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Cognitive Reserve in the Prevention of Dementia - Reading and Other Cognitive Activities - A Literature Review

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Abstract

Introduction and purpose: Dementia is a growing problem in society. A key factor in preventing dementia is cognitive reserve. The aim of this paper is to summarize knowledge regarding developing cognitive reserve through participation in reading, other cognitive leisure activities, and education.

A brief description of the state of knowledge: Higher cognitive reserve is a protective factor against cognitive decline and provides greater opportunities to compensate for brain changes occurring in the course of dementia. Numerous studies demonstrate the beneficial effect of spending leisure time on cognitive activities on the development of cognitive reserve. Furthermore, higher education also significantly contributes to higher levels of cognitive reserve. Reading is an activity that has a particularly significant impact on preventing dementia and preserving memory function. The benefits of these activities in delaying the onset of cognitive decline have been described in diseases leading to dementia, such as Alzheimer's disease and multiple sclerosis. Other aspects of reading, such as tests measuring cognitive reserve and the NART, as well as the impact of cognitive reserve on language function in older adults, will also be discussed.

Summary (Conclusions): Although research still needs to expand on the impact of specific types of cognitive activity on dementia prevention, reading activity is already showing promising results. The conclusions from this article demonstrate the benefits of such activities

on developing cognitive reserve and may serve as a starting point for further research on developing dementia prevention programs.

Key words: cognitive reserve; dementia; reading

1. Introduction and purpose

Dementia is a growing problem in the modern world. The increasing life expectancy is leading to an aging population. This translates into an increased incidence of age-related diseases, including dementia (1). Therefore, dementia prevention can be considered crucial nowadays, as it can ultimately improve the quality of life of elderly people and, from a socio-economic perspective, reduce the costs of caring for people suffering from dementia, which constitute a heavy burden on the budgets of both families and public health systems (2). Irreversible changes occurring in the brain in the course of dementia require the search for strategies to compensate for them in order to maintain cognitive performance in older people. An effective method of preventing dementia is to develop a higher cognitive reserve (3). One of the primary proxy measures for assessing cognitive reserve status is education level. Reducing illiteracy rates may effectively contribute to a decrease in the incidence of dementia in society, while higher education may delay its onset (4). While education is usually particularly relevant during adolescence, the need to develop cognitive reserve does not diminish with age. Engagement in cognitive activities, which can be practiced throughout the lifespan, is crucial in building it. A wide range of activities considered to develop cognitive functions offers a range of strategies for dementia prevention. Practicing these activities as a form of leisure time is crucial in preventing cognitive decline (5). Reading occupies a special place among such activities, which is reflected in tests assessing cognitive reserve (6,7).

This paper is a review article on the presented topic. The scientific literature used to obtain the information needed to write this article was searched using databases such as PubMed, Google Scholar, and journal search engines. The keywords used to select publications were "cognitive reserve," "reading," "dementia," and "dementia prevention."

The aim of this review is to discuss the state of knowledge regarding cognitive reserve and its impact on the prevention of dementia. Among the cognitive activities discussed, which are behaviors that increase cognitive reserve, reading will be particularly highlighted. The

importance of these activities will be discussed based on numerous scientific publications presenting research results on this topic. Particular attention will be paid to Alzheimer's disease, as it occupies a special place among dementias due to its high prevalence, and to multiple sclerosis, which, due to its early onset and chronic, progressive nature, allows for better observation of changes in cognitive reserve and function throughout the course of the disease. Furthermore, issues indirectly related to the impact of reading on cognitive reserve and dementia prevention will be discussed, such as its contribution to cognitive function tests, the importance of education, and the ultimate impact of cognitive reserve on reading in older age. The conclusions of this article are intended to provide a starting point for developing dementia prevention strategies based on reading activity both in youth and in aging.

