George at al., J Yoga Phys Ther 2014, 4:4
http://dx.doi.org/10.4172/2157-7595.1000171

Yoga & Physical Therapy

Review Article Open Access

# Effect of Physical Activity on Functional Status in Elderly with Chronic Low Back Pain

**Tsatsakos George[1]* Kouli Olga[2], Michalopoulou Maria[2], Malliou Paraskevi[2] and Godolias George[2]**

*[1]Rehabilitation Centre of Karystos, 34001, Evoia, Greece*
*[2]Department of Physical Education and Sport Science, Democritus University of Thrace, Komotini, Greece*

## Abstract

**Background:** Pain in the lumbar spine is a symptom most frequently met in declining years.

**Objective:** Even though the increase of physical activity has beneficial results in the organism's functions, a limited number of surveys exist that studied its effect on the functional status of the elderly with chronic low back pain.

**Methods:** The ODI self – report questionnaire and the functional tests "chair stand" and "turn up and go", have been used for the assessment of the functional status of the 49 older adults with chronic low back pain that completed the study.

**Results:** An analysis of covariance (ANCOVA) was performed to compare the difference between the control and the physical activity group. Both groups showed no significant differences between pre and post intervention levels on the scores provided by the ODI, "chair stand" test and "turn up and go" test.

**Conclusions:** The increase of physical activity at the levels of healthy population via free day living walking shows that it has no effect in the functional status of the elderly with chronic low back pain.

**Keywords:** Chronic low back pain; Physical activity; Functional status; Elderly

## Introduction

Pain in the lumbar spine is a symptom most frequently met in declining years. Women maintain the lead in its appearance with a percentage of 24%, while at the elderly men the percentage amounts to 18% [1]. The causes of the phenomenon of lumbar pain in elderly differ from those of the rest age groups, and are detected in compression fracture, carcinoma, spinal stenosis, aortic aneurysm, degenerative disc disease, postural abnormalities and osteoarthritis of facet joints [2]. The persistence of symptoms for more than 12 weeks is stated as chronic condition [3].

The complete assessment of functionality of lumbar consists of recording data that derive both from self-report questionnaires, as well as from functional performance tests. Questionnaires such as valid and reliable Oswestry Disability Index (ODI) have been widely used in the record keeping of lumbar dysfunction [4], along with valid and reliable functional performance tests that evaluate the lower-body strength, aerobic endurance agility and dynamic balance such as the ones included in the Senior Fitness Test (manual) [5]. According to the neurophysiological model, pain can be created and preserved in a peripheral as well as in a central level encapsulating both the spinal cord and the cerebral cortex. The central sensitization of pain that appears to some degree in most of the cases of CLBP can cause continual sensitization of the peripheral neural system.

This sensitization can be increased or reduced via the containing or fortifying stimulations that are given by the brain [6]. There are also strong indicators that the neural system is subjected in changes in the cerebral cortex's mapping, and possesses a «memory» of pain, that can activate a pre-sensitization of the tissue that can result in an exacerbation or reappearance of pain [6]. This information has led medical interventions to focus in reducing not only the peripheral but also the central procedure of pain [7] as well as and in psychological and cognitive interventions for the purpose of reducing pain via the forebrain [8]. The focus in the role of the neural tissue and its function in the formulation of pain, concurs with the increase of interest in research regarding the impact of psychological and social factors in its formulation and especially in its part concerning the augmentation of the intercession of the central neural system in the pain threshold via the forebrain [9,6]. Studies have shown that negative thinking, pathological fear or unjustified stress in regards to pain's appearance, avoidable behavior, catastrophology and distress, display interconnection with high levels of pain and disability [10,9].

Social factors such as the compensation system, conflicts in the working environment, tension in the family as well as cultural issues that affect by imposing beliefs can increase the sensitization of pain [10]. Despite this advanced knowledge there are doubts regarding not only the contribution of all these factors in pain, but also if these factors are a pre-disposition of pain or its result. Evidence show that interventions in the cognitive behavior can be effective in reducing disability and the malfunctions that are created because of not defined etiology of chronic low back pain [8]. Individuals with low level physical activity seem to have more functional limitations than active individuals [11-13]. The easiest and more acknowledged way of increasing physical activity is walking, as it does not require special equipment and has little risk of injury [14]. Previous studies in elderly people have reported gradual decrease in daily steps, a decrease that is associated with the age and especially for people over the age of 60 years [15]. The aim of this study was to assess the effect that an increase in physical activity in

