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The Effect of Physical Activity Programs to Improve Walking and Balance to Prevent Falls in Elderly People

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ABSTRACT

Many researchers define old age as a decline in functional and psychomotor abilities, which is the most exposed to age-related illnesses and therefore more to fatigue and overwork after the least effort. That is why we conducted this study in order to assist this category of population so that they can preserve or reacquire certain motor skills that can help them carry out their daily activities and be autonomous without the need for assistance. Thus, we have proposed a training program adapted to improve walking and balance, as they are two essential elements to autonomy, and to lead an active daily life. We have assumed that the proposed program will have a positive impact on walking improvement and balance in elderly people. After a prospective study, And selected a sample that includes elderly institutionalized people in the elderly institution of the wilaya of Mostaganem. Due to the nature of this study and the method used (experimental method) in a premeditated manner. The group was divided into two parts, an experimental group and a control group. Composed of 40 elderly people. We performed two tests (test and retest), the period of application of the proposed program is estimated of three months. After receiving test and retest results, we performed a statistical study Using the mean and standard deviation (SD), and after a comparative study of the two samples, we found significant differences in the retest for the test sample. We then deduced that the training program had a positive impact on balance and walking compared with the control sample.

Keywords: Elderly, physical training, training program, balance, walk, preventing falls

INTRODUCTION

For the olderly, in normal aging, it is noticed a gradual upheaval of all psychomotor functions. Advancing age brings many normal health problems that are related to aging (Paterson, 2007). Aging affects the sensory and somatosensory systems and disrupt the regulatory capacity of the postural system (sychamwy, 1986). During the aging process, the physiological functions tend to decline over time. According to some observations, this process tends to accelerate more from the age of 60 (Brown, Sinacore & Binder, 2000). Age is associated with the decline of sensory functions and muscular strength of the lower limbs, the walking pattern changes with age and can be associated with postural instability and falls (Sudarsky, 1990).

The characteristics of gait will change with age under the combined effect of physiological and pathological aging. These amendments mainly involve an irregular step, reducing the length of the stride, instability and decreased walking speed) Blanke, 1989; Coste-Salon & al, 1989; Elble,2001; Murray, Kory & Clarkson, 1969; Serratrice& Daumen-Legre,1994). They partly explain the high prevalence of geriatric fall that reached 50 % of subjects over 65 years ans (World Health

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Organization (WHO), 1989; Prudham& Evans, 1981). Several prospective studies have found that instability Postural had a strong predictive value with respect to the risk of falling, in the community and in institutions (Campbell, Borrie & Spears,1989; Nevitt, Cummings, Kidd & Black, 1989); (O'Loughlin& al, 1983; Tinetti ME, 1988; Tinetti ME, 1986).

The well-being and quality of life are the primary concerns for the elderly. In general, the quality of life depends on the autonomy and functional capacity.il is important to promote these two elements to ensure a good quality of life (Keller & Fleury, 2000). Power is important for the maintenance of functional capacity since it is an important feature for walking up and down stairs as well as in the prevention of falls (Petrella, Miller & Cress, 2004).

Functional capacity is generally associated with lower limbs. The strength, power and muscular endurance of the lower limbs has a direct influence on the independence of the elderly. Ensuring a better response of the lower limbs; Coordination and balance also improved. Walking is a great way to counter the negative effects of aging by ensuring autonomy and independence (bélande, 2007).

Walking is often associated with since independence in itself guarantee the possibility of movement, locomotion and ensuring greater possibility of physical activity. In terms of function, walking provides a level of independence (Simonsick, Guralnik, Volpato, Balfour, & Fried, 2005; Lusardi, Pellecchia, & Schulman, 2003).

Coordination and balance also improved. Walking is a great way to counter the negative effects of aging by ensuring autonomy and independence (Béland, 2007)

The static balance and dynamic balance are essential for success, without stumbling or losing balance, daily activities such as stand up, walk, get up from a chair, up or down the stairs(Paterson, 2007). Several evaluate aging balance functions and mobility by increasing the number of ground waste (Gillespie & al, 2003); (Jessup, Horne, Vishen & Wheeler, 2003); (Mahoney & al, 2007).