2. Description of the state of knowledge

2.1. Cognitive reserve

Cognitive reserve is defined as the property of the brain that allows it to maintain cognitive performance better than its objective state, which is characterized by changes in the brain related to the course of life, brain injuries or neurological diseases. It complements the concept of brain reserve, which describes the neurobiological condition of the brain characterized by issues such as the number of neurons or synapses, but does not fully take into account the issue of adaptation of cognitive processes. Both are components of a broader concept called resilience (8). Research on cognitive reserve is often conducted on the basis of proxy measures, including: level of education, occupational status, and involvement in activities that stimulate cognitive functions (9). Research confirms that low cognitive reserve correlates with faster cognitive decline, while older adults with high cognitive reserve maintain their cognitive function and slow the progression of cognitive impairment. This reduces the risk of dementia and helps individuals cope later in life by engaging compensatory processes (10). Greater neural efficiency in individuals with higher cognitive reserve allows for significant flexibility and individual variation in task processing, reducing the incidence of Alzheimer's disease and other age-related problems. Cognitive reserve is not a static value, but rather evolves throughout life. This indicates the benefits of intervention in its development regardless of the stage of life, even in its late stages (11). The protective function of cognitive reserve against the development of dementia therefore occurs at various stages of life. However, its particular importance is emphasized in early and late life, when it

is thought to provide a somewhat stronger protective effect compared to middle age. This emphasizes the importance of building cognitive reserve from the earliest years of life, as well as when cognitive functions deteriorate and dementia symptoms begin to appear, which usually occurs later in life (3). Although cognitive reserve remains an abstract concept, research indicates that higher scores may directly translate into larger gray matter volume in the brain. This translates into better cognitive performance and allows for higher brain plasticity and optimal functioning (12). Cognitive reserve and its impact on preventing the development of dementia remain a subject of ongoing research. Cognitive training as part of a generally understood healthy lifestyle has shown promising results in recent studies. These conclusions support the continued research on cognitive reserve as a protective factor against age-related cognitive decline and its importance as a method for preventing the development of dementia (13).

2.2. NART and measuring cognitive reserve tests

There are numerous questionnaires designed to assess cognitive reserve. Among them, the following can be mentioned: Cognitive Reserve Index Questionnaire (CRIq), Cognitive Reserve Questionnaire (CRQ), Cognitive Reserve Scale (CRS), Lifetime of Experience Questionnaire (LEQ), Retrospective Indigenous Childhood Enrichment scale (RICE), Premorbid Cognitive Abilities Scale (PCAS). The measures and subscales used in these scales assess aspects such as education, occupational activity, leisure activities, bilingualism, hobbies, social life, physical activity, or technology use. The PCAS and RICE scales also specifically address reading ability and reading habits (7). Routine testing indicates that people with dementia can read surprisingly well. Among cognitive measures of premorbid intelligence, reading test scores are less affected than others, such as vocabulary tests. The National Adult Reading Test (NART) was developed as a tool to assess premorbid intelligence in patients suspected of intellectual decline. In the NART, the subject reads words sequentially from a list of 50 words arranged in increasing order of difficulty. The words are relatively short and all exhibit irregularities in accordance with generally accepted pronunciation rules. This minimizes the possibility of reading through phonemic decoding rather than word recognition. The recorded number of errors can be converted into an estimated IQ. This yields IQ scores very close to premorbid scores calculated on the Wechsler Adult Intelligence Scale (WAIS). The NART test has been updated to reflect the revised WAIS-R scale. The above indicates that the assessment of reading skills is an effective

method for assessing the premorbid IQ of people with organic and functional disorders in dementia (14). The NART test score provides a good reflection of premorbid IQ in individuals with mild cognitive impairment. However, as dementia such as Alzheimer's disease progresses, the score gradually declines over time. This makes it a good indicator of dementia severity in the later stages of the disease (15). Another test based on very similar principles is the Wechsler Test of Adult Reading (WTAR). Furthermore, it has been standardized in accordance with other existing scales, such as the Wechsler Adult Intelligence Scale (WAIS) and the Wechsler Memory Scale (WMS). Validation data for specific patient groups, such as those affected by Alzheimer's disease, neuropsychiatric problems, or traumatic brain injury, are also available, increasing the reliability of its results in these specific cases (16).

