

Alex Andersen

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Public Health Need

Physical Activities to Improve Cognition in the Elderly

Ever since Promoting Health/Preventing Disease: Objectives of the Nation was published in 1980, physical fitness has been a focal point of the nation's public health agenda.¹ Over the last three decades, as HealthyPeople evolved from its original guidelines, it became evident that specific subsets of the population deserved unique attention, and as a consequence, individualized fitness goals. For HealthyPeople 2020, one area of interest was the proportion of the population over the age of 65 with reduced physical or cognitive function that engaged in physical activities. To gauge this, national and state physical activity statistics were trended. On a national level, 31.4% of adults over 65 did not engage in any physical activity in the year 2010², meaning that 68.6% of that age group did participate in some kind of physical activity. However, for the same year, only 34.8% of Americans over 65 with physical or cognitive limitations participated in some kind of exercise.³ The goal for 2020 is to increase that proportion to 35.9%.³

The proportion of adult Oregonians who participate in physical activity is higher than the national average. In 2009, 82.3% of the adult Oregon population participated in physical activities, with 59.8% meeting the recommendations set by the CDC.^{4,5} For the same year, 74.4% of Oregonians over 65 years of age engaged in exercise with 48.4% meeting the CDC recommendations.^{6,7} In Multnomah county, 84.8% of all adults participated in physical activity outside of work, which is slightly higher than the state average.⁸ Fortunately, Oregonians as a whole tend to prioritize physical activity, and statistically out-pace other states in terms of

exercise. This in mind, aging Oregonians can begin to look beyond fitness as a means of purely preserving physical health, and begin to see it as a means of protecting, even improving, their cognitive functioning.

The focus audience of this topic will be independently living Oregonians over the age of 50, with or without physical and/or cognitive limitations. Older adulthood starts at 65, by convention, but information regarding the importance of physical activity and cognitive health should be shared before retirement age. In order to build a strong foundation for healthy living, beneficial habits should be started before retirement. This will allow adults to safeguard their current, high-level of cognitive function, rather than attempt to recover losses associated with aging after they have already occurred.

Many older adults are concerned about their cognition, and worry about confusion and memory loss. In Oregon, 10.4% of adults aged 65-74 reported experiencing subjective cognitive decline, with the percentage increasing to 14.4% by the time they turned 75. Of those, over half reported that their cognitive decline interfered with their day-to-day activities including work and social interactions.⁹ The process of senescence naturally affects all parts of memory and cognition. Its effects are usually temporary and infrequent. Losing things from time to time and forgetting words or names only to remember them later are all expected occurrences in the elderly.¹⁰ Current research is looking into the cause of the cognitive changes associated with aging and have been focused on the structural changes of the white matter in the central nervous system (CNS).

As we age, cortical atrophy is observed in the brain as a result of white matter degeneration.¹¹ By measuring the fractional anisotropy (FA), the amount of white matter structural organization, the extent of the atrophy can be quantified. Using magnetic resonance

imaging (MRI) and diffusion tensor imaging (DTI) loss of FA is seen throughout the whole brain, with the posterior cortex being the least affected.¹² Degeneration of both the myelin and axons in the frontal lobe, parietal lobes, and temporal lobes, specifically the hippocampus, is hypothesized to lead to cognitive slowing and memory decline.¹³ However, physical activity has been shown to decrease, and in some cases reverse, the white matter atrophy seen with aging and thus improve cognitive function including memory, executive function, and attention.¹³⁻¹⁶

Both aerobic exercise and resistance training have been shown to improve cognitive functioning, with resistance training being slightly superior when performed alone. However, when combined into a multicomponent training regimen, the cognitive improvement is the greatest.¹⁵ In a randomized, matched-control trial of adults aged 61-89, the participants in the exercise group showed statistically significant improvement in their working memory, executive functioning, and processing speed, as compared to the non-exercise group.¹⁷ The exercise group performed a routine three times a week incorporating stretching, aerobic exercises, and strength training, again showing the importance of a multicomponent training regimen. A meta-analysis also showed that memory, including working memory, and executive functioning are the two areas of cognition that improve the most with physical activity.¹⁵

Another factor that endorses improvement in working memory performance is the consistency of physical activity. When performed sporadically or acutely there is no cognitive benefit seen from physical activity. However, if the activity is performed in more than one session then there is clear improvement in working memory.¹⁴ Resistance training and aerobic exercising are non-specific physical activities. Further research and investigation will be required in order to give more specific recommendations to patients.

