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Review

Take a Seat for Yoga with Seniors: A Scoping Review

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Abstract

Chair yoga is a specific form of yoga practiced while seated on a chair, or standing using a chair for support; this adaptation allows those with impaired standing ability to practice safely. The purpose of this scoping review was to analyze the published literature regarding the use of chair/adapted yoga with older adults. Two researchers performed the review. Data sources: PubMed Central, CINAHL, Medline Full Text, Nursing and Allied Health, SPORT discus and TRIP were accessed. Study selection: Inclusion criteria included pre-test/post-test studies with a yoga intervention for older adults using a chair. Exclusion criteria were studies with seated exercise interventions not specific to yoga, mindfulness or breathing techniques with no physical activity, yoga with no use of a chair, not specific to older adults and reviews. The search strategy was performed by two reviewers. Data extraction: Covidence, a systematic review production tool, was utilized to aid article analysis. Data synthesis: Summation of study type, sample, dosing, intervention type, setting, outcome domains and results were included. Of the 3147 studies initially identified, 75 met the inclusion criteria. This review included 32 RCTs, 11 quasi-experimental, 21 cohort, nine qualitative studies and 2 case-series studies. Most studies reported affective and psychomotor domains of learning (n = 51) and favored

chair/adapted yoga as an intervention over the control. A few studies included a second intervention. Twenty two of the 75 studies were focused on community dwelling older adults, followed by participants with orthopedic diagnoses (n = 16), and cognitive impairment (n = 9). The quality of literature supporting chair/adapted yoga is fairly substantial for both community dwelling and those with certain physical and cognitive diagnoses. It is recommended that this intervention continue to be utilized and studied.

Keywords
Chair yoga; older adults; bloom's learning domains function

1. Introduction

Healthcare practitioners have studied complementary and integrative health across a wide range of ages, diagnoses, physical and mental impairments [1]. Considering the International Classification of Functioning, Disability and Health (ICF) model, healthcare practitioners are drawn to yoga because of its multifaceted approach. Yoga improves physical capacity like other forms of exercise, but offers a spiritual component as well. Breathwork and meditation have been proven to promote relaxation, decrease stress with demonstrated improvements at the physiological levels [2-6]. The ICF is a framework for describing and organizing information, providing a standard language and a conceptual basis for the definition and measurement of health and disability. The three domains of the ICF include body structure and function, activity and participation [7]. The practice of yoga has demonstrated improvements across all three of these domains [8-13]. The body of knowledge has grown sufficiently enough to support the rigour of systematic reviews and meta-analyses [14-16]. In 2013, McCall published an overview of systematic reviews of yoga as an intervention with adults with acute and chronic health conditions including pain, psychiatric and psychological disorders and various forms of arthritis [17]. There were 13 studies with quantitative data included in the analysis and 16 reported health conditions. The findings were that the quality of the literature was high but the support for the yoga intervention was low, similar to the findings of others [1, 11, 14, 18]. Researchers are beginning to explore complementary and integrative methods to not only treat certain conditions and diagnoses, but also to optimize the physical and mental well-being of the healthy population.

Chair yoga is a specific form of yoga practiced while sitting on a chair, or standing using a chair for support. The poses are often adaptations of asanas in modern yoga as exercise [19]. The use of a chair allows those with impaired ability to stand or impaired standing balance to perform yoga safely. It has been used with pediatric populations, those with stroke, intellectual disabilities, multiple sclerosis, lower limb amputation, Parkinson's, breathing impairment, arthritis, cancer and psychiatric disorders as both a exercise modality and adjunct to therapy [20-24]. In a 2016 study with 108 community dwelling, sedentary older adults, it was determined that adapted yoga was more amenable to conventional exercise because it required less equipment and was more easily adapted [25].

A review of the literature has yet to be performed with chair yoga as the topic. This scoping review seeks to answer the question "What is known from existing empirical literature about chair

yoga used therapeutically with older adults?" The review's objectives are to explore the breadth and extent of the evidence, map and summarize the evidence, and identify knowledge and research gaps in this evidence.

2. Materials and Methods

2.1 Data Sources and Searches

The search strategy for this review was developed in consultation with the College of Health Profession's experienced librarian. The search was conducted in the months of November and December of 2021 by two researchers; the search terms used were "chair yoga AND older adult," "chair yoga OR adapted yoga AND older adult* OR elderly* OR senior* OR geriatric*" "adaptive yoga AND older adult* OR elderly* OR senior* OR geriatric*"and "modified yoga AND older adult* OR elderly* OR senior* OR geriatric.*" When available, search limits were set to include peer-reviewed, English language with the dates of 2011-2021. Databases included in the search strategy were PubMed Central, MEDLINE Full Text, Cumulative Index to Nursing and Allied Health Literature (CINAHL), Nursing and Allied Health, SPORT discus and TRIP.

2.2 Study Selection

Studies were included if they met the following criteria: (1) research included subject populations who were older adults, defined as 50 years of age or greater; and (2) pre-test/post-test design studies using chair or adapted yoga that targeted the psychomotor domain and recorded outcome measures; and/or (3) pre-test/post-test design studies using chair or adapted yoga that targeted the cognitive domain and measured outcomes; and/or (4) pre-test/post-test design studies using chair or adapted yoga that targeted the affective domain and measured outcomes. However, studies were excluded from analysis if: (1) the subject population were adults less than 50 years of age; (2) the seated exercise was not specific to yoga; (3) mindfulness or breathing techniques did not include physical activity; (4) a chair was not used as a modification; (5) were published in a language other than English; (6) populations were not exclusive to older adults and included other ages groups; (7) were a published study protocol without results; (8) were published before January 2011; (9) were not peer reviewed; (10) the design was a review of any type or (11) were opinion or perspective papers.

Covidence, a systematic review production tool, was utilized to aid article analysis. The search results were exported to Covidence and duplications were automatically removed. Two reviewers independently analyzed article titles and abstracts to determine their eligibility using the inclusion criteria. If deemed eligible by both reviewers, the full text of the article was then considered. A study was excluded when the reviewers agreed to exclude the article for the same reason. Discrepancies between reviewers regarding article eligibility were resolved through discussion. Full text articles were read of those meeting the inclusion criteria. Refer to Figure 1 for the search result (PRISMA). There were 75 studies included in the analysis.

