

Improvement of the cardiorespiratory endurance, perception of the effort and walking performance of the old people of the hospice Saint Marc of Kingasani by the practice of the adapted physical activities

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DOI: 10.18621/eurj.434150

ABSTRACT

Objective: To verify the effects of functional rehabilitation associated with a program of physical activities adapted to the biomechanical parameters and perception of the effort of the elderly.

Methods: A longitudinal experimental study of 30 elderly people living in the old people's home was conducted during a 6-month period from July 2017 to January 2018. It consisted in evaluating the biomechanical parameters and perception of the effort of older people a functional rehabilitation program associated with the practice of adapted physical activities. The parametric t test of student was used to compare the averages of different parameters of study before and after the intervention program. The statistical test results used were interpreted at the $p < 0.05$ significance level for statistical decision making.

Results: After 6 months of intervention, the elderly significantly improved their biomechanical parameters: balance ($p = 0.002$), rate ($p < 0.01$), walking speed ($p = 0.03$), strength and muscular strength of the limbs lower ($p = 0.041$), perception with effort ($p = 0.03$). This program also allowed them to reduce their risk of falling ($p = 0.057$) and to increase their motor autonomy ($p = 0.003$).

Conclusion: This study shows that a biomechanical evaluation associated with functional rehabilitation improves the balance and motor autonomy of the elderly, which leads to an improvement in their quality of life.

Keywords: Endurance, perception of the effort, walking performance

Received: Received: June 15, 2018; Accepted: August 19, 2018; Published Online: November 1, 2018

It is mentioned that aging can be a public health problem and this may be the cause of balance and falling problems. It sometimes causes falls which constitute a major public health problem in terms of hospitalization, morbidity and cost [1, 2]. Falls are common among older people, one third of people over 65



e-ISSN: 2149-3189

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and 50% of those over 80 fall at least once a year [3, 4]. It has been stated that rehabilitation will increase the quality of life in elderly people. The importance of healthy aging has been emphasized. The maintenance of balance involves several structures such as sensory receptors, the central nervous system and effectors [5, 6].

The goal of aging should not only be to gain years of life, but above all, to improve quality of life. The challenge represented by a successful aging, would thus reside in the increase of life expectancy without disability. In this perspective, the practice of a regular physical activity holds a preponderant place: whether in the framework of primary prevention (by delaying the appearance) or secondary (by slowing down) of the "bad" aging, by improving the quality of life and by reducing the entry into an institution.

Regular physical activity has many beneficial effects on the various components of physiological aging [7-9].

In the Democratic Republic of Congo, we have found that care for the elderly living in hospices in Kinshasa is starting to increasingly associate functional rehabilitation with the practice of adapted activities.

However, no studies have been conducted to verify the effects of this management on the cardiorespiratory endurance, perception of the effort and walking performance parameters of older people which is why we conducted this study to fill this gap.

METHODS

Nature and Period of Study

In this study, we opted for the experimental method and conducted a longitudinal study which consisted in evaluating the biomechanical parameters and perception of the effort of the elderly subjected to a program of functional reeducation associated to the practice of the adapted physical activities during the period from July 2017 to January 2018.

Framework of the Study

Our study took place at the old men's hospice Saint Marc of Kingasani in the commune of Kingasani, city of Kinshasa province / Democratic Republic of Congo.

Study Population

The population of this study consisted of 50 elderly people in the hospice of old St. Mark of Kingasani.

Sampling and Sample

In this population of 50 subjects, we randomly drew a sample of 30 seniors whose average age ranges from 76 to 85 years.

- Inclusion criteria

1. To have accepted to participate in this study;
2. Be present on the first and last day of the evaluation;
3. Have a medical report authorizing the practice of physical activities;
4. Being regular: having attended at least 95% of the functional rehabilitation sessions according to the attendance list;

- Exclusion criteria

All persons who did not meet the inclusion criteria above were excluded.

Choice and Justification

➤ Choice

Our choice was focused on the hospice of old men's hospice Saint Marc of Kingasani because of the large number of elderly people who live there.

➤ Justification

The choice of this group is justified by the fact that we were authorized by the hospice to take care of the elderly.

