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Elderly Friendly Exercises: A PRISMA-Guided Review of the Literature to Enable Awareness of Exercise that are Recommended for Elderly

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Abstract

In the current era, the population is getting old at a fast speed. According to the World Health Organization, the share of the population aged 65 and over has increased from 6 percent in 1990 to 9 percent in 2019. According to projections, the proportion of people over 65 years of age will increase to 16 percent by 2050, making one in six people worldwide senior citizens. Based on WHO data, these numbers were compiled. Within a few years, this number will double, resulting in a massive increase in the amount of elderly. With an increasing population of elderly people, society is more likely to need to provide care for them. In order for them to stay in nursing homes for the rest of their lives, they will have to spend a lot of money. Can fitness be a part of a healthy lifestyle if people start doing it when they are adults or even when they are getting older and older? It occurs to us that this may be of assistance to them. Using a survey of research, we will examine what researchers recommend for elderly exercise groups. The PRISMA format was followed initially, where some specific topics were selected, and based on some limitations on results and demographics of articles, the number of papers was narrowed down, which will be discussed in the methodology section.

Keywords: Exercise; Rehabilitation; Cognitive Rehabilitation

Abbreviations: MCI: Mild Cognitive Impairment; HIIT: High-Intensity Interval Training. GFR: Glomerular Filtration Rate; CVD: Cardiovascular Disease; COPD: Chronic Obstructive Pulmonary Disease; PSQI: Pittsburgh Sleep Quality Index.

Introduction

Physical exercise or other activities are always beneficial for health. Studies have proven the importance of exercise in improving health conditions, and the importance of exercise

increases with age. Regular physical exercise not only helps adults improve their health but also reduces their mental stress. As adults age, exercise helps with physical well-being to prevent different types of diseases, including heart diseases and diabetes, by improving the immune systems of the body. It helps by increasing social engagement, which relieves loneliness, mental well-being, and quality of life and reduces Dementia symptoms. According to the U.S. Census Bureau, there are more than 54.1 million U.S. residents who are over 65 years old [1,2]. This work presents a survey of the existing literature on various indoor elderly exercises and their benefits. One hundred and eighty-three papers are reviewed to understand the benefits of aerobic exercise, yoga, dance, cognitive exercises, strength training, chair-based exercises, upper and lower limb exercises, rehabilitation exercises, high-intensity interval training, and aquatic exercises. These paper reports findings that these exercises benefit the physical and mental well-being of the elderly, reduce Dementia symptoms, and improve their overall quality of life.

Aerobic Exercises

Aerobic Exercises are low-to-high-intensity physical activity that mostly relies on the aerobic energy-generating mechanism. The definition of aerobic is "requiring oxygen," which means oxygen is required to meet energy demands during this exercise by an adequate aerobic metabolism. This exercise improves cardiovascular conditions, reduces the risk of heart diseases, lowers blood pressure, controls blood sugar levels, helps in losing weight, and improves the functionality of the lungs. Jumping rope, aerobic strength circuit, running or jogging, walking, stationary bike, elliptical exercise, cardio kickboxing, and Zumba are some examples of aerobic exercises.

Yoga

Yoga is an exercise consisting of different postures. The goal of this workout regimen is to create harmony in the body, mind, and environment via physical activity, breath control, relaxation, positive thinking, and meditation. It also helps to mitigate problems related to high blood pressure, migraine headaches, high cholesterol, asthma, backaches, shallow breathing, multiple sclerosis, carpal tunnel syndrome, varicose veins, and so on.

Dance

Dance is an exercise that involves slow upper-body and lower-body movements, usually to music and within a given space. Dancing is a fun and light exercise that helps strengthen the heart, improve flexibility and agility, prevent falls for the elderly, improve cognition, increase energy levels, improve balance and establish cultural connections. It is one of the most appropriate exercises for the elderly, given its ease and low intensity. It helps lighten the mood and bring back good old memories and help improve their quality of life.

Cognitive Exercises

Cognitive exercises include any activity that helps improve the cognitive functions of the brain. The main aim of these exercises is to stimulate different parts of the brain to help boost memory, concentration, and focus in order to slow down cognitive decline with age.

Strength Training

Strength training known as resistance training or weight training, uses resistance to muscular contraction to increase skeletal muscle growth, anaerobic endurance, and strength. Resistance training is based on the principle that the body's muscles work to overcome resistance when required. Strength Training strengthens the muscles when done repeatedly and consistently. Joint health, bone density, muscle, tendon, and ligament strength are all enhanced by strength training.

Chair Based Exercises

Chair Based exercises offer an alternative to individuals who have restricted movements, mobility issues, or balance concerns due to chronic pain or old age. Individuals complete the physical activity while being seated in a chair, allowing them to alleviate pressure from the lower body.

Upper and Lower limb Exercises

Upper and Lower limb exercises target upper and lower limbs, respectively, helping to strengthen and improve the mobility of upper limbs. Upper limb exercises include exercises like shoulder circles, shoulder shrugs, boxing, elbow bends, and breathing exercises. Lower limb exercises include walking, lunges, calf raises, half squats, knee extensions, ankle circles, and marching in place.

General Exercises

General exercises include tailored physical exercises for older adults. The goal of these exercises is to improve the overall well-being of individuals and lead a healthy lifestyle.

Rehabilitation Exercises

Rehabilitation Exercises are specially designed to help the elderly improve activities of daily living and help them

regain abilities after a brain injury, trauma, and even side effects of medications. In this review, we include papers where researchers designed special rehabilitation programs in nursing homes to assess the effectiveness of such exercises on Alzheimer's.

High Intensity Interval Training

High-Intensity Interval Training is small bouts of exercise with periods of rest that can significantly increase the heart rate. This involves a short period of high-intensity exercise, typically 10-20 minutes, followed by the same amount of rest. This type of exercise is risky for elderly patients due to their weak health and other comorbidities. So far, very little research has been done on this kind of exercise for the elderly. Some benefits of this exercise include losing fat, gaining muscle, and reducing heart rate, blood pressure, and blood sugar levels.

Aquatic Exercises

Aquatic Exercises are set up in a water-based environment. These are low-impact activities that take pressure off the bones, joints, and muscles. Benefits of such exercises include improved flexibility and strength, increased circulation, and muscular flexibility. Some research has been done on aquatic exercises for the elderly in nursing homes. We have included some of those papers in our literature review that matches our inclusion criteria.

Cognitive Rehabilitation

Cognitive Rehabilitation refers to the evidence-based interventions that are designed to improve cognitive function after an individual suffers from cognitive impairment. After cognitive rehabilitation, the individual should be able to properly complete cognitive tasks and restore their previous cognitive skills, essentially restoring their normal cognitive function.

Methods

Search Strategy and Literature Searches

Scopus was used as the search engine in order to conduct a comprehensive analysis, as it had multiple fields where we could use AND, OR operators, and particular keywords to analyze multiple texts. Furthermore, a greater number of relevant articles were found as well as narrowing down the search results. Scopus provides a variety of filters that enable users to easily include or exclude papers that might be relevant to their search. There are filters for choosing the type of access based on your account, the year of the publication, author names, subject area, type of the document, source title, the stage where the publication is, corresponding keywords, affiliations, funding sponsors, related country or territory, source type, and finally the language of the documents. The use of these filters saves time by allowing users to quickly identify inclusion criteria or exclude criteria without having to read all documents. (Figures 1 & 2) present examples of how the search was conducted for yoga and balance exercises, respectively, for the elderly.

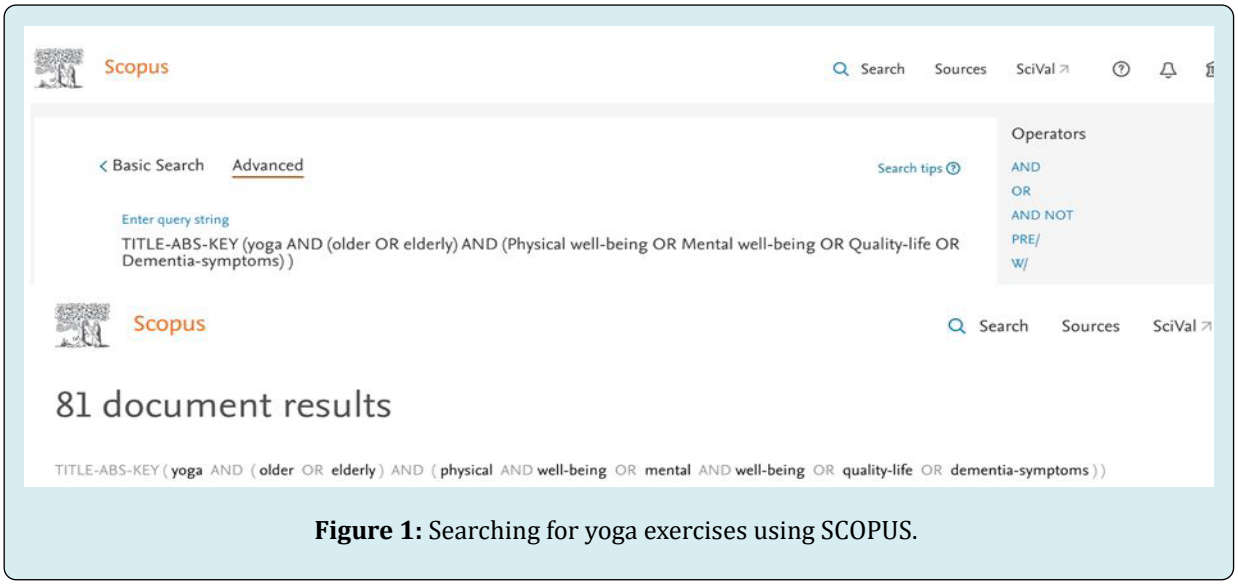

Figure 1: Searching for yoga exercises using SCOPUS.

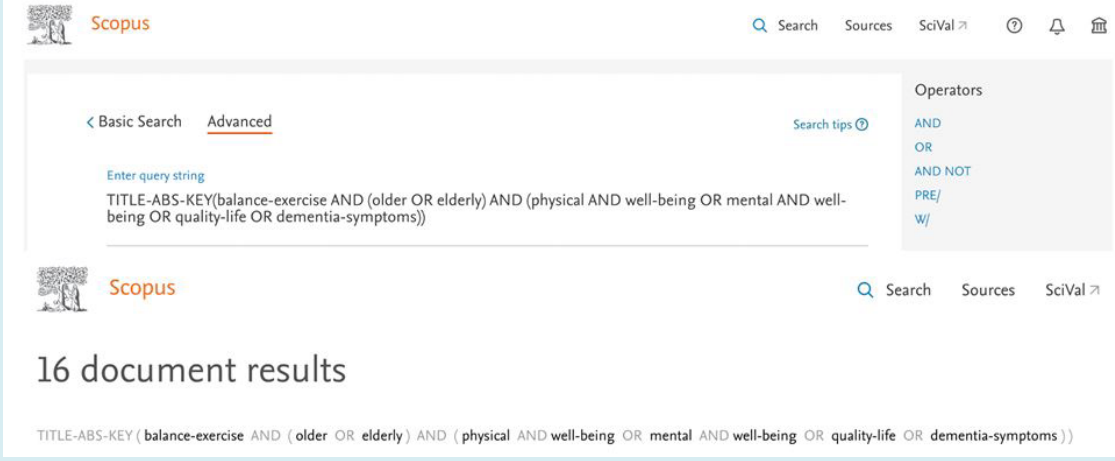

Figure 2: Searching for papers, using SCOPUS, that discuss balance exercises for the elderly.

Study Eligibility Criteria

The criteria for inclusion are articles published between 2000 and 2022. Foreign language articles are excluded. Articles with references to dementia meet the criteria for inclusion. Some of those participating are in the early stages of Alzheimer's disease; most are healthy older adults. Other mild diseases are also present in a few cases. Researchers in various countries consider age as old based on how old the participants are in their country. On average, participants over 60 years of age are considered old. Those who qualified took part in exercises designed to improve their mental or physical well-being or quality of life, specifically their dementia symptoms.

Data Extraction

The data collected from the selected studies included study-related and participants'-related data. Firstly, study-related data included: the title of the study, year of publication, the name of the first author, study design used, and country of publication. Secondly, participants' related data included participants' characteristics, number of participants, age range, and gender. Finally, outcomes: outcomes of the study, main findings, type of dementia, comorbidities, etc.

Results

Study Selection

Figure 3 shows the PRISMA flow diagram for the systematic review of elderly exercises in SCOPUS. Within the database, 1931 articles were identified, and 1007 articles were screened after the removal of duplications. After careful screening of tile and abstraction, 377 articles were found eligible. Out of these, 186 articles met the inclusion criteria and were included in the study.

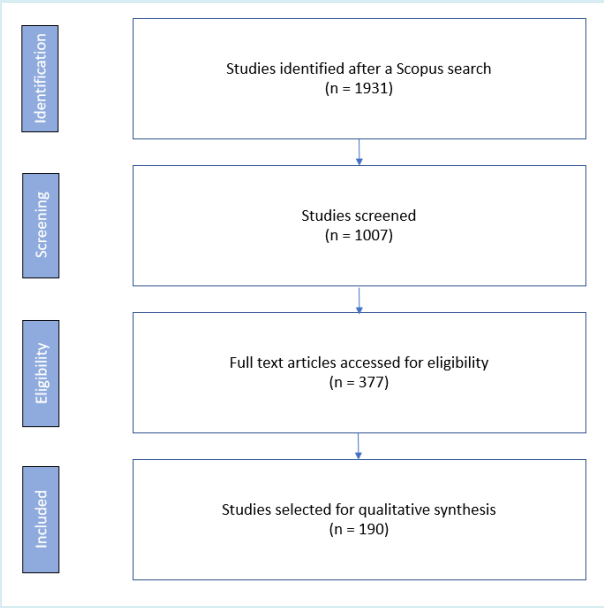

Figure 3: PRISMA flow diagram of the study selection process.

Aerobic: Using the search criteria for "Aerobic" exercise, a total of 167 studies were identified. Twelve of the 167 studies were published before the year 2000, three were written in foreign languages, twelve had limited access, nine were systematic review papers, and thirty were not for the elderly. After reading the titles and abstracts, n = 24 articles were selected for analysis in our systematic review.

Yoga: Using the search criteria for "Yoga" exercise, a total of 81 studies were found. One of them is written in a foreign language; eleven have limited access; fifteen are not for the elderly, and seventeen are systematic reviews of other

studies. After reading the titles and abstracts, n = 15 articles were selected for analysis in our systematic review.

Dance: A total of 57 studies were identified for the 'dance' exercise using the search criteria. Studies were selected after proper screening of the title, the abstract, and the outcomes. Fourteen studies met the inclusion and exclusion criteria and were analyzed further for the 'dance' exercises.

Cognitive exercises: An addition was made to the search criteria for this category by including the terms 'training' and 'therapy.' A total of 353 results were identified for 'cognitive therapy' or 'cognitive training.' Out of these, 36 studies were selected for the analysis. The studies identified in the review papers that met our inclusion criteria were also included.

Strength training: A Scopus search was performed for "Strength Training" using the search criteria. A total of 48 results were found, all of which were published after the year 2000. After careful scanning of titles, abstracts, and outcomes based on the inclusion and exclusion criteria, 12 studies were included for the analysis.

Chair based: Using the search criteria for the "Chair Based" exercise, a total of 5 results were found. One of the studies had limited access, one was a study trial, and three were relevant to our analysis and were included in the systematic review. All of the included studies were published after the year 2016.

Upper and lower limb: The search was performed using Scopus for "Upper" and "Lower" limb exercises separately. A total of 30 results were found for lower-limb exercise and 12 for upper-limb exercise. After careful scanning of titles, abstracts, and outcomes, six studies were included in the analysis based on the inclusion and exclusion criteria.

Rehabilitation exercises: Under the search criteria for 'Rehabilitation Exercises for Elderly,' 33 papers were found. Most of these papers were not relevant to our study as they included rehabilitation programs for the elderly with heart diseases or brain injuries. We only selected the studies which included elderly patients with dementia, and therefore, after carefully going through the titles and the abstracts, we included eight papers in our review that met our inclusion criteria.

High intensity interval training: For this category, the idea was to search for heavy Cardio exercises for the elderly, but due to limited results, we included the term High-Intensity Interval Training (HIIT) exercises to enhance the results. Under the search criteria using 'High-Intensity Exercise' for the elderly with dementia, only eight results were found. For a deeper search, we also used the keyword 'High-Intensity Functional Exercise' as a substitute. Further, three documents were found. Alternatively, we also used the keywords 'Cardio Exercises,' and a total of 15 papers were found. Most of these studies were conducted for adolescents or for individuals who have been physically inactive for some duration. These studies were excluded from our review because the inclusion criteria were not met. After scanning each abstract carefully, we shortlisted studies based on our inclusion criteria and involving elderly patients with dementia only, and we included n=6 papers under the HIIT category for this review.