***Corresponding author:** Tsatsakos George, Rehabilitation Centre of Karystos, Kriezotou 50 Karystos, Evoia, Greece, Tel: 306937352511; E-mail: gtsatsak@phyed.duth.gr

**Received** May 05, 2014; **Accepted** September 29, 2014; **Published** October 04, 2014

**Citation:** George T, Olga K, Maria M, Paraskevi M, George G (2014) Effect of Physical Activity on Functional Status in Elderly with Chronic Low Back Pain. J Yoga Phys Ther 4: 171. doi:10.4172/2157-7595.1000171

elderly people suffering from chronic low back pain through walking would have, on their functional status assessed through a self report questionnaire (ODI) and functional performance tests ("chair stand" and "up and go"). We hypothesized that the increase of physical activity through walking, of older adults with chronic low back pain, to the level of of healthy elderly individuals would have a positive effect on their functional status.

## Methodology

A randomized control trial has been used to examine the effect of the increase of physical activity (through walking) on the functional status of elderly people suffering from chronic low back pain. The increase of the above mentioned activity has been substantiated through increasing daily walking time, while their functional status has been evaluated by the self-report questionnaire ODI [4] and the functional performance tests for the lower trunk [5] by SFT (manual). The research was carried out in the District of Central Greece, which can be considered as a suburban community. Eighty elderly patients of both sexes suffering from chronic low back pain have been randomly assigned by an independent researcher either in the intervention group "PAG" or in the control group "CG". Each group consisted of 40 participants.

### Sample

Originally, 80 patients with low back pain participated in this study. The above mentioned patients were all over 60 years old, of both sexes and with pain in the lumbar region which remained for a period over 12 weeks. Only 49 participants completed the study. The sample was evaluated using VAS Scale, 3-8 for men who participated in PAG and 3-7 for women who participated in PAG, whereas for CG both for women and men the scale was 3-8.

In the research took part individuals above the age of 60 who had pain in their lumbar spine for a period longer than 12 weeks. Patients that were subjected to a spinal column surgery, with Cauda equina syndrome-CES, sciatic nerve pressure, and with serious spinal pathology were excluded from the research. Additionally patients with symptoms of instability in their spinal column due to spondylolysis or spondylolisthesis and that have mentioned symptoms such as feeling their spinal column «being locked» or feeling that their spinal column is «very loose» or that is «unstable» to multiple directions, have also been excluded from the research. Instability was diagnosed by the doctor with X-ray. Finally patients that displayed pain along the course of the sciatic nerve or serious spinal column pathology like ankylosing spondylitis, malignity and rehmatoid conditions were also excluded from the research.

### Procedure

The aim for the intervening group (PAG) was to approach the target of 8.000 steps per day which is related to better health [15]. The physical activity intervention that lasted for five weeks included walking on a treadmill and the steps that each subject performed were recorded with the use of a pedometer (SW200 Digiwalker by Yamax). During the first week participants performed 3 sessions during which they familiarized themselves with the use of the treadmill and each participant was given a pedometer along with a leaflet of written information concerning its use and function. After the familiarization with using the treadmill there was no change regarding the procedure of intervention. In order to determine the daily step count for the participants in the PAG, each participant wore during the introductory week, for 7 consecutive days, a pedometer. The steps performed during the introductory week not recorded for the calculation of their daily step count. The pre intervention daily step count that was calculated served as the base line step value according to which a personalized weekly step goal was set for each participant. The step goals for the first week reduced by 30% the difference in the steps taken by the patient with chronic lower back pain compared to that of a healthy individual (8000) [15]. The step goal for the second week reduced the respective difference by 60% and finally the step goal for the third and fourth week of the intervention was set at 8000 daily steps for all the participants.

Following the above personalized intervention program each participant visited the physiotherapy office in order to use the treadmill and walk until he/she reached the step goal set for him/her. According to the researcher's instructions, walking was performed at a comfortable pace, similar to the one that they use when performing their daily activities. The control group (CG) was given written information and recommendations on the prevention of lumbar pain, recommendation for relaxation, as well as adoption of ergonomic positions. The study was approved by the ethical committee of the Dept of Physical Education and Sport Science of the Democritus University of Thrace.

