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Scientific planning of physical exercise protocols to prevent Dementia in elderly. The "Fitness Alzheimer Mobility Exercise" (FAME) project. A roadmap

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Abstract

Background: Physical Exercise (PE) is considered one of the promising non pharmacological interventions in the field of prevention and treatment of dementia. A certain number of randomized control trials support the idea that PE is useful for the patients with cognitive problems. PE interventions seem to have a positive effect on participants with Mild Cognitive Impairment (MCI), Alzheimer's disease (AD) or Dementia. It improves cognitive, functional, emotional and physical performance. However, extended reviews or meta-analyses concluded that the majority of these studies show a large heterogeneity in methodology, intervention characteristics and samples, thus, the results should be interpreted with caution.

Methods: Friends' Society of Greek Association of Alzheimer's disease (FSGAAD), with the cooperation of Panhellenic Institute of Neurodegenerative Diseases (PINDIS), has submitted a proposal for funding to TIMA foundation named FAME (Fitness Alzheimer Mobility Exercise). The proposed program explores the current best practices in PE programs of organizations in Greece where people with MCI, AD or other forms of Dementia are involved, and will define the next steps to create common exercise intervention protocols.

Results: Upon the completion of this project a manual will come out, which will be the guide for both the patient's neuropsychological and physical evaluation and the exercise intervention he/she should follow.

Conclusions: The FAME project is believed, initially at national level and later at international level, to help solving the methodological issues of exercise interventions and there will be a common line that will consolidate the benefits of PE at people with MCI, AD and other types of dementia.

Keywords: Mild Cognitive Impairment; Alzheimer's disease; Dementia; Physical Exercise; Exercise Protocols.

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1 Introduction

Dementia is not a specific disease but an overall term, a syndrome, which describes a group of symptoms characterized by a loss of cognitive function, behavioral problems, motor deficits, and emotional changes resulting in a decline of a person's ability to perform everyday activities. Alzheimer's disease (AD) is the most common cause in older adults, accounting for 60–80% of all dementia cases (Alzheimer's Association, 2014). Advancing age is the main risk factor for most sporadic forms of dementia. Fifty (50) million people worldwide were living with dementia in 2018. It is estimated that about ten million new cases each year will have some type of dementia, as, around the world, there will be one new case of dementia every 3 seconds, reaching the number of 82 million in 2030 and, the nearly double number of 152 million, in 2050 (Alzheimer's Disease International, 2018). These rapidly growing numbers will have a large societal impact, placing a high economic burden on health care (Karssemeijer, et al., 2017; Winblad, et al., 2016; Alzheimer's Disease International, 2015). In Greece, 200.000 people are affected by dementia and this number is expected to exceed to 600.000 by 2050.

On the other hand, Mild Cognitive Impairment (MCI), is an intermediate state between the cognitive changes of normal aging and dementia. It presents problems with memory, language, thinking and judgment that are greater than normal age-related changes, but not to the extent that it is obvious in activities of daily living (ADL). Studies suggest that around 5 to 20 percent of individuals with MCI will develop dementia each year (Karssemeijer, et al., 2017; Langa, & Levine, 2014). Until now, there are no disease modifying drugs available and any pharmacological treatment is limited to therapies trying to alleviate the symptoms. The World Health Organization (WHO) decided to take global action against cognitive decline and dementia, encouraging governments worldwide to focus on prevention, disease-modifying therapies and improving health care services (Karssemeijer, et al., 2017; World Health Organization, 2015).

Non-pharmacological interventions, among them Physical Exercise (PE), are therefore very good choices. Engagement of an older person in a regular PE intervention improves his aerobic capacity, muscular strength, muscular endurance, flexibility, balance, motor control and performance, skill acquisition, coordination, cognition and psychological well-being (World Health Organization, 1997). Studies have shown that lifetime engagement in regular physical activities or PE reduces the risk of dementia onset in cognitively normal elderly persons. In particular, increased aerobic fitness in cognitively healthy older adults is associated with improved cardiovascular fitness, reduced age-related atrophy and increased perfusion in regions that support executive control and memory processes resulting in improved learning and memory performance (Phillips, 2017; Baker, et al., 2010). Even shorter terms of aerobic exercise can facilitate neuroplasticity to reduce both the biological and cognitive consequences of aging to benefit brain health in sedentary adults (Chapman, et al., 2013).

Experimental studies with animals showed that PE played a significant role by enhancing of neurotrophies levels, neurogenesis, and angiogenesis and by increasing the volumes of the prefrontal cortex and the anterior hippocampus. Other neurobiological effects derived from the engagement in PE programs were the reduction of amyloid deposition and the suppression of Aβ dependent neuronal cell death in the hippocampus (Groota, et al., 2016; Lautenschlager, Cox & Cyarto, 2012).

The above findings suggest that PE seems to enhance brain vitality, raising at the same time the question whether PE interventions are sufficient to slow down cognitive decline once the clinical diagnosis of MCI or dementia has been established.

Systematic reviews of randomized controlled trials (RCTs) have presented evidence of the effects of exercise on improving cognitive, executive function and depression among adults with MCI or AD while others focused on the improvement of ADL, and physical performance. The PE programs included aerobics, balance and resistance-flexibility training, or a multi modal exercise (combination of aerobic exercises with resistance training, etc.) intervention (Guitar, et al., 2018; Lam, et al., 2018; Panza et al., 2018; Groota, et al., 2016; Barreto, et al., 2015; Öhman, et al., 2014).