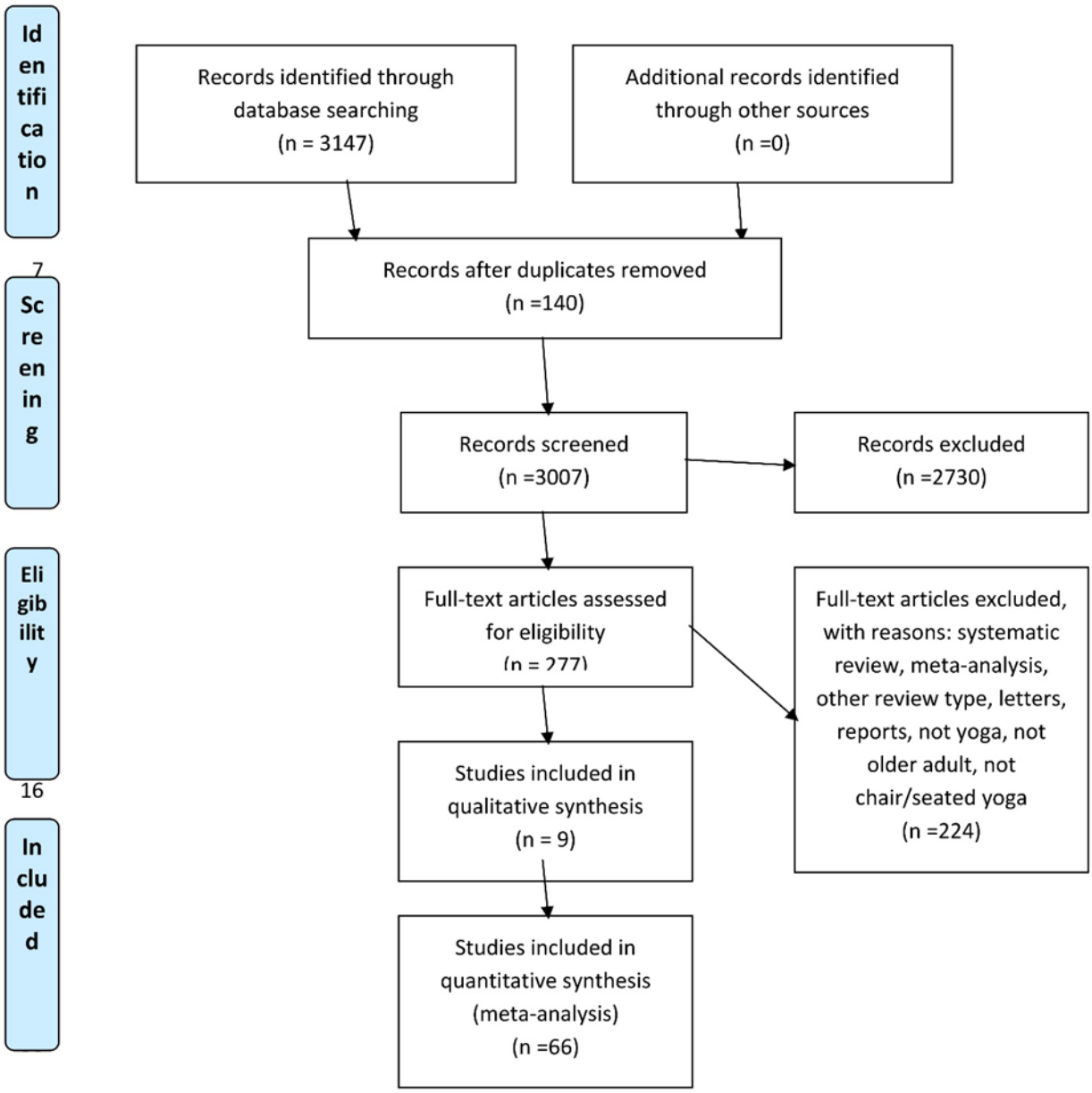

Figure 1 PRISMA Flow Chart: Chair/adapted yoga and older adults 2020-2-21 search.

2.3 Data Synthesis and Analysis

Determining the study type and which Bloom's learning domains (psychomotor, cognitive and affective) were measured by each study's outcome measures was part of the review process. Oxford's Level of Evidence was used to numerically code study design type: "1" for randomized control trials (RCT), "2" for cohort and quasi-experimental, "3" for case-control and "4" for case/case-series and qualitative [26]. The authors extracted study details of each to populate the tables. Table 1 lists study title, journal, author and country. Subsequent tables are organized according to study type and level of evidence. Table 2 consists of large RCTs, operationally defined as studies with greater than 50 participants. Table 3 consists of medium and small RCTs, defined as those with >20 and <50 and ≤ 20 participants, respectively. Table 4 lists quasi-experimental and cohort studies, and Table 5 includes qualitative and case-series studies; both tables are further

categorized using the operational definitions for study size. Data extracted from each article included first author and year, study purpose, participants, diagnoses, sample size, setting, group allocation, methods, outcome measures, results, discussion and effect. Also included in each table was classification of the outcome measures using Bloom's taxonomy of affective, psychomotor and/or cognitive domains.

Table 1 All studies included in the review.

Manuscript Title	Journal Title	First Author, yr	Country
Frailty modifies the intervention effect of chair yoga on pain among older adults with lower extremity osteoarthritis: Secondary analysis of a nonpharmacological intervention trial [27]	Experimental Gerontology	Park, 2020a	United States
Yoga decreases kyphosis in senior women and men with adult onset hyperkyphosis: Results of a randomized controlled trial [28]	Journal of American Geriatric Society	Greendale, 2009	United States
Randomized, controlled, six-month trial of yoga in healthy seniors: Effects on cognition and quality of life [29]	Alternative Therapies	Oken, 2006	United States
A pilot randomized controlled trial of the effects of chair yoga on pain and physical function among community dwelling older adults with lower extremity osteoarthritis [30]	Journal of American Geriatric Society	McCaffrey, 2017	United States
Yoga training application in overweight control of seniors with arthritis/osteoarthritis [31]	Fizjoterapia	Krejci, 2011	Czech Republic
A pilot randomized controlled trial of the effects of chair yoga on pain and physical function among community dwelling older adults with lower extremity osteoarthritis [32]	Journal of American Geriatric Society	Park, 2017	United States
Yoga Is as Good as Stretching–Strengthening Exercises in Improving Functional Fitness Outcomes: Results from a Randomized Controlled Trial [25]	Journals of Gerontology: Medical Sciences	Goethe	United States
Effect of chair yoga on frailty in older adults with lower extremity osteoarthritis: Randomized clinical trial [33]	Innovations in Aging	Park, 2019	United States
The Effect of chair yoga on biopsychosocial changes in English- and Spanish-speaking	Journal of Gerontology Social Work	Park, 2016	United States

community-dwelling older adults with lower extremity osteoarthritis [34]			
Effects of yoga on psychological health in older adults [35]	Journal of Physical Activity & Health	Bonura, 2012	United States
Enhancing an oncologist's recommendation to exercise to manage fatigue levels in breast cancer patients: a randomized controlled trial [36]	Support Care Cancer	Winter-Stone, 2017	Germany
Effects of chair yoga therapy on physical fitness in patients with psychiatric disorders: A 12-week single-blind randomized controlled trial [37]	Journal of Psychiatric Research	Ikai, 2017	Japan
Adapted yoga to improve physical function and health-related quality of life in physically-inactive older adults: a randomised controlled pilot trial [38]	BMC Geriatrics	Tew, 2017	United Kingdom
Comparison of resistance and chair yoga training on subjective sleep quality in MCI women [39]	International Journal of Kinesiology & Sports Science	Karydaki, 2017	Greece
Yoga leads to multiple physical improvements after stroke, a pilot study [40]	Complementary Therapies in Medicine	Schmid, 2014	United States
Yoga to prevent mobility limitations in older adults: Feasibility of a randomized controlled trial [41]	BMC Geriatrics	Groessl, 2018	United States
Psychosocial and cardiac outcomes of yoga for ICD patients: A randomized clinical control trial [42]	Pacing and Clinical Electrophysiology	Toise, 2014	United States
Effect of yoga breathing (pranayama) on exercise tolerance in patients with chronic obstructive pulmonary disease: A randomized, controlled trial [43]	Journal of Alternative & Complementary Medicine	Kaminsky, 2017	United States
An adapted mindfulness-based stress reduction program for elders in a continuing care retirement community: Quantitative and qualitative results from a pilot randomized controlled trial [44]	Journal of Applied Gerontology	Moss, 2015	United States
Yoga's effect on falls in rural, older adults [45]	Complementary Therapies in Medicine	Hamrick, 2017	United Sates

Yoga for managing knee osteoarthritis in older women: A pilot randomized controlled trial [46]	BMC Complementary and Alternative Medicine	Cheung, 2014	United States
The influence of tai chi and yoga on balance and falls in a residential care setting: A randomised controlled trial [47]	Complementary Nurse	Saravanakumar, 2014	Australia
The effects of modified yoga pose training on bone remodeling of elderly women with osteopenia [48]	Journal of Exercise Physiology	Phoosuwan, 2021	Thailand
Influence of chair-based yoga on salivary anti-microbial proteins, functional fitness, perceived stress and well-being in older women: A randomized pilot-controlled trial [49]	European Journal of Integrative Medicine	Marques, 2017	Portugal
Sauna yoga superiorly improves flexibility, strength, and balance: A two-armed randomized controlled trial in healthy older adults [50]	Environmental Research and Public Health	Bucht, 2019	Germany
Utilization of 3-month yoga program for adults at high risk for type 2 diabetes: A pilot study [51]	Evidence-Based Complementary and Alternative Medicine	Yang, 2011	United States
The effects of a gentle yoga program on sleep, mood, and blood pressure in older women with restless legs syndrome (RLS): A preliminary randomized controlled trial [52]	Evidence-Based Complementary and Alternative Medicine	Innes, 2012	United States
A pilot study of the effects of chair yoga and chair-based exercise on biopsychosocial outcomes in older adults with lower extremity osteoarthritis [53]	Holistic Nursing Practice	McCaffrey, 2019	United States
Yoga meditation (YoMed) and its effect on proprioception and balance function in elders who have fallen: A randomized control study [54]	Complementary Therapies in Medicine	Wooten, 2018	United States
Mindfulness and modified medical yoga as intervention in older women with osteoporotic vertebral fracture [55]	The Journal of Alternate and Complementary Medicine	Grahn Kronhed, 2020	Sweden
Yoga and exercise for symptoms of depression and anxiety in people with	Alternative Therapies	Chan, 2012	Australia