2.3. Cognitive activities in preventing cognitive decline

Developing cognitive reserve is crucial for preventing cognitive decline. It forms the basis for preventing the development of mild cognitive impairment and dementia during healthy aging (17). Interventions aimed at developing cognitive reserve, based on recreational activities that stimulate cognitive function, have yielded promising results in numerous studies. Among the five meta-analyses reviewed, four found significant correlations between participation in cognitively stimulating leisure activities and a reduced risk of cognitive impairment and dementia, while the fifth did not demonstrate statistical significance. This suggests that participation in cognitively stimulating leisure activities reduces the risk of developing dementia and cognitive impairment (5). A study conducted on the basis of self-assessment of activities undertaken by 6,346 participants mentions, among participation in social life and social activities, higher involvement in cognitive activities as a factor of lower risk of developing dementia (18). In another study conducted on 758 participants, cognitively stimulating activities (reading magazines, newspapers, or books; going to classes; and playing cards, games, or bingo) demonstrated greater speed reserve in the cohort and a trend for greater memory reserve in women. It is assumed that they may help maintain brain integrity in a manner appropriate to the cognitive demands of a given activity (19). A cohort study conducted on a population of 469 individuals over the age of 75 who were not initially demented examined the association between recreational activity and the risk of developing dementia. Over an average follow-up period of 5.1 years, recreational activities such as reading, playing board games, dancing, and playing musical instruments reduced the risk of

dementia (20). In a study of 15,582 Chinese individuals aged 65 years or older who were free of dementia at baseline and followed for an average of 5 years, the study found that active participation in intellectual activities (including reading books, newspapers, or magazines, playing board games, mahjong, or card games, and betting on horse races) even in later life can help delay or prevent dementia. Furthermore, the study found that this association could not be explained by other health-promoting practices, such as regular physical activity, adequate fruit consumption, and nonsmoking, or by health issues and aspects such as cardiovascular risk, depression, sensory impairment, or limited mobility (21). A study conducted on 75 patients with Huntington's disease showed that time off work (which usually consists of routine activities) intended for recreational activities such as reading, theater, television, driving, internet, gardening, music, etc., results in an increased cognitive reserve, thanks to which these patients are able to withstand a greater neuropathological burden (22). Taking the above into account, cognitively stimulating activities practiced during leisure time can be seen to have a significant impact on the development of cognitive reserve. Furthermore, their superiority in preventing dementia is also apparent compared to other factors, such as work, other aspects of lifestyle, or health factors.

2.4. The role of education in preventing dementia

Meta-analyses provide strong evidence for the impact of higher education on reducing the incidence of Alzheimer's disease, vascular dementia, and other nonspecific dementias. The cognitive reserve hypothesis posits that higher education reduces both the prevalence and incidence of dementia. These studies also consider the existence of a so-called "threshold effect," according to which dementia symptoms are initially masked in individuals with higher education, but once critical levels of brain pathology are reached, cognitive decline accelerates. However, they consistently indicate that individuals with lower education have a higher risk of dementia (23). A study of 546 older Australians questioned about their engagement in social, physical, and cognitive activities concluded with an assessment of their cognitive status after a six-year follow-up period. The results showed that cognitive activity in young adulthood significantly influenced the preservation of global cognition in late-life, and that social activity in young adulthood resulted in a significantly slower rate of cognitive decline in later life. Extended analysis confirmed the link between these findings and the period of formal education and demonstrated its greater importance in promoting cognitive function in later life than engaging in cognitively stimulating leisure activities (24). Another

