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Research paper

Leisure time activities and cognitive functioning in middle European population-based study

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ABSTRACT

Purpose: Physical, cognitive, and social leisure activities are associated with a lower conversion to dementia. We examined whether single components of thirteen physical, five cognitive, and six social activities, or their combined effect are related to non-conversion or performance in episodic or verbal memory, executive functioning, and language.
Subjects: A prospective five-year study in community dwelling cohort of 75-year-old adults ($N = 399$) without dementia at baseline from the Vienna Transdanube Aging Study (VITA).
Results: Using the self-reported leisure activities during the year prior to the baseline examination, later converters to dementia already had lower composite scores of leisure activities. In the adjusted analysis, hiking and summation of all physical activities predicted a lower conversion to dementia ($P = 0.019$, OR = 0.56; 95%CI: 0.34–0.91 and $P = 0.035$, OR = 0.88; 95%CI: 0.77–0.99). Cognitive activities such as reading and writing, were associated with a lower rate of conversion to dementia; in contrast, television (TV) viewing showed a trend towards increase in conversion ($P = 0.053$, OR = 1.8; 95%CI: 0.9–3.4). In multiple comparisons, physical, cognitive, and social activities lead to improvements in episodic, visual memory, executive function, and naming ability. TV viewing predicted a worse performance in executive function at five-year follow-up.
Conclusions: These results from a middle European population-based study support a protective effect of leisure time activities on lower conversion to dementia and identify an association between the passive activity of TV viewing and low executive functioning.
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1. Introduction

Non-pharmacological approaches for preventing or delaying conversion to dementia have gained significantly in importance, given the fact that no new pharmacological agents have been approved for clinical use in the past decade. Engagement in physical, cognitive or social activities has been demonstrated to delay the onset of cognitive deterioration leading to dementia [1,2]. In a 21-year observational period, physical activity at midlife was associated with a decreased risk of dementia and Alzheimer's disease (AD) later in life [3]. Physical fitness, measured by subjective or objective scales, acts as a protective factor for the development of cognitive disorders. Subjects who performed better on motor coordination had a reduced risk of developing mild cognitive impairment (MCI) or AD and performed significantly better on various neuropsychological measures [4]. The protective role of leisure physical activities in the development of dementia was also supported by a six-month randomized controlled trial, where cognition modestly improved in persons who had previously reported difficulties with memory but did not meet the criteria for dementia [5].

Leisure cognitive or social activities have a similar effect. Reading books/newspapers, writing, studying and attending theater or visiting friends may also protect against dementia [6,7]. Furthermore, involvement in several activities, rather than one, seems to be more beneficial [8].

Although complex, the mechanisms by which leisure activities decrease the risk of dementia were found to be connected to the neurodegeneration of Alzheimer type and vascular dementia. Pathways discussed in this context mostly rely on cognitive reserve theory on the one hand and the "use it or lose it" concept on the other hand [9]. A transgenic mouse model on neurodegeneration of AD type demonstrated that the providing of an enriched environment which promotes physical activity, in contrast to

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"standard housing" conditions, stimulates Amyloid beta degradation through an elevation of peptidase neprilysin [10]. Environments that offer physical, cognitive or social interaction stimuli may be conductive in increasing cognitive reserve or compensate for damaging processes, thereby delaying the clinical onset of dementia. Further protective mechanisms have been related to improvement of cerebral blood flow, to changes in hormone levels, to potentiate synaptic strength and supporting neuronal plasticity including neurogenesis. Such environment- or exercise-induced structural and functional changes have been documented in various brain regions but were best studied in the hippocampus [11] and entorhinal cortex, where the neurodegeneration of AD type is proposed to start.

Studies involving older individuals are challenging as different socio-demographic, genetic and educational factors may influence whether or not a person engages in leisure activities. So far, limited information is provided on the association between sedentary behaviors and cognitive outcomes. Recent results from a French population-based study demonstrated that regular computer use is in contrast to television (TV) viewing beneficial to cognitive function [12]. The adverse effect of viewing TV was demonstrated also in elderly Chinese, Japanese and American cohorts [13–15]. We therefore selected 399 persons without dementia at baseline from the Vienna Transdanube Aging Study (VITA) and studied the influence of leisure activities on cognitive parameters. Only those persons who had completed both a baseline and a 5-year investigation were selected for this analysis. We initially examined the association of 13 physical, 5 cognitive, 6 social individual activities, and 1 passive activity (TV viewing) with conversion/non-conversion to dementia. We subsequently examined the potential effects of physical, cognitive or social activity on episodic and visual memory, executive functioning, or naming ability at 5 years. We hypothesize that physical, cognitive and social activities will have an equivalent importance for performance of memory, executive and language function. Secondly, we were interested whether TV viewing, as passive leisure activity involving low levels of cognitive activity, would be associated with lower performance of particular cognitive domain.