poststroke disability: A randomized, controlled pilot trial [56]			
Yoga for HEART (Health Empowerment and Realizing Transformation) Intervention to Enhance Motivation for Physical Activity in Older Adults [57]	Theses and Dissertations Arizona State University	Barrows, 2018	United States
Yoga for improving sleep quality and quality of life for older adults [58]	Alternative Therapies	Halpern, 2014	Israel
The effects of chair yoga with spiritual intervention on the functional status of older adults [59]	Enfermería Clínica	Kertapati, 2018	Indonesia
Using silver yoga exercises to promote physical and mental health of elders with dementia in long-term care facilities [60]	Journal of International Psychogeriatrics	Fan, 2011	Taiwan
Effects of a chair-yoga exercises on stress hormone levels, daily life activities, falls and physical fitness in institutionalized older adults [61]	Complementary Therapies in Clinical Practice	Furtado, 2016	Portugal
Effectiveness of chair yoga for improving the functional fitness and well-being of female community-dwelling older adults with low physical activities [62]	Topics in Geriatric Rehabilitation	Yao, 2019	Taiwan
Enhancing access to yoga for older male veterans after cancer: Examining beliefs about yoga [63]	Federal Practitioner	Auguste, 2021 Study 2	United States
Sit N Fit chair yoga with community dwelling older adults with osteoarthritis [64]	Holistic Nursing Practice	Park, 2014	United States
Comparisons of chair yoga, reiki, and education [65]	Managing Osteoarthritis	Park, 2011	United States
Feasibility and Efficacy of a Shared Yoga Intervention for Sleep Disturbance in Older Adults with Osteoarthritis [66]	Journal of Gerontological Nursing	Buchanan	United States
A brief yoga intervention implemented during chemotherapy: A randomized controlled pilot study [67]	Complementary Therapies in Medicine	Sohl, 2016	United States
The effect of chair yoga in older adults with moderate and severe Alzheimer's disease [68]	Research in Gerontological Nursing	McCaffrey, 2014	United States

Feasibility trial of a 10-week adaptive yoga intervention developed for patients with chronic pain [69]	Pain Management Nursing	Hall, 2019	United States
Yoga intervention for patients with prostate cancer undergoing external beam radiation therapy: A pilot feasibility study [70]	Integrative Cancer Therapies	Ben-Josef, 2016	United States
Effect of Modified Thai Yoga on Energy Cost and Metabolic Intensity in Obese Older Adult Thai Women [71]	Advances in Rehabilitation	Widjaja, 2019	Thailand
Yoga improves upper extremity function and scapular posturing in persons with hyperkyphosis [72]	Journal of Yoga and Physical Therapy	Wang, 2012	United States
Safety and feasibility of modified chair-yoga on functional outcome among elderly at risk for falls [73]	International Journal of Yoga	Galantino, 2012	United States
Feasibility study of a modified yoga program for chronic pain among elderly adults in assisted and independent living [74]	Explore	Boehnke, 2020	United States
Physical-Performance Outcomes and Biomechanical Correlates from the 32-Week Yoga Empowers Seniors Study [75]	Evidence-Based Complementary and Alternative Medicine	Wang, 2016	United States
Development of a falls-reduction yoga program for older adults—A pilot study [76]	Complementary Therapies in Medicine	Smith, 2017	United States
Benefits of chair yoga for persons with mild to severe Alzheimer's disease [77]	Activities, Adaptation & Aging	Litchke, 2012	United States
Effects of a Yoga Program on Postural Control, Mobility, and Gait Speed in Community-Living Older Adults: A Pilot Study [78]	Journal of Geriatric Physical Therapy	Zettergren, 2011	United States
Effect of a 12-Week Yoga Intervention on Fear of Falling and Balance in Older Adults: A Pilot Study [79]	Archives of Physical Medicine & Rehabilitation	Schmid, 2010	United States
Feasibility and impact of an 8-week integrative yoga program in people with moderate multiple sclerosis–related disability [80]	International Journal of Multiple Sclerosis Care	Cohen, 2017	United States
Implementing yoga therapy adapted for older veterans who are cancer survivors [81]	International Journal of Yoga Therapy	King, 2014	United States

Merging yoga and occupational therapy (MY-OT): A feasibility and pilot study [82]	Complementary Therapies in Medicine	Schmid, 2016	United States
Yoga for persistent fatigue in breast cancer survivors: Results of a pilot study [83]	Evidence-Based Complementary and Alternative Medicine	Bower, 2011	United States
The effect of yoga practice on glycemic control of type 2 diabetes patients [84]	Open Access Theses & Dissertations	Vizcaino, 2012	United States
Therapeutic-yoga after stroke: Effect on walking recovery [85]	Indiana University Dissertations	Miller, 2013	United States
A pilot study of the feasibility and outcomes of yoga for lung cancer survivors [86]	Oncology Nursing Forum	Fouladbakhsh, 2014	United States
Measuring the effect of an eight-week adaptive yoga program on the physical and psychological status of individuals with Parkinson's disease. A pilot study [87]	International Journal of Yoga Therapy	Boulgarides, 2014	United States
Feasibility and effects of chair yoga to manage dementia symptoms in older adults [88]	Innovations in Aging	Park, 2018	United States
Evaluation of a Modified Yoga Program for Persons with Spinal Cord Injury [89]	Therapeutic Recreation Journal	Curtis, 2015	United States
Enhancing access to yoga for older male veterans after cancer: Examining beliefs about yoga [63]	Federal Practitioner	Auguste, 2021 Study 1	United States
''More than I expected:'' Perceived benefits of yoga practice among older adults at risk for cardiovascular disease [90]	Complementary Therapies in Medicine	Alexander, 2013	United States
Results from a clinical yoga program for veterans: Yoga via telehealth provides comparable satisfaction and health improvements to in-person yoga [91]	BMC Complementary and Alternative Medicine	Schulz-Heik, 2017	United States
The meaning of "Now" moments of engagement in yoga for persons with Alzheimer's disease [92]	Therapeutic Recreation Journal	Litchke, 2014	United States
Experiences of hatha yogic exercises among patients with obstructive pulmonary diseases: A qualitative study [93]	Journal of Bodywork & Movement Therapies	Papp, 2018	Sweden

Tai chi and yoga in residential aged care: Perspectives of participants: A qualitative study [94]	Journal of Clinical Nursing	Saravanakumar, 2018	New Zealand
Senior yoga in and out of chairs [95]	Topics in Geriatric Rehabilitation	Schaff, 2012	United States
Perceived benefits of using nonpharmacological interventions in older adults with Alzheimer's disease or dementia with Lewy bodies [96]	Journal of Gerontologic Nursing	Park, 2020b	United States
The effect of Iyengar yoga and strengthening exercises for people living with osteoarthritis of the knee: A case series [97]	International Quarterly of Community Health Education	Bukowski, 2007	United States
Chair yoga: Benefits for community-dwelling older adults with osteoarthritis [22]	Journal of Gerontologic Nursing	Park, 2012	United States
Development of a modified yoga program for pulmonary hypertension: A case series [98]	Alternative Therapies	Awdish, 2012	United States

RCT, large (>50 participants)
RCT, medium (>20 and <50 participants)
RCT, small (<20 participants)
Quasi-experimental/cohort, large (>50 participants)
Quasi-experimental/cohort, medium (>20 and <50 participants)
Quasi-experimental/cohort, small (<20 participants)
Qualitative/case-series, large (>50 participants)
Qualitative/case-series, medium (>20 and <50 participants)
Qualitative/case-series, small (<20 participants)

Table 2 Large RCTs.

