



Review

Non-pharmacological strategies to delay cognitive decline

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ABSTRACT

Non-pharmacological preventive strategies to delay cognitive decline have become the focus of recent research. This review aims to discuss evidence supporting the use of physical and cognitive activity to reduce the risk of cognitive decline and dementia in later life. Both strategies are associated with better cognitive health in older adults. This positive effect seems stronger for middle-aged and older adults with normal cognition and less clear when cognitive impairment is present. Physical and cognitive activities have been linked to indirect and direct biological factors affecting brain health. Future research will need to explore details about type, intensity, duration and combination of interventions. An important aim is standardization between studies, as well as evidence of improved clinical outcomes and cost-effectiveness. Identifying strategies that succeed at sustaining improved lifestyle is necessary, and the use of modern technology could play a crucial role in this regard. In the meantime advice on physical and cognitive activities should be included when health advice is given to middle-aged and older adults.

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1. Introduction

Prevention of dementia has become a priority in many countries. Although we currently lack compelling evidence from clinical trials demonstrating that the clinical syndrome dementia can in fact be prevented by targeted strategies, many opinion leaders

are convinced that this is not an utopian dream, but a realistic goal that should be pursued [1]. Several large-scale trials designed to prevent dementia are currently under way, and their results should contribute to guide future policy and practice. Examples include the Finnish Geriatric Intervention Study to Prevent Cognitive Impairment and Disability (FINGER) [2], Multidomain Alzheimer Prevention study (MAPT) [3] and Prevention of Dementia by Intensive Vascular Care (preDIVA) [4].

Many publications on this topic have highlighted current knowledge gaps. During this phase of limited evidence and in the absence of effective pharmacological strategies to prevent dementia, a timely question is: *what role do non-pharmacological strategies*

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potentially play to support cognitive health in middle and older age with the more modest aim to delay rather than to prevent cognitive decline? By delaying cognitive decline by some years, many older individuals may reach the end of their natural lifespan before crossing the dementia threshold.

With professional and social media increasingly interested on topics related to cognitive decline and dementia, it is not surprising that medical and allied health clinicians in various settings, such as primary care, memory clinics, or other specialist and allied health clinics, are consulted about effective prevention strategies. This increased interest in the general population is a unique opportunity to build cognitive health literacy and encourage healthy lifestyle behaviour. This may be particularly important in middle aged community members as this seems to be a time period when modifiable risk factors increase the risk of cognitive decline in older age [5–7]. In parallel to this, health care providers are increasingly making the clinical judgement that giving information on this topic should be part of their recommendations and management plans.

The objective of this narrative review is to present targeted information derived from recent review publications on non-pharmacological strategies that could be used for informing middle aged and older individuals about how to better protect their cognitive health. For this review we have focused on physical and cognitive activities as two of the most significant protective factors [8].

2. Methods

A literature search was conducted for recent review publications (2004–2014) using the databases MEDLINE, PsycINFO, PubMed and Google Scholar. Search terms included prevention of dementia, cognitive decline, dementia, exercise, physical activity, motor activity, physical exertion, physical fitness, cognitive activity, cognitive stimulation, cognitive rehabilitation and cognitive training. The search was limited to humans, English language and aged. References listed in articles, including those published prior to 2004 were also followed up, if relevant for this review.

3. Results

3.1. Physical activity (PA)

Historical documents from China and Greece reveal that physical activity (PA) has been promoted as an integral part of a healthy lifestyle since ancient times. In the late nineteenth and early twentieth century early epidemiological studies reported a physical activity-related risk reduction for mortality and cardiovascular events [9]. PA can be defined as any body movement that results in increased energy expenditure. Most guidelines, including those for older adults, recommend at least 30 min of moderate-intensity PA on a minimum of 5 days/week [10]. There is a substantial body of evidence demonstrating that regular PA can reduce the risk of various medical conditions, such as cardiovascular disease, diabetes mellitus and depression. As all three of those conditions have been identified as important risk factors for dementia and Alzheimer's disease (AD) [8], one common hypothesis is that delayed cognitive decline could be achieved with PA [11–17]. Additionally PA is associated with decreased risk of cerebrovascular disease [18,19], which has been reported in many publications as increasing the risk of cognitive decline often via complex interactions with other underlying brain pathologies [20].

