

Exercise is an important component of healthy living with benefits spanning medical specialties from cardiology to psychology. According to the World Health Organization (WHO), “insufficient physical activity is one of the 10 leading risk factors of global mortality”.¹ The amount of exercise deemed sufficient for adults, as stated by the WHO, is 150 minutes of moderate intensity activity each week.¹ Healthy People 2020 dedicated an entire topic area to exercise with several objectives outlining the need to increase the amount of physical activity adults participate in.² While rates of obesity and chronic disease in the United States rise, rates of physical activity are stagnating if not declining.^{1,2} In the United States 56.5% of the population eighteen years and older did not get adequate amounts of regular exercise.² However, one of the outlined goals of Healthy People 2020 is to increase the percentage of individuals participating in 150 minutes of moderate intensity exercise each week and “reduce the proportion of adults who engage in no leisure-time physical activity”.² By increasing the activity level hopefully the rising trends of obesity and chronic disease can be stalled if not reversed.

Chronic disease is typically not sudden in origin, with the major exception of mood disorders, but more often the cumulative result of poor health choices over an extended period of time. Hypertension, hyperlipidemia, cancer, arthritis, type II diabetes mellitus, dementia, and mood disorders are the most prevalent chronic conditions affecting Americans and some of the most preventable.³ The Center for Disease Control and Prevention (CDC) states “poor nutrition, tobacco use, [overconsumption] of alcohol, and lack of exercise or physical activity cause much of the illness, suffering, and early death related to chronic diseases and conditions”.⁴ These choices and others contribute to the personal and national burden of chronic disease. Nearly 52% of Americans suffer from a chronic condition with one-third living with multiple chronic diseases.³ In financial terms \$2.7 trillion, or 86%, of annual health expenditures are for patients

with chronic disease and nearly 62% of primary care visits are for diagnoses related to dementia or mental health.^{3,5} These numbers paint a discouraging picture of our nation's health, but we are not without recourse.

The impacts of exercise on health are far reaching. The National Institute on Aging (NIA) encourages physical activity for sufferers of chronic disease such as diabetes mellitus, cardiovascular disease, osteoarthritis, hypertension and depression.⁶ The United States' burden of the aforementioned conditions is rising with nearly half of all adults diagnosed with one or more chronic diseases.⁴ Chronic diseases comprise 7 of the top 10 causes of death and some of the primary sources of disability.⁴ While these diseases claim livelihoods and lives they are not without remedy. Improvements in symptoms and disability, as well as, disease pathophysiology can stall or regress with lifestyle changes including diet, tobacco cessation, and exercise.⁶ While diet and tobacco cessation are important factors the "prevalence of physical inactivity is higher than that of all other modifiable risk factors".^{7,8}

The mechanisms of disease risk reduction and overall health benefit from routine physical activity are broad. The metabolic effects of exercise include, but are not limited to, increased HDL, increased insulin sensitivity, and decreased abdominal adiposity.⁸ Reductions also occur in blood pressure, systemic inflammation, LDL cholesterol levels, anxiety and depression.⁸ The expansive systemic effects have garnered recommendations for daily exercise from professional associations such as the American College of Sports Medicine, American Heart Association, and American Geriatric Society.^{9,10} While certain disease states may respond better to exercise than others the global impact is too great to be overlooked. A meta-analysis performed in 2009 found an inverse relationship between cardiorespiratory fitness and all-cause mortality for men and women.¹¹ Across the 33 reviewed studies the conclusions echoed one

another: as an individual's physical fitness increases their risk of both cardiovascular disease and death from other causes decreased.¹¹ These findings were in congruent with a more recent study examining the relationship between changes in exercise capacity and survival.¹² The results echoed the earlier meta-analysis and found as individuals maximal exercise capacity increased their risk of all-cause mortality declined.¹²