Aquatic exercise: Initially, our plan was to explore the category of 'Swimming for Elderly patients with Dementia'; however, there was limited research on the topic. We decided to expand our search area and include water-based exercise interventions or aquatic exercises for the elderly in our scope as well. When we searched for 'Aquatic Exercises' on Scopus, a total of 28 papers were found. After going through each of them thoroughly, we selected n=5 papers, based on our inclusion criteria, for our systematic review. Then we searched using the keyword 'Swimming,' and we found 24 results, and out of those, only six were relevant considering our inclusion criteria. Papers including the search criteria 'Dementia' or 'Alzheimer's diseases' were studied thoroughly, and so, after going through their titles, abstracts, and results, we included a total of n=11 papers in this systematic review for the Aquatic Exercises or Water-Based Exercise category.

General: The search was performed using Scopus for General Physical Exercise. A total of n=339 results were identified. Eighteen of the studies were published before the year 2000, 61 of the studies were reviews, and most of the remaining were irrelevant to our analysis. n=100 papers were screened through title, abstract, and outcomes, and 14 were selected for inclusion in our analysis.

Balance exercise: Choosing Scopus as the search engine for "Balance Exercises," a total of 16 studies were identified. One paper had children as their participants, and one of them was in another language rather than English. Three of the articles were systematic reviews, and we used their references for our study. After reading these articles, n=24 papers were selected for our analysis in the systematic review.

Cycling: Using Scopus as the search engine, a total number of 34 documents were found for "Cycling" with respect to all of the criteria defined for our research. Three documents were in other languages rather than English. Seven of the found documents were not available to read. Fifteen documents used the word "cycling" as the meaning of the period, so the articles were irrelevant. In the end, n=9 articles were relevant to our search criteria.

Martial arts: All of the studies on martial arts were conducted between 2000-2022, as mentioned in the inclusion criteria. Choosing Scopus as the search engine provided us with 12 articles. One article was in another language, two of them were out of the time period we specified, 4 of them were review papers, and two articles were irrelevant to martial arts. So we came up with n=4 articles on this subject (Table 1).

Cognitive rehabilitation: Under the search criteria for "Cognitive Rehabilitation", a total of n=76 results were screened, all of which were published after 2000. After careful selection of relevance, a total of n=4 results met our inclusion and exclusion criteria and were used in our analysis of 'cognitive rehabilitation'.

References	Study Design	Category	Country	No. of Participants	Age Range	Gender	Patient Characteristics	Outcomes	Main Findings
Shams A [1]	12-week aerobic-based exercise	Aerobic	Iran	45	65–80	M	Nonsmoking, no history of asthma, respiratory and cardiovascular diseases, not taking hypnotic drugs, no musculoskeletal or fraction problems	1) the PWB total score in the MIG group was more significant than both LIG and CG), 2) QoL total scale in the MIG group was more significant than both LIG and CG	Aerobic exercise improves PWB and QoL in older adults
S VanDerVeer [2]	RCT	Aerobic	USA	(TG: 24, CG:21, excluded: 19)		F+M	All volunteers were screened with a modified Balke treadmill test	1) The heart rate response improved favorably in the therapy group. 2) No discernible variations in mean heart rate, blood pressure, or BMI across the groups.	To assist patients, accomplish the necessary amounts of exercise for their age and health state, primary care providers can use guided, independent exercise and monitoring as an effective strategy.
Motl RW [3]	Incremental exercise protocol with a recumbent stepper	Aerobic	USA	MS=31), healthy controls =29)	55+	F+M	Low risk of contraindications for strenuous exercise	The multiple sclerosis (MS) group had significantly lower VO2 peak and moderate-to-vigorous physical activity than healthy controls.	Provide initial support for targeting moderate-to-vigorous physical activity as an approach for improving VO2peak in older adults with multiple sclerosis

Huang CH [4]	randomized controlled trial (RCT)	Aerobic	Japan.	CG: 105AT: 104,RT: 102,AT+RT: 104	65-85	F+M	N/A	1) AT and RT improved composite IC Z-scores at week 26, 2) No significant differences in composite IC Z-scores were found in the ATþRT group at weeks 26 and 52	Twenty-six-week AT with self-paced home training and RT with self-paced home training improve IC among community-dwelling older adults with subjective memory concerns
Collins KA [5]	AT/RT Randomized Trial	Aerobic	United States	AT: 44,RT: 48,AT+RT: 45	49.0 ± 10.6	F+M	Mild to moderate dyslipidemia	1) Exercise groups improved peak VO2, strength, anthropometric measures 2) AT/RT significantly improved their physical component score and their mental component score 3) All groups significantly improved their satisfaction with physical function and appearance scores	Aerobic, resistance, or combination exercise training improves several components of self-rated HrQoL, including physical function, appearance, and mental well-being
Lin YT [6]	2-min step tests and 30-s arm curl	Aerobic	Taiwan	13703	65+	F+M	No heart disease, high blood pressure, chest discomfort, lightheadedness, bone or joint issues	1) Women had significantly higher flexibility than men (chair sit-and-reach tests) 2) Men had more weekly labor activity than women	Improved happiness is linked to higher levels of physical activity and intensity as well as physical fitness performance.
Teri L [7]	RT	Aerobic	USA	255	60+	F+M	Living in the community and their family caregivers were identified from the caseloads of collaborating AAAs	1) PWD physical activity increased significantly pre- to post-treatment 2) Quality of life of PWD increased significantly 3) caregiver depression improved	It increased physical activity and enhanced caregivers' and PWDs' behavioral and emotional results.

Cooper D [8]	questionnaire	Aerobic	Ireland.	353	50-90	Not Mentioned	N/A	1) The majority of participants agreed and strongly agreed that PA improves their mental health 2) feel less stressed 3) improves their heart health 4) they enjoy it	Participants predominantly undertook sufficient aerobic activities to improve health
Fairbairn P [9]	randomised Semi-blinded placebo-controlled study	Aerobic	UK	60	67 ± 8	F	Able to walk at least 50m, Unaided; classified as non-frail or pre-frail (20) and community dwelling	1) Significant improvements in self-reported emotional Well-being were seen with multi-nutrient and exercise groups 2) high-DHA multi-nutrient supplement produces similar improvements in cognitive function to aerobic exercise	Multi-nutrient supplement produces similar Improvements in verbal memory and executive function to aerobic exercise
Song D [10]	Single-blinded RCT	Aerobic	China	120	60+	Not Mentioned	With mild cognitive impairment	1) Significantly greater improvement in cognitive function in intervention group and health-related quality of life compared with the control group 2) The exercise–cognition relationship was significantly mediated by reduced depressive symptoms and improved sleep quality	Revealed the benefits and outlined the underlying mediating mechanism of an aerobic exercise program to the cognitive function and health-related quality of life
Lucertin F [11]	'TRIPL-A' RCT	Aerobic	Italy	300	65–74 years	Not Mentioned	Physically inactive type 2 diabetes (T2D) patients	Ongoing	Ongoing

Tamin TZ [12]	RCT	Aerobic	Indonesia	41 (33 completed this study)	40–80	Not Mentioned	Obese patients	1) After intervention, there were significant improvements in the land-based exercise group in the rating of perceived exertion role limitations due to physical health, emotional problems, energy/fatigue, and the decline in pain parameters. 2) In the aquatic exercise, there were significant improvements in leg fatigue, energy/fatigue, emotional well-being, and general health parameters 3) No significant differences between two groups regarding cardiorespiratory endurance and quality of life	Patients could start aquatic exercise to reduce leg fatigue and enhance general health and energy. After that, exercise could be continued in land-based settings to improve cardiorespiratory endurance and quality of life

Langelier DM [13]		Aerobic		50	42–86	M	Included if they had prostate adenocarcinoma with histological confirmation (regardless of stage) and a minimum 6-month course of disease.	1) Significantly higher scores of masculinities, physical well-being, prostate cancer specific well-being, and overall quality of life in those obtaining at least 150 min of moderate to vigorous aerobic exercise. 2) Significantly greater levels of masculinity, body image, and satisfaction of life were reported in those fulfilling aerobic standards, compared to 48% of men who had never had androgen deprivation treatment.	Men who engage in more aerobic activity than inactive men do report higher levels of masculinity, a more positive body image, and better quality of life.
Abd El-Kader SM [14]	RCT	Aerobic	Africa	40	65 to 75	Not Mentioned	With Alzheimer's disease	The outcomes of group (B), which got no training intervention, were not significantly different as a result of the aerobic exercise training. Also, at the conclusion of the investigation, group (A) and group (B) had significantly different mean levels of the tested parameters (P 0.05).	Treadmill walking exercise training is an effective treatment policy to improve quality of life, systemic inflammation, and psychological wellbeing in Alzheimer's

Zuniga KE [15]	RCT	Aerobic	N/A	179	66.4 ± 5.7	F+M	Community-dwelling	Across all assessment occasions, people who reported the fewest memory complaints had less physical symptom reporting, lower perceived stress (P 0.001), and better levels of enjoyment (P 0.001). Time and group's primary and combined impacts on SMI were not statistically significant.	The link between SMI and poor wellbeing and the fact that SMI was not responsive to exercise therapies show the need for interventions to lower memory complaints in high-risk populations.
Suna JM [16]	RCT	Aerobic	Australia	Control: 52, Intervention: 54	M+F	F+M	With heart failure hospitalization	Comparing the ET group to the control group, the PSQI global score dramatically improved in the ET group. However, changes in body mass index or resting heart rate did not correspond with improved sleep quality. Instead, it was associated with increased exercise capacity and decreased depressed symptoms.	Patients recently discharged from the hospital with heart failure experienced improved sleep quality after twelve weeks of twice-weekly supervised ET.
Sandström L [17]	RCT	Aerobic	Sweden	CG 51, IG: 50	> 65	F+M	Elderly with coronary heart disease	1) Health-related quality of life, as judged by EuroQol and Time Trade Off, as well as physical activity level and self-reported well-being, significantly improved over time in the intervention group. 2) No significant differences were found between the two groups in healthcare consumption or morbidity	The intervention group raised their level of physical activity and outperformed the control group in terms of quality of life.

Resnick [18] B	7-Step	Aerobic	USA	212	85 +- 6	F+M	N/A	Continued to exercise for physical health benefits, as well as the sense of well-being they felt for having walked/exercised.	Gives these people some helpful advice on how to start an age-appropriate fitness program and how to support them after it has been started in order to keep up with it.
McAuley [19] E	RCT	Aerobic	USA	174	60 to 75	F+M	N/A	1) Well-being significantly improved over course	Social relations integral to the exercise environment are significant determinants of subjective well-being in older adults
Bello-Haas D [20]	RCT	Aerobic	Canada	129	60<	Not Not Mentioned	Canada	Ongoing	Ongoing
Rexach JAS [21]	N/A	Aerobic	N/A	60 control group: 30Intervention group: 30	90–102	F+M	nonagenarians	Ongoing	Ongoing
Sakata T [22]	12-week qigong and aerobic exercise program	Aerobic	Japan	72	60-86	F	Relatively healthy and naive	1) Physical function including lung capacity, trunk bending, normal walking for 30 m, and rising from a supine position significantly improved 2) Both exercise programs similarly increased walking speed and rising speed	Improvements in physical function and a decrease in body fat were linked to the program.

Baker MK [23]	10 weeks of supervised exercise	Aerobic	USA	38	76.6 +-6.1	F+M	N/A	1) Improvements in hip flexion, hip abduction, chest press, muscle strength and strength gains 2) Reduction in depressive symptoms 3) PRT progression	Multiple exercise modalities sufficient to cause significant adaptation to appear difficult to prescribe and adhere to simultaneously in older adults
Makizako H [24]	randomized controlled trial	Aerobic	Japan	90	65 <	Not Mentioned	N/A	Ongoing	Ongoing
Sanders LMJ [25]	RCT	Aerobic and Strength Training	Netherlands	EG: 39 CG: 30	65 +	F+M	Dementia patients	1) The exercise intervention had a significant positive effect on 6MWS after 18 ($F(1, 66) = 5.12$, $p < 0.05$) and 24 weeks 2) The ES increased from d= 0.04 at T12 to d= 0.41 at T24	Exercise was found to improve gait speed.
Martínez-Rodríguez A [26]	RCT	Aquatic Resistance Training	Spain	CG: 20 EG: 20	65 +	F	Non-institutionalized older women	1) Intervention group showed better scores on Basic Psychological Needs Measurement Scale (BPNES), ($p < 0.05$) in autonomy & competence, and ($p = 0.001$) in relationship with others 2) Improvement in level of physical activity was observed	Improved levels of physical activity, quality of life, behavior and greater psychological well-being were observed

Hirase T [27]	RCT	Balance	Japan	Foam Rubber EG: 32, Stable Surface EG: 31, CG:30)	> 65	F+M	At least 4 risk factors were present: lived at home, were able to walk	An exercise in balance utilizing a foam rubber and beneficial to clients and service providers. beneficial to both clients and service providers. The program does not only improve physical ability, it also reduce the number of exercise sessions	Using a foam rubber pad, older adults developed better balance in just two months compared to balance training on a stable surface.
Sakamoto K [28]	RCT	Balance	Japan	EG: 315, CG: 212	37-102	F	Motion exercise training, Dementia patients with the agreement from their family, stand on their own while holding onto a bar	In 3 months, 79 falls were recorded for the training group, and 58 falls for the control group.	The act of standing for one minute on one leg while keeping one's eyes open is effective in preventing falls
Zbigniew Borysiuk [29]	RCT	Balance	Poland	CON: 28, EXP: 16	60-70	F	Ability to understand instructions, can actively participate in physical exercise, move independently and lack of injuries to lower limbs, can participate in physical exercise with moderate intensity	Decrease in the level of muscle coactivation following the exercise program	Implementation of an innovative ERMP exercise program result in the improvement of the physical capabilities of senior subjects

Gerards MHG [30]	RCT	Balance	Netherlands	IG: 40, CG: 40	>65	F+M	More than 3 months ago experienced a fall- walk without a walking aid ≥15 min	PBT protocol with three sessions evaluated on balance control, daily life falls and fear of falling	Measurement of balance control with the Mini Balance Evaluation Systems Test
Verma M [31]	RCT	Balance	India	45	>65	F+M	The individual must have fallen within the previous year, be able to walk 9 meters without assistance, be independent in their daily activities, and have a sore of 24 or more on their mental status examination score.	It has been demonstrated that dual task training increases balance performance in older adults with balance-to-balance performance under dual task conditions.	An assessment of the most suitable balance training program under the conditions of single task and dual task
Wang Z [32]	RCT	Balance	China	90	55-75	F	Healthy right-handed elderly, normal or corrected-to-normal vision, no history of neurological disease	The TUG is a simple measure of mobility and motor ability in older adults. The UPDRS-III is currently recognized as the standard tool for the clinical evaluation of PD motor symptoms.	Exercising traditionally in Chinese culture has many therapeutic rehabilitation benefits for patients.

van Schooten KS [33]	RCT	Balance	Australia	518	>65		Experienced ≥1 falls in the past 6 months or have a self-reported fear offalling or are aged 80 years or over	1) the rate of falls in the 12 months after randomization 2) At 6 and 12 months, they comprise program adherence, physical activity, balance and mobility, cognitive function, psychological well-being, quality of life, health literacy, user experience and attitudes towards the program.	Deliver unsupervised and individually tailored balance exercises that increase in difficulty over time
Philipe de Souto Barreto [34]	Pilot RCT	Balance	France	97	>65	F+M	A diagnosis of Alzheimer's disease or vascular or mixed dementia, a Mini-Mental State Examination (MMSE) score of 20 or less, living in the NH for at least 1 month, ability to walk 4 meters without human assistance, ability to rise from a chair with minimal human assistance.	The prespecified main outcome measure of LEDEN was functional status, as measured using the Alzheimer's Disease Cooperative Study Activities.	Specifically designed to assess people with dementia.