First Author, yr	Purpose of the Study	Participants (number and age)	Participant Diagnoses	Sample size < 20 = small, 20-50 medium, >50 = large	Setting	Group Allocation	Methods	Outcome Measures	Results (efficacy, physical function, perception)	Bloom's Taxonomy of Learning Domains	Discussion	Within Group Effect/Between Group Effect/Follow-up
Park, 2020a [27]	To examine the level of baseline frailty in participants and by intervention grp; the modifying effect of frailty on the effect of CY on pain and pain interference; and effect of CY on frailty.	Older adults, mean age 75.3 ± 7.5 yrs. 131 participants (46 males).	CD, KOA	large	two community sites	two gps: CY (n = 63) or HEP (n = 49)	45 min. 2 x/wk. for 8 wks. Measures: pre, 4 wks., 8 wks., 12 wks. and 20 wks.	WOMAC, pain interference and FI	Participants with higher baseline FI had greater decline in WOMAC pain and pain interference. No greater decline in FI for CY compared to HEP. No significant changes in FI.	affective psychomotor	Frailty modifies the intervention effect of CY on pain among older adults with KOA	N/A/no/no

Greendale, 2009 [28]	To assess if AY can reduce hyperkyphosis.	Older females. 118 participants.	kyphosis angle greater than 40'	large	community research unit	two grps: AY (n = 59) or C (n = 59)	AY: 60 min. 3 x/wk., for 24 wks. C: monthly seminar and mailings. Measures: pre and 6 mos.	Debrunner kyphometerangle, height, timed chair stands, FR, GS, kyphosis index, flexicurve kyphosis angle, Rancho Bernardo Blocks posture assessment and QoL.	AY had a 4.4% improvement in flexicurve kyphosis angle and a 5% improvement in kyphosis index. Improvement in Debrunner kyphometer angle, physical performance and HRQoL was not significant.	psychomotor	The decrease in flexicurve kyphosis angle in the AY grp shows that hyperkyphosis is remediable, a critical first step in the pathway to treating or preventing this condition.	no/yes-1 measure/no follow up
Oken, 2006 [29]	To determine the effect of yoga on	Older adults, mean age 72.5 ± 4.8	CD, healthy	large	university	three grps: AY (n = 44), Exercis	90 min. 1 x/wk. plus a daily HP for 6	Stroop Test, electroencephalogram, SF-36 health-related QoL; PMOS;	No effects on cognitive and alertness measures.	affective, cognitive and psychomotor	AY with more satisfaction and enjoyment	no/yes/no follow up

	cognitive function, fatigue, mood, and QoL in seniors.	yrs. 118 participants (34 males).				e (n-47) or C (n = 44)	mos. AY: 90 min. Exercise: 60 min. C: monthly phone call. Measures: pre and post.	Multidimensional Fatigue Inventory; and physical measures	AY improved physical and QoL measures compared to exercise and C.		than exercise or C.	
McCaffrey, 2017 [30]	To determine whether CY could be sustained during and 3 mos. after an initial 8-wk program.	Older adults, mean age 75.3 ± 7.5 yrs. 112 participants.	CD, KOA	large	one senior housing facility and one senior day center	two grps: CY Sit 'N' Fit (n = 63) or HEP (n = 49)	45 min. 2 x/wk. for 8 wks. Measures: pre, post and 3 mos. follow-up.	WOMAC, BBS, PROMIS Pain Interference, PROMIS Emotional Distress and Depression, life satisfaction.	There were statistically significant decreases in pain interference in the CY grp, compared with the HEP grp.	affective psychomotor	An 8-wk CY program can be an effective non-pharmacological pain therapy for this group.	yes/no/yes -1 measure
Krejci, 2011 [31]	To develop AY for OW seniors to evaluate somatic	Older adults, mean age 69.5 ± 5. yrs.	OW with arthritis or OA	large	senior homes	two grps: AY (n = 43) or	AY: 45 min. lecture and 90 min.	BMI, weight, skin fold, mood, stress, fatigue and self-esteem.	AY with a significant discrepancy between input and	affective psychomotor	AY training can be a useful method for improving	yes/yes/no follow up

	changes and differences between female and male samples.	112 participants (63 males).				C (n = 49)	yoga 1 x/wk. with daily yoga for 3 mos. C: no intervention Measures: pre and post.		check out BMI. Significant (+) changes in skin fold and psychological improvement in AY grp noted.		self-control, self-esteem and mental condition.	
Goethe, 2016 [25]	To compare the functional benefits of AY with stretching–strengthening exercises	Older adults, mean age 62 ± 5.6 yrs. 108 participants (26 males)	CD, sedentary, healthy	large	university	two grps: AY (n = 61) or exercise (n = 57)	60 min. 3 x/wk. for 8 wks. Measures: pre and post.	Single leg stance, four-square step; chair stands, arm curls), back scratch, Sit and Reach, GS and 8' Up and Go	Both grps with significant improvement in balance, strength flexibility and mobility measures.	psychomotor	AY is more amenable than conventional exercise as it requires less equipment and can be easily adapted.	yes/no/no follow up
Park, 2017 [32]	To compare CY to HEP on pain and	Older adults, mean	CD with KOA	large	senior housing facility	two grps: CY "Sit	45 min. 2 x/wk. for 8	PROMIS Pain Interference-Short Form,	CY with statistically significant	affective psychomotor	CY more effective than	yes/yes-3 measures/

	physical function.	age 75.3 ± 7.5 yrs. 102 participants (26 males).			and one senior daycare center	'N' Fit" (n = 63) or HEP (n = 49)	wks. Measures: pre, 4 and 8 wks., and 1 and 3 mos. post.	PROMIS Fatigue, BBS, GS and WOMAC.	improvements in GS and reductions in pain, pain interference and fatigue compared to HEP.		education in improving physical function and reducing pain.	yes-2 measures
Park, 2019 [33]	To determine if CY can reduce the significance of frailty.	Older adults, mean age 75.3 ± 7.5 yrs. 102 participants (72 males).	CD with KOA	large	not specified	one grp: CY	45 min. 2 x/wk. for 8 wks. Measures: pre, 4 and 8 wks.	FI constructed using 97 variables measuring OA symptoms, physical function, balance, fatigue, depression, social activities, and life satisfaction.	Both primary and secondary analysis of the linear model revealed non-significant results.	affective psychomotor	CY was not effective in reducing frailty in this population.	no/no/no follow up
Park, 2016 [34]	Compare the effect of a linguistically-tailored CY program compared	Older adults, mean age 75.3 ± 7.5 yrs. 100 participa	CD with KOA and chronic pain	large	one low-income senior housing facility and one	two grps: CY "Sit 'N' Fit" (n = 66) or	45 min. 2 x/wk. for 8 wks. Measures: pre, 4 and 8	PROMIS (Pain Interference, Emotional Distress and Depression, Ability to Participate in	Grps with significant decr pain, depression and incr socialization, not	affective psychomotor	Spanish versions of the CY and HEP were equivalent to the	yes/yes-1 measure/yes-1 measure

	to a linguistically tailored HEP.	nts (24 males, 40 Spanish).			senior center	HEP (n = 65)	wks., and 1 and 3 mos. post.	Social Activities), BBS and WOMAC.	balance. No grp differences except baseline social.		English versions.	
Bonura, 2012 [35]	To assess the effect of CY on psychological health.	Older adults aged 65-92 yrs. 92 participants.	CD	large	community facility and a senior living community	three grps: CY (n = 33), CBE (n = 33) or C (n = 32)	45 min. 1 x/wk. for 6 wks. Measures: pre, post and 1 mo. post	State Anger Expression Inventory, STAI, GDS, Lawton's PGC Morale Scale, General and Chronic Disease Self-Efficacy Scales and Self Control Schedule.	CY grp improved more than other grps in anger, anxiety, depression, well-being, general self-efficacy, and self-efficacy for daily living.	affective	Changes in self-control moderated changes in psychological health.	yes/yes/yes
Winter-Stone, 2017 [36]	Determine whether adding an exercise DVD to an oncologist's recommendation to exercise led	Females, mean age 57.75 yrs. (range 33-86). 90	breast CA, various treatment and disease stages	large	Health and Science University	two grps: AY (n = 47) or C (n = 43)	AY (REC+DVD): MD rec to exercise plus a CA-specific AY DVD	POMS (fatigue, vigor, and depression), and physical activity levels, exercise readiness and self-efficacy.	AY grp used the DVD 2 x/wk. AY grp had greater decr in fatigue, maintained exercise readiness	affective psychomotor	A low-cost and scalable AY DVD could be a simple booster to an oncologist's advice	yes/yes/no follow

