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A Scoping Review on Delaying Cognitive Decline and Dementia with Aging

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Abstract. There are a lot of elderly people who are suffering from decline in cognition or even the dementia like Alzheimer's disease as they are aging. Although cognitive decline is an irreversible trend for all the human beings, related practitioners can do some interventions to delay this trend. This review summarizes the current interventions to delay the cognitive decline among the elderly people and prevent cognitive diseases like Alzheimer's among them. The methods mainly include having healthier diets and performing healthier lifestyles. *Most studies are performed in a longitudinal study which include several follow-ups which increase the preciseness and accuracy of the results.* Results from current studies show that intaking healthier diets like drinking coffee and tea, eating mushroom as well as Mediterranean-DASH Intervention for Neurodegenerative Delay (MIND) diets, and doing healthier lifestyle are proved to have influence in delaying decline of cognition and other dementias like Alzheimer's disease. This sheds light on future treatment on the cognitive diseases like Alzheimer's disease among the elderly and have potentials to delay the cognitive decline.

Keywords: Delaying cognitive decline; dementia; aging; diets; lifestyle.

1. Introduction

The issue of cognitive decline is a common topic around the world. The elderly people with dementia and even Alzheimer's diseases are frustrating so many families. Currently above decades of millions of people are suffering from Alzheimer's disease or other dementias worldwide, and every year, there are nearly 10 million person who begin to suffer from these symptoms. There are more than 6 million Americans living under the frustration of the Alzheimer's disease. What makes things worse, there is 33% elderly people are died because of Alzheimer's disease or other dementias. The death rate caused by it has exceeded breast cancer and prostate cancer combined. Everyone will die at some age and their cognitive functions will surely decrease, but why some people suffer from dementia diseases from an earlier age or to a more serious extent is unknown quite well. Even why some people have more risks of getting Alzheimer's disease is frustrating researchers for years. In other words, there are not many results about the direct mechanisms behind Alzheimer's disease and other dementias. Although some genes related with Alzheimer's disease like APP, PSEN1 and PSEN2 are found, scientists are always striving to find ways to delay these people's decline of their cognition, delay the occurrence of dementias and even improve the cognitive abilities of those elderly people who have low risk of getting dementia. This review covers several ways including diets and lifestyles which have already proved to be positively related to cognitive function decline. All of them are empirical papers and their results have values to the whole society.

1.1. Intervention I. Intaking healthier diets

L-theanine can occur naturally, and it is found in some plants like tea, as well as coffee and mushroom. This ingredient ensures relaxation by decreasing anxiety levels and stress. As early as year 1999, animal models experiments have turned out the positive effects on cognitive functions of L-theanine in mice. In rats, Juneja and other researchers studies the long-term effects of injecting L-theanine on learning capacity and memory, by giving 180mg L-theanine per day. To test learning capacity, the study used an operant conditioning paradigm. When rats pulled a lever, a light switched on, and food was supplied as part of the operant conditioning paradigm. Rats exposed to L-theanine had much

better learning capacity than control rats, as evidenced by the fact that they gave more correct answers. Two avoidance tests, an active and passive avoidance test, were used to examine learning ability. The avoidance situations evaluated the rats' general propensity to switch in a compartment from light to dark. The electric shock was delivered in the passive avoidance test right after a rat switched from a light to a dark compartment. Rats given L-theanine displayed improved cognitive function, exhibited reluctance to enter the dark compartment, and spent longer in the compartment which is lighter compared with normal group. The active avoidance test looked at the attempts of rats to avoid an electric shock. When rats were given L-theanine, their avoidance behavior increased, indicating that their memory function had improve [1].