Bürge E [35]	Multisite RCT	Balance	Switzerland and Belgium	EG: 78 CG: 82	81	F+M	Moderate or severe dementia hospitalized for BPSD	At the inception of the study, the characteristics of the two groups were similar at the inception of the study. While CG's mean ADL score dramatically fell with time compared to initial results, EG's mean ADL score only marginally reduced over time.	When older patients with dementia are hospitalized, ADL scores for older patients with mild to severe dementia decline. regular exercise does not affect significantly the overall ADL score but postpone the loss of mobility.
Yves Rolland [36]	RCT	Balance	France	134	62-103	F+M	Ambulatory patients with mild to severe AD	When compared to baseline scores, DL mean change for exercise group with patients receiving routine medical care.	It has been found that a moderate exercise program done twice a week significantly delays the decline in activities of daily living (ADLs) in patients with AD living in nursing homes by about one third.
Steinberg M [37]	Pilot RCT	Balance	United States	27	Mean: 75	F+M	spending at least 10 hours per week with the participant with probable Alzheimer's disease.	As compared to the control group, the exercise group performed better on tests of hand function and lower limb.	In this group of frail patients, physical exercise led to improved functional performance in this group of frail patients.
Anthea Vreugdenhil [38]	RCT	Balance	Australia	40	51–89	F+M	Exercised community dwelling and lived with a caregiver or visit on a daily basis.	Better mobility, and increased Instrumental Activities of Daily Living scores	Taking part in a community-based exercise program can improve cognitive and physical function and independence in ADLs people with Alzheimer's disease.

Jun Sheng Gary Koh [39]	Mixed-Method Feasibility Study	Balance	Australia	5	>50	F+M	Having lived in the community, good cognition, and were able to walk at least three times weekly outside their home without hands-on supervision	Change in the direction of improvements in balance, strength, mobility, motor impairment of the trunk and reduced concerns about falling. participants only reported perceived improvements in balance and strength.	Participating in the program helped participants to perceive improved balance, strength and empower them to make meaningful changes, improving their daily lived experiences.
Lafond N [40]	qualitative study	Balance	United Kingdom	122	>65	F+M	Residents of home, able to walk without a cane, and at least four risk factors	A foam rubber pad could provide balance training that is widely accepted by day center clients, improving physical functioning, and reducing the number of exercise sessions for clients and service providers.	In comparison with balance training on a stable surface, balance training using a foam rubber pad improved balance ability more rapidly in an older population.
Beasley JM [40]	pilot intervention	Balance	Germany		65-75	F+M	Able to live independently, basic German, walk without a walking aid, participate in study assessments and weekly group meetings without external support, having internet access.	Persons in intervention group 2 experienced greater improvements in PA and secondary outcomes than those in intervention group 1 compared with the delayed intervention control group.	Provide answers regarding acceptance and effectiveness of web-based interventions for the promotion of PA in persons aged 65-75 years living in Germany.

Muellmann S [41]		Balance	Turkey	57	60-80	F+M	A test was chosen for those able to complete it in over 14 seconds and those unable to do so.	TUG values increased and BBS values decreased more effectively with TetraxR exercises than with electrostimulation of postural muscles.	Even though applying electrostimulation to postural muscles affected patients positively compared to pretreatment, exercises performed with TetraxR were more effective than the electrostimulation protocol to postural muscles in reducing balance disorder and this well-being continued even in the 6th month.
Alptekin K [42]	double-blind, placebo-controlled, multicenter, randomized controlled tria	Balance	United States & Sweden	150	>70	F+M	Short physical performance battery for community dwellings ≤9, Willingness to be randomized and come to the laboratory for 6 months BMI ≤35. Mini mental state examination ≥24. Obtained their informed consent, Able to complete 400 M walk within 15 min	An assessment of the 400 m walk performance was compared over a period of six months. And also, outcomes in 6-month change in some factors: body composition, muscle Cross-sectional area, leg strength, grip strength, stair climb time, quality of life, physical performance, mood/depressive symptoms, and nutritional status.	Identify the effect of nutritional supplementation on physical function and the restoration of skeletal muscle mass in older adults with mobility limitations and develop and refine health and nutrition recommendations according to these results.

Kirn DR [43]	Single blinded RCT	Balance	Norway	170	>55, Mean= 86.7	F+M	Mild or moderate dementia, able to stand up alone or by the help of one person and able to walk six meters with or without walking aid	In comparison with the CG, the IG showed a significant improvement on the Bergs Balance Scale. Strength improved significantly after an intervention when exercised 12 times or more. Compared to the control group, exercise participants were less apathetic after the intervention.	An exercise program that incorporated high-intensity functional exercise helped dementia patients improve their balance and strength.
Elisabeth Wiken Telenius [44]	pilot study	Balance	Switzerland	13	70-84	F+M	Able to walk independently with or without walking aids; able to follow instructions spoken in German, English, or Italian; with no severe illness, cognitive impairment, progressive neurological diseases, stroke, severe cardiac failure, or high blood pressure.	In the absence of the app, participants were not motivated to perform exercises; however, when the app was used, motivation increased. In particular, participants were motivated by the capability to automatically track their performance, as well as the possibility of joining a virtual exercise group.	It would be worthwhile if the Active Lifestyle prototype were further developed into a more mature system that could support physical exercise practice at home. It demonstrates that elderly people have the ability to work with mobile-based applications, adding to the knowledge base about mobile-based applications for elderly users. By providing adults living independently with the Active Lifestyle app, we were able to motivate and encourage them to do strength and balance exercises on their own.

Eva van het Reve [45]	phase II preclinical exploratory trial	Balance	Switzerland	44	>65	F+M	Having the ability to walk 20 meters with or without assistance, and being free from rapid progression, acute illness, or unstable chronic illness.	It was found that active participants had significantly higher scores on SPPB and dual-task costs of walking than inactive participants. In both the tablet and brochure groups, significant between-group differences were observed, favoring the tablet group.	In comparison to a brochure-based program, a tablet-based strength-balance training program that monitors and assists older adults living independently at home improved gait and physical performance more effectively. It was equally effective in implementing social and individual motivation strategies. An intervention utilizing tablets appears to be effective in enhancing training compliance in older adults; therefore, a tablet-based intervention improves gait in this population.

Freiberger E [46]	single-blinded RCT	Balance	Germany	280	70-90	F+M	A baseline assessment is completed, signed informed consent is provided, and the patient has fallen within the past six months or fears of falling.	SBG and FG, as measured by mixed-effects regression analyses, showed improved short- and long-term physical performance, especially with regard to mobility, balance, and walking speed, over a period of 12 and 24 months, respectively. It is the FG that showed the greatest improvement in physical performance outcomes. There was no significant difference between the control group and the group of people who suffered injurious falls due to fall related psychological outcomes.	Strength, balance, and endurance training can improve physical performance for up to 24 months. The findings did not indicate improved psychological outcomes or fewer falls. The dose of interventions and components of interventions must be modified if older people are to achieve independence and well-being.
McAuley E [47]	FlexToBa trial = two-armed RCT	Balance	United States	300	>65	F+M	N/A	N/A	N/A
Madureir MM [48]	RCT	Balance	Brazil	60	>65	F	N/A	As compared to CG, BT showed significant improvements in well-being, physical function, psychological status, symptoms, and social interaction in all parameters measured by OPAQ. The BT group also reported a 50% reduction in falls compared with the CG group, with an improved BBS.	As well as improving functional balance and reducing falls, the long-term Balance Training Program of OP women improves their overall health quality of life.

Pitkänen A [49]	Observational Intervention Study	Balance, flexibility, strength training		86	N/A	N/A	Patients with Dementia	Neuropsychiatric symptoms decreased for both groups.	In patients with dementia, physical exercise may improve their NPS and function.
Aranceta J [50]	Community-based cross-sectional	Biking	Japan	596	60-89	N/A	Mean weight was 75.8 +/-10 kg for men and 66 +/- 9.14 kg for women; mean height was 164.6 +/- 6.5 cm for men and 153 +/- 5.5 cm in the female subgroup. Body Mass Index was (BMI) 27.8 +/-2.8 kg/ m2 in the male group and 28.1 +/- 3.6 kg/m2 among females. Prevalence of obesity (BMI > or = 30) was 22.7% for men and 28.9 % for women.	About 70% of the sample had been involved in the program at least for three years.	Community health initiatives aimed at this group can be implemented through such interventions.
Teixeira A [51]	cross-sectional study	Biking	Portugal	219	18-75	F+M	Reading Portuguese and understanding it, wearing an activity-monitoring device on the wrist for four consecutive days, not having a pacemaker.	SMM was reduced in both genders by increasing MVPA in women, while central adiposity was increased by an increase in % fat mass.	SMM and ASMM variation in both genders did not appear to be explained by demographic variables.

Qianqian Sun [52]	Systematic Review and Meta-Analysis of Randomized Controlled Trials	Biking	China	1713	>65	N/A	N/A	N/A	The combined interventions improve objective cognitive function in SCD better than active or nonactive controls. In addition to improving objective cognitive ability and preventing SCD from becoming MCI or AD with no adverse effects, combined physical-cognitive interventions have potential value.
McEwen SC [53]	RCT	Biking	USA	92	60-75	F+M	1) Montreal Cognitive Assessment (MOCA) ≥ 23 2) Stroke Risk (FSRP) Questionnaire 3) STOP-BANG Questionnaire for Sleep Apnea 4) Patient Health Questionnaire 5) Memory Function Questionnaire	Simulated memory improved significantly in the SIM group but not in the SEQ group and this improvement applied to non-trained reasoning abilities too. However, the SEQ group was significantly better at executive function than the SIM group.	Older adults can improve memory, attention, and reasoning abilities by performing a simultaneous memory training and aerobic exercise program.

Arthur Daniel Sculco [54]	A matched stratified design	Biking	USA	35	25-65	F+M	Sedentary and in good general health, free of any medical or psychological contraindications and willing to adhere to the exercise intervention prescribed for the experimental group.	The initial 10-week AE phase of the study indicated that low to moderate AE significantly improved mood profiles but did not alter pain levels. AE patients in the 2.5-year follow-up phase received significantly fewer pain medication prescriptions and were given fewer physical therapy referrals. There was no significant difference in the number of medical office visits for pain or epidural blocks administered to either group. Only exercising patients' work status improved.	Low to moderate aerobic exercise appears to improve mood states and work status and reduce the need for physical therapy referrals and pain medication prescriptions For LBPP in the care of a neurosurgeon.
Focht, BC [55]		Biking	USA	15	60–76	F+M	Healthy, nonobese, and sedentary on inclusion in the sample	RPE-overall was significantly higher in older adults (d = 0.57). Older adults expressed significantly greater overall perceptions of exertion during cycling even though they exercised at the same relative intensity. As compared to older participants, younger participants rated the cycling session as "somewhat hard," whereas older participants felt "somewhat light."	An acute bout of stationary cycling was unfavorable to sedentary older and younger adults. Sedentary individuals' feelings during exercise, mainly when they first adopt regular exercise training, should be considered when determining exercise prescriptions.

Karen Steindorf [56]	MARIE study	Biking	Germany	7421	59-67	F	N/A	LPA, sports, and cycling were less popular among women with CVD or hypertension. Sports less often carried out by women with benign breast diseases, melanomas, rheumatism, or arthritis. Overweight or obese women, full-time employees, individuals in specific occupational groups, smokers, immigrants, nulliparous women, and young mothers received low levels of activity.	A major therapeutic strategy for medical care teams should be PA due to the high prevalence and increasing burden of these diseases in the elderly.
Marina De Rui [57]	cohort study	Biking	Italy	2349	>65	F	N/A	People who participate in outdoor activities have higher serum 25OHD levels than those who do not. In particular, gardening and cycling regularly practiced subjects had higher serum 25OHD levels. Indoor activities did not seem to affect 25OHD levels significantly. In a logistic regression analysis, cyclists, gardeners, but not brisk walkers, had lower probabilities of vitamin D deficiency.	Whether they are elderly, overweight, or suffer from comorbid conditions, regular cycling and gardening reduce the likelihood of inadequate vitamin D status.

Angelo Compare [58]	RCT	Biking	Italy & Spain	300	55-75	F	Exclusion: having been treated for bone or neuromuscular disease; having orthopedic prosthetic implants in the lower limbs and/or spine; suffering from herniated discs, eye disease, severe cardiovascular diseases, pacemakers or osteosynthesis material in situ; severe mental illness; linguistic limitations; a significant functional problem major depression, anxiety.	A high level of internal consistency has been found in SHS. This scale measures subjective happiness in a reliable and valid manner as shown by test-retest and peer reliability studies, as well as convergent and discriminant validity studies	Health promotion and improving health in middle and old age have become a European health and research priority due to the link between lifestyle and disease. In the future, research will be conducted to assess the cost-benefit of these behavioral prevention treatments.
Parry SW [59]	RCT	CBT	N/A	415	>=60	N/A	Older adults with the fear of falling	There were significant reductions in mean FES-I [–4.02; 95% confidence interval (CI) –5.95 to –2.1], single-item numerical fear of falling scale and HADS scores at 12 months in the CBTi group compared with the usual care group. There were no differences in the other secondary outcome measures.	The CBTi was generally well-received by patients. There are several variables that can alter how the CBTi is delivered during everyday practice. There was no proof that the intervention was economical.

Cathy Alessi [60]	RCT	CBT	USA	159	72.2 ± 7.7	F+M	Older adults facing Insomnia	Intervention subjects had greater improvement than controls between the baseline and posttreatment assessments, the baseline and 6-month assessments, and the baseline and 12-month assessments.	Manual-based CBT-I delivered by non-clinician sleep coaches improves sleep in older adults with chronic insomnia.
Khashab AS [61]	Experimental study	CBT	Iran	30	60-75	N/A	older adults with depression	The results of the data analysis revealed that cognitive behavioral therapy increased spiritual well-being and emotional intelligence of the mourners was not significantly different between the 2 groups (P<0.01). However, the means of Spiritual Well-Being and Emotional Intelligence at pretest was not significant in the intervention group compared with the control group (P>0.05).	Method of cognitive behavioral therapy helps confront the emotional drain and grief acceptance, increasing the spiritual well-being and emotional intelligence of the elderly bereavement.
Hui C [62]	A randomized trial	CBT	China	EG: 32 CG: 31	EG: 66.25 (4.85) CG: 65.23 (3.93)	F+M	Older adults with generalized anxiety disorder	Compared to the control group, the measures' scores of the experimental group decreased significantly after the intervention and six-month follow-up. The interaction effect for group × time was also significant. These results indicated the improvement of the CBT-IU group and the persistence of effect after six months.	Group CBT-IU is effective in Chinese older adults with GAD. The effects of CBT-IU on GAD symptoms persist for at least six months after treatment.

Jarvis MA [63]	Randomized control design	CBT	South Africa	IG: n = 15 CG: n = 17	(60–79) : IG:12 CG: 15 Older old (80+): IG :3 CG: 2	F+M	N/A	There were significant changes in social cognition and loneliness levels, and an increase in WhatsApp usage	At 1-month follow-up, even with a significant reduction in WhatsApp usage, a significant reduction in loneliness was maintained. LI-CBT delivered via instant messaging may be effective in reducing loneliness experienced by older people
Tang T [64]	Pilot trial	CBT	China			-	Depressed older adults	The CBT helped in reducing depression.	The majority of participants in the CBT arm completed all sessions. The study showed that the CBT reduced more GDS scores over time compared with care as usual.
Furukawa H [65]	RCT	CBT	Japan	Shogi-CBT group (n = 33) Control group (n = 34)	>60	M	Healthy older adults	The effect sizes were medium in both the S-CBT group and WLC group for problem-solving skill. Regarding self-reinforcement, the effect size was large in the S-CBT group, and medium in the WLC group.	Improvement in domainsl like problem-solving skills, self-reinforcement, and negative automatic thoughts were seen,

CT Yao [66]	quasi-experimental study	Chair Yoga		EG: 16 CG: 15		F	Community-dwelling older women	1) Improvement in handgrip strength, upper limb muscle strength, lower limb muscle strength, static balance, agility and dynamic balance, and well-being was improved after the intervention 2) Upper limb strength deteriorated in the control group.	Chair yoga training is an inexpensive exercise program that improves functional fitness and well being
GE Furtado [67]	pre–post randomized (controlled) trial	Chair-based	Portugal	EG: 17 CG: 15	65 above	F	Pre-frail Older Women	Exercise group showed improvement in functional fitness performance, increase in happiness levels, decrease of stress perception and depressive state after the intervention	Chair exercises that combine muscular strength, balance, and gait speed training are promising interventions to improve physical and mental health of older pre-frail adults.
T Cordes [68]	RCT	Chair-based	Germany	IG: 26 CG: 26	70-92	F+M	Nursing Home Residents	The results of the ANOVA showed significant improvements of the intervention group for hand grip strength, manual dexterity, cognition, and depression while the values of the control group decreased.	Multicomponent Chair based exercise intervention improved motor functions and cognition in nursing home residents who were unable to walk.