Individuals living with chronic disease span a lifetime from newborn to elderly. The prevalence of chronic disease in adults, ages 18 to 44, is 18%, but that number jumps to 49.1% in those 45 to 64 years of age, and finally 80% in individuals over 65.³ The United States is aging with a quarter of the population 65 years and older.¹³ This places a large portion of the financial and healthcare burden on individuals nearing or already retired, navigating how to stay healthy later in life. Preserving health and maintaining independence are at the forefront of many aging Americans' minds. As addressed earlier, there are many ways to meet these goals and improve health, such as tobacco cessation and better nutrition, but incorporating regular exercise has broad implications for quality of life and longevity.⁸ Despite the positive benefits of physical activity, older adults are less likely than their younger counterparts to exercise and those with at least one chronic disease even more so.¹⁴ Beginning a new exercise routine can be intimidating at any age, but with instruction on how to start, ideas for activities to do, and learning the real life benefits, hopefully older adults can find integrating physical activity to be physically and mentally rewarding.

The benefits of physical activity are great for all ages, but the focus of this paper and subsequent presentation will be specific to those most impactful on older adults. According to the NIA, there are four categories of exercise benefitting seniors.^{15,16} Endurance activities, strength training, balance, and flexibility regimens each come with their own perks.¹⁵ While

some exercise is better than none blending different categories of exercise offers the best health outcomes and reduces the risk of injury.^{8,17,18} The main areas of wellness addressed by the four classes of activity are cardiorespiratory fitness, chronic disease management and prevention, maintaining independence, and preserving cognitive function.¹⁶ Staying active can be made more accessible by providing seniors with education on the specific categories of exercise, why each is valuable to their health, and how to incorporate it into their daily lives.

Not all physical activity is created equal for all benefits. Endurance, or aerobic, exercise includes activities that elevate the heart rate and increase respiratory demand for an extended period of time.¹⁹ Aerobic exercise plays a role in strengthening the heart allowing it to pump more effectively.¹⁹ For older individuals with heart failure, endurance training has been shown to increase exercise tolerance, also known as VO_{2peak} , and alleviate symptoms.^{19,20} Improvement in symptomatic heart failure is multifactorial.²⁰ A study published earlier this year in the American Heart Association's journal, *Circulation*, found individuals with heart failure who began an aerobic exercise routine had statistically significant increases in VO_{2peak} , ejection fraction, and a reversal of left ventricular hypertrophy.²⁰ Not only did participants of the study experience physical benefits but when questionnaires aimed at quantifying quality of life before and after the 12-week course of aerobic training were compared a significant portion said theirs had improved.²⁰ Cardiovascular benefits were not reserved for those with heart failure. Individuals with other cardiac risk factors, such hypertension, dyslipidemia, and insulin resistance experienced reduction in overall risk of a serious cardiac event.²¹

There are more benefits to endurance exercise than cardiorespiratory fitness. For individuals with mild cognitive impairment (MCI) participating in 6-months of high intensity aerobic exercise improved executive functioning, with a bias towards women.²² A study by the

American Geriatrics Society found that moderate to vigorous intensity aerobic exercise “appears to be one of the most promising preventive strategies against cognitive impairment in the elderly population.¹⁰ In the study 215 seniors wore accelerometers to objectively measure the intensity of exercise as low, moderate, or high.¹⁰ Those who participated in moderate to high intensity physical activity regularly had a cognitive benefit as measured using executive functioning pre and post study.¹⁰ The benefit was greatest if the participant completed the recommended 30 minutes a day of moderate level physical activity.^{2,10}

Strength, or resistance, training is another important component of preventing functional decline with aging.²³ According to the NIA maintaining “muscle strength can make a big difference in [seniors] ability to stay independent and carry out everyday activities such as climbing stairs and carrying groceries”.¹⁶ As muscle mass declines with age and inactivity physical function follows suit making muscle strength an important in one’s ability to complete activities of daily living (ADLs) and remain independent.^{16,24} The positive aspects of strength training also include improving or stabilizing bone health and alleviating symptoms of osteoarthritis.^{8,21} Resistance training cannot only stop the progress of osteoporosis but increase bone mineral density and increase DEXA T-scores.⁸ Strength training cannot only prevent the development of osteoarthritis but has been shown to “reduce pain and disability” from the disease.²¹ According to the National Institutes of Health, “[m]any types of resistance training equipment can effectively be used to improve muscular fitness, including free weights, machines with stacked weights or pneumatic resistance, and even resistance bands”.²¹ The advantages are broad and recommendations from Health People 2020 make it an achievable goal with 2 to 3 days per week of resistance training.²