	to better outcomes than a recommendation alone.	participants.					(REC + DVD). 30 min. AY 3 x/wk. for 8 wks. C (REC): MD rec. Measures: pre, 4 and 8 wks.		and reported less decr in physical activity compared to control.		that motivates patients with breast CA to engage in exercise to manage weight.	
Ikai, 2017 [37]	To investigate the effects of CY on falls risk.	Adults. 56 participants (36 males).	psychiatric disorder	large	inpatient hospital	two grps: CY (n = 28) or C (n = 28)	20 min. 2 x/wk. for 12 wks. Measures: pre, post and 6 wks. post.	Anteflexion in sitting, strength, MFES, QoL, psychopathology and function.	CY group significantly incr spinal flexibility, hand strength, leg endurance, MFES and QoL. No change in function or psychopathology.	affective psychomotor	CY may contribute to reduced falls.	yes/yes/yes
Tew, 2017 [38]	To evaluate the feasibility	Older adults, mean	sedentary at risk for	large	yoga center, two	two grps: CY (n =	CY: 75 min. 10 sess in	SPPB, health status, Warwick-Edinburgh	CY grp scored more favorably on	affective psychomotor	CY program appeared feasible	yes/yes/no follow up

	and effects of a CY program.	age 74.8 ± 7.2 yrs. (10% male). 52 participants.	mobility limitations.	community-based facilities and one care home	25) or WL: (n = 27)	12 wks. plus education C: WL, education. Measures: pre and 3 mos.	Mental Well-Being Scale, feasibility, adverse events and interviews.	all measures and reported value in the program and experienced a range of perceived benefits.	and beneficial in improving mental, social and physical function.	
	RCT, large (>50 participants)									

AY: adapted yoga, BBS: Berg Balance Scale, BMI: body mass index, C: control, CA: cancer, CBE: chair-based exercise, CD: community dwellers, CY: chair yoga, decr: decreased, DM: diabetes mellitus, DVD: digital video disc, FR: Functional Reach, GDS: Geriatric Depression Scale, GS: gait speed, grp(s): group(s), HEP: health education program, HP: home program, HRQoL: Health Related Quality of Life, incr: increased, KOA: knee osteoarthritis, MFES: Modified Falls Efficacy Scale, min.: minute, mod: moderate, mo.(s.): month(s), N/A: not applicable, OW: overweight, (+): positive, PMOS: Profile of Mood States, QoL: quality of life, STAI: State Anxiety Inventory, MD: physician, rec: recommendation, SPPB: Short Physical Performance Battery, x/: times per, wk.(s.): week(s), WL: wait list, WOMAC: Western Ontario and McMaster University Osteoarthritis Index, yr.(s.): years.

Table 3 Medium-sized and Small RCTs.

First Author, yr.	Purpose of the Study	Participants (number and age)	Participant Diagnoses	Sample size < 20 = small, 20-50 = medium,	Setting	Group Allocation	Methods	Outcome Measures	Results	Bloom's Taxonomy of Learning Domains	Discussion	Within Group Effect/Between Group Effect/Follow-up

				>50 = large								
Karydaki, 2017 [39]	To investigate the effects of exercise on subjective sleep quality.	Older females, mean age 72.6 ± 5.9 yrs. 49 participants.	mild cognitive impairment	medium	three daycare centers	three grps: CY (n = 15), RT (n = 16) or C (n = 18)	CY: 45 min. sess 2 x/wk. C: cognitive activities 2 x/wk. Duration 12 wks. Measures: pre and post	MMSE, PSQI, BBS and SFT.	No significant differences between or within grps pre or post for the PSQI/subscale scores.	cognitive psychomotor	CY is feasible, safe, well accepted and well attended.	yes/yes-2 measures/ no follow up
Schmid, 2014 [40]	To assess change in physical functioning (pain, ROM, strength, and endurance).	Older adults, mean age 63.1 ± 8.8 yrs. 47 participants.	chronic stroke	medium	University-based research laboratory	two grps: AY (n = 37) or C: WL (n = 10)	AY: 2 x/wk. for 8 wks. Measures: pre and post.	Pain interference, ROM, Arm Curl Test, Chair Sit-to-Stand Test, 6MWT and modified Two Minute Step Test.	Pain, neck and hip ROM, UE strength, and the 6MWT scores all significantly improved. No changes in WL grp.	affective psychomotor	AY may improve physical functioning after stroke. AY be complementary to traditional rehab.	yes/yes/no follow up

Groessl, 2018 [41]	To examine the feasibility and safety of conducting a RCT to investigate CY and mobility limitations.	Older adults, age 60-89 yrs. 46 participants.	sedentary at risk for mobility limitations.	medium	yoga studio	two grps: CY (n = 22) or HEP (n = 24)	CY: 60 min. 2 x/wk. HEP: 90 min. 1 x/wk. Duration 10 wks. Measures: pre and post	Recruitment and adverse events rates, attendance, retention, and satisfaction, gait, balance, strength and self-report outcome measures.	Retention was high (89%). Attendance was good; yoga (82%) and HEP (74%) attended at least 50% of sess. Satisfaction high. Mean effect size for physical measures was 0.35.	affective psychomotor	CY is feasible for older adults at risk for mobility problems. CY was safe, accepted, and well attended.	yes/yes-2 measures/ no follow up
Toise, 2014 [42]	To evaluate the efficacy of AY in reducing clinical psychosoc	Adults, mean age 66. 46 participants.	implantable cardioverter defibrillator (ICD)	medium	hospital	two grps: AY (n = 26) or C (n = 20)	AY: 90 min. 1 x/wk. for 8 wks. C: standard medical care every 6–9 mos.	Florida Shock Anxiety Scale, Florida Patient Acceptance Survey, Center for	Total shock anxiety decreased for AY and incr for control. AY had	affective	study demonstrated psychosocial benefits from a program of adapted	yes/yes/yes-1 measure

	ial risks shown to impact morbidity and mortality.				Observed events were tracked during the intervention and through a 6-mo follow-up.	Epidemiologic Studies Depression Scale, Positive Health Expectation Scale, State-Trait Personality Inventory, Interpersonal Support Evaluation, Self-Compassion Scale, Symptom/Emotion Checklist, Expression Manipulation Test and device treated ventricular events.	greater self-compassion and mindfulness. A linear model of observed device-treated ventricular (DTV) events revealed that the expected number of DTV events in the yoga group was significantly lower than in the control. AY had a 32% lower risk of	yoga (vs UC) for ICD recipients. These data support continued research to better understand the role of complementary medicine to address ICD-specific stress in cardiac outcomes.