T Cordes [69]	Systematic Review	Chair-based		511	79 ± 7 years	N/A	Nursing Home Residents in long-term care	1) Studies reported task-specific improvements in physical and cognitive functions and enhanced well-being. 2) Three studies showed improved lower body performance after a multicomponent CBE program in mobile residents. 3) Three studies which included only residents not able to walk showed improved physical functions, indicating that immobile residents benefit from CBE programs.	CBE interventions may improve physical and cognitive functions as well as well-being in nursing home residents. Task-specific multicomponent CBE improves different domains of physical and cognitive functioning.
Paul Sadler [70]	Randomized controlled trial	(CBT-I, standard), (CBT-I+, advanced)	Australia	72	75 ± 7	F+M	Older adults diagnosed with comorbid insomnia and depression	Cognitive behavior therapy for insomnia (CBT-I) and cognitive behavior therapy for insomnia and positive mood strategies (CBT-I+) both generated significantly greater reductions in insomnia and depression severity compared to PCG from pre to post ($p < .001$), which were maintained at follow-up	CBT-I and CBT-I+ were both effective at reducing insomnia and depression severity for older adults. Mental health services that deliver treatment for comorbid insomnia with cognitive behavior therapy may improve recovery outcomes for older adults with depression.

Tanaka M [71]	Randomized Controlled Comparative Study	Cognitive Behavioral Therapy	Japan	46	69.7 ± 8	F+M	Older adults with comorbid insomnia and depression	The results showed the effectiveness of a brief CBT-I intervention for depression.	A brief CBT-I intervention consisting of sleep hygiene education, stimulus control, sleep restriction, cognitive restructuring, and relaxation is effective for improving depressive symptoms among older adults in the community.
Young D.K.-W [72]	Randomized waitlist-controlled trial	Cognitive simulation therapy	China	Treatment Group (TG): 51 Control group (CG): 50	TG: 80.53 ± 6.26 CG: 79.86 ± 6.59	F+M	Older adults with Dementia	Participants had a mean baseline MMSE score of 20.67 (SD = 2.30). The repeated measures ANCOVA demonstrated that the treatment group was significantly more effective than the control group in improving the MMSE score with a moderate effect size after controlling for group difference in age, gender, education, and having a diagnosis of dementia	The present study demonstrates the effectiveness of the expanded CST model on the improvement of cognitive ability of community dwelling Elderly with mild stage dementia.
Capotosto E [73]	RCT	Cognitive therapy	Italy	39	EG: 88.25 (5.15) CG: 86.52 (5.55)	F	Older adults with mild to moderate dementia	CST-IT was the only group that maintained its Cognitive measures and mood measures and Quality of life – Alzheimer's Disease scale were also better for the CST-IT group.	The findings confirm the efficacy, at least in the short term, of the CST in sustaining cognitive functions and perceived quality of life in older adults with dementia in the Italian care setting as well.

Helmes E [74]	RCT	Cognitive therapy	Australia	52	83 (mean)	F	Older adults with anxiety	The therapy group showed significant improvements on all measures at the end of the seven-week program, while the control group did not.	This study represents one of the first studies of the effectiveness of an MBCT program on anxiety symptoms for older people using a randomized controlled trial.
Piras F [75]	A single-blind, multicenter, randomized controlled study	Cognitive therapy	Italy	EG: 21 CG: 14	EG: 83.81(10.93) CG: 85.43 (5.18)	F+M	Older adults with dementia	There was a greater improvement in general cognitive functioning among the CST-IT group following the intervention A trend towards improvement was also identified in short-term/ working memory – the backward digit span task- and perceived quality of life. No significant differences emerged between the two groups for the other domains considered.	The present results support the efficacy of CST in people with vascular dementia.
Moghadam NK [76]	A quasi-experimental design	Cognitive therapy	Iran	30	72-74	F+M	Older adults with depression	The results showed that cognitive-existential group therapy significantly affected the life expectancy and depression in elderly living in nursing homes ($P < 0.01$).	The cognitive-existential group therapy with a picture of self and emphasis on training time and awareness of death in elderly increased the life expectancy, reduced depression, and improved the mental health of the elderly.

Zhao J [77]	Randomized controlled clinical trial	Cognitive therapy	China	CrExp therapy (n=48) Control group (n=45)	60-85	F+M	Older adults with MCI	There was a greater improvement in general cognitive functioning among the CST-IT group following the intervention. The improvements in cognitive functioning were maintained at the 6-month follow-up	Creative Expression therapy has greater positive effects on cognitive functions and daily living ability than standard cognitive training.
Caroline M. Williams [78]	An exploratory study	Cognitive therapy	UK	13	>=65	9 F, 4 M	Older adults with depression	Five overarching themes emerged from the thematic analysis, which revealed that older persons experienced improvements in their mental health and well-being as well as feeling "released from the past."	MBCT (Mindfulness-based cognitive therapy) is an acceptable approach for people aged 65 years and over. Further research should explore potential mechanisms of change including changes in meta-cognitive awareness and self-compassion.
Ayers CR [79]	Randomized clinical trial	Cognitive therapy	USA	CREST: 31 CM: 27	>=60	F+M	Older adults with anxiety and mood disorder	Participants in the CREST condition had significantly greater improvement on the SI-R than participants in the CM group interaction, with participants who completed the CREST condition.	CREST appears to be an efficacious treatment compared to CM for older adults, but CM also showed meaningful benefits.

Read JR [80]	RCT	Cognitive therapy	-	iCBT (n = 150) control group (n = 152)	>=65	N/A	Older adults with multimorbidity	Chi-square analyses indicated there were significantly fewer cases of depressive disorder in the treatment group compared to the control group by six-month follow-up	These results indicate that depressive disorder was prevented in the first six months following iCBT with three times the number of cases of depressive disorder in the control group compared to the treatment group.
Belliveau C [81]	RCT	Cognitive Therapy	Canada	MBCT (n = 32) TAU (n = 29)	MBCT: 67.8 ± 6.8 TAU: 68.1 ± 5.9	F+M	Older adults with depression and anxiety	A significant reduction in symptoms of depression and anxiety among participants following Mindfulness-Based Cognitive Therapy (MBCT) compared to Treatment as Usual (TAU).	The results suggest that the symptom reduction following MBCT in older-adults may not be accompanied by changes in the stress-response and inflammatory pathways.
Sanchez CP [82]	RCT	Cognitive therapy	-	EG: 20 CG: 10	>60	N/A	Older adults with mild vascular or Alzheimer dementia	Compared with the active controls, the cognitive stimulation virtual therapy showed a greater improvement in general cognitive functioning after the intervention. A trend towards improvement was also identified in short term/working memory and perceived quality of life	The present results support the efficacy of cognitive stimulation virtual therapy CSVT program in people with dementia during COVID-19

Read JR [83]	RCT	Cognitive therapy	-	Internet-delivered (n = 150) Treatment As Usual (TAU, n = 152)	>= 65	N/A	Older adults with two or more chronic physical health conditions	There were significantly fewer cases of depressive disorder in the intervention group compared with the TAU group during the 24 months after the intervention. No differences were found on depressive symptoms at 24-month follow-up.	Internet-delivered cognitive behavior therapy had high engagement and acceptability. The results provide support that depressive disorders can be prevented in older people with multimorbidity through participation in internet-delivered cognitive behavior therapy.
Neti Juniarti [84]	RCT	Cognitive therapy	Indonesia	Intervention group :45 Control group: 45	>=60	IG: 10M 35F CG: 15M 30F	Older adults with Dementia	The mean score for cognitive function in the intervention group showed significant increase between pre- and post-intervention and there was no significant difference in the control group before and after intervention.	Based on the results, the Indonesian older people exercise program and reading aloud activity had a positive effect on the cognitive function of older people with dementia.

Sherry L Willism [85]	RCT	Cognitive training	USA	Memory (n = 703) Reasoning (n = 699) (n = 699) Speed of Processing (n = 702) Control (n = 698)	65 to 94	Memory: 537 F Reasoning: 537 F Speed of Processing: 538 F Control: 514 F	Older adults with good functional and cognitive status	Each intervention's effects on the specific cognitive capacity it was intended to affect persisted for five years; processing speed: effect size. With the reasoning intervention for reasoning performance and the speed of processing intervention for speed of processing performance, booster training resulted in further improvement.	Reasoning training resulted in less functional decline in self-reported instrumental activities of daily living. Compared with the control group, cognitive training resulted in improved cognitive abilities specific to the abilities trained that continued 5 years after the initiation of the intervention.
Paula Schimidt Brum [86]	RCT	Cognitive training	-	EG: 16 CG: 18	EG:73.3 (5.8) CG: 74 (5.1)	EG: 2 M, 14 F CG: 7 M, 11 F	Older adults with MCI	The study showed significant results compensating cognitive decline.	These results indicate the importance of non-pharmacological interventions for older adults with MCI to help compensate for cognitive decline.
Joe Verghese [87]	Randomized single-blind control design	Cognitive training		Intervention Group (IG): 12 Control Group (CG): 12	IG: 77.4 ±7.0 CG: 79.9 ± 7.5	IG: 8 F CG: 7 F	Frail older adults	The 10 intervention participants improved gait velocity over the 8-week intervention both during normal walking and walking while talking compared with the 10 control participants	The findings of this pilot trial are promising and suggest that cognitive remediation may improve mobility in sedentary seniors.

Karlene Ball [88]	RCT	Cognitive training	USA	908	73.1	-	Healthy older adults	Participants randomized to the speed-of-processing and reasoning interventions had an approximately 50% lower rate (per person-mile) of at-fault MVCs than the control group. There was no significant difference observed for the memory group.	Cognitive speed-of-processing and reasoning training resulted in a lower at-fault MVC rate in older drivers than in controls.
Yvonne Brehmer [89]	-	Cognitive training	Sweden	23	60-70	12 F	Healthy older adults	Improved working memory, attention, episodic memory, less everyday cognitive problems; BOLD decrease in frontal, parietal and temporal regions, higher neural efficiency.	Neocortical brain activity decreased post training and that were larger in the adaptive training group than in the controls under high work memory load.
Jennifer L.O'Brien [90]	-	Cognitive training	-	22	65–82	11 F	Healthy older adults	Changes in event-related potentials related to attention allocation and capacity following speed of processing training support the idea that training leads to cognitive enhancement.	The study provides electrophysiological evidence that speed of processing training may be successful in counteracting age-related declines in selective attention.
Smith-Ray RL [91]	RCT	Cognitive training	USA	45	72.5(mean)	91% F	Frail older adults	Compared to controls, intervention participants experienced statistically significant improvements in BBS and gait speed. Mean performance on distracted gait speed also improved more for intervention participants compared to controls.	The study suggests initial evidence that cognitive training may be an efficacious approach toward improving balance and gait in older adults known to have a history of falls.

Michelle L Ellis [92]	RCT	Cognitive training	USA	54	75.3 96.39 75.1 6.26	12 F, 11 M 24 F, 7 M	Frail older adults	Of the 54 participants included in the analyses, 23 who were randomized to cognitive training performed significantly better on a composite of everyday speed of processing from pre- to post-training compared with 31 participants who were randomized to the control group.	Results indicate that speed of processing training may improve everyday cognitive performance among older adults with Heart Failure.
George W Rebok [93]	randomized, controlled single-blind trial	Cognitive training	USA	2832	73.6 (mean)	N/A	Healthy older adults	Each intervention group reported less difficulty with instrumental activities of daily living. The reasoning and speed-of-processing interventions maintained their effects on their targeted cognitive abilities at 10 years. Memory training effects were no longer maintained for memory performance.	Each Advanced Cognitive Training for Independent and Vital Elderly cognitive intervention resulted in less decline in self-reported IADL compared with the control group. Reasoning and speed, but not memory, training resulted in improved targeted cognitive abilities for 10 years.
Feng Lin [94]	Randomized single-blind controlled pilot trial	Cognitive training	USA	21	ML:72.9±8.2, CG: 73.1 ± 9.6	11 M	Individuals with MCI	Vision-Based Speed-of-Processing Training (VSOP) training led to significantly greater improvements in trained	These findings highlight the potential of VSOP training to slow cognitive decline in individuals with aMCI.

Massimo Piccirilli [95]	RCT	Cognitive training	Italy	Trained subjects: 25 Control subjects: 25	72.88 (±4.78)	F+M	Healthy older adults	The performance of subjects in the experimental group significantly improved in several neuropsychological tests, including attention, processing speed, memory, and executive functions, as well as mood state.	The results suggest that an active lifestyle may protect against cognitive decline in aging.
Murtadho MA [96]	Quasi-experimental study	Cognitive training	Indonesia	63	60-80	F+M	Older adults with dementia	The value of the cognitive function in the intervention group therapy Memory Brain Gym and Games with the result that significant, which means there was no difference in effectiveness of an increase in cognitive function after being trained in Brain Gym and therapeutic Memory Games. Both of them can improve the cognitive function of the elderly with dementia.	Brain Gym and therapeutic Memory Games equally improve cognitive function in older adults with dementia.
Sze MY [97]	Pilot study	Cognitive training	China	Intervention group: 11 Control group: 11	>= 65	IG:(10 F, 1M CG (8F, 3M	Older adults with cognitive impairment	The intervention group improved significantly specifically in the subscales of attention, language, abstraction, and delayed recall. Unlike, in the control group, there were no significant changes.	The learning therapy intervention involving reading aloud and arithmetic enhanced cognitive functions and IADL performance of older adults with cognitive impairment.

Bischoff LL [98]	Two-arm, stratifed-randomized controlled feasibility trail	Cognitive training	Germany	24	83.7 ± 6.4	21 F	Healthy older adults	Life satisfaction and physical functioning increased in the intervention group after training whereas the control group showed a decrease.	A multi-component training seems (1) to lead to clinically relevant improvements in physical functioning as well as in psychosocial wellbeing and (2) to be feasible and well accepted in nursing home residents
Law LLF [99]	RCT	Cognitive training	N/A	cognitive training (N = 38)	≥60	N/A	Older adults with mild cognitive impairment	Post-intervention results of ANCOVA revealed cognitive training improved everyday problem-solving (P = 0.012) compared to wait-list control	The findings support combining cognitive and exercise intervention may give additive and even synergistic effects.
F Landi [100]	Pilot Study	aerobic/ endurance activities, strength training, balance, and flexibility training	Italy	30	80.9 ± 8.5	N/A	MCI	1) Treatment group showed significant reduction in the behavior problems, such as wandering, physical and verbal abuse, and in the sleep disorders. 2) A significant reduction in the use of antipsychotic and hypnotic medications was observed in subjects of the treated group.	Engaging in regular physical activity may delay or prevent the onset of cognitive impairment and behavioral problems in demented, frail elderly people.

AN Ilnitsky [101]	N/A	Combined aerobic and anaerobic training	USA	218	60-69	N/A	N/A	The extended motor load programs and the combination of aerobic and anaerobic training in the form of Nordic walking and strength training, both significantly improve the cognitive status of elderly people by an average of 10.7%, $p<0.05$ for six months.	Significant positive changes are observed three months after the start of training, and that is not observed with the isolated use of aerobic training.
Marmeleira [102, 103]	Randomized Controlled Trial	Dance	Portugal	37	55-80	F+M	Healthy older adults	Within the creative dance training group, knee joint position sense, knee kinesthesia (in flexion) , and arm positioning significantly improved after 12 weeks.	This study showed that a creative dance program emphasizing body awareness can improve proprioception in older adults.
Ana Cruz-Ferreira [104]	RCT	Dance	Portugal	57	65–80	F	Older women	After the intervention, the experimental group had better physical fitness and life satisfaction when compared with the control group.	Enhanced physical fitness (strength and flexibility of lower limbs, aerobic endurance, motor agility/ dynamic balance, and body composition) and life satisfaction of older females.
Kattenstroth JC [105]	RCT	Dance (Agilando)	Germany	CG: 10 IG: 25	CG: 72.30±1.84 IG: 68.60±1.45	F+M	Healthy older adults	There was no change in performance or further degradation in the control group after 6 months.	The effects developed in the IG were without alterations in the cardio-respiratory performance.