Balance and flexibility each make up their own class of exercise, but there is some overlap in possible activities and benefits. Both play a crucial part in maintaining independence by reducing the risk of falls for seniors.¹⁶ Strengthening exercises for the lower body positively impact balance, but specific balance and flexibility exercises are the biggest contributors in reducing risk of falls and post-fall injuries.^{25,26} According to a randomized control study on the effects of tai chi and fall risk most falls result from “impaired balance and restricted mobility”.²⁶ Tai chi is not alone in developing balance and flexibility. In a systematic review, assessing balancing-improving activities for older adults, yoga, qui gong, and dance all have components of balance and flexibility with measurable impacts on “gait, balance, coordination and functional tasks”.^{25,26} Besides the physical benefits of exercise programs like tai chi and yoga also support cognitive function.²⁷ While it is not clear whether the benefit comes from the meditative aspect of these practices, the physical, or both, individuals who include some form of yoga, tai chi, or dance experienced moderate improvements in cognitive scoring.²⁷

No matter the exercise, avoiding a sedentary lifestyle is associated with reduction in many chronic diseases such as certain cancers, osteoarthritis, type II diabetes mellitus, cardiovascular related death, depression, and anxiety.^{8,21} The best results come from a varied routine incorporating endurance, strength, balance, and flexibility training.^{18,23,27} A 2017 systematic review had the goal of determining what if any cognitive benefit do older adults experience from aerobic versus strength versus multicomponent training.¹⁸ Multicomponent training was defined as a regular fitness routine including aerobic, strength, flexibility, and balance exercises.¹⁸ While the results of aerobic and strength training alone were inconsistent, multicomponent training had a positive statistically significant impact on executive function for older adults with and without cognitive impairment.¹⁸ The same is true for balance with

multicomponent exercise providing the greatest risk reduction for falls in older adults.²⁵

Incorporating different types of exercise does not have to be overwhelming or time-consuming. The NIH recommends for seniors to start slow and try to keep expectations realistic in the beginning.^{15,16} If someone has already been incorporating exercise into their routine then the next step is to make sure it meets the guidelines put forth by the CDC and WHO for intensity and duration.^{1,17} For optimal health benefits older adults should be engaging in 150 minutes of moderate intensity activity a week, or 75 minutes of vigorous intensity, combined with at least 2 days a week of strength training.^{1,17} These guidelines can seem daunting but finding enjoyable activities is important to making physical activity a habit.¹⁵ Some forms of exercise can be easily combined. Stretching is a great way to follow up a run, brisk walk, or resistance training as it is most effective when the temperature of the muscles is elevated.²¹ Not all exercise has to involve a trip to the gym. Physical activity can take place at the lake, on a hiking trail, in the garden, or at a dance class. Making exercise a socially engaging also contributes to routine adherence.^{16,27} In Bend, Oregon there are numerous opportunities to get active and social. The Bend Senior Center offers classes and a fitness center for less than \$40 per month. In addition, there are several local clubs to join for activities like pickleball, softball, tennis, and basketball. If leaving home is not an option the NIA publishes free handouts with accessible exercise routines good for any budget or space.^{16,28}

Remaining active is an effective treatment and prevention for many chronic diseases.⁸ As the population ages the percentages of those living with multiple chronic diseases will continue to rise.³ The ability to change the course of the disease process and improve the quality of life for our patients does not necessarily come from a pharmacy but rather a different kind of prescription. The value of discussing this topic is also personal for me. Watching my

grandparents and now my parents age has solidified the importance of staying active later in life. My paternal grandmother was a swimmer and I remember swimming with her regularly growing up. It was her daily routine, 5 days a week. She enjoyed going with friends or alone and barring illness or travel she was at the pool. Then there was my maternal poppa. He faithfully walked 3 miles with his dog Chip every Monday through Friday and enjoyed hiking through the Smokies and Appalachian Mountains near his home. They not only had few chronic health conditions and limited or no cognitive decline, but also seemed to find enrichment from their chosen recreational activities. Not only did they enjoy their exercise but as their granddaughter I enjoyed being active with them.

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