study demonstrates a significant association between illiteracy and a higher rate of dementia in the population. Its findings indicate that 16% of dementia cases in South Korea in 2015 can be attributed to illiteracy, and this rate is expected to decline to approximately 2% by 2050 as a result of a reduction in illiteracy rates in society. Among the socioeconomic aspects of education's importance, the issue of cost savings in future dementia care also arises. The data also applies to other regions of the world, such as Latin America, South Asia, the Middle East, and Africa, emphasizing the importance of combating illiteracy in children, adolescents, and middle-aged adults as a primary prevention method for the development of dementia (4). Education also influences the volume of the cerebral cortex through numerous mechanisms, such as shaping intelligence and skills, creating new neural connections, and promoting a healthy lifestyle. These factors, by increasing cognitive reserve and brain capacity, help maintain cognitive performance (25). A study conducted on 459 participants assessed the impact of higher levels of education and reading activity on the development of cognitive deficits in later life. The results demonstrate how higher education level (defined as education lasting more than 13 years) translates into better cognitive function and larger hippocampal volume. However, it also indicates that the low-educated group (less than 12 years) may achieve better results on cognitive tests as a consequence of increased reading activity (26).

2.5. The role of reading in creating cognitive reserve

The results of the study cited above, in addition to education, also consider reading as a factor in dementia prevention. Although years of education demonstrated a beneficial effect on structural changes in the hippocampus, the level of reading activity significantly contributed to better cognitive test scores in the low-educated group. This provides evidence of the impact of reading on developing cognitive reserve, which, by definition, is intended to compensate for unfavorable changes occurring in the brain (26). In the previously cited study, reading books or newspapers was listed among the leisure activities associated with a reduced risk of dementia. Compared to the group whose reading activity was classified as rare (once a week or less), the group with frequent reading activity (several times a week) had a significantly lower risk of dementia (1.00 vs. 0.65) (20). A Spanish study examining the prevalence of subtle cognitive decline among nuns compared to women in the general population assessed the influence of potential protective and risk factors. The results suggest that reading may play a key role in preserving memory and cognitive function in nuns compared to controls. Among the factors examined, the delayed onset of cognitive decline in

the nuns group may be explained by higher levels of education, higher engagement in reading activities, lower levels of depression, and lower benzodiazepine consumption (27). A six-year follow-up study conducted in Japan examining social interactions and dementia prevention lists high frequency of newspaper reading among the factors preventing dementia (28).

Chang, in a secondary analysis of the Taiwan Longitudinal Study on Aging - a study of 2,946 participants, of which 818 had 14 years of follow-up, found that high reading activity (defined as reading almost daily) was associated with a lower likelihood of cognitive decline compared with low reading activity. This finding is consistent with the results obtained at both the 6- and 10-year follow-ups (29). A study conducted as part of the Rush Memory and Aging Project among 951 older adults evaluated the use of proxy measures of cognitive reserve and their relationship to cognitive function in old age. One of the proxy measures assessed was reading ability. The results of this study indicate that, next to education, reading ability is the most reliable measure of cognitive reserve in relation to cognitive function in old age. Reading ability assessed using the NART was strongly associated with both working memory and, secondarily, episodic memory, as well as global cognition (30). Another study aimed to clarify which type of intellectual activity is most beneficial for cognitive reserve. For this purpose, a three-dimensional model of activity description was constructed, assigning characteristics to each activity, defining whether it is active vs. passive, novel vs. familiar, and productive vs. receptive. Reading was classified as an active, novel, and receptive activity. The results indicated that activities described as novel and productive are particularly crucial for preventing cognitive impairment. However, they also showed that reading moderates the effect of age on semantic memory (31). A study assessing the impact of living alone on cognitive reserve conducted among 269 women in Mexico City, 73% of whom were single, widowed, separated, or divorced, and one-third lived alone, yielded paradoxical results. Living alone was found to be an independent factor reducing the likelihood of mild cognitive impairment, assessed alongside a higher likelihood of demonstrating high cognitive reserve. This result appears to be the effect of higher engagement in intellectual and artistic pursuits. It is worth noting that two-thirds of the respondents reported reading as their main hobby (32). In a study focusing on the concept of the Cognitive Age Delta - the difference between predicted cognitive age and chronological age - various factors were assessed as determinants of cognitive age. Among them, premorbid verbal ability, assessed through reading and vocabulary tests, is an independent factor strongly influencing better cognitive performance in both healthy individuals and those on the Alzheimer's disease continuum. Furthermore, this