Maristela Moura Silva Lima [106]	Qualitative research study	Ballroom dance	Brazil	60	≥60	F+M	Healthy older adults	Five major categories of therapeutic meanings of ballroom dancing for participants are: ballroom dancing is fun; brings health benefits and good dancing memories; allows participants to establish cultural connections to the larger Brazilian dancing culture and provides opportunities for socializing.	The study suggests that the ballroom dancing classes created a culture of inclusion that embraced both understanding and acceptance among senior citizens, which in turn might improve their quality of life.
Iva Holmerová [107]	RCT	Ballroom dance	Czech Republic	52	81.9 ± 8.6	F+M	Frail older adults	The experimental group outperformed the control group from pretest to posttest in the chair stand test, the 2-minute step test, the chair sit-and-reach test, and the timed up-and-go test.	Dance-based exercises may help to maintain or even improve mobility-related performance in a sample of low-functioning older adults living in a long-term care setting.
Waugh M [108]	RCT	Dance (ballroom dancing)	Australia	530	72–96	F	Healthy older adults	Internal consistency was high. Dance self-efficacy was weaker in participants with less dance experience, poorer mental health, poorer cognitive and physical abilities, and insufficiently active.	The dance self-efficacy measure demonstrated good criterion and construct validity.
Kevin Charras [109]	Crossover experimental design	Dance (creative)	France	23	83.47±5.40	F+M	Older adults with dementia	A significant positive effect for the execution time of the Get Up and Go test and a significant increase in wellbeing after the sessions and for the mean score was observed.	Interesting quantitative and qualitative outcomes were observed

Ho RTH [110]	RCT	Dance (creative)	China	(DMT):68 Exercise Group (EG): 68 Control Group (CG): 68	79±8	F+M	Older adults with dementia	The DMT group showed significant decreases in depression, loneliness, and negative mood and improved daily functioning and diurnal cortisol slope. The exercise group of matched intensity showed no significant effects on the outcomes	The study findings support the potential utility of DMT as a multifaceted intervention for improving various aspects of functioning in older adults with declining cognitive abilities.
Zilidou VI [111]	RCT	Dance (Greek)	Greece	Active Group (AG): 22 Dance Group (DG): 22	AG: 66±5.51 DG: 68.73±4.73	F+M	Healthy older adults	The results showed that the dance training improved optimal network performance as estimated by the small-world property. Further analysis demonstrated that there were also local network changes resulting in better information flow and functional reorganization of the network nodes.	The study argues that the induction of neuroplasticity of the mature human brain leads to the prevention of dementia. Promising solution seems to be the dance programs because they combine cognitive and physical activity in a pleasant way.
Styliani Douka [112]	-	Dance (greek)	Greece	Healthy: 30 MCI: 30	Healthy: 65.50 (med) MCI: 67.50 (med)	F+M	Healthy elderly, elderly with MCI	The results showed a significant improvement in: attention, anxiety, verbal fluency for MCI, Verfls, Verfmo: and in executive functions.	The dance intervention presented significant benefits to mental and physical health in healthy elderly and in elderly with MCI, also in their quality of life.

Shanahan J [113]	observational cross-sectional design	Dance (Irish dance)	Ireland	Dance group: 39 Control Group: 33	Dance group: 64 (med) Control Group: 69 (med)	F+M	Healthy older adults	When controlling for between-group differences in levels of physical activity (ANCOVA analysis), the dancers had significantly better balance, functional capacity, and quality of life (all $P < 0.05$) compared to controls. No differences between the groups were observed in other measures of functional fitness.	Regular participation in set dancing is associated with health benefits for older adults. These results may inform future studies prospectively examining the role of set dancing for falls prevention, emotional well-being, and cognitive function in community-dwelling older adults.
Aliberti S [114]	One-group experimental design	Dance (Line dancing)	Italy	14	65±5.29	F	Depressed older adults	Dancers improved their state of depression; in particular, they felt a better satisfaction in their life (d = 0.6), a greater interest in activities (d = 1), less boredom (d = 0.8), a good mood most of the time (d = 0.8), greater happiness throughout the day (d = 0.7), and the perception of a wonderful life (d = 0.5)	Line dancing has proven to be an effective physical activity for improving the state of depression in late second-and third-age dancers.
Xiuyi Yao [115]	Pilot study	Dance (square dancing)	China	31	73.35 ± 5.10	F	Depressed older adults and with MCI	The scores of psychological well-being and fatigue increased at the end of the three-month follow-up.	Public square dancing proved to be an acceptable, viable, and valuable intervention for MCI residents with depressive symptoms.

Hackney M [116]	one-group experimental design	Dance (Tango)	USA	13	77-95	F	Older adults with visual impairment	Exploratory measures of dynamic postural control ($p < .001$), lower body strength ($p = .056$), and general vision-related quality of life ($p = .032$) scores showed improvements following training	These older individuals with visual impairment benefitted from 30 hours of tango improving their balance, lower body strength, and quality of life.
JM de Farias [117]	non randomized clinical study	General	Brazil	15	68.3 ± 13.8	F	Diagnosed with AD	1) Physical training significantly improved judgment and problem-solving domains of the memory score among patients with AD 2) Exercise training decreased the levels of neuron-specific enolase, a marker of neuronal damage.	Physical Exercise training could block AD progression and improve antioxidant capacity and anti-inflammatory system.
O Molinero [118]	N/A	General	Spain	263	65-98	N/A	N/A	The present sample of individuals with osteoarticular pathology showed better levels in the evaluated indices than the healthy sedentary ones, which would indicate a beneficial effect of the practice of physical activity.	Physical activity influences the perceived quality of life, depression levels, and subjective well-being in older adults regardless of osteoarticular disease.

CK Liang [119]	cluster randomized controlled trial	General	Taiwan	733	65 and above	N/A	Community-dwelling older adults	1) Multidomain intervention for 12 months significantly improved cognitive performance in people with PCDS, and those with cognitive dysfunction only. 2) An early benefit on visuo-spatial executive function was seen in older adults with mobility-type frailty. 3) Intervention also improved frailty scores among participants with mobility-type frailty, handgrip strength for participants with PCDS, and gait speed in the normal group.	Community-based multidomain intervention (physical exercise, cognitive training, nutrition advice and disease education), could prevent global cognitive decline
N Juniarti [120]	N/A	General	Indonesia	IG: 45 CG: 45	N/A	N/A	Community-dwelling older people with dementia	1) No significant difference was seen in the CG between the mean cognitive function scores pretest and posttest one month after the intervention. 2) Significant differences were found in the cognitive function scores before intervention and after intervention in the intervention group.	Indonesian older people exercise program led to a significant improvement in the cognitive function of the older people with dementia.

Bae S [121]	RCT	General	Japan	EG: 126 CG: 130	N/A	N/A	N/A	1) The cortical thickness increased for the middle temporal ($p < 0.001$) and temporal pole ($p < 0.001$) in the multicomponent exercise group. 2) Cortical thickness changes were significantly associated with change in trail making test, and story memory after a 10-month multicomponent exercise intervention	Multicomponent exercise programs that combined physical exercise and cognitive training provides protection from age-related cortical thinning.
Pereir T [122]	Pilot Study	General	Portugal	CG: 10 IG: 11	65 and above	N/A	Community-dwelling older adults	1) Reduction in BP and arterial stiffness, better cardiovascular efficiency, decrease in the stroke work and an increase in the VAC, as well as in the left ventricle efficiency parameter were observed in IG. 2) An improvement in handgrip strength and self-efficacy for exercise in IG was observed	Tailored physical exercise for older adults increases their cardiac efficiency and thus improves their overall well-being.
da Silva VF [123]	RCT	General	Brazil	EG: 140 CG 140 60	65-80	N/A	Frail elderly	Physical and Mental Exercises, including strength, endurance, and walking resulted in a decrease in dementia symptoms and improved cognition.	Physical exercises when combined with brain stimulation can improve cognition and reduce the symptoms o dementia.

Cardalda IM [124]	RCT	General	Spain	Therabands Group: 30 Multi-Calisthenic Group: 30 CG: 30	75 and above	F	Frail-aged adults	1) The TG program showed some improvement in cognitive state and functional independence and significant improvement was shown in physical and mental components. 2) MG showed a tendency to the stabilization of the parameters used, while CG showed a tendency to deteriorate.	Physical Exercise is an effective method for improving and maintaining health, cognitive state, functional independence and stability in frail-aged institutionalized people.
Kurdi FN [125]	Cohort Study	General	Indonesia	EG: 30 Non-EG: 30	60 and above	N/A	N/A	Exercise group demonstrated better MMSE score (28.56 ± 1.76), and a higher concentration of BDNF(235.34 ± 12.56 pg/mL)	Physical exercise helps maintain geriatric cognitive function performance by BDNF protein regulation.
Zhu X [126]	quasi-experimental intervention study	General (Cognitive Training plus TaiChi)	China	CG: 47 Multimodal Intervention: 38 Cognitive and physical training: 30 Cognitive Training: 38	60 and above			1) No significant difference was demonstrated between any of the three intervention groups and control group for MoCA. 2) For composite cognition, all three intervention groups demonstrated improvements at the three month follow-up, with a large effect size in the cognitive training plus Taichi group, and medium effect sizes in the multimodal intervention group and cognitive training group.	Multimodal intervention, cognitive training plus Taichi, and cognitive training could improve cognitive function in community-dwelling older adults. The combination of cognitive training and Taichi showed greater efficacy than the other two interventions.

Sáez de Asteasu ML [127]	N/A	General (Multi component Physical Exercise Program)	Spain	EG: 185 CG: 185	75 and above	N/A	N/A	1) At discharge, the exercise group showed a mean increase of 0.1m/s(95% confidence interval[CI], 0.07, 0.13;p<0.001) in the verbal GVT and 0.1m/s(95% CI, 0.08, 0.13; p<0.001) in the arithmetic GVT over usual care group.	Multicomponent exercise training program could be an effective therapy for improving cognitive function in very old patients during acute hospitalization.
González-Roldán AM [128]	N/A	General (Multi component Training)	N/A	49	60 above	N/A	N/A	1) After the physical exercise intervention reduction in diastolic blood pressure, pain threshold and sleep disturbances, and an increase of walking speed were observed 2) Greater quality of life factors (GENCAT scale), like emotional well-being, personal development, physical well-being, self-determination, and social inclusion were reported.	Physical exercise programs improve quality of life, emotional well-being and physical well-being in the older adults.
Yujia REN [129]	N/A	General/ RT & Taijiquan exercise	China	EG: 60 CG: 61	60 and above	N/A	N/A	1) The score of loneliness lowered in the EG and increased in the control group after 8 weeks. 2) The scores of spiritual well-being and resilience were significantly higher in the experimental group than in the control group.	Group reminiscence therapy in combination with physical exercise could improve spiritual well-being and mental health of the elderly.

Buckley C [130]	N/A	Golf	England	29	65-80	F	Healthy, active and plays golf	1) Pearson's correlation showed moderate association between quadriceps peak torque and grip strength in active older females 2) Lower limb endurance tests were significantly correlated with quadriceps peak torque. 3) Spearman's correlation showed that grip strength had moderate correlation with general physical well-being (PCS).	This study provides new data on the association between grip strength, quadriceps strength, functional endurance, and HRQoL in active older female golfers aged 65-80.
C da Silveira Langoni [131]	RCT	Group Aerobic and Strength Training	Brazil	Intervention group: 26 Control group: 26	60+	N/A	Older Adults with Mild Cognitive Impairments	1) After 6 months of aerobic and strength exercise elderly with MCI in the IG showed significant cognitive and functional improvement 2) CG showed deterioration in cognition and worsening of the Functional Reach Test Scores.	Group based strength and aerobic training program showed improvements in cognitive function, muscle endurance, aerobic conditioning, and balance in older adults with MCI.
de Oliveira [132]	RCT	Gymnastic	Brazil	GT: n = 11, AG: n=15, GG: n=13	69-74	F	Non-exercising health and Mat Pilates healthy	MT, AG, and GG are efficient for improving postural balance in elderly women after 12 weeks of training.	MT, AG, and GG are efficient for improving postural balance in elderly women after 12 weeks of training.
Sculthorpe NF [133]	RCT	HIIT	Australia	IG: n=22 CG: n=11	Avg: 62	M	Healthy Aging Men	Data collection: Phase A B C 6 weeks interval between each phase	Physical Well Being was observed and there was a significant improvement in participants overall wellbeing.

Calverley TA [134]	Review	HIIT	Multiple	N/A	N/A	N/A	N/A	N/A	HIIT can promote improvements in molecular and vascular functions and healthy aging population
Li X [135]	RCT	HIIT	China	29	64.8 ± 3.9	F+M	physically inactive older adults	N/A	Mental Wellbeing Symptoms of Dementia Quality of Life Seemed to improve
Annika Toots [136]	RCT	HIIT	Sweden	N = 186EG: 93 CG: 93	65+	F+M	Aging adults	In participants with non-Alzheimer's dementia, the exercise program slowed decline in ability to perform ADLs and improve balance at 4 and 7 months. No such effect was evident in participants with AD At 4 months, balance had improved in the exercise group and declined in the attention in the control group; at 7 months, balance had declined in both groups. Independence in ADLs deteriorated in both groups, with no significant between-group difference at 4 or 7 months	a 4-month HIFE program appears to slow decline in ADL dependence and improve balance. The first study found an effect only at 12 months but not at 6 months, 53 suggesting that intervention length is important for achievement of effects in this population and that the 4-month intervention in the present study was too short.

Kim DR [137]	RCT	Lower-limb exercises	South Korea	EG: 10 CG: 10	60 above	M	N/A	Intervention Group showed significant differences in skeletal muscle mass (P=0.01) and modified Alzheimer's disease assessment scale-cognitive score(P=0.01)	Cognitive training activities, such as arithmetic operations, fruit picking, and puzzle-solving, required the upper limbs' movement improved the participants' skeletal muscle masses and positively affected their upper-limb and balance functions and improved cognitive function.
AZIZANA [138]	quasi-experimental analysis	Lower-limb exercises	Malaysia	Behavioral Group: 18 Physical Group: 23 CG: 22	65+	M+F	N/A	Mental health improved	Combination of Physical Training and behavioral strategies may be a promising strategy in enhancing better physical and mental well-being of the elderly.
Vedovelli K [139]		lower-limb/ upper-limb	Brazil	Intervention group: 20 Control Group: 9	80-97	N/A	N/A	1) The intervention group showed improvements in physical fitness, depressive symptoms, cognitive performance, and Brain-derived neurotrophic factor (BDNF) levels. 2) A linear regression identified an association between aerobic conditioning and BDNF levels.	Combined muscle strengthening and aerobic conditioning improves cognitive performance and increases BDNF levels.

McAnulty S [140]	RCT	Martial Arts	USA	17	40-56	M+F	Passed the medical screening and practiced Kung-Fu and Tai Chi for a minimum of one year.	Old were significantly older, practiced more months, suffered higher systolic blood pressure, and scored better on the cardiovascular augmentation index than Young. Sleep interference and overall pain were greater in old practitioners. For any variable, there was no difference.	Physical fitness is maintained in older people through Tai Chi and Kung-Fu practice. It did not prevent changes in cardiovascular stiffness, systolic blood pressure, and pain associated with aging.
Kuei-Min C [141]	quasi-experimental study	Martial Arts	Taiwan	21	65-88	M+F	No prior Tai Chi experience, A minimum of one month living in the facility, Mandarin or Taiwanese proficiency, cognition and ability to express name, address, and phone number	Tai Chi practice significantly improved the physical health and social functioning of frail elders	Age-related frailty can be improved with Tai Chi
Kuei-Min C [142]	II Phase	Martial Arts	Taiwan	40 - Convenience sampling strategy	75.83 ± 6.08	M+F	40 the elderly in Taiwan. "55% were Male, spoke Taiwanese (70%), were widowed (60%), and had retired (100%). 23 Subjects in the non-Tai Chi group had a mean age of 78.14 ± 7.02 years."	(77.78%) Tai Chi group members found slow and large motion forms manageable; forms that required extraneous lower body movements were too difficult to follow (61.11%) and forms that required complicated hand gestures were too difficult to follow (44.44%).	Rest your body with these three activities.

Shu-Ching C [143]	N/A	Martial Arts	aiwan	80	> 65	N/A	a. Elderly community-dwellers. b. At least six months in Taichung, Taiwan. c. Mandarin or Taiwanese. d. Name and address can be verbally stated. e. independent and ambulatory.	There was a difference between Tai Chi subjects and non-Tai Chi subjects in mean psychological status scores (60.13 versus 24.8). Total mood disturbance score for Tai Chi subjects was 14.13, while it was 75.68 for non-Tai Chi subjects.	Practitioners of Tai Chi enjoyed better physical health than non- practitioners.
Chiu SC [144]	Preliminary Study	Resistance Training	Taiwan	IG: 33 Combination Group: 31	63-96	M+F	Elderly with SO (Sarcopenic Obesity)	1) The right grip strength of the intervention group increased by 1.71 kg and the left grip strength improved by 1.35 kg compared with baseline values. 2) The self-care scores of the intervention group increased by 2.76 points over baseline scores, particularly for the action of dressing oneself.	Resistance exercises for elderly residents in LTC facilities may play an important role in helping them maintain physical well-being and improve muscle strength.
Kuiack SL [145]	N/A	Resistance Training	USA	8	63-68	F+M	Diagnosed with Dementia	There was an increase in strength and power for the hip abductor/adductor ($p < .01$), shoulder press ($p < .05$), leg extension/leg curl ($p < .01$) and chest/back ($p < .01$) exercises	Resistance training can increase muscle strength and power for elderly persons with dementia.