									experiencing device-related firings at the end of follow-up.			
Kaminsky, 2017 [43]	To determine if yoga breathing could substitute for a pulmonary rehabilitation program.	Older adults, mean age 68 ± 8 yrs. 43 participants.	mod to severe COPD	medium	two academic pulmonary practices	two grps: CY breathing plus education (n = 21) or education only (n = 22)	CY: 30 min. yoga breathing plus 30 min. education 1 x/wk. Education: 60 min. education. Duration 12 wks. Measures: pre and post.	6MWT, lung function, biochemical markers, dyspnea and QoL.	6MWT incr in CY and decr in control, with a nearly significant effect. CY improved inspiratory capacity and air trapping. Both grps had significant improvements in symptoms.	affective psychomotor	Yoga breathing was associated with improved exercise tolerance in patients with COPD.	yes/yes/no follow up
Moss, 2015 [44]	To study the feasibility	Older adults, mean	CD	medium	continuing care retireme	two grps: CY (n =	CY: 120 min. 1 x/wk. plus	SF-36, Acceptance and Action	CY showed significant improvem	affective	Feasibility and potential	yes/yes-2 measures/

	and effectiveness of a MBSR program.	age 82 ± 7.2 yrs. (range 63-94). 39 participants.			nt community	20) or C (n = 19)	25-30 min. daily home practice C: no intervention. Duration 8 wks. Measures: pre and post.	Questionnaire, Five Facet Mindfulness Questionnaire, Self-Compassion Scale and Brief Symptom Inventory.	ent in acceptance and psychological flexibility and in role limitations due to physical health. CY reported incr awareness and self-compassion, and less judgment.		effectiveness of an adapted mindfulness-based stress reduction program in promoting mind–body health.	no follow up
Hamrick, 2017 [45]	To assess the impact of yoga on falls frequency or fall rates.	Adults > 65 yrs. 38 participants.	able to walk at least 150 without an assistive device	medium	university	two grps: AY (n = 19) or C (n = 19)	AY: 60 min. 2 x/wk. plus 10 min. yoga and 5 min. relaxation exercises home program	Falls, BBS, FGA, DGI, SLS, FRT and ABC scale.	15 reported 27 falls in the 6 mos. prior to study, compared to 13 with 14 falls in the 6 mos.	affective psychomotor	Yoga can reduce self-reported falls and improve balance measures. The addition of	yes/no/no

							for 8 wks. C: relaxation exercises only Measures: pre, 8, 16 and 24 wks. post (via phone)		from study start. No difference between grps. All improved on BBS, FGA and DGI, SLS (R) and FRT. ABC incr in AY only.		home yoga did not enhance the benefit over relaxation exercise only.	
Cheung, 2014 [46]	To assess the feasibility and potential efficacy of AY in managing OA-related symptoms.	CD women, mean age 72 yrs. 36 participants.	KOA	medium	university	two grps: AY (n = 18) or WL (n = 16)	AY: 60-min. 1 x/wk. for 8 wks. with HP 30-min. 4 x/wk. education materials WL: completed intervention after data collection. Measures:	WOMAC, SPPB, PSQI, Cantril Self-Anchoring Ladder, and QoL.	95% retention. Significant incr in AY WOMAC pain, stiffness and SPPB at 8 wks. Significant treatment and time effects in WOMAC pain,	affective psychomotor	AY with HP is feasible and safe. AY may lead to improvements in symptoms and LE function, but is inconclusive for sleep and QoL.	yes/yes-3 measures/ yes-1 measure

							baseline, 4, 8, and 20 wks.		function and total scores from 4 to 20 wks. Sleep improved but total PSQI decr at 20 wks. BMI and QoL not significant.			
Saravanakumar, 2014 [47]	To determine the feasibility of an RCT to determine if a modified TC or AY is more effective than UC to improve	Frail older adults, mean age 83.8 ∓ 8.0 yrs. 33 participants.	physical and mild cognitive impairments	medium	residential care	three grps: TC (n = 11), AY (n = 11) or C (n = 11)	TC and AY: 30 min. 2 x/wk. for 14 wks. C: encouraged to exercise. Measures: pre, 7 and 14 wks.	BBS, falls, pain Verbal Descriptor Scale, and Dementia QoL.	No significant differences in falls between grps. AY demonstrated decr falls and pain scores; QoL improved for TC only.	affective psychomotor	TC and AY is feasible and of interest.	no/positive change/no follow up

	balance, QoL, pain and reduce falls.											
Phoosuwan, 2021 [48]	To examine the effects of AY on bone remodeling.	Elderly females, mean age 64.47 ± .86 yrs. 32 participants.	osteopenia	medium	university	two grps: AY (n = 16) or C (n = 16)	AY: 50 min. 3 x/wk. for 12 wks. C: usual activity. Measures: pre and post.	biochemical markers of bone turnover	Bone resorption significantly incr in both groups compared to baseline. The incr was lower in the AY than C.	psychomotor	AY may benefit bone maintenance and offer a safe exercise option.	yes/no/no follow up
Marques, 2017 [49]	To assess the changes mediated by CY on emotional status, biochemical markers	Older adult females, mean age 82 yrs. 25 participants.	institutionalized	medium	two different health and social centers	two grps: CY (n = 15) or C (n = 10)	CY: 50 min. 2-3 x/wk. for 28 wks. C: encouraged to perform complementary activity.	HrES, CSRT, SFT, anthropometric measures, biochemical markers, Charlson Comorbidity	ROM improved in CY. IgA and lysozyme levels secretion rates tended to incr/maint	affective psychomotor	CY shows a positive effect, which may lead to an improved well-being. CY can be used as a therapeuti	yes/yes-1 measure/ no follow up

	and function.						Measures: pre and post.	Index, and adherence.	ained in CY. HrES trended toward improvement in CY only.		c co-adjuvant to medicatio n.	
Bucht, 2019 [50]	To investigate the effects of sauna yoga on flexibility, strength, balance, and quality of life.	Older, active adults, mean age 69 yrs. (range 60-80). 23 participants.	CD	medium	fitness center with sauna	two grps: SSY: (n = 11) or CY (n = 12)	SSY and CY: 30 min. 1 x/wk. for 8 wks. Measures: pre and post.	Chair Sit and Reach Test, shoulder and lateral spine ROM, strength in LE, balance with eyes closed, and QoL.	SSY statistically significant incr chair sit-and-reach test. No change in shoulder, lateral spine ROM and LE strength. Balance and QoL improved in SSY only.	affective psychomotor	SSY may be a feasible means to incr ROM in older adults. Strength and balance do not meaningfully benefit from a sauna environment.	yes/yes-1 measure/ no follow up
Yang, 2011 [51]	To assess the feasibility	Older adults, mean	Sedentary, aged 45-65 yrs. with a	medium	University Hospital	two grps: CY (n =	CY: 60 min. 2 x/wk. for	BP, blood glucose, insulin, lipid	CY grp revealed a pattern of	affective psychomotor	CY could potentially reduce risk	yes/yes /no follow up

	of implementing CY.	age 51.7 ± 4.9 yrs. 23 participants.	history of Type 2 DM and at risk for DM		Clinical and Translational Research Center	12) or HEP (n = 11)	12 wks. HEP: education mailings every 2 wks. Measures: pre and post.	levels, body weight, Exercise Self-Efficacy Scale, and Yoga Program Satisfaction Questionnaire.	improvements in weight, BP, insulin, lipid levels and exercise self-efficacy. High satisfaction with CY.		of type 2 diabetes in older adults. CY grp perceived improvement in strength, ROM and balance.	
Innes, 2011 [52]	To examine the effects of AY versus an educational film program on sleep, mood, perceived stress, and sympathetic	older females, 20 participants.	Post-menopausal, OW, sedentary with restless leg syndrome.	medium	university	two grps: AY (n = 10) or C (n = 10)	AY: 90 min. 2 x/wk. C: 90 min. educational film, 2xs/wk. Duration 8 wks. Measures: pre and post.	PSQI, PSS, PMOS, STAI, BP, and heart rate.	AY with significantly greater incr in sleep and mood and decr in insomnia, anxiety, perceived stress and BP.	affective psychomotor	AY may be an effective intervention for improving sleep, mood, perceived stress, and BP in this group.	yes/yes/no follow up

	activation .											
McCaffrey, 2019 [53]	To determine the effects of two exercise activities on pain and walking ability.	Older adults, mean age 78.8 ± 8.9 yrs. 18 participants (8 males).	CD with KOA	small	low-income senior housing facility	two grps: CY (n = 9) or CBE (n = 9)	50 min. 2 x/wk. for 8 wks. Measures: pre, 4wks. and 8 wks.	WOMAC and TUG.	Both grps had statistically significant improvements in function. No significant differences between grps.	psychomotor	Gains in physical function are possible with seated exercise regimens.	yes/no/no follow up
Wooten, 2018 [54]	To test if AY is as effective as proprioceptive training.	Older adults, mean age 72.1 ± 8.9 yrs, 16 participants (4 males)	falls history	small	university	two grps: AY (n = 8) or prop (n = 8)	45 min. 3 x/wk. for 12 wks. Measures: pre and post.	Balance Error Scoring System, Tinetti, dynamic posturography, joint position and kinesthesia, knee extension strength	Neither grp showed statistical improvements in any variable, except AY dynamic posturography.	psychomotor	Changes in other variables demonstrated medium to high effect sizes.	No/no/no follow up