suggests that vocabulary can be used as a proxy measure of cognitive reserve (33). A study on cognitive reserve and language function compared a group of older adults with subjective cognitive decline and those who did not report such decline. Among the study results, two analyses considered reading activity to be particularly important for building cognitive reserve. Among those who read 10 or more books per year, the percentage in the group reporting no cognitive decline was significantly higher than in the group with such symptoms. A statistically significant difference was also found when comparing non-readers or those who read up to one book per year with those with higher reading activity – the percentage of those reporting higher reading activity was higher in the group without subjective cognitive decline (34). Research identifies reading as one of the cognitive factors that maintain and develop cognitive reserve. It facilitates the development of cognitive functions such as language, attention, memory, executive function, and intelligence. It increases neuroplasticity and neurogenesis by directly stimulating specific areas of the brain. This beneficial effect is evident across all age groups, education levels, and regardless of whether a person is a good or poor reader. Both academic and recreational reading stimulate the brain and can positively impact the development of cognitive reserve (6).

2.6. Alzheimer disease - cognitive reserve and reading aspect

A generally healthy lifestyle has a beneficial effect on reducing the risk of Alzheimer's disease (35). Studies have identified the practice of cognitively stimulating activities, such as reading, writing letters, visiting the library, and playing games like chess or checkers, as among the components of a healthy lifestyle (36). A study conducted on 232 participants assessed the relationship between cognitive reserve and cortical thickness in areas susceptible to Alzheimer's disease and the risk of progression from normal cognitive function to clinical symptoms of mild cognitive impairment. Cognitive reserve was measured using a composite score of three measures reflecting participants' lifetime cognitive experience. In addition to the baseline score on the WAIS-R vocabulary subtest and years of education, baseline scores on the NART were considered. High cognitive reserve was found to better compensate for cortical thinning, which occurs in the earliest stages of Alzheimer's disease, regardless of cognitive reserve. A supplementary analysis examining the impact of individual measures individually, rather than combined, demonstrated that the protective effect of reading and vocabulary on the risk of clinical symptoms of mild cognitive impairment was stronger than that of years of education (37). Another study, evaluating two prospective cohorts (n=2680),

aimed to quantify the association of modifiable risk factors with years of delayed dementia onset as part of its prevention in Alzheimer's disease. Among the factors assessed was cognitive activity, measured by the frequency of four brain-stimulating activities: newspaper reading, magazine reading, book reading, and playing games. Participants with higher levels of these activities were diagnosed with Alzheimer's disease later. The delay time was calculated to be 3.5 years (38). After analyzing 966 participants from the Religious Orders Study or Rush Memory Aging Project who underwent brain autopsy and annual cognitive assessments prior to death, we identified factors thought to contribute to brain resilience in the context of Alzheimer's disease neuropathology. Among the factors examined were baseline reading level (assessed using the National Adult Reading Test (NART)) and the frequency of cognitive activity, which included newspaper reading, magazine reading, book reading, listening to the radio, watching television, playing games such as cards or checkers, solving crosswords or other puzzles, and visiting museums. According to the analysis, both reading level and previous cognitive activity showed a strong association with higher resilience (39). It is therefore suggested that reading can be effectively used as a tool to support memory development and cognitive reserve in individuals predisposed to Alzheimer's disease. The broad range of activities encompassed by the general concept of reading, as well as the wide variety of content, make reading an attractive tool for stimulating brain activity, enabling it to address the preferences, interests, and needs of individuals targeted for prevention (40).

