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**EFFECTS OF PHYSICAL ACTIVITY ON THE OCCURENCE
AND PROGRESSION OF COGNITIVE IMPAIRMENT IN
ELDERLY**

ABSTRACT

SCIENTIFIC COORDINATOR: PROF. UNIV. DR. ROXANA-SANDA POPESCU

PhD STUDENT: IOANA GABRIELA FIȚA

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INTRODUCTION

World Health Organisation (WHO) mandates physical activity for elders over 65 years old, in the absence of medical contraindications, regardless of race, gender, ethnic group or income.

Though every society and almost every country agree on the importance of physical activity and its impact over the physical health, there is controversy surrounding the positive impact of mild-moderate intensity of physical activity on the cognitive impairment of elderly persons. There is evidence suggesting that sustained physical activity helps preservation of the cognitive function. Yet, more evidence is needed for the hypothesis that regular practice of low intensity form of physical activity has a positive influence on the process of healthy cognitive aging.

This paper brings strong arguments that the consistent usage of some simple therapeutic methods as walking could make the difference between a senescence with an improved quality of life, close to a normal adult, and a disabled senescence, with increased care needs and poor quality of life.

The clinical research has been conducted at the National Institute of Geriatrics and Gerontology „Ana Aslan”, Bucharest and the results are based on two longitudinal studies that recruited elderly subjects from the aforementioned Institution: one retrospective observational study, " Evaluation of risk factors for age related cognitive decline " with 415 patients ≥ 65 years enrolled and another longitudinal study, this time a prospective study, involving 223 subjects aged ≥ 65 years and investigating the influence of moderate physical activity on mild - moderate cognitive impairment evolution - „Effects of physical activity on the occurrence and progression of cognitive impairment in elderly”.

Last but not least, in order to evaluate the potential of implementing of such measures, in elderly patients therapy, in the actual conditions of the healthcare system in Romania, we made an initial evaluation (acceptability study) of an European standard of care for elders „EASY – Care Standard 2010” questionnaire. The research has been done in collaboration with the University of Sheffield from UK.

ACTUAL KNOWLEDGE

1 Definitions and concepts

The first part of the paper presents the concepts and operational definitions used, in order to have a uniform and adequate approach of the research topic.

The first chapter describes aspects of elderly, age and the concept of geriatrics and gerontology. We also addressed the aging theories studied so far, with the presentation of two of the most important theory of free radicals and cellular aging theory.

2 Demographics

This chapter approaches general aspects of population aging, its socio-economic effects and elderly medical care impact on the medical system. Any demographic changes arising from the aging world population have a significant impact on the society and particularly on the costs of medical services necessary for the elderly care.

3 Elders characteristics

We introduced in this chapter the general concept of a geriatric syndrome and the description of the four major geriatric syndromes, otherwise known as "the 4 giants of geriatrics", as well as clinical particularities of elderly pathology.

We have described the importance of comprehensive geriatric assessment and the scales used for patient management over 65 years of age, which is different from assessing adult under 65 years old, due to biological peculiarities of the elderly.

4 Physical activity in elderly

This chapter describes elderly musculoskeletal changes and their impact on daily activities and quality of life.

We also described the concepts of physical activity, physical exercise and the data known so far about the positive effect on the changes that occur due to age and sedentary lifestyle but also on the chronic pathology common on people above 65 years old.

5 Cognitive function in elderly

Normal cognitive aging is represented by cognitive changes associated with aging and they are not considered pathological. Cognitive alterations besides normal cognitive aging are defined as pathological cognitive disorders. We described the data known so far about the influence of physical activity in general and walking in particular on elderly cognitive function.

PERSONAL CONTRIBUTIONS

6 Evaluation of risk factors for age related cognitive decline

The study objective was to detect the influence of the physical activity (represented by daily activity performed by the patient included in study) upon cognitive decline. Two non-direct parameters – Living Environment (Urban/ Rural) and Long term active/passive physical activity – have been used in order to identify the influence of daily physical activity on cognitive decline. The severity of cognitive decline has been measured using Mini Mental State Examination (MMSE) on persons older than 65 years of age over a period of two years.