Grahn Kronhed, 2020 [55]	To explore the effect of mindfulness and modified medical yoga (MMY) on HRQoL, stress, sleep, and pain.	Older adult females, mean age 71.8 yrs. (median 72, range 63-82). 15 participants.	osteoporotic vertebral compression fracture	small	university and fitness center	two grps: theory (T, n = 7) or MMY (n = 8)	60 min. 1 x/wk. for 10 wks. Measures: pre and post.	sleep, stress, pain numeric rating scale, QoL (EQ-5D, RAND-36, and Qualeffo-41) and patient enablement instrument (PEI).	Adherence was 89% (MMY) and 87% (T). Sleep, stress, and social function domains were improved in the MMY. Better trend of PEI for MMY.	affective psychomotor	MMY may be feasible to improve social function, sleep, and stress in this group.	yes/yes-3 measures/ no follow up
Chan, 2012 [56]	To determine whether exercise and yoga would be feasible and improve self-reported	Older adults, mean age 69.4 ± 14.5 yrs. 14 participants.	chronic stroke	small	Centre for Physical Activity in Ageing	two grps: yoga and exercise (YEX, n = 8) or C: exercise (EX, n = 6)	YEX: 90 min. 1 x/wk. plus 24 HP (40 min.) sess for 6 wks. EX: 1 x/wk. for 6 wks. Measures: pre and post.	GDS, STAI, recruitment, retention, compliance and safety.	GDS and STAI did not significantly differ between grps, YEX had greater improvements. No	affective psychomotor	YEX influences mood poststroke. It is a feasible, safe, and acceptable intervention.	positive change/no /no follow

	symptoms of depression and anxiety more than exercise alone.								adverse events, high retention and compliance in YEX grp.			
Barrows, 2018 [57]	To examine acceptability, demand, fidelity, and efficacy in promoting physical activity of an AY program.	older adults, 11 participants	CD with cardiovascular disease	small	yoga studio	two grps: AY: yoga with theory and support (n = 6) AYC: yoga without theory (n = 5)	60 min. 1 x/wk. for 12 wks. Measures: pre and post.	Chair Stand Test, Arm Curl Test, 2-Minute Step Test, Sit-and-Reach Test, Back Scratch Test and 8' Up-and-Go Test	AY with significant reduction in BMI. AY with better theoretical mechanisms (self-knowledge and regulation, motivation appraisal, environmental resources) than AYC.	affective psychomotor	AY was feasible and improved cardiovascular health and functional fitness outcomes, including BMI, body composition, strength, flexibility, and balance.	yes/yes/no follow up

RCT, large (>50 participants)
RCT, medium (>20 and <50 participants)
RCT, small (≤20 participants)

AC: empathic attention control, AD: Alzheimer's Disease, ADLs: activities of daily living, AY: adapted yoga, BBS: Berg Balance Scale, BI: Barthel Index, BP: blood pressure, C: control, CA: cancer, CD: community-dwellers, CY: chair yoga, decr: decreased, DM: diabetes mellitus, ED: erectile dysfunction, GST: Gait Speed Test, GDS: Geriatric Depression Scale, grp(s): group(s), HADS: Hospital Anxiety and Depression Scale, HEP: health education program, HP: home practice, IADLs: Instrumental Activities of Daily Living, incr: increased, KOA: knee osteoarthritis, LTC: long term care, mid: middle, min.: minutes, mo.(s.): month(s), mod: moderate, NRS: numeric rating scale, PSQI: Pittsburgh Sleep Quality Index, POMS: Profile of Mood States, PD: Parkinson's Disease, POMS: Profile of Mood States, PPS: Perceived Stress Scale, (+): positive, +: plus, QoL: quality of life, RCT: randomized control trial, ROM: range of motion, s: second, sess: session, SD: standard deviation, SF-36: 36-item Short-Form Health Survey, SFT: Senior Fitness Test, sign: significant, SLB: Single Limb Balance, SPPB: Short Physical Performance Battery, 6 MWT: Six Minute Walk Test, STAI: State Trait Anxiety Inventory, TUG: Timed Up and Go, UC: usual care, UE: upper extremity, UI: urinary incontinence, WL: wait list, wk.(s.): week(s), WOMAC: Western Ontario and McMasters Osteoarthritis Index, yr.(s.): year(s).

Table 4 Quasi-Experimental and Cohort Studies.

First Author, year	Purpose of the Study	Participants (number and age)	Participant Diagnoses	Sample size < 20 = small, 20-50 = medium, >50 = large	Setting	Group Allocation	Methods	Outcome Measures	Results	Bloom's Taxonomy of Learning Domains	Discussion	Within Group Effect/Between Group Effect/Follow-up
Quasi-Experimental Design Studies												

Halpern, 2014 [58]	To examine the efficacy of AY for treatment and determine ability of AY to enhance QoL.	Older adults, mean age 72.96 ± 7.08 yrs. 90 participants (16 males).	insomnia	large	medical center	two grps: AY (n = 59) or C (n = 31)	AY: 2 x/wk. + daily HP C: WL. Duration 12 wks. Measures: pre and post.	Karolinska Sleepiness Scale, Epworth Sleepiness Scale, PSQI, daily sleep and practice logs, Depression Anxiety Stress Scale, POMS, SF-36 and home sleep.	AY showed significant improvements including sleep, fatigue, well-being, depression, anxiety, stress, mood and function in physical, emotional, and social roles.	affective psycho motor	AY was shown to be safe and improved sleep and QoL in the group. Outcomes depended on practice compliance.	yes/yes/ no follow up
Kertapati, 2018 [59]	Investigate effects of CY with spiritual intervention on the functional status of	Older adults, mean age 66 yrs. 84 participants, mostly	healthy	strong	university	two grps: CY (n = 42) or C (n = 42)	CY: 60 min. CY with spiritual intervention 3 x/wk. for 4 wks. Measures	Functional Independence Measure	CY grp has significant incr in functional status following CY with spiritual	psycho motor	Recommend a minimum of 4wks. CY with higher frequency combined	yes/yes/N/A

	older adults.	females .				: pre and post.		interventio n. .		with positive thoughts.	
Fan, 2011 [60]	To test the effects of CY on physical and mental health.	Older adults, mean age 75.15 ± 7.40 yrs. 59 particip ants (24 males).	Institutio nalized with mild to mod dementia	large	LTC facility	two grps: CY (n = 33) or C (n = 35)	CY: 55 min. 3 x/wk. for 12 wks. C: UC. Measures pre and post.	Body compositi on, cardiopul monary functions, ROM, strength, endurance , balance, depressio n and problem behaviors.	CY had better physical and mental health, lowered BP, reduced respiration rate, improved cardiopul monary fitness, strength, ROM, balance and endurance . Depressio n and problem behaviors	affectiv e psycho motor	CY has positive benefits for physical and mental health in this group. It is recomme nded that CY be included as a routine activity in LTC facilities.	yes/yes/no follow up

								significantly reduced.			
Furtado, 2016 [61]	To assess the effects of CY on ADLs, falls, physical fitness, salivary cortisol and alpha amylase.	Older females, mean age 83.8 ± 6.6 yrs. 35 participants.	institutionalized	medium	center for social and health care support	two grps: CY (n = 20) or C (n- = 15)	2 x/wk. for 14 wks. Measures: pre and post.	Lawton IADL, fear of falling, SFT, 30s Chair Sit and Reach Test, 30s Arm Curl Test, 8' Up and Go Test, and biochemical markers.	Fear of falling decreased in both groups, cortisol incr and amylase decr in control. No significant change in physical fitness.	affective psycho motor	CY able to maintain fitness scores and stress hormone levels, but unable to change participant's perception of IADL performance.	yes/yes-1 measure/no follow up
Yao, 2019 [62]	To investigate the effect of CY on functional fitness	Older females, mean age 76.38 yrs. 31 participants.	CD with low physical activity	medium	two community sites	two grps: CY (n = 16) or C (n = 15)	CY: 110 min. 2 x/wk. Control: UC. Duration 12 wks. Measures	Well-being questionnaire and functional fitness (strength, static and dynamic	Significant improvement for CY in handgrip, limb strength, static and	affective psycho motor	CY provides a simple and inexpensive exercise program	yes/yes/no follow up