Physical activity offers a major opportunity to increase the duration of active and independent lives, and reduce functional limitations (Cress & al, 2004).

The objective of this study was to define the influence of a suitable physical training on improving the walking and balance in the elderly. The main hypothesis of this study was that physical activity program adapted to a positive effect on improving the walking and balance of elderly people.

MATERIALS AND METHODS

Population

40 subjects participated in this study which. Twenty women with an average age (69.25) and twenty men with an average age of 73.95 years. each group is divided into two parts an experimental group and a control group. People who had an age greater than 60 years and had the opportunity to participate in this 12-week training cycle in two weekly 60-minute sessions were included in this study. Criteria for non- inclusion concerned the presence of respiratory diseases cardiovascular, neurological and medically evaluated and rheumatoid justifying a cons -indication to physical activity.

From Table 1, which is the main pillar of our study, in remarks The presence of a large dispersion in the age of the experimental group (6.18 ±) compared to the control group (3.31 ±). This is due to the age difference in elderly men, This does not affect our study because both groups are in old age. As for women's groups, there are no large dispersion between the two groups. Regarding the weight, height, there is no significant difference between the sexes and between the two groups, which facilitates the work of researchers. How researchers use the body mass index, we want to determine which of the ideal weight for the research sample, which researchers believe is important in determining the process of walking and balance. where the increase in underweight only affects the elderly. It was shown from the weight indicator of the study

Table 1: Characteristics of speech subjects and elderly witnesses

Group	Men				Women			
	Control		Experimental		Control		Experimental	
	X1	Y1	X1	Y2	X1	Y1	X2	Y2
Aged	69.1	3.31	71.5	6.18	71.3	4.02	69.2	3.93
Weight	76.3	6.498	73.7	4.34	68.4	3.27	75.7	6.34
Height	1.66	0.049	1.66	0.029	1.56	0.085	1.57	0.072
IMC	27.7		26.8		28.15		30.77	

sample of men and women increased weight, which means that there is an increase in body fat. This is due to physiological changes that occur with age and thus affecting the external changes.

By stella and Jacques " Older people will have difficulty in moving, to maintain good posture as well as to preserve its balance. Several phenomena occur including loss of muscle mass by 30 to 50% degeneration of cartilage and loss of elasticity of the ligaments and tendons (stella & Jacques, 2000).

Methods

The progress of the physical activity program

Subjects were assessed two days before the training period and after the end of the training period. Intervention group participants were involved in a physical activity program developed by physiotherapists and rehabilitation physician. This program lasting 12 sessions with two weekly sessions of 60 minutes. Was centered on the balance training with strengthening exercises, mobilization floor (Belhassen, 199a). learning techniques to raise the ground; coordinating work and exercises eyes closed (Belhassen, 1999b). The assessment tests are performed during the first and the last session of the cycle. A session consists of six 10-minute segments.

- 10 minutes of contact, verbalization and warm; to seek joint mobility, tone muscle and heart rate.
- 4 * 10 minutes of programmed activities based on initial assessments.
- 10 minute cool-down and verbalization. For patients control group, they have been a simple oversight and continued their life habits

Tests

All subjects performed all tests before and after the training period in order.

Test timed up and go

The test originally named Get Up and Go (Mathias &al, 1986), became the Timed Up and Go since the publication of the Podsiadlo having validated with a time score (Podsiadlo & Richardson, 1991).

This is the simplest test in consultation and probably the most reliable. a subject sitting on a chair must stand, walk 3 meters in front of him, back to the chair and sit. The score is given by the time in seconds and it certainly benefits from this test to perform clinical analysis developed at the beginning of this article. Timed Up and Go is reproducible over time and between observers and the results are correlated with those of BBS. (Yelnik, 2007-2008).

Test walking speed F8W

The F8W requires a person to walk a figure-of-8 around 2 cones placed 5 ft (1 ft=0.3048 m) apart. A figure-of-8 was chosen because:

(1) The task is readily recognized by name alone;
(2) The pattern consists of walking on curved paths, clockwise and counterclockwise, with straight-path walking between the curved paths;
(3) Alternation between straight and curved paths requires switching motor strategies, including biomechanical and movement control adjustments;
(4) Motor planning is needed to navigate the straight and curved paths.