As the issue of ageing has become a heated topic around the world, researchers want to figure out the potential effects of drinking tea, coffee and eating mushroom on delaying cognitive decline in the ageing population as all of them contain L-theanine. In one paper, Feng et al wanted to study whether the frequency of drinking tea is related with the elderly people's cognitive function who are oldest through a longitudinal experiment. In this experiment, they recruited 7139 participants who were 80 to 115 years old with an average of 91.4 years old. Then the researchers did follow-up experiments in year 1998 (baseline year), as well as year 2000, year 2002, and year 2005. Only 913 subjects joined the experiment in year 2005. The subjects needed to report how often they drank when they were 60 years old as well as at that time point. Three choices of three different frequencies were provided to choose. The test of cognitive function was to ask participants to use 1 minute to call food names through their best efforts, excluding people who potentially develop dementia. They employed a linear mixed effects model and assessed verbal fluency scores as well as repeated measurements to investigate whether drinking tea at age 60 has impact on cognitive function. In the baseline year 1998, researchers found that verbal fluency was higher for daily and infrequent people who usually drank tea VS those who didn't, and there was a distinct linear trend in mean scores throughout tea consumption categories. For instance, while only 25.0% of non-tea drinkers reported exercising regularly, less proportions of participants who drank tea daily or on daily basis reported exercising. These variables were treated to be covariates since they are linked to cognition during old age. It is noteworthy that most participants did not alter their tea consumption behavior between the time the age of 60 years old and year 1998. According to the unadjusted model, daily drinkers had a higher average verbal fluency score (1.84 points) higher than people who didn't drink in 1998, while occasional ones had a verbal fluency score of 0.83 points higher. For all three groups, the mean value of verbal fluency dropped as time passes, and it is evident that during the follow-up period, daily drinkers consistently outperformed occasional drinkers in terms of verbal fluency scores, and occasional drinkers consistently outperformed non-drinkers when it comes to verbal fluency scores. The relationship between drinking tea frequency were still significant and have statistic value after they adjusted the model. (P value is <0.0001). All these results show that in a 7-year follow-up, an improvement in cognitive function is related with intaking tea, and whether participants reported the frequency of drinking tea at age 60 or in year 1998 which means they grew into 91.4 years old on average, the connection was still significant. And people who drink tea on a daily basis decrease in their verbal fluency score the most fast from their baseline, although continuously outperforming nondrinkers at all time points [2]. There are also similar positive results in drinking coffee and eating mushroom because of the ingredient L-theanine. According to Marjo et al, people who drink coffee moderately decreased their risk of dementia to a 65-70% extent, and people who drink coffee less often decreased their risk of it to a 62-64% extent where moderately-drinking coffee means 3-5 cups of coffee daily and low consumption means 0-2 cups of coffee daily, and gender as well as consumption levels also play an important role. Results show that the positive effect of drinking coffee is most prominent among males, and besides, people who drink coffee more have lower risks of suffering from dementia than those who drink less coffee among males [3]. Feng et al also found that participants eating mushrooms above 2 portions every week had decreased risks of getting impairment in cognition; after considering medical condition, living ways and other factors, this relationship are still significant a Mushroom consumption was associated with reduced odds of having MCI and this was significant when participants consume 3 over 4 portions during a week the slope

became less steep when the mushroom consumption level is higher, which offers a recommended weekly intake [4].

Besides drinking coffee and tea, researchers also found that the Mediterranean-DASH Intervention for Neurodegenerative Delay (MIND) diet can help delaying decline in cognition Both diets focus more on vegetables and fruits, avoiding too much salt and unhealthy ingredients. A cohort study done by Martha included 1306 participants who were free of dementia and agreed the annual clinical evaluation. Every participant needed to complete a cognitive testing per year. Using standardized neuropsychological testing procedures, technicians performed twenty-one trials, nineteen of trials are focusing on cognition includes different fields of memory. The scores of all 19 tests were written down. The mean scores obtained from baseline population were used to standardize the raw values for each test, and the standardized scores were then averaged. MIND diet includes 5 unhealthy ingredients and 10 healthy ingredients which are good to brains. Then they scored every diet by setting 0, 0.5, 1 for each dietary component according to certain quantities of servings. Both scores of DASHES and Mediterranean are put together in MIND diets. The pace of decline among participants in the first 25% scores was significantly smaller than that for those in last 25% proportion. The disparity in rates amounted to 7.5 years of age difference. Each cognitive domain had a statistically significant relationship with the MIND diet score, particularly memory of episodic, memory of semantic, and speed in perception [5]. This corresponds to the conclusion of another study made by Cinta et al that the memory improved significantly in this diet with nuts compared to the group without nuts, but the cognition globally improved in this diet which is added with olive oil [6]. In summary, drinking coffee, tea, eating mushroom, and taking MIND diets and DASH diets on a regular basis can do good to the cognition of the elderly.