Data Collection Technique

Cardiorespiratory endurance, perception of the effort and walking performance parameters were assessed before and after the program. The walking speed was measured with a stopwatch, the elderly are timed while walking a distance of 6 m at their preferred speed or spontaneous speed, the normal walking speed in the elderly varies between 1.1 and 1.5 m / sec; the rate was measured as the number of steps per minute, the baseline was based on the size of the elderly person and ranged from about 90 steps / minute for tall subjects (1.83m) to about 125 steps / minute for small subjects (1.5m); Timed get up and go Test was evaluated thanks to the time taken by the

Table 1. Comparison of average cardiorespiratory endurance, perception of the effort and walking performance of men before and after the intervention program

Parameters	Men (n = 17)		p value
	Before	After	
Rate (pas/min)	35.2 ± 9.36	45.2 ± 3.42	0.005
Walking speed (m/sec)	0.37 ± 0.09	0.2 ± 0.44	0.042
Risk of falling	17.4 ± 1.51	27,4 ± 1.34	< 0.01
LL muscle strength	2 ± 0.70	4.2 ± 0.44	< 0.01
Motorskills (sec)	29.8 ± 0.44	18.8 ± 1.30	< 0.01
Perception of effort	7.2 ± 0.83	4.4 ± 1.14	0.002

The values were presented as mean ± SD (standard deviation), LL = lower limb, *p* < 0.05 statistically significant

subject to get up from a chair, walk 3 meters, turn around, go back to the seat and sit down; Strength and muscle power of the lower limbs was measured using the number of sit-stand achieved by the subject in 30 seconds, An impossibility or low score below five sit-stand passages sign a level of dependence high and perceived effort was measured using the borg scale, rated from 0 (no effort) to 10 (very very difficult effort).

Description of the Program

The intervention program consisted of static and dynamic balance exercises; exercise of walking on without obstacle then with obstacle; aerobic exercise, muscle strengthening exercises of the upper limbs, lower limbs then abdominals and relaxation exercises.

Ethical Consideration

All subjects had consented in writing to participate in the study according to the Helsinki Declarations. The information collected from the elderly was kept confidential. And all Authors declare originality and ethical approval of research. Responsibilities of research: responsibilities against local ethics commission are under the Authors responsibilities.

The study was conducted under defined rules by the Local Ethics Commission guidelines and audits.

Statistical Analysis

After being validated, the data was entered using Microsoft World and Excel 2013 software. Quantitative data were represented as mean ± standard deviation with their extremes in the tables. Statistical analyzes were performed using SPSS 20.0 software (Statistical Package Social Science). In univariate statistical analysis, the matched student t test allowed us to compare the averages of the study parameters before and after the intervention program. The statistical test results used were interpreted at the *p* < 0.05 significance level for statistical decision making.

RESULTS

Comparison of means before and after the intervention program

Sex effect

In men, the data in Table 1 shows a statistically significant difference for cadence parameters, fall risk,

Table 2. Comparison of average cardiorespiratory endurance, perception of the effort and walking performance parameters of women before and after the intervention program

Parameters	Women (n = 13)		p value
	Before	After	
Rate (pas/min)	35.2 ± 9.36	38,92 ± 11,43	0.005
Walking speed (m/sec)	0.372 ± 0.09	0.1 ± 0.12	0.05
Risk of falling	17.4 ± 1.51	20.04 ± 1.17	0.006
LL muscle strength	3 ± 0.70	1 ± 0.73	< 0.01
Motorskills (sec)	29.8 ± 0.44	30.6 ± 0.95	0.001
Perception of effort	7.2 ± 0.83	4.12 ± 0.88	< 0.01

The values were presented as mean ± SD (standard deviation), LL = lower limb, *p* < 0.05 statistically significant

Table 3. Comparison of means of cardiorespiratory endurance, perception of the effort and walking performance parameters at the first and third test

Parameters	1 st Passation	3 th Passation	p value
Rate (pas/min)	38.3 ± 11.05	47.63 ± 8.152	< 0.01
Walking speed (m/sec)	0.4 ± 0.12	0.37 ± 0.09	0.03
Risk of falling	17.1 ± 1.21	27.23 ± 1.194	0.007
LL muscle strength	1.97 ± 0.71	4.47 ± 0.571	0.041
Motorskills (sec)	30.47 ± 0.93	19.23 ± 1.478	0.003
Perception of effort	7.13 ± 0.86	4.33 ± 0.802	0.03

The values were presented as mean ± SD (standard deviation), LL = lower limb, $p < 0.05$ statistically significant

perceived effort, lower limb strength and muscle power, motor skills, and speed of movement. walk after the program (Table 1).