### Functionality

The ODI is a questionnaire which is widely used for record keeping of disability of low back pain (LBP) [4,16,17]. It consists of 10 questions of daily activities in the answers of which the degree of the performing difficulty is described. The total score of the questionnaire depicts the percentage of disability. Question No 8 which deals with the "sexual life" has been excluded from the original questionnaire, so that it conforms to the everyday activities of the elderly. Additionally functional performance test were also performed by all the participants that completed the study. The tests "turn up and go" and "chair stand" evaluated the lower trunk strength, agility and dynamic balance. All measurements were performed prior to the start of this study and upon the completion of the intervention 4 week period

### Data analysis

The outcome measures were analyzed as continuous variables and presented as the Mean ± SD. Paired t-test was used to compare outcome variables before intervention, with outcome measures after each intervention. Since the randomization method did not ensure that baseline characteristics would be the same between groups before intervention, an analysis of covariance (ANCOVA) was performed to take account of chance imbalances at baseline between the treatment groups, using the first measure as a covariate variable [18]. This analysis was used to compare differences in outcome measures between the two intervention groups and to estimate the adjusted mean differences and the 95% confidence intervals for each outcome measure at each treatment. Analyses were performed using SPSS21.

## Results

### Demographic and baseline characteristic

The demographic data are presented in Table 1. The average age of

| | *PA* | | *CG* | | *Not Completed The Study* | |
|---|---|---|---|---|---|---|
| | Men | Women | Men | Women | Men | Women |
| N | 8 | 9 | 8 | 24 | 14 | 17 |
| Age (years) | 65-72 | 60-70 | 60-74 | 60-80 | 60-75 | 62-78 |
| VISUAL ALANOGE SCALE (1-10) | 3 - 8 | 3 - 7 | 3 - 8 | 3 - 8 | 3 - 8 | 3 - 8 |

**Table 1:** Demographic characteristics.

| Group | Pre-intervention | Post-intervention | Adjusted Mean (Standard Error) | 95% CI (Confidence Interval) | p-value |
|---|---|---|---|---|---|
| PHYSICALACTIVITY | 7,56 ± 3.22 | 8,06 ± 4.94 | 8,53 (1.32) | (5.86-11.20) | 0.467 |
| CONTROL | 11,77 ± 5.27 | 10,00 ± 5.03 | 9,76 (0.92) | (7.89-11.62) | |

**Table 2:** ODI levels before and after intervention. Comparison of the adjusted mean and 95% CI of ODI levels (adjusted for baseline using ANCOVA) after intervention between two groups.

| Group | Pre-intervention | Post-intervention | Adjusted Mean (Standard Error) | 95% CI (Confidence Interval) | p-value |
|---|---|---|---|---|---|
| PHYSICALACTIVITY | 14,56 ± 3.88 | 14,12 ± 3.84 | 12,10 (0.58) | (10.93-13.27) | 0.087 |
| CONTROL | 10,87 ± 3.52 | 12,37 ± 3.60 | 13,39 (0.39) | (12.59-14.18) | |

**Table 3:** “stand up” functional test levels before and after intervention.Comparison of the adjusted mean and 95% CI of “stand up” levels (adjusted for baseline using ANCOVA) after intervention between two groups.

| Group | Pre-intervention | Post-intervention | Adjusted Mean (Standard Error) | 95% CI (Confidence Interval) | p-value |
|---|---|---|---|---|---|
| PHYSICALACTIVITY | 10,92± 2.13 | 16,59± 22.77 | 19,38 (3.52) | (12.28-26.49) | 0.165 |
| CONTROL | 14,30± 3.57 | 14,46± 4.22 | 13,07 (2.39) | (8.24-17.90) | |

**Table 4:** “turn up and go” functional test levels before and after intervention.Comparison of the adjusted mean and 95% CI of “turn up and go” levels (adjusted for baseline using ANCOVA) after intervention between two groups.

the participants was 67, 7 ± 5, 2 years. The majority of the participants were women 67.3%, while 17 subjects completed all measurements in the PAG and 32 in the CG.

### Functional level

There were no significant decreases of ODI levels after the intervention for both groups when compared with pre-treatment levels (7, 5 ± 3, 2 versus 8 ± 4, 9 in PAG and 11, 7 ± 5, 2 versus 10 ± 5 in CG with $F(1,47)= 0,53$ and $p>.05$. Table 2 shows ODI levels before and after the intervention for both groups.

