Chapter 10
Gamified Cognitive Training to Prevent Cognitive Decline

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ABSTRACT

Due to the ageing population, cognitive decline is becoming a widespread problem that requires immediate attention. Preventive strategies can play an important role in reducing progressive decline and delaying or completely preventing the transition of cognitive decline into dementia. One such strategy is computer-based cognitive training, which has been widely used and tested to maintain and improve the cognitive performance of older people. Typically, cognitive training packages utilise gamification techniques to increase engagement. Although gamification can be a powerful motivator for people completing cognitive training, it could also be overwhelming for people with cognitive impairments if designed poorly. This chapter introduces the literature on computer based cognitive training, use of gamification in training, and the DOREMI project that aims to design cognitive training games for older people with cognitive impairment, using a user-centred design process to ensure that the gamification tools used to motivate participation are effective, meaningful, and user-friendly.

INTRODUCTION

The increasing age of the European population is becoming a growing and urgent issue: it is estimated that in 2050, 35% of EU population will be over 60 (World Alzheimer Report, 2009). Related to the global ageing of the population, health trends are changing and mild disability and chronic diseases are increasing (Rechel, 2009), causing a consequent increase of the long-term costs, particularly for pathologies that represent high rates of dependency, like dementia. The ageing population will not inevitably lead to significantly higher health care expenditure if appropriate measures are taken and older people are empowered to manage their own health.

Dementia refers to a diagnostic category that includes specific disorders (e.g. Alzheimer’s disease, front-temporal dementia) all characterized by the progressive decline of cognitive functions, such as memory, language and attention.
About 6 percent of over 60s in European countries are affected by dementia and trend research indicates that the rate is constantly growing (Wimo et al., 2010). According to OECD estimations in 2012, France, Italy, Spain, Sweden and UK had the highest prevalence, with 6.3% to 6.6% of the population aged over 60 affected by dementia (Wimo et al., 2010). Due to the debilitating nature of dementia, people with this disease become increasingly dependent on their caregivers and require assistance in conducting even the most basic daily activities. As a result of the increased pressure, people caring for patients with dementia are at higher risk of depression, anxiety and reduced quality of life (Pinquart & Sorensen, 2006). Due to the high impact of dementia on the quality of life of people affected, their caregivers and the healthcare system, many studies during the last decade have been conducted to enable understanding of early predictors and risk factors of the disease. A key risk factor for the incidence of dementia is cognitive decline (Plassman et al., 2006) and one way of managing dementia is to design interventions, which target people with early signs of cognitive impairment, before dementia develops. Cognitive decline refers to changes in cognitive functions, which are more pronounced than would be expected within the spectrum of normal ageing. Cognitive decline can affect one or more cognitive functions including memory, orientation, language and executive functions. The prevalence of cognitive decline is 10.7% of the population, increasing with age, and higher in women (Di Carlo et al., 2000).

The probability of developing cognitive decline is associated with numerous risks factors, such as tobacco use, the Apo lipoprotein E _4 genotype, and certain medical conditions, as well as protective factors, like cognitive training and physical exercise (Di Carlo et al., 2000). This chapter will focus on protective factors and, in particular, on cognitive training, leaving readers with the opportunity to explore the theme of risk factors associated with cognitive decline in other articles or reviews (i.e. Plassman et al., 2012).

The “use it or lose it” theory applied to the study of cognitive science during ageing has been widely circulated in recent decades, not only in the scientific community but also in the wider public, as evidenced by the numerous popular self-help books that encourage readers to maintain “active mind” (McKhan & Albert, 2002; Rowe & Kahn, 1998). The scientific community has confirmed this hypothesis. Numerous studies both, epidemiological and clinical show that people who lead a mentally engaged lifestyle are less likely to develop cognitive decline and dementia (Albert et al., 1995; Henderson et al., 1996). Activities that have been reported to be protective against cognitive decline include leisure time, learning a foreign language, playing puzzles, crosswords etc. The assumption underlying the “use it or lose it” hypothesis is related to the theory of cognitive plasticity, which refers to the capacity of the brain to change its structure and functionalities on the basis of the stimuli and the requests of the environment and is connected to the theory that the brain is able to develop and adapt throughout the whole lifespan (Baltes et al., 2006). This theory has been confirmed by several studies in animals and humans and has been used to investigate the potential of the brain to prevent and recover from a decline in cognitive function (Jones et al., 2006; Mercado, 2008).

Cognitive Training

Although many EU states have prioritised the assessment and diagnosis of cognitive decline (for instance by developing guidance about diagnostic criteria), preventive interventions for older people tend to be less well developed.

Methods typically used in research and clinical practice to improve or maintain cognitive functioning can be categorised into cognitive stimulation, cognitive training and cognitive rehabilitation (Clare & Woods, 2004). These terms are not interchangeable; cognitive stimulation usually involves