Hong J [146]	RCT	Strength Training	South Korea	23	65+	F	Elderly Women	1) Significantly larger increase in BBS scores increased significantly among IG than CG 2) Fear of falling scores significantly decreased among than among CG	The main finding was that a 12-week telepresence program involving progressive exercise may improve physical performance (chair stand test score), improving balance (BBS score), and reducing fear of falling in elderly women at risk of falls.
Schoenfelder DP [147]	RCT	Strength Training	USA	81	64-100	F+M	Elderly nursing home residents	Balance and fear of falling, were maintained or improved for the EG compared to CG	The exercise program improved balance and the effect remained significant 3 months after completion of the program. Lower strength gain (knees and ankles) was significantly associated with increase in gait speed and improved falls efficacy
Wilson ML [148]	Pragmatic, randomized, controlled feasibility trial	Strength Training	USA	80 (LIFT) 33 (SSSH)	65+	N/A	N/A	1) LIFT participants were able to complete significantly more arm curls in 30s and significantly reduced their 8-foot-up-and-go time when compared to SSSH participants	Participation in an 8-week strength-training program can significantly improve the strength, flexibility, agility, dynamic balance, and aerobic endurance of older adults

Rhodes RE [149]	Hypothesis Testing	Strength Training	Canada	30	75-80	F	Elderly Women	Significant correlations between scores on Self-efficacy and Adherence were found at all time periods	Interventions targeting older women's confidence in overcoming barriers of fatigue, bad mood, lack of time, vacation, and bad weather should result in increased exercise adherence in strength-training programs
Gylling AT [150]	RCT	Strength Training	Denmark	HRT: 149 MIT: 154 CG: 148	62-70	N/A	N/A	1) strength training had a positive effect on isometric knee extensor strength in both groups 2) HRT group showed increased muscle mass cross-sectional area of vastus lateralis muscle, a decreased whole- body fat percentage, visceral fat content and an improvement in mental health 3) chair-stand performance improved in all groups	This type of training in a mixed group of healthy and chronically diseased elderly individuals can be implemented with good compliance and induces consistent changes in physiological parameters of muscle strength, muscle mass and abdominal fat.
Qi M [151]	Pilot Randomized Control Trial	Tai Chi and Thera-Band Training	Australia	31	≥ 55	N/A	Older office workers	21 could independently practice the TCTB or Tai Chi exercise motions at the end of the learning stage.	12-week TCTB program was found to improve lower limb and right upper limb strength in older sedentary office workers

Ejiri M [152]	Cohort Study	Walking, at-home exercise and strength training	Japan	553	65-92	F+M	Community-dwelling older adults	1) Strength training at home improved psychological well-being. 2) Older adults who engaged in both walking and home training reported higher psychological well-being than those who engaged in only one of them	The exercises proved to be associated with older adults' psychological well-being.
Halpern J [153]	A waiting-list controlled trial	Yoga	Israel	Phase 1: 31, Phase 2: 43	60+	F+M	N/A	The YI group showed significant improvements, over controls, in a range of subjective factors, including overall sleep quality; sleep efficiency; sleep latency and duration; self-assessed sleep quality; fatigue; general well-being; depression; anxiety; stress; tension; anger; vitality; and function in physical, emotional, and social roles.	N/A
Hernandez-Tejada MA [154]	a randomized trial	Yoga	USA	Otago:10 Otago + Gentle Yoga and Yogic Breathing: 10, Otago + Gentle Yoga and Yogic Breathing + Behavioral Activation: 10	70.6 ± 6.4	F+M	Most reported taking antihypertensive, cholesterol, and/or pain medications.	N/A	An integrated approach to address the physical and emotional well-being of older persons is feasible, according to a study.

Gour P [155]	randomized control trial (RCT)	Yoga	India	144	60-80	F+M	N/A	Exercise should be promoted in the neighborhood as a way to better manage these treatments.	Explores the feasibility of practicing yoga/ light exercise and its effect on the sedentary behavior of the elderly population.
Kelley GA [156]	12 randomized controlled yoga trials	Yoga	USA	752	60 to 75	F+M	N/A	1) Yoga was associated with improvements in both HRQOL and MWB	Yoga is associated with improvements in HRQOL and MWB among older adults
Östh J [157]	Randomized controlled trial (RCT)	Yoga		180	65 to 85	Not Mentioned	N/A	N/A	Ongoing
Saravana kumar P [158]	Randomized controlled trial (RCT)	Yoga	New Zealand	19 (16 residents and 3 staffs)		F+M	N/A	tai chi and yoga programs are appropriate for frail, dependent older people in residential care when modified considering individual's ability, motivation and preference	N/A
Majumdar V [159]	Randomized controlled trial (RCT)	Yoga	India	250	60–80	F+M	N/A	N/A	Ongoing
Park J [160]	Randomized controlled trial (RCT)	Yoga	USA	CY: 66	61–74 HEP: 65	F+M	ameliorate symptoms associated with osteoarthritis (OA)	1) Older women in the CY group showed greater reduction in pain interference during the CY intervention than those in the HEP 2) The younger geriatric group (ages 61–74 years) had decreased depression scores during the eight-week intervention period	Supervised group-based CY is recommended for older adults with OA

Oliveira JS [161]	Randomized controlled trial (RCT)	Yoga	Australia	560	60+	Not Mentioned	N/A	N/A	Ongoing
Choudhary A [162]	Randomized controlled trial (RCT)	Yoga	India	144	60–80	Not Mentioned	N/A	N/A	Ongoing
Tew GA [163]	(RCT)	Yoga	UK	Yoga group: 25 Control group: 27	74.8 ± 7.2	F+M	N/A	1) the yoga group had a higher SPPB total score compared with the control group, a faster time to rise from a chair five times and better performance on the chair sit-and-reach lower-limb flexibility test	The modified yoga program seems doable and maybe advantageous in terms of enhancing mental and social well-being as well as certain physical functions in older, sedentary individuals.
Norade chanunt C [164]	(RCT)	Yoga	Australia	39 Thai Yoga Tai Chi	67.7± 6.7	F+M	N/A	After 12 weeks chair-stand, arm-curl, sit-&-reach, back-scratch,8-foot up-&-go,6-min walk, vitality, enjoyment TY greatly improved as compared to C, however TC did not alter when compared to C. TY made progress with chair-stand, sit-&-reach, 6-min walk, vitality, and enjoyment compared to TC after 12 weeks	Low-intensity Thai Yoga exercises are a great way for older people to significantly enhance their health and wellbeing.

Selman L [165]	controlled, non-Randomized trial	Yoga		IG: 7, CG: 8	71.2 ± 10.09	F+M	NA	1) The Intervention group reported enjoying yoga and valuing the home-based aspect. 2) The educational control intervention reported little effect on their well-being and no impact on mechanisms hypothesized to explain yoga's effectiveness	Further study is required to improve the technology utilized to offer Tele-Yoga to persons with HF and COPD, but it is an acceptable and relevant intervention overall.
Donesky-Cuenco DA [166]	RCT	Yoga	Australia	38 Intervention 19 Control 19	73.21 ± 8.38	F+M	N/A	Muscle strength, active range of motion, physical well-being, and aspects of mental well-being (emotional well-being and self-care) improved significantly in the yoga group ($p < .05$).	Iyengar yoga programs for older people is beneficial for health and well-being, and quality of life
Donesky-Cuenco DA & Vogler J [167]	RCT	Yoga	USA	29	69.9 ± 9.5	F+M	Clinically stable patients with chronic obstructive pulmonary disease (COPD).	1) Yoga training had small effects on DI after the 6MW test, improved 6MW distance and self-reported functional performance compared to UC 2) Greater reductions in DD in the yoga group compared to UC 3) Small positive changes in muscle strength and HRQoL	Yoga training was safe and feasible for patients with COPD

Neville C [168]	Quasi Experimental	Aquatic Exercise Swimming	Australia	11	88.4	F+M	Healthy aging adults	Left-handgrip strength improved (p=0.017) Skeletal muscle index (p=0.002) and lean mass (p=0.001) decreased in both groups	1) Reduce stress and anxiety in the elderly 2) Can improve psychological well being 3) Aquatic intervention reduces BPSD Aquatic exercise program can improve psychological wellbeing and reduce BPSD in people with dementia
Hobden T [169]	Qualitative Study	Aquatic Exercise Swimming	England	4 persons with dementia 4 careers 6 facilitators	60+	F+M	Healthy aging adults 12-week program swimming sessions followed by 17 minutes interview	Swimming helps with agitation and restlessness Confidence and empowerment: Enjoyment of the sessions came from the confidence and feeling of empowerment "You're safer you feel more secure" Creating a support network "It's nice to have a break"	1) swimming benefits as a form of exercise 2) boosts confidence and empowering participants 3) empathy in creating a safe and secure collaborating experience 4) participants felt valued being part of a group
Frontera WR & Peel NM [170]	Qualitative Study	Rehabilitation	Puerto Rico	N/A	N/A	N/A	Healthy aging adults	An increase in physical activity results in increased functional capacity	Physical Activity aids in overall wellbeing in people with dementia Encourage elderly to perform approx. 150 min of moderate physical activity every week.
Bergamin M [171]	RCT	Aquatic Exercise Swimming	Italy	59	65+	F+M	Healthy aging adults	results support the use of warm-water exercise among the effective training employed in the elderly population	Aquatic exercise is a better activity to improve dynamic balance in the elderly people with dementia

D'Cunha N M [172]	Systematic Review	Aquatic Exercise Swimming	Australia	n=11 articles	NA	F+M	People with Dementia	studies include a psychological outcome, and demonstrate the potential for improvements in well-being, quality of life, mood, cognition, and reducing depression anxiety and behavioral symptoms	Positive physical outcomes observed after swimming: 1) improved grip strength, 2) increase in metabolism, motion and joint mobility 3) reduction in sleep disturbances
Becker BE [173]	Case Study	Aquatic Exercise Swimming	USA	1	53	F	N/A	reduction in agitation and facial expressions of anger with increased verbalization, including her calling out, "Hi Mom," to her mother	Walking on level ground improved dramatically gained the ability to stand upright from a water-treading position
Fedor A [174]	RCT	Aquatic Exercise Swimming	USA	EG: n = 27 CG n = 33	EG: 63.26 CG: 65.67	F+M	N/A	improvements in cardiovascular fitness and cognitive functioning significant increases in executive function, attention, and memory performance	N/A
Long A [175]	Mixed-Methods Design	Rehabilitation	Nottingham	16	N/A	F+M	People with dementia	improvements in physical activity levels, loneliness, cognition, anxiety, and depression, for all participants - Strength and activities of daily living remained largely unchanged whilst mobility, balance, and quality of life slightly deteriorated	physical activity levels improved by 4.44 met hrs. per week, ability to recall improved by a score of 1.13 met hrs. per week, recognition remained static, with an improvement of 0.06 Both loneliness (1.75 points) and mood (1.33 points) decreased

Forbes D [176]	RCT, systematic review	Rehabilitation	Canada	16 trials with 937 participants	N/A	N/A	N/A	Exercise programs benefits the ability to perform ADLs in six trials with 289 participants with dementia	Conclusion says that exercise can improve the ability to perform ADLs in people with dementia
Laver KE [177]	Interview, Surveys	Rehabilitation	Australia	interviews: n=13 surveys: n=91	60-80	N/A	N/A	rehabilitation programs are good for maximizing independence and quality of life Rehabilitation helps people with dementia achieve their nominated goals, can delay functional decline and may delay admission to residential care	a) experiences with post-diagnostic care, (b) highly conceptual understanding of rehabilitation. (c) social engagement in rehabilitation programs
McGilton KS [178]	Cohort Study	Rehabilitation	Canada	17,263 (2489 had dementia)	≥66	F+M	Community-dwelling older adults after discharge from inpatient rehabilitation facilities in Ontario, Canada	older adults with dementia received home care services more often than older adults without dementia	Older adults with dementia were nearly twice as likely to have received home care prior to their hip fracture
McNelly L [179]	Literature Review	Aquatic Exercise Swimming	N/A	56	80-90	N/A	N/A	reduced neurobehavioral symptoms, apathy, depression, and agitation. Higher levels of ADL, improved mood, and higher psychological well-being in people with dementia was observed	Aquatic exercise had a positive impact on physical function Well-being was measured in two different studies and showed positive results.
Smith TO [180]	RCT	Rehabilitation	N/A	n=6	N/A	N/A	Six studies were included for this review	N/A	People with dementia who were in rehabilitation are less likely to develop delirium.

Henwood T [181]	RCT	Aquatic Exercise Swimming	Australia	n=37 n= 29 exercise group		F+M	Aging adults	Results support benefits of participation in the Water memories Swimming Club for residential aged care adults with advanced dementia, leading to positive trends for balance, physical performance, and grip strength.	This study shows benefits of aquatic exercise in adults with advanced dementia. Positive effects across ADL, psychological well-being, anxiety, and depression were observed
Cross H [182]	Systematic Review	Rehabilitation	UK	NA	NA	NA	Aging adults	Hearing rehabilitation techniques, and visual aids, improved quality of life in the residents	N/A
Ries JD [183]	Research Article	Rehabilitation	USA	NA	NA	NA	Aging adults	It is important to understand the movement disorders often seen in dementia, the intricacies of motor learning in this population, and the importance of the therapeutic relationship	N/A
Tsujimoto T [184]	RCT	Aquatic Exercise Swimming	Japan	n=77	>60	F+M	Aging adults	results suggest that regular engagement in water-based exercise, even combined with land-based exercise, might have long-term benefits for maintaining physical performance in older adults	N/A

Rodríguez AM	RCT	Aquatic Exercise Swimming	Spain	n=34	>65	F	Aging females	Results provided evidence for the beneficial effects of MART (motivational aquatic resistance training) program in older adults physically active older adults are more likely to achieve greater well-being	Behavioral regulation is characterized by self-choice, volition, and autonomy rather than pressure, demand, and control, and the result is higher quality behavior and greater psychological well-being.
Telenius EW	RCT	HIIT	Oslo	170 CG: 83 IG: 87	86.7	F+M	Participants from 18 nursing homes were allocated to control group and intervention group	IG improved the score on Berg's Balance Scale by 2.9 points, Having exercised 12 times or more was significantly associated with improved strength after intervention ($p<0.05$). The level of apathy was lower in the exercise group after the intervention, compared to the control group ($p = 0.048$).	HIFE program improved balance & muscle strength and also reduced apathy in nursing home patients with dementia.
DM Campos [185-187]	Systematic Review	Aquatic Exercise Swimming	N/A	n= 16 studies	>65	F+M	Aging adults	aquatic exercise has positive effects on the quality of life, cognitive functions, mood, anxiety, and internal health.	Aquatic exercises can be an effective training alternative with greater adherence in the elderly

Adamski N [188]	double baseline assessment	Cognitive Rehabilitation	Switzer land, Germany	25	71.5 +- 4.37	F+M	Parkinson's Disease	1) significant improvements in verbal and visuospatial short-term and long-term memory 2)HC-T improved on mental speed, and verbal and visuospatial working memory	Specific cognitive intervention improves cognitive inefficiencies in patients with PD as well as in healthy older people. -the efficacy of the applied computerized cognitive training tool BrainStim could be verified in patients with PD and healthy age-matched controls
Kindarova AA [189]	N/A	Cognitive Rehabilitation	Russia	41	60.3 +- 8.5	F+M	moderate cognitive impairment	1) patients showed a significant decrease in the severity of cognitive disorders and depression 2) postive dynamics in relation to attention, memory, and logical operations	Statistically significant results prove the effectivenss of cogntive-motor training in patients with MCI

Guilcher SJT [190]	Qualitative	Cognitive Rehabilitation	Canada	80	50+	F+M	delay in hospital discharge, English or French speaking, recruited while in one of two hospitals included in study	1) patients experienced lack of cogntive activities 2) patients experienced feelings of depression 3) patients experienced lack of motivation due to rehabiliation	1) patients feel self-dependent and experience boredom in prolonged rehabilitation centers or hospital stays when they lack cogntive activies 2) lack of cognitive activity can result in depression 3) therapists can use positive and negative reinforcement and tailor the type of motivation for individual patients to decrease the lack of motivation rehabilitation patients experience.
Pereira A [191,192]	Experiential paradigm	Cognitive Rehabilitation	United Kingdom, Nether lands, Portugal	96	64-87	F+M	moderate cognitive impairment	1)PM (prospective memory) was consistently identified as a sensitive and specific indicator of cognitive impairment 2) encoding was consistently beneficial for PM performance in the case of healthy and cognitively impaired older adults	The encoding technique of prospective memory can improve the well-being of cognitvely impaired individuals

Study Characteristics

Aerobic: All the studies were conducted between 2000–2022. A randomized control trial has been used for most of the studies [4,5,7,9-12,14-20,26]. The majority of the studies have been conducted in the United States of America. The number of participants in those studies ranged from 30 to 13,703. The age range of the participants was somewhere between 50 and 102. But in most cases, the participants were over 60 years old. Both male and female participants participated in those studies, though there are several studies where only participants of one specific gender participated [1,9,22]. The researcher selected healthy participants generally. But there were some studies where participants with mild cognitive impairment [10], Alzheimer's disease [14], coronary heart disease [17], and suffering from heart failure hospitalization [16] participated.