2. Methods

2.1. Study population

This study is based on data collected in the Vienna Transdanube Aging Study, a population-based study of 75-year-old inhabitants of two municipal districts of Vienna, Austria. All inhabitants born between May 1925 and June 1926 were contacted in a personal letter and were invited to participate in the initial, cross-sectional investigation. In adherence to ethical vote, the subjects were not allowed to be visited at home. Due to this selection, the VITA-population is an age-homogeneous sample and both age and gender distribution corresponds to previous studies [16]. The subjects gave written informed consent for participating, and the study was approved by the local ethics committee of the Vienna Medical University. VITA began in 2000 with a baseline examination of 606 persons (40% of 1505 contacted); participants were re-examined every 2.5 years [17]. Data from baseline and the five-year follow-up investigation is included in the following analyses.

Five hundred and eighty-five individuals without dementia at baseline examination were selected for this study (Fig. 1, flow chart). Of 581 classifiable participants, 440 were cognitively unimpaired and 141 had MCI. Persons who participated in the 2.5 year investigation, regardless of cognition, and were lost at 5-year follow-up, were excluded from the analysis. At 5 year follow-up, 399 persons met the criteria for both baseline and 5-year investigation. Two hundred and eighty-two individuals remained free of dementia (68%), 117 (28%) converted to dementia. Of 282 participants without dementia, 215 were cognitively unimpaired and 67 were diagnosed with MCI. One hundred and eighty-two persons did not participate in the 2.5 or 5-year follow-up and were excluded. The reasons are depicted in Fig. 1. Of 182 excluded persons, 74 participants had died. In 88 persons who refused to participate, following causes were documented: lack of interest ($n = 35$), somatic morbidity ($n = 38$), depression ($n = 5$), lack of time ($n = 5$), fear ($n = 3$) and forgetfulness ($n = 2$).

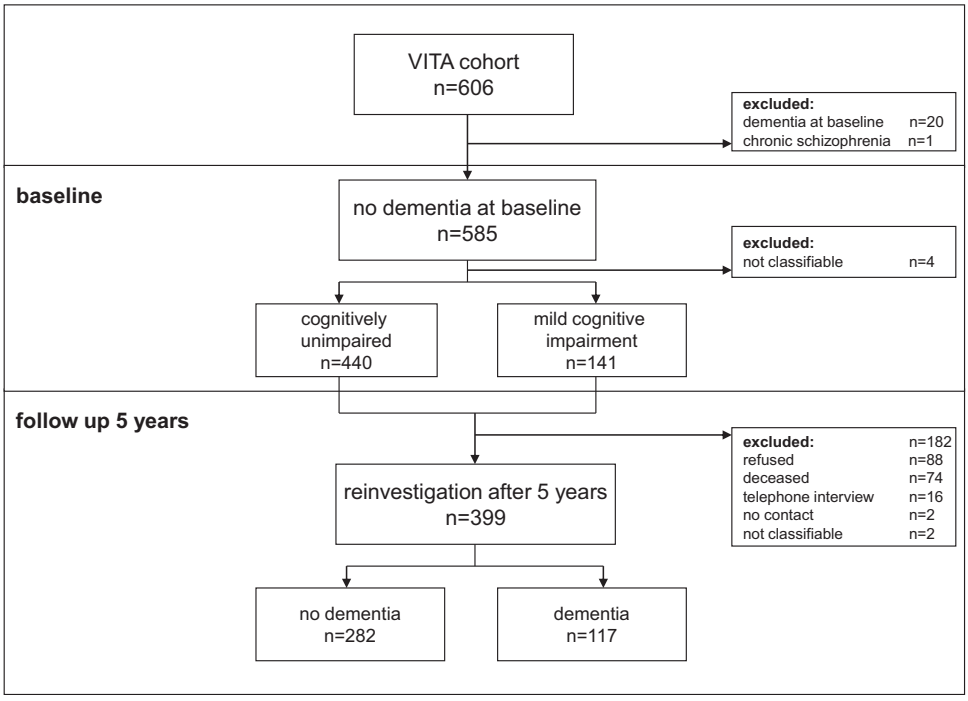

Fig. 1. Flow chart of studied population, which represents selected persons without dementia at baseline.

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