418 |
| PG | Pretest | 3.30±0.327 | 3.10±0.521 | 3.16±0.468 | 3.19±0.440 |
| | Post-test | 3.59±0.331 | 3.27±0.737 | 3.26±0.416 | 3.38±0.531 |

OAS: Overall Attitude Score; PL: psychosocial loss; PC: physical change; PG: psychological growth.

TABLE IV.—*Results of the Fullerton Functional Fitness Test.*

| Tests | Time | Training Mean±SD | Mental Mean±SD | Control Mean±SD | Sum Mean±SD |
|---|---|---|---|---|---|
| Chair stand | Pre-test | 7.91±3.390 | 9.09±2.982 | 11.00±3.873 | 9.33±3.568 |
| (repetitions) | Post-test | 10.82±5.115* | 11.36±3.202* | 12.09±4.505 | 11.42±4.243 |
| Arm curl | Pre-test | 12.27±2.970 | 12.82±3.970 | 15.91±5.375 | 13.67±4.399 |
| (repetitions) | Post-test | 15.27±4.541* | 15.36±4.249* | 19.18±5.564* | 16.61±5.018 |
| Back stratch | Pre-test | -0.90±12.784 | -3.41±10.670 | -1.55±9.730 | -1.98±10.765 |
| (cm) | Post-test | -1.23±11.048 | 0.70±10.389 | -2.82±12.123 | -1.11±10.952 |
| Sit & reach | Pre-test | -8.36±18.565 | 4.41±22.571 | 1.18±23.932 | -0.92±21.822 |
| (cm) | Post-test | -6.59±15.398 | 3.36±20.41 | -5.59±21.096 | -4.09±18.858 |
| Up & go | Pre-test | 13.952±9.185 | 15.06±5.128 | 11.386±7.108 | 13.466±7.267 |
| (seconds) | Post-test | 11.906±5.882 | 11.756±5.067* | 11.56±6.272 | 11.740±5.581 |

*Significantly different from pretest (P≤0.05).

participation (t=-3.675; P=0.004; t=-3.693; P=0.004), but no other significant pre- to post-test differences were observed. No between group differences were observed either at pre- or post-test (P>0.05).

The Attitude to Aging (AAQ) results with the overall attitude score (OAS) and the three subscales are presented in Table III. Scores show a trend at above mid-range (2.91-3.44) in all subscales with standard deviations of 0.75-0.737. There were no differences between pre- and postmeasures in any variables. Also, no between group differences were observed either at pre- or post-test (P>0.05).

The results on the Fullerton Functional Fitness Test (Table IV) showed that all measures were at a relatively

low level compared to population averages. Due to the 15-week exercise program, Training group significantly improved in the chair stand (t=-3.573; P=0.005) and arm curl (t=-2.76; P=0.02) measures. Participants in the Mental group showed significant increases in the chair stand (t=-3.3; P=0.008), arm curl (t=-2,39; P=0.038), and Up & go tests (t=3.033; P=0.013). Interestingly, the inactive Control group also improved in the arm curl test (t=-2.679; P=0.023).

The results of body composition tests are shown in Table V. The height of the subjects were within the normal age appropriate range, but the BMI values particularly in the Mental group appeared to be slightly high (BMI>30.0 is considered overweight). Fat percent, visceral fat area and fat-free body mass were also regarded high. No groups showed any significant changes in any measures of body composition, except the Mental group that showed a significant reduction from pre- to post-tests in the fat-free body mass measure (t=3.322; P=0.008).

Table VI summarizes the results from the Rathus Assertiveness self-reporting instrument. Every subscale and the RATHUS sum total results were appropriate to the characteristics of the sample. No significant pre- to post-test changes were observed, except in the Mental group where subjects showed a significant improvement in the uncertainty subscale (t=-4.042; P=0.002).

Repeated Measures ANOVA indicated a significant intercept in the Test of between-subject effects (F=2350.560 (3.21), P<0.000). There was a signifi-

TABLE V.—*Results of the body composition test.*

| Tests | Time | Training Mean±SD | Mental Mean±SD | Control Mean±SD | Sum Mean±SD |
|---|---|---|---|---|---|
| Height | Pretest | 155.27±9.850 | 149.00±4.899 | 155.45±7.244 | 153.24±7.969 |
| (cm) | Post-test | 155.09±9.550 | 148.91±5.205 | 154.82±5.759 | 152.94±7.466 |
| Weight | Pretest | 69.982±12.872 | 69.036±8.936 | 57.864±13.011 | 65.627±12.683 |
| (kg) | Post-test | 69.818±13.275 | 68.864±8,586 | 58.218±14.062 | 65.633±12.977 |
| BMI | Pretest | 28.382±6.247 | 30.991±3.589 | 24.227±5.325 | 27.867±3.411 |
| (kg/m²) | Post-test | 29.327±7.039 | 30.882±3.425 | 24.445±6.152 | 28.218±3.359 |
| Fat% | Pretest | 36.509±12.745 | 44.673±5.902* | 31.855±9.314* | 37.679±10.849 |
| (%) | Post-test | 38.618±12.472 | 44.864±6.484* | 32.527±10.997* | 38.670±11.211 |
| VFM | Pretest | 147.227±43,223 | 158.818±31.33 | 123.555±44.896 | 14.200±41.754 |
| (cm²) | Post-test | 152.255±36.765 | 169.145±36.19 | 123.782±48.656 | 148.394±43.966 |
| FFM | Pretest | 43.500±7.416 | 37.891±3.67 | 39.009±7.503 | 40.133±6.711 |
| (kg) | Post-test | 41.655±6.446 | 36.873±3.667* | 38.418±6.81 | 38.982±5.981 |

*Significantly different from pretest (P≤0.05).