The participants who did aerobic exercise improved their heart rate response in this study VanDerVeer S, et al. [2]. After 34 weeks of exercise, the treatment group improved the mean Physical Activity Score for the Elderly (PASE) by 66 points from baseline and decreased the mean heart rate by 2.4 beats per minute. In Huang CH, et al. [4], aerobic training improved the IC Z-scores by 0.17 at week 26, as did resistance training separately. But there were no significant differences in IC Z-scores for a combination of both of those training. The Multiple Sclerosis group had lower cardiorespiratory fitness (VO2peak) and moderate-to-vigorous physical activity [3]. Although all the groups improved peak VO2, physical function, and appearance scores, the group with Aerobic Training (AT) also improved strength and anthropometric measures in this study Collins KA, et al. [5]. A study was conducted with Persons with dementia (PWDs), and the results show that the quality of life of the participants increased significantly [7] after the exercise. Aerobic exercise and other exercises improve mental health and reduce stress, according to 91.9% of participants [8]. In Fairbairn P [9], after 24 weeks of multi-nutrient and 12 weeks of aerobic exercise, verbal memory and executive functions, as well as emotional well-being, improved significantly. The cognitive function and health-related quality of life improved significantly in the case of the intervention group [10]. Aerobic exercise also reduced depressive symptoms and improved sleep quality. Improvement in leg fatigue, energy fatigue, emotional well-being, and general health can be achieved using aerobic and knee-strengthening exercises with knee osteoarthritis participants [12]. The researchers did not observe any improvement in cardiorespiratory endurance and quality of life, though. Forty Alzheimer's patients participated in the study Abd El-Kader SM [14] for two months. Tumor necrosis factor-alpha (TNF-α), interleukin-6 (IL-6), Beck Depression Inventory (BDI), and Profile of Mood States (POMS) were reduced by 25.2%, 19.4%, 23.5%, and 21.3%, respectively. In addition, the mean values of RSES increased by 15.7%. Also, SF-36 health quality of life (SF-36 HRQL) improved significantly after the study. The effect of aerobic exercise on brain health after a 12-month randomized controlled trial study was examined in this study Zuniga KE [15]. Across all assessment occasions, those with the fewest memory problems had lower perceived stress, lower physical symptom reporting, and higher happiness scores. Subjective memory impairment (SMI) remained steady throughout the intervention and was not appreciably affected by exercise training. The change in Pittsburgh Sleep Quality Index (PSQI) was observed through a randomized control trial with participants hospitalized for heart failure in this study Suna JM [16]. Before the exercise, 45% of participants reported poor sleep quality. But after the 12-week disease management program, the sleep quality improved, and depressive symptoms were reduced for the exercise group. But there was no change in body mass index or resting heart rate.

Yoga: All these studies were carried out between the years 2000 and 2022. All of the studies used a randomized control trial as the study design. The number of people who took part in those studies ranged from 19 to 752. The participants ranged in age from 60 to 85 years old. Both males and females participated in those studies. The participants were healthy without having any physical disorders in most cases. But in Kelley GA, et al. [156], the participants reported taking antihypertensive, cholesterol-lowering, and/or pain medications. In Choudhary A, et al. [162], participants had ameliorated symptoms associated with osteoarthritis. Also, clinically stable patients with chronic obstructive pulmonary disease (COPD) participated Donesky Cuenco D, et al. [167]. Authors in Gour P, et al. [155] show that yoga exercise significantly improves overall sleep quality, sleep efficiency, and sleep latency. Saravanakumar P, et al. [158] shows that yoga is associated with improvements in both health-related quality-of-life (HRQOL) and mental well-being (MWB). Participants with chair yoga showed a greater reduction in pain interference Choudhary A, et al. [162]. In Selman L, et al. [165], the yoga group achieved a higher Short Physical Performance Battery (SPPB) score than the control group. After 12 weeks of yoga exercise [166], participants showed a significant improvement in a senior fitness test (chair-stand, arm-curl, sit-and-reach, back-scratch, 8-foot up-and-go, and 6-min walk). Not only physical well-being (like muscle strength and active range of motion) but also mental well-being improved after taking a yoga session [168]. Though yoga exercise has a small effect on reducing dyspnea intensity, it significantly reduces dyspnea-related distress [169]. Other studies [161, 163,164] are still in the works.

Dance: Of the styles of dancing, three studies used ballroom dancing [106-108], 3 used traditional dance forms (two used Greek dance [111,112] and one used Irish dance [113]), one used tango [116], 1 used line dancing [114], 1 used square dancing [115], 1 used Agilando [105], and four studies used

creative dances [103,104,109,110] designed according to the need of the respective study. The studies included have been carried out in various countries, including China, the United States of America, Greece, France, Portugal, Italy, Ireland, the Czech Republic, Germany, Australia, and Brazil. The majority of the studies used Randomized Controlled trials as the study design to compare the effects of dancing on various parameters between the experimental groups and the control groups. The sample size of the included studies ranged from 13 to 530. The age of the participants ranged from 60-96 years. Twelve studies had a majority of female participants, and two of them included just female participants. Half of the studies included healthy older adults. Five studies targeted older adults with pre-existing medical conditions, out of which two targeted Dementia patients [109,110], one targeted older adult with visual impairment [116], two included patients with Mild Cognitive Impairment [112,115], and two targeted patients having symptoms of depression [115,114]. The studies concluded that including some dance sessions in the daily routine of older adults helps in improving physical well-being, mental well-being [104,105,110,111-115], and quality of life [104,106,112-116]. Some of the papers support the potential utility of dance intervention for improving various aspects of functioning in older adults with dementia [109,110] and also for preventing the development of the symptoms of dementia [111].

Cognitive exercises: Different types of cognitive training and therapies were used in the included studies to improve cognition in older adults. Nine of them used Cognitive Behavioral Therapy [24,25,27,36,37,39,43,47,51], four of them used Cognitive Stimulation Therapy [28,30,38,45], and others used some well-designed cognitive training to align with the desired outcomes. The majority of the studies used Randomized Controlled trials as their study design. The countries in which these studies were carried out include the United States of America, China, Sweden, Iran, Italy, Australia, the United Kingdom, South Africa, Indonesia, Canada, Germany, and Japan. The sample size of the selected studies ranged from 12 to 2832. The majority of the studies had more female participants than males, while some of them had males in greater numbers. Most studies focus on the effect of the training on the mental well-being of the participants. Eight studies targeted older adults with Mild Cognitive impairment [16,26,33] as they were at a higher risk of suffering from dementia in the future. Seven studies targeted healthy older adults. Three of them focused on frail older adults, including adults having a history of falls [21], a history of heart failure [22], and walking difficulty [17]. Some studied the effect on older adults with either anxiety disorder [29,31,35], depression [27,32,34,47], or both [44], while two of them targeted older adults suffering from insomnia and depression [36,39]. Six of the included studies studied the effect of cognition therapy on older adults suffering from dementia [28,30,38,41,45,49] ranging from mild to moderate dementia, vascular, Alzheimer's' or mixed. The outcomes of the studies indicate that the use of cognitive training and therapies can potentially reduce as well as prevent cognitive decline in older adults.

Strength training: Six of the selected studies were Randomized Controlled Trials [25,151,131, 146-148], one was a Cohort Study [152], one was an Observational Intervention Study [50], and one was a Preliminary Study [144], one was a Pilot Study [101], one was Hypothesis Testing [149], and two were unknown [102,145]. These were conducted in Japan [152], Netherlands [25], Australia [151], Brazil [131], USA [102,145,147,148], Taiwan [144], Italy [101], South Korea [146], Canada [26]. The age criteria for most of the studies were 65 and above. Most of them included both males and females, while two of the studies included only women [146,149]. The participants of the studies were Community-Dwelling Older Adults [152], Patients with Dementia [25,50,145], Older Adults with Mild Cognitive Impairments [31,101], and Elderly with Sarcopenic Obesity [144], Older Office Workers [151]. The studies concluded that Strength Training is beneficial for Older Adults' physical well-being and quality of life-improving their muscle strength and power.

Chair based: Two of the selected studies were Randomized Controlled Trials [68,69], and 1 was a Systematic Review [70]. Two of these studies were conducted in Portugal [68,38], and one was conducted in Germany [69]. The age of the participants was 65 and above. Only female participants were included in one of the studies Furtado GE, et al. [68]. Two studies included participants who were Nursing Home Residents [69,70] while the other study included pre-frail older women [68]. The studies concluded that chair-based exercise programs have positive effects on physical and cognitive functioning in older adults, thus improving their physical and mental well-being.

Upper and lower limb: Two of the studies conducted quasi-experimental studies [67,138], one conducted randomized controlled intervention [137], one conducted a randomized controlled pilot trial [14], and the others didn't mention the study conducted. Two of the studies included only female participants [67,130], and one included only male participants [37]. One of the studies included women who were healthy, active, and played golf [130], and one of the studies were conducted on community-dwelling older women [67]. The age range for the selected papers was 60 and above. The number of participants ranged from 20 to 63. Two of the studies were conducted in England [14,130], one was conducted in South Korea [137], one in Malaysia [138], and one in Brazil [139]. The study [67] concluded that chair yoga improves upper and lower limb strength. A combination of different types of training can improve upper and lower limb strength, thus improving the physical well-being of older adults.

Rehabilitation exercises: The studies reviewed for this paper in the rehabilitation programs for the dementia category were conducted after 2018. Out of the seven papers, 1 was a quasi-experimental study, and two were based on qualitative studies consisting of literature reviews, interviews, and surveys; 1 was a mixed-method study including both a focus group and systematic review; 2 were randomized controlled trials. Three of these studies were conducted in Canada [177], in the United Kingdom [183], 2 in Canada [177,179], 1 in Australia [178], and 1 in the United States of America [184]. The number of participants in these studies ranged from n= 19 to n=17,263. 65% of the total participants in the studies combined were female, and 35% were male.

Out of 7 papers reviewed for rehabilitation exercises for the elderly with dementia, almost all papers support the idea that rehabilitation programs work in favor of physical-wellbeing, mental well-being, quality of life, and symptoms of dementia for elderly patients. Rehabilitation programs may help people with dementia achieve their goals in ADL and can delay functional decline and admission to residential care.

High intensity interval training/cardio: Five papers were reviewed for high-intensity interval function for this paper. All of these studies were randomized controlled trials and included participants of age 65 and above. One study with 167 participants with a mean age of 80 years, conducted in Oslo, was also included [44].

Most studies in the HIIT category were conducted in Europe. Other locations include Oslo, Australia, and China. One paper was a combined effort of physicians from the United Kingdom, New Zealand, Japan, Canada, and France [134]. All of these studies were published fairly recently, after 2012. For the high-intensity training exercises, mostly healthy and physically active participants in the early stages of dementia were recruited since the nature of such exercises could have adverse effects on older participants. After carefully selecting participants, interventions were subjected to low-frequency HIIT exercises to avoid serious injuries or adverse effects.

In most papers, high-intensity exercise was excluded in studies that involved elderly patients due to overall weak health and comorbidities associated with the elderly. Studies were carefully conducted and only included healthy aging people to avoid any serious consequences due to high-intensity exercise. The outcomes were measures based on physical well-being, mental well-being, quality of life, and symptoms of dementia. The analyses and experiments carried out measured the changes in activities in the daily living of the elderly, referred to as ADL, to monitor the effects of interventions [133-136].

Aquatic exercises/swimming: All of the studies were conducted between 2014-2021. The majority of these studies were conducted in North America, Europe, and Australia. Out of the 14 studies, five were controlled trials, whereas the rest were systematic literature reviews. Most participants were in the age bracket of 50 -89. One is a case study on a female lady, age 53, with end-stage dementia, where she was put under a 5-month aquatic exercises session, and the results were recorded to gauge her physical and mental well-being.

General exercises: Six of the selected papers conducted Randomized Controlled Trials [26,119,121,123,124,150], one nonrandomized clinical study [117], one pilot study [122], one quasi-experimental intervention study [126], and one cohort study [125]. The majority of the studies included participants with ages above six years. Two of the studies targeted older adults diagnosed with dementia [117,120], two of the studies included community-dwelling older adults [119,122], one study included frail aged adults [124], and one included non-institutionalized older women [26]. Two of the studies [26,117] included only female participants. The majority of the studies were conducted in Spain [26,118,124,127], two of the studies were conducted in Indonesia [120,125], and one was in Portugal [122]. two in China [126,129], one in Denmark [150], one in Brazil [117], one in Taiwan [119], and one in Japan [121]. The number of participants ranged from 15 to 733. The studies concluded that physical exercise could prevent cognitive decline and improve quality of life, mental well-being, and physical well-being.

Balance exercise: Study periods ranged from 2000 to 2022. A Randomized Controlled Trial was the primary study design. Most of the studies were conducted in the United States. The number of participants was in the range of 27 to 900. Only four of the experiments had participants exclusively of the female gender, and the majority had both sexes as participants. The age range for the elderly differs from one country to another country. On average, the range of elderly is considered above 60, but in some cases, participants were chosen above 50.

The researcher mostly selected healthy participants. But there were some studies where participants had some comorbidities. One study with people who suffer from osteoporosis [49] and five studies on people in the early stages of dementia [28,34,35,37,45].

Biking: Most of the research was conducted in the USA. Based on which country the research was conducted, the considered age range for the elderly differed. The considered age differed from 59-89.

The number of participants differed from 15 to 7421. Most of the articles have chosen participants from both genders, but some were chosen by females only. One of the studies used participants with cognitive impairment, depression, Glomerular Filtration Rate (GFR), Cardiovascular Disease

(CVD), neurodegenerative diseases, osteoarticular diseases, osteoporosis, any kind of cancers, diabetes, Chronic Obstructive Pulmonary Disease (COPD) are included to compare if the result of cycling differs for these patients, but other studies registered only healthy participants [59].

Martial arts: Like most of the exercises, this one is also so popular in the United States of America. Five out of 12 were conducted in the United States. For the four exercises we are studying, 3 out of 4 were conducted in Taiwan [141-143], which is the first country to study martial arts. As already mentioned, considering age depends on the culture, so it changes from country to country. The average age of being old was 65 and above in the United States [140], but in Taiwan, we can see the old considered age is around 75 and above [141-143]. The participants were selected based on the inclusion criteria, and 3 of them had some comorbidities [141,143,144], but one of them had healthy participants [142]. The number of participants was between 17 and 80. All four studies chose participants from both genders. The first study contains forty percent of the participants with some family history of cardiovascular disease [141]. And the second study chose some participants with hypertension, arthritis, heart disease, diabetes, and stomach ulcer [143]. And the third one excluded subject with severe cardiovascular, musculoskeletal, or pulmonary illnesses [144].

Cognitive rehabilitation: Four articles on the topic of cognitive rehabilitation were selected and were published during the years of 2016-2022. These studies were published within the countries of Switzerland, Germany, Russia, Netherlands, United Kingdom, and Canada. The number of participants included in the studies ranged from 25-96, whom of which were in the age range of over 50 years. All of the studies on the topic of cognitive rehabilitation included both females and males. Two studies [190,194] included participants who had moderate cognitive impairment, one study included participants who were diagnosed with Parkinson's Disease [189], and one study included participants who had a delay in hospital discharge for cognitive rehabilitation purposes [191]. Participants showed an improvement of cognitive capabilities after cognitive rehabilitation in two studies [189,190,192], specifically in verbal and visuospatial short-term and long-term memory, mental speed, attention, and logical operations. Participants who were in a setting with no cognitive activities [191] resulted in depression and a lack of motivation.