This study is a retrospective observational clinical study and included 415 patients aged ≥ 65 years, hospitalized in the 4th Department of INGG Ana Aslan, during 2009-2010.

Assessment of cognitive function has been made using Mini Mental State Examination (MMSE), which is recorded in all patients as part of the usual in-hospital evaluation.

Our results confirm the possibility of using the living environment and the type of professional activity as indirect parameters for evaluation of the effect of prolonged physical effort (represented by daily activity performed) on the development of cognitive impairment in the elderly. These preliminary results were used as the first indicator of the evolution of a homogenous population of elderly persons over 65 years with similar living habits and coming from a similar cultural background. The results of the evaluation show in this particular population correlations between cognitive function, physical activity, metabolic profile (serum total cholesterol, triglycerides, fasting glucose, BMI), blood pressure. The same population characteristics were used then in a follow-up prospective research that constitutes the last part of this PhD thesis.

7 “EASY – Care” System

Easy-Care System is a set of assessment, guidance and education tools used for primary care of the elderly. This system was initiated between 1990 and 1994 as a project of the World Health Organisation and developed by the European Commission, initially in Europe, later expanding globally. Today the system is applied in various forms in 30 countries on all continents.

Since this thesis aims to assess an important parameter of elderly care, ie. the effects of physical activity in this group, for a better understanding of the integration of our results, we considered important to assess the implementation of Easy-Care system in Romania and to utilize the results of this assessment as a tool to measure objectively the

readiness of the healthcare system to implement behavioural modifications measures aimed to delay the decline of cognitive function in Romanian elders.

The study was conducted on a total of 20 patients aged over 61 years admitted to the National Institute of Geriatrics and Gerontology "Ana Aslan", Bucharest, in a period of nine months (January to September 2011). A total of 10 specialists of Geriatrics and Gerontology and 10 Family Medicine Physicians have been interviewed using questionnaires designed for this purpose.

For data collection we used three questionnaires:

1. Questionnaire "Easy-Care Standard 2010", translated in Romanian that was applied to patients.
2. A semi-structured evaluation form assessing the acceptability and benefits of "EASY-Care" questionnaire which was addressed to patients.
3. A semi-structured evaluation form assessing the acceptability and benefits of "EASY-Care" questionnaire which was addressed to the doctors.

The results of this exploratory study showed that patients, geriatric physicians and family practitioners consider EASY-Care questionnaire possessing a high degree of acceptability. EASY-Care questionnaire was considered by all physicians interviewed as an useful tool for assessing the health and social care needs of the elderly.

All doctors interviewed considered that the EASY-Care questionnaire should be introduced as a compulsory part of the routine assessment of elderly patients. The only element identified by both the patients and the physicians that could hamper implementation and integration into practice, is the time required by the questionnaire application to the patients. The doctors felt that the questionnaire should be applied by trained medical personnel involved in the care of elderly patients.

Questionnaire "Easy-Care Standard 2010" introduces a standardized assessment of elderly patients.

8 Effects of physical activity on the occurrence and progression of cognitive impairment in elderly

The last study performed in this research was a study evaluating the influence of moderate physical activity on mild - moderate cognitive impairment, assessed by the Mini Mental State Examination (MMSE) and the clock drawing test (TDC). Depression, an important covariant, has been assessed separately through GDS (geriatric depression scale).

The study was designed and conducted in a prospective longitudinal way. It involved a number of 223 subjects aged ≥ 65 years. Subjects included in the study, were subjects hospitalized in NIGG "Ana Aslan" for geriatric assessment and treatment in the interval 2009-2012.

The subjects were asked to perform the following task: continuous easy walking for 60 minutes, three times a week (approximately 2 km each time), with short pauses of maximum 3 minutes (max 3 pauses).

Groups and subgroups of the study were homogeneous in terms of education level and were consistent in terms of the distribution of cognitive impairment.

We have noticed, that for all subjects enrolled in the study, there was a progressive decrease in the scores on tests assessing cognitive function TDC and MMSE at both times of assessment (at 6 months and one year). This finding demonstrates, for our study population, the existence of a slightly progressive cognitive impairment associated with ageing for all subjects, regardless the baseline cognitive status.

