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Effects of a health improvement programme on quality of life in elderly people after falls

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ABSTRACT

Introduction: Falls of elderly people illustrate a telling health problem related to both physical injury and its psychical effects. They also bring about significant medical and economic consequences.

Aim: The aim of this study is to assess the predisposition to falling as well as the subjective evaluation of quality of life in the elderly after implementation of the fall prevention programme.

Material and methods: The observational study and statistical methods encompassed people aged 65 or older who reported falls during ordinary daily activity. A group of selected patients took part in a three-stage (three-month) rehabilitation programme designed by the authors. The research tools consisted in modified scales: the Katz ADL scale, the Lawton IADL scale, the Tinetti test for balance and gait evaluation, and the EuroQol 5D questionnaire for subjective evaluation of quality of life. The study included test performer before implementing the programme as well as after its completion.

Results and discussion: Slipping at home was the most frequent cause of falling, as it constituted almost 50% of the analyzed cases. During the programme no falls were observed. Patients who completed the programme showed improvements in all the analyzed aspects, especially in activities of daily living and the level of pain.

Conclusions: Both considerable functional and physical improvement as well as lower levels of pain was observed in the participants of the programme. A systematically conducted health improvement exercise programme minimizes susceptibility to falls and has a beneficial effect on improvement of quality of life in elderly people.

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1. Introduction

The underlying causes of falls in the group of elderly people concern numerous overlapping internal and external factors. The internal factors include age, sex, living alone, frequent medicine use, multiple co-morbidities, motor and gait impairment, nutritional deficiencies, dementia, vision deficits, and many others.[1–4] As a result of these circumstances, one deals with lowered attention, orthostatic disorder (which is a common symptom of impaired blood pressure regulation especially after assuming the upright position, which is related to the aging process), diseases (hypertension, diabetes, influence of medication, etc.) and symptoms of balance disorders, which in consequence lead to falls. The external factors consist in environmental hazards (poor lighting, slippery floors, uneven surfaces, living alone, etc.), inappropriate footwear or clothing, inappropriate walking aids or assistive devices, architectural barriers.[5–7] Also being careless while performing daily life activities and walking in disorderly space or on stairs may lead to falls.[1,8] A fall results in an injury which impairs mobility and independence, leading at the same time to disability, which may cause a serious decrease in quality of life of an elderly patient. A long-term disability exerts dramatic effect on the life of family members and care givers of elderly people.[1,9] There appears also a secondary problem limiting the activity of elderly people after falling – the so called 'post-fall syndrome,' which is characterized by a fear of falling again, not undertaking some activities, considerably limited motor activity with secondary impairment of physical ability, and subsequent lowering of quality of life.[9–11]

This process determines physical functionality, a feature which is individual to each person and which is defined as a process of adapting to the environment. The concept behind the fall prevention relies on minimizing susceptibility to falling: improving the indicators of physical ability, minimizing the post-fall syndrome, and in turn increasing the subjective evaluation of quality of life.

2. Aim

The aim of this study is to assess susceptibility to falling as well as the subjective quality of life after implementation of the fall prevention programme.

3. Material and methods

The observational study and statistical methods encompassed people aged 65 and more whose health was being improved in a day care unit of Rehabilitation Department. The research was conducted over the period of 3 years. The 'fall prevention' programme, which in each case lasted for 3 months, was conducted only for those patients who presented in order to improve their health after an injury caused by a fall (during the day, while performing activities of daily living). The research included 87 patients. Conditions to be met in order to qualify a patient for the programme comprised: signing an agreement to participate in a fitness experiment, falls confirmed in an interview, walking alone (or with an assistive device such as a walking stick or a crutch), a general condition enabling the patient to participate in the programme. The disqualifying criteria comprised diagnosed Alzheimer's disease, Parkinson's disease, and post-stroke states. The basic research tool consisted in the modified scales: Katz – Activities of Daily Living (ADL), Lawton – Instrumental Activities of Daily Living (IADL), Tinetti test for balance and gait evaluation, and the EuroQol 5D questionnaire for subjective evaluation of quality of life.

Having interviewed the subjects, the researchers established the most common circumstances in which falls occurred. These were decreased vigilance, lack of support, absentmindedness, hurry and co-occurring diseases causing orthostatic disorders.

