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Review

Can physical activity improve the mental health of older adults?

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Abstract

The world population is aging rapidly. Whilst this dramatic demographic change is a desirable and welcome phenomenon, particularly in view of people's increasing longevity, it's social, financial and health consequences can not be ignored. In addition to an increase of many age related physical illnesses, this demographic change will also lead to an increase of a number of mental health problems in older adults and in particular of dementia and depression. Therefore, any health promotion approach that could facilitate introduction of effective primary, secondary and even tertiary prevention strategies in old age psychiatry would be of significant importance. This paper explores physical activity as one of possible health promotion strategies and evaluates the existing evidence that supports its positive effect on cognitive impairment and depression in later life.

Introduction

The world's population is aging at a rapid pace. In Australia, for example, in 2001 more than 2.3 million persons were above the age of 65, which is 12.4% of the total population. It is expected that this number will increase to 6 million over the next 50 years thus amounting to 24.2% of the total population [1].

Whilst increasing longevity is a positive development, it also leads to an increase in age-related diseases and disabilities with all its social and financial implications for society. Somatic disorders such as cardiovascular diseases, cancer, movement disorders, osteoporosis, osteoarthritis and special sensory deficits are all highly prevalent in later life. Mental disorders are also frequent in later life (affecting approximately 20% of old people), with dementia and depression being the most prevalent conditions in this age group [2]. Moreover, dementia and depression are the leading causes of years of life lost due to disability in Australia [3]. Currently, more than 25 million people worldwide have dementia, with Alzheimer's Disease (AD) being the most frequent cause of dementia in Western societies [4].

There is an urgent need to focus research on the development and evaluation of effective preventative strategies, such as those successfully introduced to decrease the incidence of coronary heart disease, stroke and some cancers. Delaying the clinical onset of AD by two years would reduce the total number of AD cases by approximately 600,000 in the USA alone [5]. Physical activity (PA) is often seen as an intervention that has the potential of decreasing the burden associated with depression and cognitive impairment in later life and this paper represents a critical review of the evidence that supports such an association.

Aging and physical activity

Sedentary lifestyle is becoming increasingly common at all ages [6]. A recent survey found that 62% of Australians were sufficiently active to enjoy the health benefits associated with PA in 1997 but, worryingly, this number declined to 57% in 1999 [7]. Ageing is associated with progressive decline in activity levels, which are also influenced by education, gender, ethnicity and income [8]. Older adults are more likely to engage in PA of lower intensity, such as walking, gardening, riding a bicycle, or playing golf rather than running, doing aerobics or team sports [9]. For example, the most popular types of physical activity amongst Western Australians aged 60 years or over were walking for recreation (60%), gardening (48%) and playing golf (15%) [10].

Can physical activity protect or improve health in older adults?

Regular PA, including in later life, can reduce morbidity and mortality, postpone disability and prolong independent living [11], which can potentially counterbalance some negative effects of aging [12]. Suggested effects of regular PA include the preservation of muscle mass, prevention of sarcopenia and reduction of the age-related decrease of metabolic rate [13]. There is good evidence that being physically active improves cardiovascular outcomes, reduces the risk of diabetes and some types of cancer (especially breast cancer), assists in the prevention of falls, and maintains peak bone mass [14].

Can physical activity influence cognitive function?

The relationship between PA and cognitive function remains unclear. Regarding physiological effects, one hypothesis is that PA can counter age-related decline in cardiovascular function associated with brain hypoxia and consequent cognitive decline.

Dishman suggested that increased oxygenation of the brain may stimulate and protect the central nervous system [15]. Only a handful of studies have systematically investigated the association between PA and cognitive function. Stewart et al. reported that physically active subjects were 50% less likely to present with cognitive impairment (OR = 0.48; 95% CI= 0.23–1.02) [16]. Schuit et al. (2001) also found that adults who exercised at least 30 min/day had higher MMSE scores than older adults who did not ($p < 0.05$) [17]. This same group showed that carriers of the ε4 allele of the apolipoprotein E (APOE), a genetic risk factor for AD, have a 13.7-fold increase in the risk of cognitive decline (95% CI: 4.2–45.5) if they perform less than one hour of PA per day when compared to non-ε4 carriers who are active. This finding suggests that PA may contribute to modify the deleterious effect on cognition of the APOE ε4 genotype.