Progressive decline of cognitive function assessment scores in all subjects regardless of functional status during the study shows inverse correlation between the two tests and age, this augmenting the finding that MMSE and TDC can only be used as screening methods for the diagnosis of cognitive disorders. In order to obtain a more complete diagnosis, there would be necessary additional clinical, pre-clinical and psychological tests.

MMSE score improved significantly in the active subgroup versus sedentary subjects for all subjects enrolled in the study at both assessments (6 months and 1 year). The same result was observed for the group of patients with normal cognitive function and for those with mild cognitive impairment who were enrolled in active subgroups. We have thus demonstrated the possibility of a positive influence of mild to moderate physical activity on MMSE test scores from both categories of subjects.

For subjects with mild dementia included in the active subgroup we observed improvement in MMSE score on both assessments, but the improvement was statistically significant only one year after starting physical activity. This results infers that the more accentuated the cognitive function deficiency is, the longer period of time required for the physical activity to play a positive influence role on the MMSE test scoring.

TDC score improved significantly in the subgroup of active subjects for all seniors enrolled in the study at both assessments, at six months and at 1 year. The same was observed for the group of patients with normal cognitive function and those with mild cognitive impairment enrolled in active subgroup. We have thus shown positive influence

of mild to moderate physical activity on TDC test scores obtained from both groups of subjects.

TDC test score obtained for subjects with mild dementia included in the active subgroup has improved at both assessments, but the improvement was statistically significant again only 1 year after physical activity. This result indicates that the higher cognitive function is impaired a longer period of time is needed for mild to moderate physical activity to positively influence the test score obtained at TDC.

Corroborating the results obtained in the two tests assessing the cognitive function, it can be inferred that cognitive function was positively influenced by mild to moderate physical activity on all categories of patients studied since the differences between the initial and the final evaluation are statistically significant.

Depression score assessed by GDS (Geriatric Depression Scale) was positively affected by mild to moderate physical activity in all categories of patients studied, the differences between the initial and the final one being highly statistically significant.

The results of the study showed statistically significant differences between the initial and final for all study groups for all metabolic markers studied, showing thus the positive impact of mild to moderate physical activity on them.

9 Final conclusions

We consider that this thesis has achieved the ultimate goal, namely to demonstrate a positive causal relationship between the cognitive function evolution in the elderly and mild to moderate physical activity. Furthermore, all three other studies have shown interesting findings that we summarize in the following:

1. The level of education and socio-cultural factors may influence cognitive function, measured by "total" MMSE test score and subscales MMSE test score.
2. „EASY-Care Standard 2010” questionnaire was considered by all physicians interviewed as a useful tool for assessing the health and social care needs of the elderly. By using this simple questionnaire patient anamnesis can be guided, avoiding thus, by understanding the general context of the state of the elderly, unnecessary analysis or investigations.
3. „EASY-Care Standard 2010” questionnaire should be introduced as a compulsory part of the routine assessment of elderly patients because this questionnaire introduces a standardized assessment of elderly patients.
4. When assessing cognitive function measured by MMSE and TDC score it was found a slowly progressive degradation without any intervention.

5. Cognitive function measured by MMSE and TDC score has improved significantly in subjects who performed physical activity (walking two kilometres three times a week) for a period of 6 months to 1 year.
6. In people with cognitive function impairment (mild dementia) performing mild to moderate physical activity is required at least one year to obtain the improvement of cognitive function.
7. Mild to moderate physical activity relieves symptoms of depression assessed by GDS test score obtained from patients included in the study.
8. Mild to moderate physical activity improves studied metabolic markers: triglycerides, cholesterol, glucose, BMI.

10 Proposals

Based on these results and in order to improve some medical practices addressed to elderly persons care in Romania, we propose the following measures:

1. Performing a validation study of the questionnaire „EASY – Care Standard 2010” to facilitate its implementation as a way of standardized assessment, able to identify immediate and long-term care needs of elderly patients.
2. Introducing walking as mild to moderate physical activity as therapeutic and preventive method for developing cognitive impairment in the elderly but also for maintaining functional independence and quality of life.
3. Developing a complex structure for implementation of this type of organized physical activity in which to engage geriatrist, specialist in medical rehabilitation, physiotherapist, psychologist and social worker.