Designed to be a measure of walking skill, we based scoring for the F8W on 3 components of skilled movemen (Brooks. V.B, 1986).: (1) speed (time for completion), 2) amplitude (number of steps taken), and 3) accuracy (a tight versus an overly wide curved path). The accuracy component was defined as follows: F8W completed within a 2-ft surround of the cones (yes or no).

Test Tinetti

(Tinetti ME, et al 1994) is certainly the most classic test in gerontology. It has two parts. The first part is a static study with 13 items, all close to those realized during a current physical examination, examination standing, ability to stand and intrinsic imbalance. Each item is rated from 1 (normal) to 3 (abnormal). The second part of the Tinetti test is an observation walk with 9 items that are simply quoted "normal" or "abnormal". These items are mostly difficult to assess. This despite being the most common test in Gerontology, it is rather vague in its quotation in particular in the second part that is never used. TT seems to be primarily an educational tool of good quality to assess very accurately the semiotic balance abnormalities as well as the walk of the oldery (Pérennou & al, 2005).

Test unipodal

Tinetti et al (Tinetti ME, 1986), unipodal showed that the test is a good way of identifying non - fallers elderly fallers of the extent that they are unable to hold this position for 30 seconds. Also, the simplicity and the validity of this test led us to use (Toulotte, Thévenon & Fabre, 2004).

The test methodology was as follows: subjects were asked to stand on one leg with eyes open for 30 seconds. The stopwatch was starting from the foot of the free leg not touching the ground The free leg should be flexed to know the angles between the trunk and the femur and the femur and tibia were 90 ° and they were tested using a tee (T). Each base foot (free leg) was recorded. Then the subjects performed the same test under the same conditions but eyes closed (Hurvitz, Richardson, Werner, Ruhl & Dixon, 2000).

RESULT

Regarding the values obtained timed and go test (Table 2). There was a significant improvement in overall score between initial and final evaluation (0.05). And degree of freedom (18). This mean that there are significant differences in the results of the experimental groups. And through the previous results, we can see that the proposed program had a positive impact. It contains exercises based on improving motor skills joints and improvement in muscle strength of the lower limbs and joint flexibility. Indeed, Sudarsky and Nashner and Cordo demonstrated that postural instability is due to a decrease in muscle strength of the lower limbs. This decrease could result from a center of displacement before gravity of the axis of the ankles, which would help balance problems and falls (Nashner & Cordo, 1981). Aging skeletal muscle results histologically by a decrease in density in muscle fibers (mostly type II). Anatomically in a reduction of muscle mass (sarcopenia) and functionally by a decrease in muscle strength (Evelyne & Jacqueline, 2011).

Table 3 compares the test result FW8 before and after training; the experimental group increased significantly (0.05) their average walking speed. But no significant difference statistically was observed between the first forward speed test and the second test in the control group. This is in agreement with the study results (James, Wall, Bell, Campbell& Davis, 2000) where a statistically significant difference (0.05) with 12 degrees of freedom between the pre- and post -test. Daily life walking often involves the added complexity of walking while doing other activities (ie, dual-task or multi-task walking. A complex task of walking may require a greater proportion of the physical and mental capacity, which results in decreased performance not seen the works for simple tasks walking (Brauer, Woollacott, Shumway & Cook, 2001). However, activities of daily living in the home and community require curved path walking ability (eg, walking around a table, avoiding obstacles, street corners navigation (Courtine, 2003).