From specific controlled trials it has been shown that yoga, tai chi, and dancing can all improve cognition in the elderly. Eyre et al. showed that by attending one Kundalini yoga class per week, and performing a short meditation exercise at home daily, adults over 55 years of age showed greater improvement in their executive functioning as compared to memory enhancement training.¹⁸ This is a very specific type of yoga, but a meta-analysis showed that nonspecific yoga also improves cognitive function.¹⁵ Along the lines of guided movements, tai chi has been shown to improve cognitive functioning in adults over the age of 60.¹⁹ When performed three times a week, tai chi improves logical memory recall. Tai chi and yoga are both low impact activities that can be performed either sitting or standing and are therefore ideal options for elderly patients. Tai chi and yoga also incorporate multiple facets in their routines including physical movement, balance, and mental focus. The specific combination of physical exertion and mental focus has been cited as the likely reason for the well-demonstrated cognitive benefits of these forms of exercise.²⁰

Dancing is another activity that inherently creates multimodal stimulation. Burzynska et al. showed that participating in one hour dancing sessions three times a week prevented cognitive decline by decreasing loss of white matter in the fornix in the elderly.¹³ Dancing was compared to aerobic exercising in the study, and the greater benefit seen from dancing was attributed to the social engagement that occurs in dance. Dancing characteristically involves at least two people who need to coordinate their movements together. Although not usually performed with a partner, both yoga and tai chi can incorporate the social factor by encouraging synchronized movements.

One advantage of yoga and tai chi is that once a few simple movements are mastered in the studio, they can be replicated at home and don't require the presence of a partner to be

completed. Access to group physical activities is a challenge for the elderly and therefore having options that can be performed independently allows them to pursue physical and cognitive improvement without barriers. If Kundalini yoga, tai chi, or dancing are not readily available for the elderly, then aerobic exercises such as walking²¹, or strength training with resistance bands²² can still be employed. These forms of exercise don't require transportation to specific locations, and can be done conveniently from home. Alterations can also be made by combining activities in different patterns, and a social factor can also be added by performing them with a neighbor or close friend.

Physical activity as a method to preserve cognitive functioning is promoted by the Centers for Disease Control and Prevention(CDC), National Institute of Health (NIH), and Administration for Community Living (ACL).²³ Ideally, adults should perform 150 min of moderate activity each week², in any combination as long as the sum is 150 min. For the greatest benefit, the activities should be multimodal, incorporating physical, cognitive and social components, and engagement should be consistent and long term.¹⁴ For the members of Hollywood Senior Center on Portland, OR, I will list the what activities have been shown to provide cognitive improvement, and give recommendations of how they can alter any current activities to increase their benefit.

The Hollywood Senior Center in Portland sponsors yoga, tai chi, and a walking group that can be utilized by its members.²⁴ Group classes and exercises are also provided by the Portland's Parks and Recreation department, the Elsie Stuhr Center, and the Community Senior Center of Hillsboro. I will make a list of the types of physical activities and exercise classes from each location. By providing a list of available activities and their locations around

Portland, my audience members will have the opportunity to find something of interest that is near them.

I will review the National Institute of Aging's Go4Life website to show my audience an online resource for exercises that can be performed at home, or with a group, that will be both physically and mentally beneficial for them. The website includes information about the exercises, how to make a plan and execute a beneficial exercise routine. From the website I will provide printed handouts of the different types of exercises recommended by the National Institute of aging, in case there are members that do not have access to a computer or printer.

I will also hold a discussion with the audience members on how to alter their current physical activities to make them more cognitively favorable. Many of the members live independently and already engage in physical activities. After hearing what types of exercises they already do I will have them brainstorm what they could add in to make it a multicomponent activity. For example, for those who walk, adding in dumbbells or stairs will add resistance training to an aerobic exercise.

I chose this topic because of the importance exercise has on my life and well-being, and because I want to promote all the life that remains after retirement. Physical activity is one of the primary ways that I relieve stress. Though I also use it to socialize and enjoy myself during time off. There are many ways to engage in exercise, not just going to a local gym, and I want to reveal many of the options that exist. Walking, hiking, gardening, cleaning, bike-riding, and shopping are all activities that are easily accessible, and sometimes performed daily, that can function as exercise. Describing these exercises and their modifications so that people can get the greatest physical and mental benefit from them is my main objective. These are also activities that many people want to continue to perform as long as possible. Life does not end with

retirement, and after 65 when many people have a greater abundance of time, they should remain physically and mentally able to continue to pursue life. Throughout my life I have seen the stark contrast of health between people who exercise and those who don't. Physical activity does not need to be a burden, and I want to show people that even by performing their daily activities they can be benefitting their health and longevity.

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