Also, there were no significant increases in the "stand up" test scores after the intervention for both groups when compared with pre-treatment levels on “stand up” (14, 5 ± 3, 8 versus 14, 1 ± 3, 8 in PAG and 10, 8 ± 3, 5 versus 12, 3 ± 3, 5 in CG with $F(1,48)=3,06$ and $p>.05$. Table 3 shows “stand up” functional test levels before and after treatment in both groups.

There were no significant decreases of “turn up and go” scores after treatment in both groups when compared with pre-treatment levels on “turn up and go” (10, 9 ± 2, 1 versus 16, 5 ± 22 in PAG and 14, 3 ± 3 ,5 versus 14, 4 ± 4, 2 in CG with $F(1,48)=1,98$ and $p>.05$. Table 4 shows “turn up and go” functional test levels before and after treatment in both groups.

## Discussion

The present study dealt with the effect of physical activity increase (walking) on the functional status of the elderly who suffer from chronic low back pain. According to our findings the intervention had no effect on the functional status of the participants as it was recorded by both the self-report questionnaire and the two functional performance tests. These results do not support our hypothesis that the increase of physical activity through walking would contribute to the improvement of the functional status of the participants.

At the initial phase of the study 80 individuals were recruited and completed data collection at that stage. Each group was formed by 40 participants, of which 32 from the CG and 17 from the PAG completed the intervention programme. The dropout rate was significantly high for the PAG since more that 50% of them did not complete the intervention program. This indicates that this intervention program was not particularly popular among the participants and this may be attributed a. to the lack of habituation with the treadmill and b. to the difficulty of acquiring and using sporting clothing and gear.

The increase of physical activity was achieved by gradually increasing the number of daily steps taken by the participants (amount of physical activity) and not the intensity of it. According to the instructions given to the participant, they had to increase the amount of walking at a comfortable pace (as the one they use when they perform they activities of daily living) that was classified as low intensity physical activity. The above may be the reason for not providing data to support previous findings according to which walking on a moderate pace had a significant effect on the improvement of the disorder of patients with chronic low back pain [19]. Furthermore, several surveys have examined the role of physical activity in lower lumbar pain with no definite results [20-22]. In a survey by Hurwiz et al, low level activity was inversely associated with low back disability ($p<0.05$) that was assessed via the 24-item Roland–Morris Low Back Disability Questionnaire [23].

Moreover, the weight status of the participants did not constitute a criterion of seclusion from the current study. This may have contributed to the final formulation of our results along with the relatively high drop-out rate that resulted in less than 60% of the participants completing the study protocol. According to the study of Vincent et al. [24], the obese elderly with chronic low back pain were prone to more pain during a programme that included walking than those who were overweight.

Furthermore, most of the previous studies that provided findings on this topic, included participants aged up to 65 years old, without specifying their finding for older adults, an age group for which the reasons for chronic pain are different [25]. Accompanying diseases with chronic low back pain of spine such as osteoarthritis may affect many different joints, particularly those of knee, hand, hip, and spine resulting in functional limitations very difficult to overcome/ minimize.

### Suggestions for future research

Future research aiming to elucidate the effect of physical activity on the functional capacity of the elderly with chronic LBP should place emphasis on the choice of the intensity of the activity, in relation to the average rate approach related to the specific activity. As the age group of older adults is concerned, seclusion criteria (such as osteoarthritis, obesity and generally the accompanying diseases) should be determined with great caution since they may strongly affect the outcome of the intervention.

## Conclusion

The increase of physical activity via walking on a treadmill in patients with chronic low back pain, had no significant effect on their functional status when the intervention was designed for the participants to gradually reach the daily step count of healthy individuals of similar age - older adults.