In the experimental group training has had positive effects on test results have tinetti.et the show an improvement in gait and balance compared to the control group, the results of the calculated value T

Table 2: Comparative study between the control group and the experimental group in the pre-test and post-test in test timed up and go

Timed up and go	Group	Pre-test		Post-test		T value		Degree of freedom	The level of significance
		X1	Y1	X1	Y2	T test calculated	T test tabulated		
Men	Control	16.3	6.12	16.93	6.49	0.22	2.10	18	0.05
	Experimental	15.16	3.92	11.56	2.7	2.38			
Women	Control	16.87	3.06	18.09	1.75	1.09			
	Experimental	14.59	2.80	12.06	1.50	2.51			

Table 3: Comparative study between the control group and the experimental group in the pre-test and post-test in the test FW8

Tinetti	Group	Pre-test		Post-test		T value		Degree of freedom	The level of significance
		X1	Y1	X2	Y2	T test calculated	T test tabulated		
Men	Control	15	2	14.9	1.96	0.11	2.10	18	0.05
	Experimental	16.2	1.98	24	1.82	9.13			
Women	Control	14	2.44	13	2	1.16			
	Experimental	16	1.76	24.4	1.42	11.69			

experimental and grouped by raising compared to the value tabulated 2.10 and 18 degrees of freedom. This means that there are statistically significant differences in the experimental group results. This study is consistent with the study (sauvage & al.1992) improvement there was statistically significant at the significance level (0.05) and the degree of freedom (12). And compatible with the study (Hue., Ledrole, Seynnes & Bernard,2001), where the improvement was statistically significant between the pre- and post - test to post the significance level (0.004) and the degree of freedom (13). The control group for the value T calculated value and less than the tabulated that means there is no improvement for this group.the previous results demonstrated that physical activity program has a positive effect on improving the walking and balance on the topics are studying. And This is due to the program contained on the exercise of force, balance exercises, Stretching and flexibility exercises, coordination and this has been confirmed by studies that have achieved the same results.

Table 5 shows the results of the experimental group and control group in the pre -test and post -test time measured during static balance test with eyes open and eyes closed. The experimental group (man and woman) is improvement in static balance with eyes open and close relative to the control group. The results of the calculated value T experimental grouped and raise compared to the tabulated value 2.10 and 18 degrees of freedom. These results correspond with the study (Bernard & al, 2004) a statistically significant difference was found in the post-test at significant level (0.04) and degrees of freedom (29). The control group for the value T calculated and less than the value of T tabulated. which means that the level of balance and remained stable there is no progression. But it is remarkable that the time measured during static balance test with eyes closed and less than the time measured during static balance test with eyes open. This result goes in the same direction as those of the literature.

But it is remarkable that the time measured during static balance test eyes closed lower time measured during static balance test with eyes open. This result is the same meaning as those in the literature, the visual system and revealing imbalance that can disassembled different postures of the body parts to ensure the stability of the body in space. The aging of the balance system and the aging of the vestibular system and visual system. Balance in the trainings reduce the risk of falling and weight training ensures the maintenance of long-term independence (Geneviève, 2011).

The results of the experimental group for both sexes was observed an improvement in the equilibrium level compared to the control group. Which is evidenced by the results, when the value of "T" calculated is greater than the value of "T" and tabulated at the 95 % and 18 degrees of freedom. this is evidence that there are significant differences in the results of the experimental groups. This confirms that there is an improvement from the balance of elderly men and women. Our results point in the same direction as those of Crilly & al. (Crilly, Willems, Trenholm, Hayes & Richardson, 1989) that tested 50 women aged from 72 to 92 years after an exercise program based on postural control for 12 weeks.

Their results on the postural movements with eyes closed and open show a significant improvement compared to a control group for the anteroposterior axis provided eyes closed. All other results are not significant.

DISCUSSION

The aim of this study was to evaluate the influence of a physical activity program on improving the walking

Table 4: Comparative study between the control group and the experimental group in the pre-test and post-test in the Tinetti test

FW8	Group	Pre-test		Post-test		T value		Degree of freedom	The level of significance
		X1	Y1	X1	Y2	T test calculated	T test tabulated		
Men	Control	22.86	3.30	24.98	3.10	1.47	2.10	18	0.05
	Experimental	24.19	2.97	17.37	1.31	6.62			
Women	Control	24.39	5.83	28.39	4.23	1.75			
	Experimental	24.44	5.31	18.85	3.63	2074			

Table 5: Comparative study between the control group and the experimental group in the pre-test and post-test in the test unipoda