Based on systematic reviews and meta-analysis on risk factors for dementia and Alzheimer's disease (AD) published between 2005 and 2011, Barnes and Yaffe calculated the proportion of cases of AD that could be prevented if relevant risk factors could be eliminated.

For PA they estimated that approximately 13% of AD cases could be attributed to physical inactivity [8]. One of the systematic reviews incorporated in this calculation was based on 16 prospective studies and included 163,797 non-demented participants of which 3219 developed dementia at follow-up. The relative risks for the highest compared with lowest level of PA reported in this review were 0.72 (95% CI = 1.16–1.67) for dementia and 0.55 (95% CI = 0.36–0.84) for AD [21]. Other reviews, systematic and non-systematic, including those focusing on randomized controlled trials (RCTs) with non-demented participants, are consistent with these positive findings [22–27] including other dementia types such as vascular dementia [28]. However some reviews have reported mixed results [29–31].

There are fewer reviews in the literature investigating the potential cognitive benefits of PA for older adults who either have subjective memory complaints or do already experience some objective cognitive impairment, as for example mild cognitive impairment (MCI) in the absence of dementia. As the number of PA studies for this population is still limited and these reviews use either disparate inclusion criteria or mixed clinical samples, reported results are less consistent [32–35]. A number of studies have reported significant cognitive benefits mainly in the areas of attention, executive functions and memory [36–41], however, others have been negative [33,42,43].

3.2. Cognitive activity (CA)

The term cognitive activity (CA) should not be limited to cognitively stimulating leisure activities in middle and old age, but should also include cognitive activities in the context of life long learning, employment and volunteer work. Unemployment or underemployment in middle age is associated with an increased risk of cognitive decline in old age and intellectually stimulating work environments have been reported as showing protective potential [44–46].

Barnes and Yaffe [8] estimated that approximately 19% of AD cases could be attributed to cognitive inactivity or low educational attainment. This estimation was based on two systematic reviews and meta-analyses. The first publication included 22 longitudinal studies investigating various brain reserve markers (higher education, occupational attainment, intelligence and mentally stimulating leisure activities) in a total of 21,456 participants of whom 1733 developed dementia at follow-up and reported combined OR of 0.54 (95% CI = 0.49–0.59) [47]. The second paper included 13 cohort and six case-control studies investigating the association between low education and dementia or AD. The reported relative risks were 1.59 (95% CI = 1.26–2.01) for dementia and 1.80 (95% CI = 1.43–2.27) for AD [48].

Until recently, review papers investigating whether cognitive rehabilitation targeting memory could be of benefit for individuals with MCI were negative with only a very limited number of original studies available in the literature [49]. Most reviews published since then, however, have reported benefits [50]. For CA, in the context of secondary prevention interventions, a common typology is to distinguish the sub-groups cognitive stimulation (CS), cognitive training (CT) and cognitive rehabilitation (CR). CS aims to enhance cognitive and social functions, CT offers practising to improve specific tasks and CR focuses on improving everyday functioning. In a recent systematic review investigating the benefits for CS, CT and CR for participants with MCI or mild dementia, 11 out of 18 included studies using CS demonstrated significant improvements in cognitive function [51]. Only nine publications investigated whether the interventions had any impact on activities of daily living (ADLs) and no significant treatment differences were identified. A further 13 studies using CT and CR were reviewed and seven studies observed significant cognitive improvements. Benefits for ADLs were only found in one trial with MCI [52]. Additionally clinical significance

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