Yaffe et al. stratified their subjects according to a self-report questionnaire that provided an estimate of the number of kilocalories (kcal) expended per week or city-blocks (= 160 m) walked per week [18]. Women in the highest quartile of activity had an OR of 0.66 (95% CI: 0.54–0.82) of experiencing significant cognitive decline during 6–8 years follow-up when compared to women in the lowest quartile of physical activity. More importantly, the findings of three independent follow-up studies indicate that PA may reduce the risk of dementia in later life [19-21]. Laurin et al. showed, in nested case-control study with 4,615 community-dwellers participating in the Canadian Study of Health and Aging, that older subjects engaging in moderate to high levels of PA were less likely to develop cognitive impairment (OR = 0.57, CI: 0.46–0.70) or dementia (OR = 0.58, 95% CI: 0.45–0.76). Older women performing PA of greater intensity than walking more than 3 times a week seemed to benefit the most from the protective effect of PA against AD [21].

Randomized control trials looking at the effects of PA on cognition are rare, but the results of two studies are of interest. Emery et al. observed that subjects suffering from chronic airway disease who walked, as exercise, for 10 weeks had significantly better word fluency than non-active controls [22]. Molloy et al. reported similar findings in an intervention trial investigating older female outpatients after three months of a 45-minute exercise program [23]. Most of the studies mentioned above recruited individuals who were cognitively normal at the time of entry into the study. These studies had relatively small sample sizes and the measures of cognitive function (such as the MMSE) used were rather crude.

Can patients with dementia benefit from physical activity?

Trials with PA in older adults who are already suffering from cognitive decline or dementia are rare [24]. This is surprising, as regular physical activity is recommended for patients with dementia not only to support physical health, but also to improve quality of life and behavioral and psychological symptoms (BPSD). BPSD occur in most patients with AD at some stage of the course of the illness and are especially stressful to carers, as well as the patient. One study found that regular physical activity can prevent weight loss in AD [25] whereas another [26] reported that patients with mild to severe AD benefited from a 7-week PA program in regards to the risk of falls, BPSD, cognitive function and nutritional status.

Scarmeas et al. has also reported that higher levels of PA amongst patients with AD is inversely correlated with cerebral blood flow to the temporal and parietal lobes [27]. This was interpreted as being an indication that physical active patients have a higher brain reserve.

In addition, postmortem examination has shown that patients who were physically active present a significantly larger burden of disease than sedentary patients who have a similar degree of cognitive impairment. This finding supports the brain reserve hypothesis and suggests that regular PA delays the clinical progression of AD by counteracting the effects of AD-related brain pathology. Teri et al. investigated, in a randomized clinical trial, whether a home-based exercise program would reduce functional dependence and delay the institutionalization of 153 community-dwelling subjects with AD [28]. Patients and their carers were randomized to an exercise plus behavioral management technique group (intervention) or to a "routine medical care" (control) group. The intervention was carried out in the homes of patients and lasted 3 months. The exercise component was a mixture of endurance activities, strength training, balance, and flexibility training and altogether 12 hours of exercise in 30 min intervals were performed.

The patients in the intervention group were, at 3 months, more physically active and had improved scores for physical functioning and depression compared to the patients of the control group. Even after 2 years, the intervention group had significantly better physical functioning scores. They also were less likely to be institutionalized because of behavioral problems than controls (19% versus 50%). Although this study produced valuable new information, it remains unclear to what extent the effect was caused by exercise, by the training of the carers, or by a combination of both interventions.

Can physical activity influence mood in older adults?