Group	Pre-test		Post-test		T value		Degree of freedom	The level of significance
	X1	Y2	X1	Y2	T test calculated	T test tabulated		
EOR								
Men								
Control	1.17	0.71	1.02	0.33	0.61	2.10	18	0.05
Experimental	1.08	0.67	3.02	0.69	6.32			
Women								
Control	1.07	0.29	1.09	0.32	0.73			
Experimental	1024	0.55	1.98	0.65	2.72			
EOL								
Men								
Control	1.12	0.55	0.92	0.32	0.97			
Experimental	1.17	0.54	2.07	0.70	3.19			
Women								
Control	1.02	0.32	0.97	0.26	0.34			
Experimental	1.01	0.71	1.91	0.89	2.49			
ECR								
Men								
Control	1.06	0.40	1.01	0.28	0.40			
Experimental	1.03	0.76	2.80	0.52	6.02			
Women								
Control	0.87	0.59	0.74	0.28	0.63			
Experimental	0.97	0.49	1.72	0.61	3.02			
ECL								
Men								
Control	0.89	0.47	0.81	0.40	0.38			
Experimental	1.17	0.87	1.91	0.62	2.17			
Women								
Control	0.92	0.33	0.91	0.27	0.01			
Experimental	0.94	0.60	1.63	0.67	2.42			

and balance on the elderly. Trainings were adapted according to the results in an assessment of the physical condition measuring three types of important activities result in for the elderly to maintain its functional autonomy.

Results noted that there is a variable improvement in walking and balance, but insufficient compared with the results of assessment tests walking and balance. The experimental group was not out of the danger zone falls, it means we have increased the weeks of training. But we can say that improving the walking and balance is acceptable. And the outcome of the study approved the exercises scheduled for the experimental groups improve strength and muscle power of lower members. Recent international recommendations define beneficial levels of physical activity for the health of people over 65 advocated muscle strengthening activities (work against resistance) that must complete endurance activities (aerobic) (Who, 2010). These strengthening exercises should be practiced at least 2 days, not consecutive, week in the form of exercises using the major muscle groups (with 8 to 12 repetitions of each exercise (Inserm. 2008). This study demonstrated that physical training based mainly on muscle strengthening, static and dynamic balance. The increase in muscle strength would put the center of gravity at the axis of the pins, thus giving a better balance (Toulotte & al, 2004). Through exercises conducted open and closed eyes and on different surfaces. Meanwhile, the improvement of static

balance could also come from the increase in muscle strength through exercises performed using elastic bands (Lord, Ward, Williams & Strudwick, 1999). Our results also showed a significant improvement of the various operating parameters (speed walking, walking pace). Our study shows that following a period of three months of physical training significantly improved the tests unipodal open and closed eyes, was observed in the experimental group. Does this result goes in the same direction as those of literature, established by (Haeur & al, 2001). The results of our study can then be compared with those reported by (Albinet, Bernard, & Palut., 2006), these authors have in fact recently shown that a program of physical activity two months could improve the static and dynamic balance for the healthy old people. Our results are in the same direction as that of (Brown & al 2000) conducted a randomized clinical study more focused on the physical exercises, In 84 sensitive subjects (83 years on average). The complete program included stretching exercises, coordination, balance, functional desk and muscle building for 3 months with 3 sessions per week. The results show an improved strength, balance, flexibility and functional capacity.

CONCLUSION

This study demonstrated the possibility for elderly people to improve the parameters of walking and static balance through training of 12 weeks based on muscle strengthening, Walking on deferent track and also on the static and dynamic balance the trainings reduce the risk of falling and weight training ensures the maintenance of long-term independence. Therefore, physical training would reduce or delay the effects due to aging and now physical autonomy since no new fall was reported during this training period.

To maintain functional independence along with the increase of life expectancy is one of the key goals of the health policy for the elderly. Maintaining physical activity helps maintain muscle function needed to maintain mobility and ability to perform activities of daily living among seniors. Physical activity prevents the appearance of a number of adverse events related to aging in the elderly generates a wellness accompanied physics.

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