1.2. Intervention II. Performing healthier lifestyles

Among the healthier lifestyles, researchers have put the emphasis on social activity as well as other relaxing methods like medication and music. Results show that on overage, every one-point increase in social activity, the cognitive functions decrease 0.034 unit per year or 0.47 unit in global cognitive functions [7]. Riccardo et al also did a longitudinal study and found that if a person participates more in physical, social, or intellectual activities, they will have more chances of improving their cognitive function and getting dementia by having smaller risks, and a slower cognitive decline [8]. In another study, 200 elderly people above 70 years old were recruited whose Mini-Mental State Examination (MMSE) are above 27. At 6 months and 12 months after baseline, the researchers measured the cognitive function of participants using MMSE. All participants were divided in three groups according to whether they ever played the musical instrument, were playing an instrument during that time, or they had been playing a certain musical instrument previously. Results showed that 70 elderly people out of 200 have played the musical instrument in the past and 27 elderly people out of 200 were playing the musical instrument at that time. Among 97 participants who played the musical instrument, 56 people played key-board instrument at first place, with woodwind at the second and violin at the third. Results showed that after 12 months people who have ever played have a significant improvement in their cognition compared to people who have never played musical instruments (p value is 0.01). This prospective analysis emphasizes the possible long-term advantages of practicing a musical instrument [9]. According to Corinne et al, early-stage dementia patients were given a three-week assignment to listen to well-known music every day for an hour. Brain activity was monitored both before and after an intervention while participants completed a cognitive test. Paired-measures tests assessed the influence made from intervention on the structure, function, and cognition of a brain over time. Six musicians and eight non-musicians out of the 14 persons in the intervention of music finished it. Post-baseline, there was a decrease in functional connectivity of fronto-temporal, as well as decreased activity in critical musical network nodes such the right inferior frontal gyrus and bilateral basal ganglia. Additionally, the measurements done in the functional and structural brain as longitudinal changes were significantly changed by musician status. The memory subdomain also saw a considerable improvement [10]. Both groups (Doing Kriya meditation and listening to music) give improvements after 3 months when they did tests in terms of memory and cognition (Doing

memory functioning questionnaire etc.). Changes were unrelated to their expectancies of treatment as well as the age, gender, or other factors. In summary, doing physical exercise, listening to music, doing meditation, performing social activities all do good to delay the cognition of the elderly and prevent certain dementias.

2. Discussion

This review sheds light on potential ways to delay the cognitive decline and other dementias among the elderly people. Most of them are cohort, empirical paper and focus on longitudinal results. These ways include drinking coffee and tea constantly and moderately, eating mushroom 0.75 portions/week, performing daily social and physical activities, doing Kirtan Kriya meditation, and being exposed to music consistently for at least three months. However, there are some limitations for current study results. There is no specific kind of tea and coffee is recommended, also many of the studies judge the frequency and extent by setting approximately five or less levels and giving scores. It may cause some deviations among each group. Besides, as there may exist small variations from person to person, maybe more standardized recipe should be recommended with the hope of more advanced technology. Among the elderly, eating healthily and living healthily are very important for them, but researchers must also consider its feasibility. Nowadays, the ageing speed of population is getting faster and faster, and many countries are facing this serious issue as they cannot provide enough services both at community level or individual level. Plus, their children are also busy with their work, it seems to be hard for them to really follow a healthy plan themselves for a constant period of time except for participating the research. However, as the results are shown to have positive effects on them, it is an urgent need to encourage more and more elderly people to perform the plans. The author think more social service should be shifted to elderly people, and the government should allocate enough funds to families of elderly people especially for those who are suffering from dementias, and it should encourage young people nowadays to care more for the elderly people. For the future interventions to delay cognitive decline, the author think not only elder people should add eating healthy diets and performing healthy lifestyles, but also the related department should formulate individualized electronic devices targeting each individual. For example, after measuring the improvement level before and after an intervention for each individual, this electronic device should automatically remind the elderly person to perform the task like drinking tea and doing social activities by shaking their wrist or calling their family members (if they have serious dementias). They may also join the WeChat group within their neighborhood and perform the plan more actively.

3. Conclusion

In summary, drinking coffee, tea, and eating mushroom as well as DASH diet and Mediterranean diet; listening to music, doing meditation, physical exercises and social activities all do good for cognitive functions among elderly people. All these interventions have potential to delay the cognitive decline and prevent dementias like Alzheimer's disease. This review sheds light on the current interventions and provide a more individualized and more feasible plan for the elderly in the future.

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