However, the effects of PE in older adults with MCI or dementia vary in efficacy. The large variability in exercise protocols, study populations and treatment compliance complicate interpretation of the results. In many studies, the duration of the exercise intervention was relatively short, from 6 weeks to 3 months. A high degree of heterogeneity existed between different types of PE. There is limited information whether the sex or the age or the type of dementia affected the results. Another limitation was the different assessments used in the included studies, while neuropsychological and physical performance tests varied resulting in no reliable, valid, and sensitive to change outcomes (Song, et al., 2018; Heyn, Abreu, & Ottenbacher, 2004). The general conclusion of the studies is that PE seems to play an important role but there is a need for further high quality RCTs with the best methodology (Guitar, et al., 2018; Song, et al., 2018; Farina, Rusted, & Tabet, 2014).

The aim of the Fitness, Alzheimer, Mobility, Exercise (FAME) project is therefore to address all these limitations.

General Objectives: The main objective of the FAME project is to develop, implement and evaluate, through Information, networking, exchange and transfer of knowledge, the best practices of therapeutic PE in people with MCI and AD, with a view to creating a common physical activity protocol that meets the needs of the above groups.
A second objective is the application of a common protocol with neuropsychological and physical performance assessments.

2 Method

Friends' Society of Greek Association of Alzheimer's disease (FSGAAD), with the cooperation of Panhellenic Institute of Neurodegenerative Diseases (PINDIS), has submitted a proposal for funding to TIMA foundation. The proposed program explores the current best practices in PE programs of organizations in Greece (such as Municipalities, Associations of Alzheimer's Disease), where elderly people and people with MCI and AD are involved, and will define the next steps to create common exercise intervention protocols.

2.1 Study design

The recruitment goal for the FAME project is to enroll an adequate number of health professionals who are engaged in management of MCI and AD through PE interventions in Greece.

Friends' Society of Greek Association of Alzheimer's disease (FSGAAD), having the support of the Greek Federation of Alzheimer's Disease and Related Disorders and the Social Services of the Municipalities, Day Centers of Alzheimer's disease, Municipal Fitness Centers or Municipal Centers of Open Protection of elderly people, will have the opportunity to examine many people with MCI and AD.

It will then be recorded in which of these facilities are applied PE interventions, the number of participants, duration, frequency and type of interventions (aerobics, strength exercises, dance, etc.). The number of professionals implementing the above programs will be recorded. A brochure will be sent by e-mail informing every organization about the objectives of the proposed action. Attached will be sent a form in which the trainee trainers will need to write down in detail all the information related to the exercise intervention they apply to their participants. Finally, a consensus document will be given for participation in the action, which after signing it will be returned to FSGAAD.

Next step is a scientific meeting involving the health professionals working in the participating organizations at the PINDIS facilities. The aim of this meeting is to bring together these professionals in order to discuss and exchange knowledge about the exercise protocols they apply to their clients, whether they use group or individual methods, if they are targeting to their clients' physical, or cognitive, or physical and cognitive improvement. Another aim is the discussion about the tools used in order to assess the clients' cognitive, psychological, functional and physical performance.

Every presentation as well as the discussions related to the exercise programs will be recorded using electronic means in order to create an original file with the minutes of the meeting accessible to everyone who will take part at the event. The material will be uploaded to PINDIS website.

At this meeting will also be set out the bases for the cognitive, functional, physical and psychological evaluation of the participants in the programs and it will be agreed which tests will be in common for the above assessments. A questionnaire with a 5-point rating scale will be used in order to evaluate the scientific value of the meeting. Proposals and comments will also be requested through two open-ended questions. Overall a total of thirteen (13) questions will be applied on the axes of scientific approach and organization of the meeting, fulfilment of scientific and educational goals and objectives, content evaluation and development of the modules. Following this action will be the creation of a Facebook account where health professionals will be informed about the actions and the results of the program and about the developments in the field of PE in people with MCI and AD. In addition, a manual will be developed where there will be written guidelines about the design and implementation of a PE program, guidelines for the arrangement of the exercise intervention area, guidelines and examples for the engagement of a person to the intervention, guidelines concerning the behavior of the health professional and the creation of a security and trust feeling for the involved client. This manual will also be uploaded to PINDIS website. The proposed project will have a duration of 12 months.

2.2 Participants

It is expected to take part in this project 40 health professionals, physical educators, adapted physical educators, and physical therapists, from all over Greece, who are conducting PE interventions to people with MCI and AD. About 74 attended the first meeting in December 2018.

3 Results

Upon the completion of this project a manual will come out, which will be the guide for both the client's neuropsychological and physical evaluation and the exercise intervention he should follow. At the same time this manual will be the "bible" for the implementation of common exercise programs in local and national level, laying the foundations for a measurable intervention which will be the core in the fight for the prevention and management of these neurodegenerative diseases.

4 Discussion

Results of a certain number of reviews and meta-analyses underline the importance of PE interventions for the improvement of cognitive, functional, physical and psychological function in adults with MCI and AD. However, all these studies report the need for future well designed RCTs, in order to have a clearer picture about the benefits of exercise interventions. The FAME project is believed that will answer to that question initially in a national level and later in international level. The proposed program will be one of the first applications in this area of health, paving the way and expanding opportunities for therapeutic interventions in this category of the elderly. The development of an innovative exercise program for people with MCI and AD that combines physical and cognitive exercise is expected to be better accepted by participants than traditional exercise programs. The project has direct and indirect benefits for promoting public health and improving the quality of life of a large number of patients in our country. Increased physical activity can reduce health risk factors and improve quality of life, reducing treatment and rehabilitation costs. After this effort the prescription of PE will be a reality.

Authors contributions

All authors contributed in a similar way.

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Competing interests

The authors have declared that no competing interests exist.

Ethics statement

We applied the project to Ethics Committee of Greek Alzheimer's Association, and we received approval.

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