The functional assessment was performed on the basis of a modified ADL scale, which evaluates the basic activities of daily living, and a modified IADL scale, which evaluates more complex activities of daily living.[12,13] Application of the ADL scale allowed the authors to assess six basic activities of daily living. These were: (1) taking a shower/bath, (2) dressing or undressing, (3) using the toilet, (4) moving from the bed to the armchair, (5) eating and (6) sphincter control. Every activity performed without assistance was awarded one point. The lower the independence, the lower the score the patient received. The Lawton IADL scale made it possible to assess eight functional parameters. These were abilities to: (1) use a telephone, (2) do shopping, (3) prepare meals, (4) do housework, (5) do the washing, (6) use transport, (7) take medications, and (8) manage money. The higher the score, the better the functional ability of the patient. Pursuing the objective of the study, the physical condition of the subjects was assessed with the use of a modified Tinetti test.[14] In the part devoted to balance, the following activities were assessed: (1) arising from a chair with eyes open, (2) sitting down on a chair, (3) shifting to the balanced sitting position: upper limbs to the side, lower limbs above the ground, (4) standing with eyes closed, (5) standing with a stick on one foot, (6) sitting down on a ball (balance, unbalance), (7) arising from a chair + walking around it + sitting down again, arising from a chair + turning around + sitting down again. In the part concerned with gait, the assessment concerned the ability to walk in a balanced way (along a route and a line), to walk sideways (step), to walk sideways (grapevine), to walk around a circle 1.5 m in diameter, to walk and step over an obstacle, to walk and go past an obstacle, to walk and climb an obstacle, to walk across the street. The assessment also included the ability to walk in all directions, simultaneously overcoming obstacles, moving objects of various sizes, lifting objects and reaching for objects overhead. Obtaining fewer than the maximum of 82 points indicated a risk of falling. In order to assess the subjectively evaluated quality of life, a modified EuroQol 5D test was applied. It checked self-assessment with reference to five fields that focused on: mobility, self-care, leading a normal daily life activity, presence and degree of pain, mood disorders. Exercises were selected individually for each patient, with special attention paid to their difficulties while performing them or excluding those impossible to perform. The general structure of the programme is presented in Table 1. It included exercise in front of a mirror (individual demonstration):

Table 1 – Programme.

Stage	Types of exercise
Month I	Body posture exercise Balance exercise Exercise generally improving condition
Month II	Improving body posture and balance Improving gait indoors Complex exercise generally improving condition (moving objects, rach-to-grasp grip, etc.)
Month III	Improving gait outdoors (uneven surface, sudden turns and stops, overcoming terrain obstacles, etc.) Controlling and improving activities of self-service at home and outside

demonstration + instruction (performs with difficulty, repeats after demonstration); exercises of one's own (remembered ones). To improve gait and balance, exercises such as the following were introduced: marching with changing pace, marching with changing direction, trunk twists, bends, exercises with a chair, moving big objects, moving small objects in both hands, moving unstable object (a cup on a saucer, an egg on a spoon). Exercises preventing orthostatic disorders included: lifting objects such as a towel, a sponge, a pen; reach-to-grasp a shelf overhead. The subjects performed their activities alone at home, having been instructed to exercise three times a week.

The distribution of results is presented in histograms. The statistical analysis was performed with the use of Start Graphix 5.0 software. The applied tests comprised: χ^2 test for independence and non-parametric singed-rank test. The significance level $\alpha = 0.05$ was predetermine to indicate that the acquired data was statistically significant.

4. Results

On the basis of the medical history of the patients it was determined that the most frequent cause of falling (48%) was slipping due to icy surface, slippery surface in an unknown area, slipping at home (on rugs or unexpected obstacles such as spilled water). Only in 10% of the falls, the cause consisted in orthostatic disorders while standing up after waking up. The results are shown in Fig. 1.

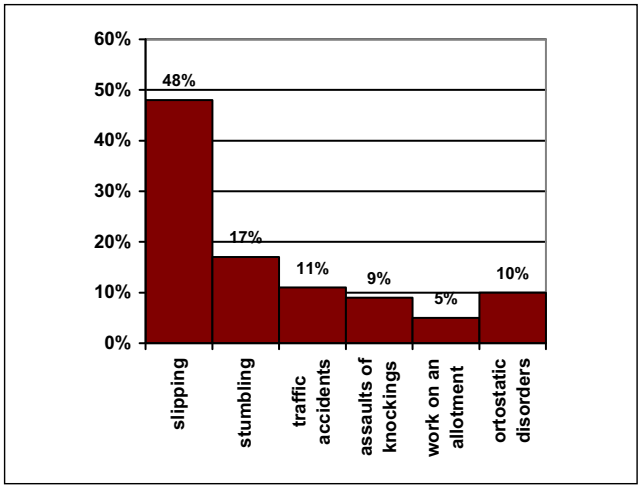

Fig. 1 – Circumstances of falls.

Analysis of the obtained results referring to susceptibility to falling before and after the exercise programme is presented in Table 2. The histogram shows the statistical analysis (Fig. 2). It shows a shift of the peak value toward an improvement of the analyzed values (a higher score). This is reflected also in an increased mean value and a shift of the histogram. A considerable physical and functional improvement was observed, an improvement, which is statistically significant.