2.7. Multiple sclerosis - cognitive reserve and reading aspect

Multiple sclerosis, as a chronic, progressive, and early-onset disease (20-40 years of age), in which cognitive decline occurs in over half of patients, offers numerous opportunities for research on the impact of cognitive reserve on the course of dementia, compared to late-onset diseases. Furthermore, the ability to identify patients at greatest risk of future cognitive decline based on neuroanatomical parameters and intellectual development across the lifespan may offer them the opportunity for early cognitive rehabilitation. However, the development and maintenance of cognitive reserve should be a crucial factor in preventing cognitive decline in all patients (41). Patients with multiple sclerosis who engaged in more cognitive leisure activities in early life demonstrated better current cognitive status and were able to withstand more severe brain atrophy without developing cognitive impairment, regardless of other factors affecting reserve, such as intelligence, education, or maximum lifetime brain growth. Activities classified as cognitive leisure activities include reading books, magazines,

and newspapers (42). In a study of 36 patients diagnosed with multiple sclerosis, their premorbid cognitive activity (e.g., reading) during leisure time was assessed. Based on the study results, this activity was considered an independent source of cognitive reserve. Premorbid cognitive leisure activities were not correlated with brain atrophy, but were positively correlated with current cognitive status, allowing patients to withstand more severe neuropathology before cognitive impairment occurred (43). Another study of 62 patients with multiple sclerosis focused on the concepts of brain reserve (assessed using magnetic resonance imaging) and cognitive reserve (referring to cognitive leisure in early life). Follow-up analyses of this study showed that brain reserve provides more protection against cognitive inefficiency, not memory deficits, while cognitive reserve provides higher protection against memory deficits than cognitive inefficiency (44). A study conducted on two samples of patients with multiple sclerosis - Italian and American - assessed which specific types of cognitive activities impacted hippocampal volume and memory. Activities were divided into three groups: reading-writing (including reading books, magazines, newspapers, and producing non-artistic writing), art-music, and gaming-hobby. Of the types studied, reading-writing proved to be the only predictor of hippocampal volume and the best predictor of memory (45). In a study of 128 German patients with multiple sclerosis, 27 neuropsychological tests were administered to assess basic cognitive functions, attention, visual perception and construction, executive functions, memory, language, problem-solving, and learning. Furthermore, their educational background, occupational status, physical activity, and reading habits were taken into account. The results show that reading activity is correlated with basic cognitive functions, executive functions, visual perception and construction, and attention. Furthermore, among readers, those who engage with challenging materials may also benefit in learning, memory, problem-solving, and language. An assessment of education duration and its impact on cognitive reserve also indicated a particular benefit of other factors influencing cognitive reserve in individuals with shorter education. This suggests that increased engagement in reading activity, for example, may offset shorter education periods in terms of cognitive reserve in patients with multiple sclerosis (46). In a study conducted with 14 participants with multiple sclerosis, an intervention was implemented in the form of cognitively stimulating activities. Ten of the participants chose to engage in reading. After 12 weeks, participants' opinions were collected about the benefits they perceived after the intervention. They cited subjective improvements in cognitive function, increased impairment in awareness, and engagement in compensatory strategies (47). The literature thus demonstrates the beneficial impact of cognitive reserve on

maintaining cognitive function in individuals with multiple sclerosis. In addition to a higher level of education, which can be a measure of cognitive reserve, cognitive enrichment through appropriate use of leisure time is also suggested. Among the possible activities, reading is mentioned as particularly beneficial for building cognitive reserve, even in individuals with lower education (48).