We observed in the table above that elderly women living in the elderly home have statistically improved their cardiorespiratory endurance, perception of the effort and walking performance parameters after our intervention program (Table 2).

In Table 3 comparing the averages at the first and third tests, all the cardiorespiratory endurance, perception of the effort and walking performance parameters were significantly modified.

DISCUSSION

We conducted a longitudinal experimental study that consisted in evaluating the cardiorespiratory endurance, perception of the effort and walking performance of 30 old people living in the home of old man subjected to a program of functional rehabilitation associated with the practice of the adapted physical activities during a period of 6 months from July 2017 to January 2018.

This study reveals that the cardiorespiratory endurance, perception of the effort and walking performance of older men were significantly modified after the intervention program.

These results are consistent with those observed in the Salma *et al.* [10] who indicated that the program of resistance exercises, stretching, games activities, games, circuits, dance and relaxation offered to the elderly, were effective in reducing their risk of falling and thus improved their cardiorespiratory endurance, perception of the effort walking performance.

Falls can be prevented by exercise programs aimed at normalizing or restoring muscle strength, restoring

balance and reducing the use of drugs [11].

In the literature, it has been demonstrated that muscle strengthening and stamina enhancement help to maintain functional abilities and complementary effects in balancing work on falls prevention [12-14]. With respect to the 13 older women after the intervention program, this study has shown that the latter have significantly improved their cardiorespiratory endurance, perception of the effort and walking performance. These results corroborate those found in the Soares and Sacchelli study [15], which showed that regular exercise by a group of elderly working women and another group of sedentary older women revealed that this activity has an influence positive on the maintenance of balance, which means that the chances of suffering a falls are lower in active older women.

It has been proven that the cognitive abilities, quality of life, prevention of age-related bone loss, etc. [16-18].

Our results differ from those found by Manckoundia [19] which emphasize that a management exclusively by progressive muscular reinforcement, brings an improvement in muscular strength, and certain functional activities (standing seated transfer) the speed of walking and a reduction of pain in patients. This is justified by the fact that Manckoundia *et al.* based their program exclusively on muscle strengthening exercises against us, we used several varieties of exercises.

Regarding the handover effect, we noticed that at the third handover compared to the first, the elderly significantly improved their rate ,walking speed , muscle strength and power of the lower limbs , motor skills , the risk of falling and the perception of effort. These results are similar to those of the literature which emphasize that the maintenance abilities of

balance functions and muscle strength are preserved in the elderly [19, 20]. The epidemiological studies have shown the benefit of regular exercise in reducing the risk of falling, regardless of the role of exercise on the prevention of osteoporosis. A meta-analysis of studies using the management of fallers showed that all management including exercises and balance work reduced the risk of falling. It has been clearly shown that some practices such as tai chi, lead to offer exercises conducive to better control of balance [21-23].

According to Buranello *et al.* [25], in their study, the risks of falls are closely linked to the maintenance of balance and that the practice of physical exercises is effective in reducing the risk of falls and improvement of cardiorespiratory endurance and walking performance.

Our results corroborate with those of the literature which emphasize that the balance training is the key to any fall prevention exercise program [25, 26].

The results of this study are different with those found by Mariama BAH in 2016, which does not seem to have given positive results on the improvement of the balance in the elderly following a management based exclusively on muscle strengthening exercises [27]. This difference is justified by the fact that the intervention program applied by the latter did not take into account the variety of exercises.

Limitations

The small number of patients was relatively themain limitation of this study. So, a study with more patients wouldprovide a more comprehensive picture.

CONCLUSION

This study shows that the regular practice of adapted physical activities associated with functional rehabilitation allows the elderly to improve not only their cardiorespiratory endurance, and walking performanceparameters but also their perception of the effort whatever the sex. Given the importance of the physical activities thus demonstrated, the hospices of old people must have a specialist in adapted physical activities in their multidisciplinary team. A study carried out on a large number of older people must be undertaken.

Authorship declaration

All authors listed meet the authorship criteria according to the latest guidelines of the International Committee of Medical Journal Editors, and all authors are in agreement with the manuscript.

Conflict of interest

The authors disclosed no conflict of interest during the preparation or publication of this manuscript.

Financing

The authors disclosed that they did not receive any grant during conduction or writing of this study.

Acknowledgment

Our thanks go to the authorities of the hospice of old men Saint Marc of Kingasani for allowing us to conduct our research within this institution and the elderly to have agreed to work with us.

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