

Dementia and physical activity

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Already today, the increase in life expectancy and the accelerated increase in longevity—the number of centenarians will triple from the year 2000 to 2050 [15]—confronts us with questions which are not easily answered. But what we can realize from social and economic development is that we will be forced not only to cure diseases but much more to prevent them. This particularly applies to those diseases which coincide with the aging development as Alzheimer's disease and other forms of dementia. There is not only need of reliable and valid dementia diagnosis [8] and of effective medication but there is also an urgent need to discover and implement effective physical activity interventions.

With the worldwide demographic trend of population aging, Alzheimer's disease and other forms of dementia will become an increasingly major public health problem among the elderly. The term “dementia” describes a syndrome associated with a range of diseases which are characterized by the progressive impairment of brain functions, including language, memory, perception, personality, and cognitive skills. These diseases lead to a decline in the ability to perform everyday activities. These declines in mental function may manifest themselves through different symptoms at various times. Alzheimer's disease is the most common form of dementia, estimated to be responsible for 70% of dementia cases. It is followed by vascular dementia as probably the next common type. Depression affects up to 40% of patients with

dementia, usually when dementia is mild or moderate, and may cause vegetative symptoms, e.g., withdrawal, anorexia, weight loss, or insomnia (cf. [12]).

Wimo et al. [18] estimated the worldwide occurrence of dementia in 2000 and during the period 1950–2050. The calculations were based on worldwide demographics of the elderly and age-specific prevalence and incidence values of dementia, estimated from a meta-analysis. The worldwide number of persons with dementia in 2000 was estimated at about 25 million persons. Almost half of the demented persons (46%) lived in Asia, 30% in Europe, 12% in North America, 7% in Latin America, and 5% in Africa. About 6.1% of the population of 65 years of age and older suffered from dementia (about 0.5% of the worldwide population) and 59% were female.

Incidence rates were recently calculated from United Nations estimations and projections from prevalence, remission, and mortality data by Ferri et al. [4]. Though evidence from well-planned representative epidemiological surveys is scarce in many regions, they found that 24–30 million people have dementia today, with four to six million new cases of dementia every year (one new case every 7 s). The number of people affected will double every 20 years to 81–100 million by 2040. Most people with dementia live in developing countries—60% in 2001 and rising to 71% by 2040. Rates of increase are not uniform; numbers in developed countries are forecasted to increase by 100% between 2001 and 2040 and by more than 300% in India, China, and their south Asian and western Pacific neighbors. These detailed estimates seem to constitute the best currently available basis for policymaking, planning, and allocation of health and welfare resources. We must conclude that dementia is one of the most common causes of institutionalization, morbidity, and mortality among the elderly and we have to face the obvious consequences.

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Although in mild cognitive impairment memory or another aspect of cognition is impaired (not merely slowed), this impairment is not severe enough to interfere with daily functioning. Up to 50% of patients with mild cognitive impairment that affects memory develop dementia within 3 years. Currently, there is no clear way to predict which patients will develop dementia. The natural history varies depending on the cause of dementia. It is typical, however, that intellectual and other cognitive functions inexorably decline over 2 to 10 years. Although the decline occurs in a continuum, symptoms can be divided into mild (early), moderate, and severe (late). Personality and behavior changes may develop during any stage [12].

Patients with dementia are susceptible to muscle disuse atrophy, which can be delayed by adequate physical exercise and nutrition. A regular supervised exercise program (e.g., 15 to 20 min/day of walking) is recommended. According to a preliminary report by Mechling and Brach [9], these programs can be extended to 60 min/day twice a week with people showing mild and moderate symptoms. Exercise can reduce restlessness, improve balance, maintain cardiovascular tone, help improve sleep, and reduce frequency and severity of behavior disorders and falls [5]. A supportive environment includes encouragement of and opportunities for physical and mental activity and social interaction. These activities may help to slow cognitive, physical, social, affective, and functional decline. Delaying the onset of symptoms of dementia and slowing the vicious circle to dependence will not only help the individual affected but also caring relatives, nursing staff, and society as a whole [1].

The main problems accompanying the development from cognitive impairment to the different forms of dementia is that activities which could stimulate cognitive or physical performance are reduced or even given up. Thus, it seems to be conceivable that Morley concludes that "...cognitive decline is associated with a decline in physical performance" ([11], p. 24). The reduction of physical activity leads to a dramatic increase in the age-dependent deterioration of strength. This leads to a reduction of competence and independence and, ultimately, to limitations in activities of daily living, social retreat, and isolation [10].

Physical activity can reduce the risk of dementia [7] and cognitive performance can be improved by physical exercise and by increasing the physical fitness level [6]. Strength training contributes to the improvement of balance performance [13] and strength control [16]. But improvements will only occur when sensory, cognitive, and motor systems are addressed simultaneously [17]. This shows how close the relationship between physical and cognitive performance is and how this might contribute to cope better with everyday demands. Several research results confirm the positive influence of physical activity and

training on information processing, memory, executive functions, motor coordination, and motor learning [2, 3, 14].

What do we really know about these physical activity interventions? Are these direct or indirect effects? Does physical activity protect directly by better oxygen supply and transmitter metabolism? Or does it rather protect indirectly by reducing the risks that impair cognition as hypertension and diabetes? What are the adequate forms of intervention? What type of physical activity and training program (intensity, frequency, duration) is required for achieving positive effects on cognition? Which types of skill (e.g., closed, open, skills with enforced cognitive demands) are recommendable to gain positive effects on cognition? Will positive effects be observed in different groups which show mild, moderate, or severe symptoms of dementia?

The data on prevalence, incidence on dementia, the demands, and the questions raised underscore the urgency of research in this area. Unless there are significant breakthroughs in the treatment and/or prevention of dementia, the prevalence of dementia is expected to continue to increase in line with the worldwide aging population. Though the causal effects of physical activity have not been understood in all details, there is enough evidence and experience not to hesitate any longer to start physical activity intervention programs to contribute to the prevention of cognitive impairment, Alzheimer's disease, and other forms of dementia.

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