Discussion

Physical Well-Being

It has been shown by different studies that aerobic exercise can improve physical fitness in different ways. It improves psychological well-being (PWB) and quality of life (QoL) in older people [1], heart rate response [2], VO2peak [3], and intrinsic capacity (IC) [4]. It can also improve some aspects of health-related quality of life (HrQoL), such as physical function and appearance [5], physical activity and intensity [6,7,17], fitness performance [6,8], verbal memory and executive function [9], cognitive function [10], general health and energy [12], cardiorespiratory endurance [12], body image [13], systemic inflammation [14], sleep quality [16], and functional balance [49]. It also reduces leg fatigue [12], memory problems [14], the risk of heart failure [16], the chance of falls [49], and body fat [22].

Yoga is an efficient exercise for physical well-being because it increases body flexibility, muscle strength, respiration, energy, and metabolism. It also reduces body weight and the chance of injury. Sleep quality [153] and sleep efficiency [153] are also improved by yoga exercises as well as feasibility measures [154]. The community should use this kind of physical exercise to better control the physical effects of aging [155]. Yoga has been associated with a higher health-related quality-of-life (HRQOL) score [156,158,166] and physical attributes [163]. In addition, yoga exercise is also very beneficial to participants with osteoarthritis [160], physically inactive older adults [163], heart failure (HF) [165], and chronic obstructive pulmonary disease (COPD) [165,167] in terms of improving their physical condition.

The majority of the studies reviewed for dance exercises showed a significant positive effect on the physical fitness of older adults. The common outcomes among the studies on physical fitness included improvement in balance, lower-body strength, and mobility-related performance. Also, a creative dance program emphasizing body awareness can improve proprioception in older adults [2]. One of the studies independently reported the improvement in strength and flexibility of lower limbs, aerobic endurance, motor agility/dynamic balance, and body composition [6] as the positive effects of dance intervention. Other beneficial effects were found for dance-related parameters such as fall prevention [7], improvement in postures, and reaction times [4].

The studies suggest that proper cognitive training helps frail older adults who might have a history of falls or fear of falling improve their balance and gait.

Based on the studies included in the analysis, strength training has a significant positive effect on the physical well-being of the elderly. The outcomes of strength training interventions included improvement in muscle strength, power, balance, gait speed, and flexibility. The study Qi M, et al. [151] aimed at determining the feasibility of Tai Chi with the Resistance Band Training Program reported an improvement in the upper and lower limb strength of the elderly. The study Chiu SC, et al. [144] observed the effects of resistance training intervention and concluded that it

plays an important role in improving muscle strength and maintaining the physical well-being of older adults in LTC. The study Wilson ML, et al. [148] suggested that engaging in a strength training program can significantly improve older people's strength, flexibility, agility, dynamic balance, and aerobic endurance.

Physical Training enhances the physical well-being of the elderly. In a study Yao CT, et al. [67], chair yoga significantly improved upper and lower limb strength, thus improving the functional fitness and well-being of older adults. Combined chair-based exercises improve the functional fitness of older adults [68]. A systematic review [70] of chair-based exercise interventions for nursing home residents reported that CBE interventions improve different domains of physical functioning, including lower body performance and other benefits.

High-Intensity Interval Training for the elderly, especially with comorbidities, has very limited research so far. It is primarily due to the fact that the goal of high-intensity exercises is to increase the heart rate through fast exercises, which can be damaging for elderly patients. Most studies only included healthy aging individuals. One study, which was carried out in 2017 in Australia, involved thirty-three healthy aging men that underwent low-frequency HIIT exercises intervention on peak muscle power to assess physical well-being. Participants were monitored at three distinct measurement points (phase A), after six weeks of conditioning exercise (phase B), and after six weeks of HIIT once every five days in INT (phase C). The result showed that static balance in the elderly remained unaffected after the intervention. While the results showed that six weeks of HIIT exercise is a feasible and effective method to induce improvements in peak power output, however, it does not improve static balance in inactive aging men [133].

Another study to judge the physical well-being of elderly dementia patients was carried out in Oslo in 2016. In this study, 176 participants with a mean age of 85, diagnosed with dementia, and living in nursing homes were included. The intervention consisted of intensive strengthening and balance exercises in small groups biweekly for a duration of 12 weeks. The results showed that a high-intensity functional exercise program improved balance and muscle strength in the patients. It also reduced lethargy in nursing home patients with dementia, thereby showing positive effects on physical well-being [44].

Many studies, among what has been discovered, showed that Balance exercise is beneficial for the elderly to increase physical well-being. For measuring the effectiveness, one test would be created and taken from the participants before and after the exercise, so it would be a numeric way of comparing. For example, in one study, balance, mobility, and lower body strength were assessed. More specifically, lower body strength was measured by the number of chairs rises in a 10-second period. Other studies created other tests to measure the effectiveness. In some cases, the measured time significantly reduced [38,39,44,46], but in some cases, although they expected a great change, it was not considerable.

Researchers showed that cycling was effective in helping the elderly in many aspects of their lives. It has been discovered that cycling can help the elderly to reduce the probability of insufficient levels of vitamin D [58]. Cycling was successfully used as part of a 4-week memory training and aerobic exercise program designed to improve memory, attention, and reasoning abilities in older people. The sedentary old adults who performed stationary cycling for an acute period of time experienced reduced self-efficacy and negative mood results. It also proved to improve mood and decrease the number of physical therapy sessions [51-59].

Despite the lack of research into martial arts, both Tai Chi and Kung Fu have been found to maintain physical fitness in older individuals compared to younger practitioners [140-143]. However, age-associated changes in cardiovascular stiffness, systolic blood pressure, and pain were not prevented. It has also been proved that Tai Chi practice is beneficial for frail older people. Besides, a new Tai Chi has been developed that is a simplified version to compare the result between frail adults and professional experts. They concluded that an evaluation for each step of the designed exercise is needed to enhance the well-being and quality of life of participants [140-143].

Mental Well-Being

Physical activity has been shown to have a positive effect on the mental health of the elderly. Several studies included in the analysis suggested that the mental well-being of older adults who engaged in strength training improved. The study Ejiri M, et al. [152] examining the prevalence of exercise as a coping strategy among community-dwelling older adults and its impact on their psychological well-being showed that those who engaged in strength training had better psychological well-being than those who did not. The study Langoni CS, et al. [131] aimed at determining the effects of group aerobic exercise and strength training on cognition, conditioning, muscle endurance, and balance in underprivileged community-dwelling older adults with Mild Cognitive Impairment (MCI) showed significant improvement in cognitive function.

According to the study Kim DR, et al. [137], arithmetic

operations, fruit picking, and puzzle matching were among the multicomponent training exercises that significantly enhanced cognitive performance. The study Vedovelli K, et al. [139] engaged participants in interventions including upper and lower limb strengthening and the results showed improvements in cognitive performance and BDNF levels.

Multicomponent exercise programs that combine physical and cognitive training have been shown to improve cognitive functioning in older adults. Physical activity is an effective way to improve and maintain the cognitive status of elderly individuals, thus improving their mental well-being.

A study Furtado GE, et al. [68] aimed at verifying the effect of a chair-based exercise program on the functional fitness of pre-frail older women suggested that chair exercise interventions improve the mental health of older adults. Another study Cordes T, et al. [69] conducted to examine the effect of chair-based exercise intervention reported improvement in cognition.

Dance exercises can help in improving cognitive function, as reported by some of the studies. Participants improved their state of depression; in particular, they felt better satisfaction in their life, a greater interest in activities, less boredom, a good mood most of the time, greater happiness throughout the day, and the perception of a wonderful life [14]. Dance exercises also help improve verbal fluency, attention, and executive functions in participants suffering from Mild Cognitive Impairment [9].

The studies reviewed for cognitive exercises discuss potential outcomes in improving cognitive function in older adults while doing different activities. The study McAuley E, et al. [19] provides strong evidence that cognitive training improved working memory, attention, episodic memory, and fewer everyday cognitive problems. Speech-of-processing and reasoning training seems to be a promising solution to improve everyday cognitive performance. Moreover, the outcomes of some of the studies support the efficacy of cognitive behavioral therapy in reducing insomnia, depression, and anxiety. The study Wang Z, et al. [32] suggests that cognitive-existential group therapy with a picture of self and emphasis on training time and awareness of death in the elderly increased life expectancy reduced depression and improved the mental health of the elderly.

Aerobic exercise is good not only for physical well-being but also for mental well-being. After aerobic exercise, the participants improved their mental well-being [5], happiness [6], behavioral and emotional status [7], and subjective well-being [19]. This kind of exercise also helps to determine how to handle stress and make choices.

Yoga exercise helps to improve mental well-being by reducing mental stress and improving sleep quality [153] and physical wellness [158,160,165]. Feasibility measures like satisfaction with the program also improve mental well-being [154]. It has been shown that mental well-being is related to doing more minutes of yoga per week [156]. This exercise can also help patients with heart failure (HF), and chronic obstructive pulmonary disease (COPD) improve their mental health [165].

Aquatic Exercises are generally known to improve mental well-being. The studies carried out in the recent past for aquatics exercises for the elderly indicate that moderate-intensity swimming or other aquatic exercises, such as water aerobics and aquatic therapy, can significantly improve mental well-being in older adults. For water-based exercises, results mostly indicated improvements in psychological well-being. Results show that swimming can help elderly patients with depression, agitation, and restlessness. It also gives confidence and a feeling of empowerment to the elderly as they feel more in control of their bodies in the water. It provides a significant change in the environment which allows them to forget their worries and illnesses for some time [170]. Furthermore, results showed higher levels of activities of daily living and improvement in balance, muscle mass, and grip strength. Participants also experienced a positive trend across Behavioral and Psychological Symptoms of Dementia (BPSD) [182].

HIIT also showed generally positive effects on the mental wellbeing of the elderly. The results showed an overall decline in apathy and lethargic moods of participants in the nursing home due to HIIT exercise programs.

Studies show that cognitive rehabilitation can improve memory, verbal and visuospatial memory, speed, attention, and logical operation in the elderly population [189,190,192]. By keeping the mind active with cognitive rehabilitation tasks, elders are less likely to experience boredom, depression, or a lack of motivation [3]. By doing so, elders can improve their social and mental wellbeing [192]. Specific cognitive interventions [189], cognitive motor training [190], cognitive encoding, [192] are methods of cognitive rehabilitation that have successfully improved the mental well-being of cognitively impaired individuals. The use of the computerized cognitive training tool BrainStim has also proven so. This further exemplifies how cognitive rehabilitation can be integrated in many ways to improve mental well-being in the elderly.

Quality of Life

Dance intervention can contribute to improving the quality of life of older adults, as reported by some of the

reviewed studies. The dancing, especially when done in groups, creates a culture of inclusion that embraces both understanding and acceptance among senior citizens, which in turn might improve their quality of life. Moreover, dancing is fun; it brings health benefits, brings back some good dancing memories, it allows participants to establish cultural connections and provides opportunities for socializing. Also, in the qualitative analysis [12], participants reported increased confidence and a sense of accomplishment, ease of learning, closeness to real life, and a sense of belonging as the outcomes of dance intervention.

Strength training leads to a significant improvement in the quality of life in terms of general health and physical functioning of the elderly. In the study Furtado GE, et al. [68], a chair-based exercise program was able to increase happiness in the elderly. In general, physical exercise is effective in improving the quality of life in older adults.

Aerobic exercise plays an important role in improving the quality of life of participants. It improves several components of Health-related Quality of Life [5,10-14,49,17] more than the control group.

As yoga exercise improves both physical well-being and mental well-being, that is why it is also associated with the improvement of overall quality of life [158,164,166].

A study conducted with 186 participants living in a residential care facility in Sweden, aged above 65 and diagnosed with dementia, monitored the quality of life on the basis of dependence on Activities of Daily Life (ADL). A cluster-randomized controlled trial was carried out; a control group consisting of ninety-three participants was subject to a high-intensity functional exercise program consisting of lower limb strength and balance exercises. The other group was subject to seated and controlled activity for a total duration of 7 months. Blinded assessors measured ADL independence using the Functional Independence Measure (FIM) and Barthel Index (BI) and balance using the Berg Balance Scale (BBS) at 0, 4, and 7 months. The results showed that in older people with mild to moderate dementia, a 4-month HIFE program reduces ADL independence and improves balance [136].

Reduction in Dementia Symptoms

The review suggests that dance exercises can potentially help in reducing symptoms of dementia. The study [8] argues that the induction of neuroplasticity in the mature human brain leads to the prevention of dementia. A promising solution seems to be the dance programs because they combine cognitive and physical activity in a pleasant way. Other studies that targeted Dementia patients reported immediately enhanced well-being after dance sessions, shorter execution time, reduced self-perceived competencies in balance, and variations in social behaviors of participants [10]; improvement in daily functioning [11] as the beneficial outcomes of dancing sessions.

The review for cognitive exercises gives strong shreds of evidence to help improve the condition of Dementia patients. The study Sakamoto K, et al. [28] confirms the efficacy, at least in the short term, of cognitive stimulation therapy in sustaining cognitive functions in older adults with dementia in the Italian care setting as well. A trend towards improvement was also identified in short-term/working memory using cognitive therapy [30]. According to the findings, older adults with dementia in Indonesia who participated in an exercise program and a reading aloud activity saw an improvement in their cognitive performance [49].

The analysis of the study Pitkanen A, et al. [50] showed that physical exercise has positive effects on neuropsychiatric symptoms (NPS) and the level of functioning in some patients with dementia. The study Landi F, et al. [101] observed the impact of a moderate-intensity exercise program on behavioral problems of frail, elderly, demented patients living in the nursing home and suggested that physical exercise may be an essential and strong preventive factor in the aged population against cognitive impairment, Alzheimer's disease, and other dementias. A study Farias JM, et al. [117] suggested that physical exercise could be an effective method for blocking AD progression. The study Juniarti N, et al. [120] aimed at examining the effect of exercise and learning therapy on cognitive functions and physical activity of older people with dementia in Indonesia reported a significant improvement in the cognitive function of the older people with dementia.

Aquatic exercises are known to reduce BPSD in people with dementia and improve staff distress related to BPSD. Having outdoor activities like swimming interventions generally improved the atmosphere of the nursing homes, not only for the residents but also for the staff in the nursing homes. Swimming helped with agitation and restlessness [171,175]. Participants experienced positive trends across BSPDs, activities of daily living, psychological well-being, anxiety, and depression [182].

Limitations

For this systematic review, a comprehensive search was performed on only one electronic database, named Scopus. Because this systematic review covers a wide range of topics on exercise for the elderly, only one electronic database is used. So, it is possible that some important

studies were left out of this database. Also, the filtering and searching processes the researchers used may have omitted some relevant research. However, because the researchers performed a rigorous search and screening technique, they believe the number of missing studies is quite low. There are some studies ongoing and yet to be published their result [20,24,53,159,161,162].

Although many documents were found, there is some lack of proper research on some important exercises, and also some studies on participants with comorbidities as well. Because this kind of study would help to see the result of exercises better, and these kinds of studies are few. So, for example, the study on gymnastics, which is a popular one, is limited to one that we could find, so this study was removed from the study. This happened for some other exercises as well. With the few studies which had some participants with a particular disease, great conclusions and comparisons have been brought to the study Oliveira MR, et al. [132].

A major limitation of the aquatic exercises was the lack of skilled staff to monitor the participants underwater. The attendance of participants was not regular; the dropout rate was more than usual. Skilled staff was required to be able to perform these exercises in a safe and secure environment in water bodies [182].

One of the limitations of using cognitive exercises recognized by the researchers was that the effect of the exercise declined with time after the exercise sessions were over. Thousands of studies showed up in the search using the search criteria for this category, which made it difficult to filter the relevant studies for the review.

Researchers encountered certain challenges while conducting the studies. Certain studies reported results from trials conducted on a small number of participants. A small sample size undermines the validity of a study. Although most of the included studies reported positive results, their sample size was small to validate the study.

Cognitive rehabilitation is designed for individuals who possess some type of cognitive impairment. The participants of the studies included were moderately cognitively impaired or were diagnosed with Parkinson's disease. The results of these studies cannot be generalized for the elderly population, but can be generalized for the elder population who have some type of cognitive impairment.

Conclusion

Most of the included studies did interventions for cognitive, balance, and aerobic exercises, with cognitive exercises having the most numbers. General Physical exercise, Yoga, Dance, Aquatic, Strength Training, Aquatic, Cycling, and Rehabilitation Exercises were included in relatively lower numbers. Chair-based, Martial Arts, HIIT, and Upper and Lower-limb exercises intervention studies are included in unsatisfactorily low numbers, with Chair-based exercise intervention having the least. It is known that there is a lack of research on some of the subjects, which has been compensated to some extent by using synonyms to replace the terms used.

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