TABLE VI.—*Results of Rathus Assertiveness with paired samples t-test.*

| Tests | Time | Training Mean±SD | Mental Mean±SD | Control Mean±SD | Sum Mean±SD |
|---|---|---|---|---|---|
| RS | Pretest | 7.91±3.390 | 9.09±2.982 | 11.00±3.873 | 9.33±1.559 |
| | Post-test | 10.82±5.115* | 11.36±3.202* | 12.09±4.505 | 11.42±0.637 |
| UN | Pretest | 12.27±2.970 | 12.82±3.970 | 15.91±5.375 | 13.67±1.962 |
| | Post-test | 15.27±4.541* | 15.36±4.249* | 19.18±5.564* | 16.60±2.232 |
| EM | Pretest | -0.90±12.784 | -3.41±10.670 | -1.55±9.730 | -1.95±1.303 |
| | Post-test | -1.23±11.048 | 0.70±10.389 | -2.82±12.123 | -1.12±1.763 |
| SE | Pretest | -8.36±18.565 | 4.41±22.571 | 1.18±23.932 | -0.92±6.640 |
| | Post-test | -6.59±15.398 | -0.09±20.710 | -5.59±21.096 | -4.09±3.500 |
| SN | Pretest | 13.952±9.185 | 15.06±5.128 | 11.386±7.108 | 13.47±1.885 |
| | Post-test | 11.906±5.882 | 11.756±5.067* | 11.56±6.272 | 11.74±0.174 |
| PPR | Pretest | 7.91±3.390 | 9.09±2.982 | 11.00±3.873 | 9.33±1.559 |
| | Post-test | 10.82±5.115* | 11.36±3.202* | 12.09±4.505 | 11.42±0.637 |

*Significantly different from pretest (P≤0.05).
RS: Rathus Sum; UN: uncertainty; EM: emotion; SE: self-efficacy; SN: saying no; PPR: personal participation in a relationship.

TABLE VII.—*Results of Post-hoc Test LSD.*

| Group | Group | Mean Diff. | Std. Error | Sig. |
|---|---|---|---|---|
| Training | Mental | -0.7924 | 1.019 | 0.443 |
| | Control | 1.4709 | 1.043 | 0.170 |
| Mental | Training | 0.7924 | 1.019 | 0.443 |
| | Control | 2.2633* | 1.019 | 0.035* |
| Control | Training | -1.4709 | 1.043 | 0.170 |
| | Mental | -2.2633* | 1.019 | 0.035* |

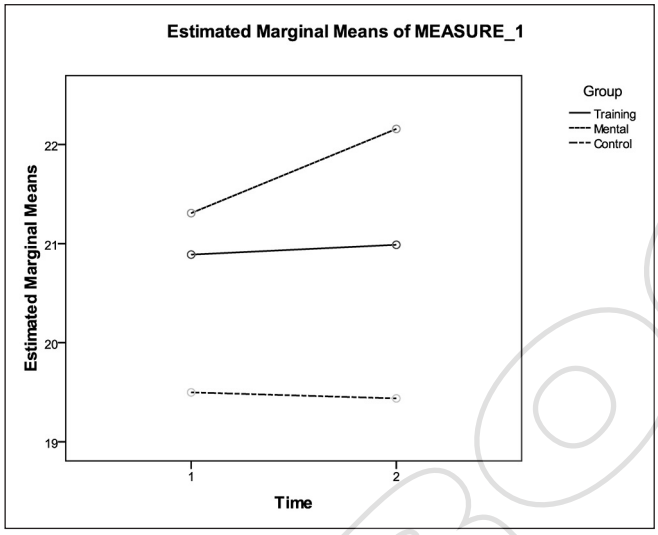


Figure 1.—Result of Repeated Measures ANOVA.

cant effect of Variables (F=507.231, P<0.05), Variables x Group (F=2.371, P<0.05) and Variables x Time (F=1.961, P<0.05). However, there was no such effect found in Variables x Time x Group (F=1.011; P>0.05). The *post-hoc* results suggest that Mental group improved significantly more than the Control group (Table VII). Figure 1 shows the overall positive changes observed in the Training and Mental groups and a decline in Control group variables over time.