### References


1. Lavsky-Shulan M, Wallace RB, Kohout FJ, Lemke JH, Morris MC, et al. (1985) Prevalence and functional correlates of low back pain in the elderly: the Iowa 65+ Rural Health Study. J Am Geriatr Soc 33: 23-28.
2. Rudy TE, Weiner DK, Lieber SJ, Slaboda J, Boston JR (2007) The impact of chronic low back pain on older adults: a comparative study of patients and controls. Pain 131: 293-301.
3. de Vet HC, Heymans MW, Dunn KM, Pope DP, van der Beek AJ, et al. (2002) Episodes of low back pain: a proposal for uniform definitions to be used in research. Spine (Phila Pa 1976) 27: 2409-2416.
4. Fairbank JC, Pynsent PB (2000) The Oswestry Disability Index. Spine (Phila Pa 1976) 25: 2940-2952.
5. Rikly R, Jones J (2001) Senior fitness test manual. Human Kinetics p:61-73.
6. Zusman M (2002) Forebrain-mediated sensitization of central pain pathways: 'non-specific' pain and a new image for MT. Man Ther 7: 80-88.
7. Bogduk N (2004) Management of chronic low back pain. Med J Aust 180: 79-83.
8. Woby SR, Watson PJ, Roach NK, Urmston M (2004) Are changes in fear-avoidance beliefs, catastrophizing, and appraisals of control, predictive of changes in chronic low back pain and disability? Eur J Pain 8: 201-210.
9. Linton SJ (2000) A review of psychological risk factors in back and neck pain. Spine (Phila Pa 1976) 25: 1148-1156.
10. Nachemson A (1999) Back pain: delimiting the problem in the next millennium. Int J Law Psychiatry 22: 473-490.
11. Simonsick EM, Lafferty ME, Phillips CL, Mendes de Leon CF, Kasl SV, et al. (1993) Risk due to inactivity in physically capable older adults. Am J Public Health 83: 1443-1450.
12. Camacho TC, Strawbridge WJ, Cohen RD, Kaplan GA (1993) Functional ability in the oldest old: cumulative impact of risk factors from the preceding two decades. J Aging Health 5:439-454.
13. Clark DO (1996) The effect of walking on lower body disability among older blacks and whites. Am J Public Health 86: 57-61.
14. Taylor AH, Cable NT, Faulkner G, Hillsdon M, Narici M, et al. (2004) Physical activity and older adults: a review of health benefits and the effectiveness of interventions. J Sports Sci 22: 703-725.
15. Aoyagi Y, Park H, Watanabe E, Park S, Shephard RJ (2009) Habitual physical activity and physical fitness in older Japanese adults: the Nakanojo Study. Gerontology 55: 523-531.
16. Nordin M, Alexandre NM, Campello M (2003) Measures for low back pain: a proposal for clinical use. Rev Lat Am Enfermagem 11: 152-155.
17. Ostelo RW, de Vet HC (2005) Clinically important outcomes in low back pain. Best Pract Res Clin Rheumatol 19: 593-607.
18. Vickers AJ, Altman DG (2001) Statistics notes: Analysing controlled trials with baseline and follow up measurements. BMJ 323: 1123-1124.
19. Shnayderman I, Katz-Leurer M (2013) An aerobic walking programme versus muscle strengthening programme for chronic low back pain: a randomized controlled trial. Clin Rehabil 27: 207-214.
20. Hartvigsen J, Bakketeig LS, Leboeuf-Yde C, Engberg M, Lauritzen T (2001) The association between physical workload and low back pain clouded by the "healthy worker" effect: population- based cross-sectional and 5-year prospective questionnaire study. Spine 26:1788–1792
21. Hartvigsen J, Frederiksen H, Christensen K (2006) Physical and mental function and incident low back pain in seniors: a population-based two-year prospective study of 1387 Danish Twins aged 70 to 100 years. Spine (Phila Pa 1976) 31: 1628-1632.
22. Hendrick P, Milosavljevic S, Hale L, Hurley DA, McDonough S, et al. (2011) The relationship between physical activity and low back pain outcomes: a systematic review of observational studies. Eur Spine J 20: 464-474.
23. Hurwitz EL, Morgenstern H, Chiao C (2005) Effects of recreational physical activity and back exercises on low back pain and psychological distress: findings from the UCLA Low Back Pain Study. Am J Public Health 95: 1817-1824.
24. Vincent HK, Seay AN, Montero C, Conrad BP, Hurley RW, et al. (2013) Functional pain severity and mobility in overweight older men and women with chronic low-back pain-part I. Am J Phys Med Rehabil 92: 430-438.
25. Rudy TE, Weiner DK, Lieber SJ, Slaboda J, Boston JR (2007) The impact of chronic low back pain on older adults: a comparative study of patients and controls. Pain 131: 293-301.


**Citation:** George T, Olga K, Maria M, Paraskevi M, George G (2014) Effect of Physical Activity on Functional Status in Elderly with Chronic Low Back Pain. J Yoga Phys Ther 4: 171. doi:10.4172/2157-7595.1000171