Penninx et al. reported a significant reduction of depressive symptoms amongst their 439 older adults participating in an 18-month walking program, hinting at the possible antidepressant effect of physical activity [29]. Such an effect is supported by a randomized clinical trial reported by Blumenthal et al. [30]. They recruited 156 people aged 50 to 77 years who met criteria for the diagnosis of a major depressive episode according to DSM-IV. Subjects were randomized to treatment with sertraline (50 to 200 mg), exercise, or a combination of both. Subjects randomized to exercise attended 3 supervised sessions of physical activity per week for 16 consecutive weeks (walking and jogging). All three forms of treatment were associated with a significant reduction of depression scores, and there was no significant difference in treatment response between the groups. There is also encouraging evidence that the positive effect of physical activity on mood may persist over time. Singh et al. studied a sample of 29 subjects aged 60 years and over who were randomized to a 10-week program of supervised exercise (n = 15) or education, and were later followed-up for another 20 weeks [31]. They found a significantly greater decline of depression scores amongst subjects in the exercise group after 20 weeks and 26 months. In addition, Babyak et al. showed that subjects with a depressive disorder who exercise are less likely to relapse after 10 months, particularly if they remain physically active during the follow-up period [32]. Finally, the results from the Almada County Study showed that physical activity was associated with decreased odds of prevalent (OR-0.90, 95% CI = 0.79–1.01) as well as incident depression over 5 years (OR = 0.83, 95% CI = 0.73–0.96) in a community-dwelling sample of 1947 adults aged 50 to 94 years [33].

Physical activity and quality of life in older adults

The large body of research in this area clearly demonstrates that a major aim of PA programs is not just decreasing mortality, but also decreasing morbidity i.e. 'adding life to years' and not just 'years to life'. Spirduso and Cronin have recently shown, in a detailed review of cross-sectional and prospective studies, that PA is consistently associated with improved well being and better quality of life in later life [34]. They also concluded that long-term PA delays disability and maintains independent living. In addition, older adults who expend larger amounts of energy daily (walking, gardening and exercise) are more likely to have optimal function in their activities of daily living (ADL).

Physical activity recommendations for older adults

The National Heart Foundation of Australia recommends 30 minutes of moderate intensity PA (activity that is energetic, but at a level at which a conversation can be maintained) on most or all days of the week to improve cardiovascular health. They also suggest that "the total amount of PA seems to be more important than the intensity, so that lower intensity daily activity may confer benefits that are similar to higher intensity activity on fewer days of the week". This was confirmed by the results of randomized trials that included lifestyle PA as well as structured exercise programs [35]. The Center for Disease Control and Prevention (CDC) calls for increased level of activity by incorporating any activity of at least moderate intensity into the day. For older adults, the daily accumulation of PA (stair climbing, gardening, brisk walking, or housework) in intermittent short bouts may be sufficient to achieve the recommended 200 kcal/day [36]. Suggested types of PA for older adults include moderate cardiovascular training with walking being the most popular, strength training, aerobic and balance and flexibility training. Balance training has been shown to reduce falls (Judge et al, 2003). Even more so than for younger adults, older people should be screened for illnesses, such as heart disease, before they start a PA program.

Can older adults be motivated to participate in physical activity?

More than any other age group, older adults are seeking health information and are willing to make behavioral changes to maintain their health and independence [37]. Unfavorable perceptions of one's own health are associated with lower engagement in PA, whereas perceived enjoyment and satisfaction are possible predictors of more frequent PA in men and women of all ages [38]. This suggests that psychosocial rather than biomedical variables may influence continued participation in exercise programs. In addition, older adults are more compliant with interventions that allow them to perform their PA of choice on their own, in an environment where they feel safe and competent, and where competition is not an issue [39].

An expert panel identified important determinants for exercise compliance: biomedical status, past exercise participation, and educational level [40]. Van der Bij et al. concluded, in a review of PA interventions for older adults, that in the short-term (< 1 year) home and group-based interventions are equally successful in achieving high participation rates (84–90%), although these rates tend to decline with time (≥ 1 year) [41]. PA intervention trials utilizing cognitive-behavioral strategies and regular telephone contacts have higher participation rates than others [38]. High retention rates (92% after 6 months) were reported in a physical activity plus behavioral intervention program with centre-based and home-based initiated approaches in middle to older aged women [42].

Conclusion

This paper has reviewed the recent literature on a topic that is of increasing interest for clinicians and researches trying to improve treatment outcomes for older patients with mental illnesses such as depression and cognitive impairment.

It can be seen that physical activity, like a number of other lifestyle interventions, holds the promise of better mental health outcomes for older adults. Such an intervention has the advantage of being safe and inexpensive and produces a wide range of health benefits. However, it is still necessary to wait for the convincing results of randomised trials that will systematically investigate the use of physical activity as a primary preventative strategy for dementia and depression in later life.

Competing interests

None declared.

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