The scores referring to the subjective evaluation of quality of life are presented in Table 3. The histogram shows an increase of the peak value and is shifted toward an increased self-assessment of quality of life. It is also visible that the mean value in the histogram increased and the coefficient of variation decreased after the therapy (Fig. 3).

It was also checked answers for which questions responses made a statistically significant difference. With reference to the first two questions (the first concerning walking alone, without help, and the second referring to self-care), a tendency toward an improvement was observed, without statistically significant difference.

For next three questions – which referred to activity in free time, pain and mood disorders – a statistically significant difference was observed between the distribution of

Table 2 – Results of subjects qualified for the fall prevention programme referring to susceptibility to falling.

Parameter	Before exercise	After exercise
Number of patients	87	87
Mean score	51	63
Median	51	64
Mode	69	71
SD	12.9	9.0
Minimum	18.0	32.0
Maximum	71.0	77.0
Lower quartile	42.0	58.0
Upper quartile	64.0	70.0

Statistical assessment of therapeutic effects (signed-rank test)

Statistical value	*P*-Value	Statistical conclusion
8.1025	0.0000	Statistically significant difference between groups

Table 3 – The summary score of the subjects qualified to the fall prevention programme (N = 87) referring to the subjective evaluation of quality of life (EuroQol5D).

	$\bar{x}\pm\sigma$	Median	Mode	Minimum	Maximum
Before therapy	5.3 ± 3.2	5.0	3.0	0.0	10.0
After therapy	6.4 ± 2.8	6.0	5.0	0.0	10.0

The achieved therapeutic effect is statistically significant $P = 0.0000$, signed-rank test.

Table 4 – The variable of daily life activity in free time in the subjects before and after the exercise.

	Before therapy		After therapy	
	Number of subjects	Stratum weight, %	Number of subjects	Stratum weight, %
Daily life activity in free time				
Very good	32	18.39	41	23.56
Moderate	37	21.26	40	22.99
Very bad	18	10.34	6	3.45

There is a statistically significant correlation between daily life activity and the time of evaluation.
$P = 0.0270$; Cramer's coefficient $V = 0.2038$ (χ^2 independence test).

Table 5 – The variable of pain in the subjects before and after the exercise.

	Before therapy		After therapy	
	Number of subjects	Stratum weight, %	Number of subjects	Stratum weight, %
Pain perception				
No pain	17	9.77	29	16.67
Moderate pain	32	18.39	35	20.11
Severe pain	38	21.84	23	13.22

There is a statistically significant correlation between pain and the time of evaluation.
$P = 0.0309$, Cramer's coefficient $V = 0.1999$ (χ^2 independence test).

scores before and after the therapy, which confirms an increased subjective evaluation of quality of life (Tables 4–6; and Figs. 4–6).

5. Discussion

The importance of both internal and external factors leading to falls in the elderly is comprehensively treated in the literature

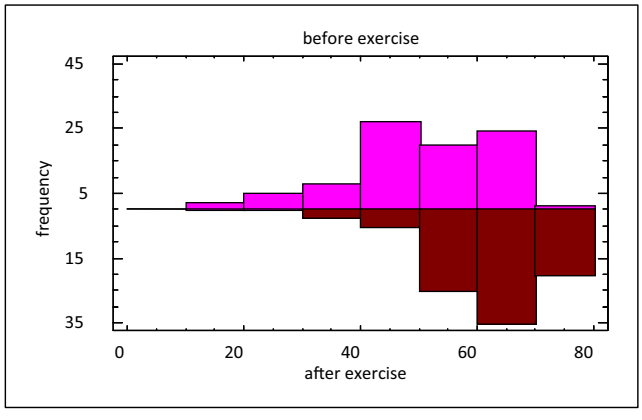

Fig. 2 – The summary score for functional ability and physical condition in the subjects (susceptibility to falling). A comparison of scores for one person before and after the implementation of the programme.

of the subject. Reducing some of them is strongly dependent on physical ability and health of the elderly patient. Insightful studies of numerous authors demonstrate that the external factors have less effect on the risk of falling.[1,4,10] A lot of studies show that the direct health-related causes of falling include: balance disorders, impaired muscular strength, disorders of gait and dizziness (psychomotor agitation), limited independence in daily life activities, a decrease in blood pressure, seizures, fainting and eyesight disorders.[10,15]

Falls can be prevented through a multi-strategy intervention which embraces means leading to changing patients' behaviors, systematic exercise, recreational activities such as walks, exercise in the swimming pool, as well as breathing exercise.[1,16,17]

Appropriately chosen exercise and repetitiveness of performed activities ensure a decrease in the risk of falling, which is confirmed also by Stel and Stewart.[18,19] Focused exercise and gait training programmes (i.e. walking), physical exercise, balance training, physical therapy, low-load training, and individually addressed programmes minimize susceptibility to falling and increase independence of the elderly.[20] Obviously, falls result not only in injuries but also in the fear of another fall. This leads to decreased activity, assuming a passive approach to life, limiting everyday mobility, depressive states, which in turn lead to lowered quality of life.[21,22]

In order to prevent the above sequence, the fall prevention programmes have to raise awareness of the elderly and their

Table 6 – The variable of mood disorders in the subjects before and after the exercise.