2.8. The importance of cognitive reserve in reading

An Italian study of 65 older adults assessed the impact of cognitive reserve on their cognitive functions and linguistic abilities. The results showed that higher levels of cognitive reserve positively impacted the processing of abstract text and low-frequency words. The cognitive reserve provides the information necessary to create context when processing abstract expressions. Furthermore, individuals with higher levels of cognitive reserve demonstrated faster reading speed and faster resolution of syntactic violations. These findings suggest that the modulatory effect of cognitive reserve helps maintain rapid and accurate linguistic responses during the aging process (49). Another study conducted on 120 older adults examined how cognitive reserve and working memory influence reading comprehension and how their predictive value varies depending on sentence structure and task requirements. The results of the sentence comprehension test demonstrate a beneficial effect of cognitive reserve on reading comprehension performance. In tasks involving the verification of a sentence presented simultaneously with an image, the predictive value of cognitive reserve turned out to be crucial, while in tasks with sequential presentation of text and image, the predictive value of working memory increased (50). A cross-sectional study of 1,869 Korean individuals examined the relationship between dementia knowledge and dementia worry and engagement in cognitive activities. Individuals who engaged in more reading had higher levels of knowledge about dementia. Dementia knowledge and cognitive activity are positively associated. Consequently, individuals with higher levels of knowledge about dementia engage in more cognitive activities, creating higher cognitive reserve and thus preventing dementia. In contrast, higher dementia worry reduces cognitive activity (51). An interesting new solution is interactive systems supporting cognitive training in older adults as a tool for dementia prevention. The interactive format improves eye-hand coordination and brain memory. The use of multimedia provides feedback. A key element of such cognitive games is the use of reading functions, both by incorporating it into the task structure and in the form of feedback (52).

3. Summary (Conclusions)

Cognitive reserve remains a key factor in preventing cognitive decline and the development of dementia. Among numerous tests and proxy measures assessing its level, education level proves particularly important. While higher education reduces the incidence and prevalence of dementia, illiteracy or a lower level of education is a risk factor for developing dementia. Although acquiring education is usually associated with adolescence, the development of cognitive reserve is also possible later in life. Engaging in leisure-time activities that develop cognitive functions becomes increasingly important. Among these numerous examples, reading deserves special mention. Research demonstrates its impact on protecting against cognitive decline, reducing the risk of developing dementia, and preserving memory function. Vocabulary and reading abilities are also used as proxy measures to assess cognitive reserve. Reading, as well as other cognitive activities, may also contribute to delaying the onset of cognitive impairment in Alzheimer's disease. A similar effect has also been demonstrated for multiple sclerosis, highlighting not only the level of engagement in cognitive activities before the onset of the disease, but also its importance for cognitive rehabilitation during its progression. However, the number of studies assessing the impact of reading independently of other cognitive activities and its impact on dementia prevention is limited. Expanding research on individual activities is necessary to identify specific strategies for dementia prevention. In the face of efforts to improve public education and combat illiteracy, reading is becoming a readily available technique for building cognitive reserve. The research results cited above offer great promise for improving society's cognitive reserve through changes in leisure time strategies. Including reading in dementia prevention programs is promising.

Author's contribution

Conceptualization: Michał Brzeziński, Kacper Godyń-Müller; Methodology: Mateusz Kasprzak, Michał Grześkowiak; Validation: Hanna Pelant, Martin Zeigner, Joanna Błaszczyk; Investigation: Bartosz Kulak, Zuzanna Majchrzak, Klaudia Pierzyńska; Writing - original draft preparation: Michał Brzeziński, Kacper Godyń-Müller, Bartosz Kulak, Klaudia Pierzyńska; Writing -review and editing: Michał Brzeziński, Kacper Godyń-Müller, Mateusz

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Declaration of the Use of Generative AI and AI-Assisted Technologies in the Writing Process

During the preparation of this work, the authors used generative artificial intelligence tools only for linguistic refinement, including improvements in grammar, clarity, and academic style. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the substantive content of the publication.

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