Cognitive Processes of the Elderly Brain with MindGym Approach

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ABSTRACT

MindGym is an approach for improving the quality of life of the elderly by applying cognitive processes and mind gymnastics in order to keep them active in vital mental shape. The target is to influence mental conditions that lead to mental disorders, such as depression, dementia, sedentariness, cognitive decline and personality disorders, mostly present in elder people, but also experienced by youngsters. The idea is to develop a prototype interactive system for creating everyday mind gymnastics, which is based on recommended audio-visual content, IPTV, social networks, cloud enabled devices and applications. Furthermore, it will enable detecting the abnormal changes in the elderly brain by using fMRI and EEG technologies for various stimuli. The authors give an overview of current research and projects in the area and define the basic objectives of planned MindGym research activities. Several experiments are conducted in order to prove the hypothesis that various types of music stimulate the brain differently, which can be used as mental activities for elderly.

Keywords	Cloud Computing, Cognitive Processes, Elderly Health Care, IPTV, MindGym, Social Inclusion

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1. INTRODUCTION

Medicine is a science that improves the health of people and thus increases the average length of life. The longer life requires socialization of the elderly in order to live independently. Many researches proved that physical and mental activities improve the overall people’s health by helping them with various diseases (Richardson, 2014; Scheewe, 2013; Weaver, 2012). Additionally, this will facilitate the life of the elderly caregivers.

The massive development of ICT (Information and Communication Technology) and their interaction with medicine is a very hot topic nowadays. Many on-going FP7 research projects develop an analysis of the state of the art in the area. Many of them are reviewed in this paper. In this direction, we propose a new approach (MindGym) to establish a new paradigm for the treatment of mental and neurological conditions that are frequently associated with aging. The main objective is to develop a new strategy for treating mental conditions that can be easily integrated with the existing healthcare systems in spite of the diversities. The overall goal of the MindGym concept is to improve mental agility (Gusev et al., 2014). The whole strategy promotes mental well-being of older people by enhancing brain activity, which is analogous to physical condition improved by regular training (Gusev et al., 2015). This multidisciplinary approach in the field of neuropsychiatry, psychology, physical health, society and environment will be beneficial for both the elder population and the medical/healthcare staff.

In our earlier paper (Gusev et al., 2014) we have elaborated on the concept behind the use of IPTV to provide an interactive system with content specially developed for elderly people to keep them mentally active. Different strategies were analyzed in our paper based on hardware, content and software as different technological aspects. In this paper we give a more specific elaboration of the used approaches based on fMRI (functional magnetic resonance imaging) and EEG (electroencephalogram) scanning, comparison of the results, evaluation of the sensor stimuli and development of a tool for achievement motivation. Further on, the main goal of this paper is to make a comparison of the MindGym approach with other known approaches, research papers and projects.

The rest of the paper is organized in several sections. Section 2 presents the general overview of the concepts, outputs and specific objectives of the planned research. The approach and concept are elaborated in Section 3. Section 4 discusses the related work and overviews the current projects. Section 5 elaborates the impact of realizing such a research. In Section 6, we present initial results how different type of music activates the human brain. Finally, Section 7 concludes the paper.

2. OBJECTIVES

The establishment of an integrated preventative and therapeutic strategy accomplishes the following primary goals:

- **Objective 1. Understanding the Mental Conditions:** This will be achieved by analysing the regions of brain activity of the elderly using different audio-visual content as stimuli. The main aim is to determine the influence of internal and external determinants to the brain activity. To obtain reliable results we will define a test environment where older people are exposed to carefully chosen audio-visual content, including documentaries, quizzes, interactive program, music, web browsing and social media participation. Two different
A Next Generation Technology Victim Location and Low Level Assessment Framework for Occupational Disasters Caused by Natural Hazards
www.igi-global.com/chapter/next-generation-technology-victim-location/56236?camid=4v1a

Content-Based Image Retrieval for Medical Image Analysis
www.igi-global.com/chapter/content-based-image-retrieval-medical/62231?camid=4v1a