	Before therapy		After therapy	
	Number of subjects	Stratum weight, %	Number of subjects	Stratum weight, %
Mood disorders				
Never	18	10.34	18	10.34
Sometimes	24	13.93	42	24.12
Often	18	25.86	27	15.52

There is a statistically significant correlation between mood disorders and the time of evaluation.
$P = 0.0091$, Cramer's coefficient $V = 0.2378$ (χ^2 independence test).

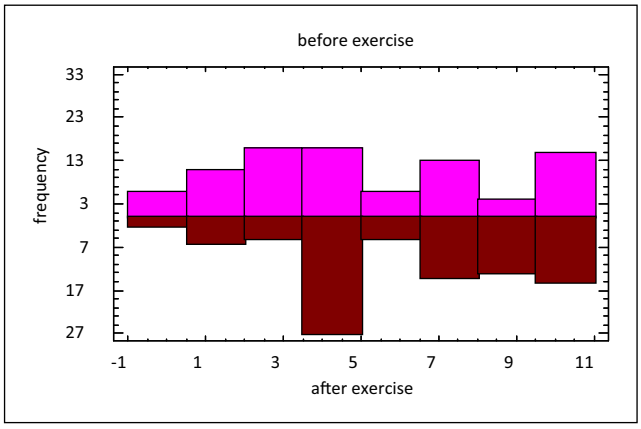

Fig. 3 – The summary score for subjective evaluation of quality of life (EuroQol5D) before and after the implementation of the exercise programme.

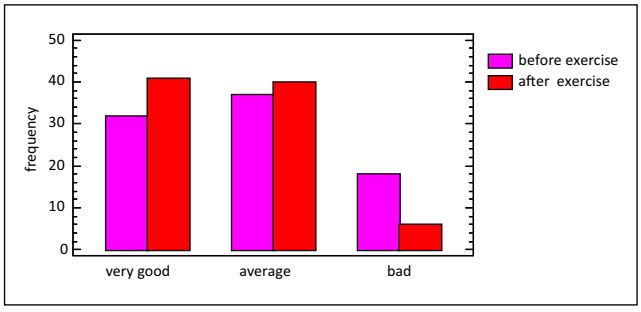

Fig. 4 – The histogram of summary score for daily life activity in the subjects before and after the exercise programme.

caregivers through participation in various workshops and life of their communities.[23]

On the basis of the research referring to quality of life, in which the authors applied EuroQol 5D questionnaire for patients after falls and which followed implementing a programme of simple exercise, it can be said that the self-evaluated quality of life of the patients increased. There are also satisfactory results when it comes to subjective evaluation of walking alone and self-care, for which there appeared a tendency toward improvement of the analyzed variables. An increase in daily life activity in free time, as well as a decrease in pain and mood disorders also influenced health improvement in the subjects.

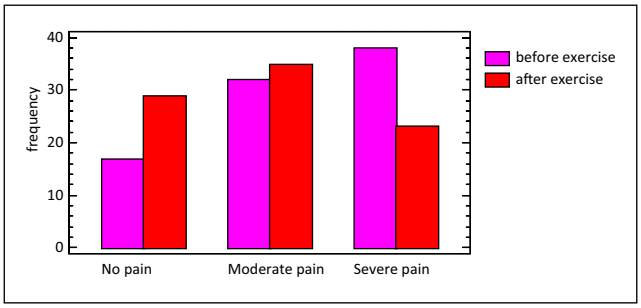

Fig. 5 – The summary score for pain before and after implementing the exercise programme.

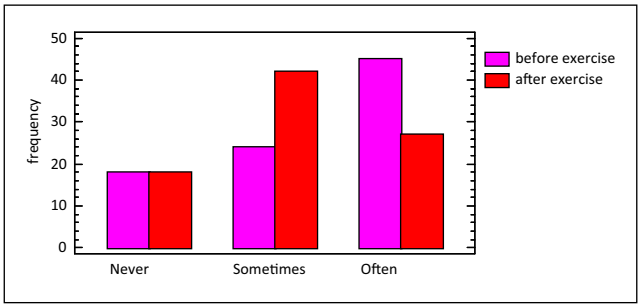

Fig. 6 – The summary score for mood disorders before and after implementing the exercise programme.

6. Conclusions

The implemented improvement programme increased the level of physical ability in the elderly, considerably limiting the risk of falling. Increased daily life activity, less severe pain and less frequent mood disorders significantly improved their quality of life.

Conflict of interest

None declared.

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