## Discussions

Regular physical activity has been shown to improve older adults' physical condition and coordination, reduce perceived pain, increase physical mobility, and reduce fall related accidents.[40] Furthermore, a physically active lifestyle has a positive effect on the elderly's daily functions, therefore it improves certain attributes of quality of life.[41] This study confirms that a well-designed exercise program can have a positive impact on nursing home residing older adults' physical, mental, and psychological status even over a short period of time. Physical activity alone had positive impacts only on the relevant fitness assessments; however, when exercise was coupled with a weekly discussions focusing on healthy aging a broader set of positive effects were noted. Supporting staff and students played an important role in these results, as their cheerfulness and optimism appeared to be a motivational factor for the subjects.

Nursing home residing older adults tend to experience a greater decline in their psychomotor skills, self-support and cognition compared to community residing counterparts,[20, 42] and in most cases they are dissatisfied with their social and emotional life.[35] Thus we hypothesized that regular discussions on health, quality of life, and future plans, along with the presence of young people in a physical activity setting would bring meaningful and positive changes to our subjects' perception of life. The results of the present study point in the direction that such interventions may enhance social support, quality of life, and physical fitness of nursing home residing older adults.

Older adult subjects participating in the combined exercise and weekly discussion program significantly improved their perceptions of social participation through the 15-week intervention. This finding is important because social relationship is considered a major factor in both life satisfaction and quality of life.[3] Likely, this intervention was meaningful through the enhanced social aspects and communication, magnified by the support personnel and students. On the contrary, subjects' perception of their sensory abilities, autonomy, past, present and future activities, death and dying, and intimacy did not change significantly in the short course of our study, although we observed some promising trends.

Similarly, non-significant changes were observed on the Attitude to Aging (AAQ) subscales through the

15-week long program, although some of the observed trends pointed toward positive changes. Since young people were present in all exercise and discussion sessions it was expected that the older adults' attitude would improve. We believe that a more extensive program with more frequent sessions may have a better impact on most areas of quality of life and attitude towards aging. In our intervention the increased social support was apparent only twice a week and for the rest of the time our subjects performed their usual daily routines surrounded by the same people. Hence, future interventions should apply more intense programs in an attempt to change the local culture toward a more supportive environment for the older adults.

One of the most important factors of functional decline in older adults is the decreasing level of physical activity.[43] Regular exercise has positive effects on the daily routine activities, muscular strength and endurance, and balance.[44] In our study the applied age appropriate exercise program had positive outcomes, as our experimental subjects showed improvements in the muscular strength and endurance, as well as the mobility measures. However, we noted that subjects who were involved in the weekly structured discussions showed a more well-rounded fitness improvement than the subjects exposed to exercise sessions alone. It is likely that subjects through their weekly discussions gained awareness and thus paid more attention to conscious decisions in healthy active living, which may have contributed to their improvements in fitness.

There is an inverse relationship between age and BMI, body fat, and fat free mass.[45] The aging process results in a decrease in muscle mass and muscle strength. In the present study we did not observe significant changes in body composition for most subjects. However, the one significant change we noted was a decrease in fat free body mass in the Mental group, which was surprising to us. As a reduction in fat free mass, to include a loss in bone and muscle mass is a rather negative health outcome and may lead to physical constraints, an exercise program was expected to have the opposite results. However, it is possible that the duration and intensity of the exercise program was not sufficient to positively impact body composition measures, despite the positive changes measured by the fitness variables. Furthermore, the general health of our subjects allowed us to apply only low to moderate training loads, which appeared to be ineffective in soliciting positive body composition changes.

Assertiveness and quality of life correlates with the individual's general disposition, mental status and satisfaction.[46] A positive change was observed in the uncertainty subscale for the Mental group subjects, which suggests that the ongoing discussions of physical, mental and social problems comforted the subjects and gave them a stronger feel of security.

When interpreting these results, one needs to take into consideration that older adults in nursing homes form a close community. Through observations and discussions the whole community may change in certain aspects. Regular communication and a positive relationship among the older adults might have influenced those individuals' behavior and daily activities who did not participate in our intervention. Arm curl is a good example for that, because this measure was improved even in the control group. All changes can be viewed as an advantage in older people's lives. Through working with a small group of the nursing home residents, the presence of support personnel and students positively influenced the various qualities and characteristics of all members of the community.

This study was not without some limitations. One obstacle was our restriction to use indoor facility only. This restricted us from applying the aerobic endurance assessment for the Fullerton Functional Fitness Test, which otherwise may have provided us further insights regarding the effectiveness of our exercise intervention. If safety is ensured, certain outdoor physical activities may have had provided additional positive changes in both attitude and fitness, and may have also impacted the subjects' overall perception of quality of life.

## Conclusions

An interesting finding of our study is that subjects in the Training group demonstrated improvements in only a few areas, such as in social participation, chair stand, and arm curl, while subjects in the Mental group demonstrated improvements also in the up-and-go and uncertainty measures. This finding suggests that the inclusion of regular discussions on aging, health, and quality of life may be beneficial in eliciting further fitness and assertiveness improvements. Therefore, it is

recommended that future research endeavors utilize this model, along with the use of college students majoring in exercise and leisure areas who can provide social support to the older adult subjects in their journey.

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