	and well-being.					: pre and post.	balance, agility, ROM).	dynamic balance, agility and well-being. Control experienced significant decr in UE strength.		that improves functional fitness and well-being.	
Auguste, 2021: Study 2 [63]	To examine the impact of yoga participation on beliefs and the role of beliefs in program outcomes.	Veterans, median age of 69.2 ± 10.9 yrs. 28 participants (96% males)	cancer survivors within 3 yrs. of diagnosis	medium	medical center	one grp: AY	AY: 2 x/wk. for 8 wks.	Standardized interviews about interest in and barriers to yoga, Beliefs About Yoga Scale, health-related QoL	Beliefs were more positive following intervention for expected benefits, discomfort, and social norms related to yoga. Physical function	affective psycho motor	Education to inform potential participants about yoga practice, modifications, benefits, and address physical and logistical barriers	yes, N/A, no follow up

								improved after yoga participation, especially for those with higher beliefs.		may be useful in increasing access to older, cancer surviving Veterans.	
Park, 2014 [64]	To study the efficacy of CY in reducing pain and improving physical function and psychosocial well-being.	Older adults. 25 participants.	CD	medium	senior center	two grps: CY (n = 14) or HEP (n = 11)	CY: 45-min. 2 x/wk. for 8 wks. HEP: 45 min. education 2 x/wk. for 8 wks. Measures: pre, 4, 8 and 12 wks.	McGill Pain Questionnaire, GST, 6MWT, BBS, GDS, and Life Satisfaction Index.	AY with greater improvement in depression and life satisfaction.	affective psycho motor	CY provided more benefits in psychological effects. No significant improvement in physical benefits.	no/no/no
Park, 2011 [65]	To determine if the effect of	Older adults, mean age 80	CD with KOA	medium	Life Long Learning Center	three grps: CY (n = 7), Reiki (n = 7), or HEP (n = 7)	45 min. sessions 2 x/wk. for 8 wks.	WOMAC and Center for Epidemiol	Statistically significant decr in	affective psycho motor	CY reduced pain and improved	yes/yes-2 measures/ no follow up

	CY or Reiki on pain, depressive mood and physical function is greater than education.	± 8.3 yrs. 21 participants.				Measures: pre and post.	ogic Studies Depression Scale.	scores for pain and physical function in CY, and a statistically significant incr in physical function in HEP. CY with feelings of improved health and well-being.		physical function. Reiki with significant changes on the quantitative measures; however, CY with improved well-being.	
Buchanan, 2017 [66]	Test the feasibility and efficacy of an AY program for sleep disturbance in older	Older adults, mean age 55 yrs. (range 50-72). 16 particip	Sleep disturbance as a result of chronic KOA pain	small	community location	two grps: SY shared yoga/with a partner (n = 9) or IY individual yoga/no partner (n = 7)	30 min. 1 x/wk. plus HP using audio CD for 12 wks. Measures: pre and post.	Insomnia Severity Index (ISI), SOMAC, Patient Health Questionnaire, sleep report, sleep diary	SY and IY did not differ in attendance, HP, or efficacy outcomes. All statistically	psycho motor	Program is feasible in both formats. Efficacy data suggest AY may improve	yes-2 measures/ no/no follow up

	adults with OA.	ants (9 males).						significant improvements on the ISI and PROMIS sleep scale.		sleep, but further research is needed.	
Sohl, 2016 [67]	To investigate the feasibility of CY during chemotherapy.	Adults, mean age 57.7 yrs. (60% males). 15 participants.	colorectal CA	small	CA center	two grps: CY (n = 6) or AC (n = 5)	CY: 3-15 min. sess + 4 x/wk. HP for 8 wks. AC: 3 sess podcast of CA + 4 x/wk. HP Duration 8 wks. Measures: pre and post.	Feasibility, fatigue, sleep, QoL and inflammatory biomarkers.	75% of CY and 71% of AC participants were retained. 97% adherence to in-person sessions.	affective psychomotor	The study supported the feasibility of conducting a larger RCT to assess CY compared to AC group.	N/A
McCaffrey, 2014 [68]	To examine the feasibility of the Sit 'N' Fit CY Program.	Older adults. 9 participants.	CD with AD	small	adult day care center	one grp: CY	50 min. 2 x/wk. for 8 wks. Measures:	6MWT, GST, and BBS.	(+) changes were seen across all physical measures.	psychomotor	Need an RCT to determine the effect CY on this	yes/yes-1 measure/yes-1 measure

						pre, 4, 8 and 12 wks. post.				population.	
Hall, 2019 [69]	To assess the feasibility of AY for older adults	Adults, mean age 51.4 ± 11.3 yrs. 33 participants (8 males).	chronic pain	medium	pain management clinic	three grps: chronic low back/neck/spine pain or fibromyalgia/widespread chronic pain or other chronic pain (knee, wrist, shoulder, hip, etc.)	AY all grps: 60 min. 1 x/wk. for 10 wks. Survey measures at baseline (10 wks. prior), pre and post.	Recruitment, adherence, satisfaction, global impression of change, and likelihood of continued practice. Survey of pain, physical function, mood, and sleep.	Recruitment of patients through MD referral was highly feasible; but retention rates were very low. A trend toward improvement in all outcomes was identified.	affective psycho motor	AY can incr active self-care and mind-body awareness to improve overall health.	no/no/no follow up
Ben-Josef, 2016 [70]	To recruit patients with prostate CA to a	Males, mean age 66.4 yrs.	active prostate CA, receiving outpatien	medium	outpatient hospital	one group: CY with some standing poses. Eischens yoga.	75 min. 2 x/wk. for 6-9 wks. Measures	Participation, ED, UI, fatigue, and QoL.	12 (30%) participated in ≥50% of classes, and 15	affective psycho motor	CY is feasible for these patients during	yes- 1 measure/N/A/no follow-up

	clinical trial of CY.	(range 51-74). 27 participants.	t radiation therapy at time of intervention.			: pre, mid and post.		(59%) were evaluated. Fatigue scores incr by wk. 4, but then decr. ED, UI, and QOL scores were stable.		outpatient radiotherapy.	
Widjaja, 2019 [71]	To investigate the effect of modified Thai yoga on metabolic intensity and energy expenditure.	Older, female adults, mean age 65 ± 5 yrs. 26 participants	obese and normal weight	medium	university	two grps: non-obese (NB) and obese (OB)	60 min. 3 x/wk. for 4 wks. Measures pre and post.	Heart rate, BP, oxygen consumption, 6MWT, estimated $V0_2$ peak metabolic equivalent, energy and activity expenditures.	The difference between all parameters measured from OB and NB groups were significant.	psycho motor	Thai AY provides a well-tolerated, light intensity exercise for study population.	yes/yes/no follow up

Wang, 2012 [72]	To quantify the changes in UE function and scapular posturing following AY.	adults > 60, mean age 75.5 ± 7.4 yrs. 21 participants.	adult-onset hyperkyphosis	medium	university	one grp: AY	AY: 60 min. 3 x/wk. for 24 wks. Measures: pre and post.	Maximum vertical reach, timed book tests, and scapular posturing.	Significant improvements with small to large effect sizes in outcome measures. No changes in vertical reach.	psycho motor	AY likely to reduce the risk of scapular impingement and help preserve functional independence.	yes/no/no follow up
Galantino, 2012 [73]	To assess the safety and feasibility of CY.	Older adults, mean age 87.8 yrs. 20 participants (4 males).	at least one fall in the past 6 mos.	medium	AL facility	one group: CY	60 min. 2 x/wk. for 8 wks. Measures: pre and post.	Fear of falling, sit to stand subscale of the SPPB, HADS, and TUG.	Gains were noted in Fear of Falling and SPPB sit to stand subscale. Improved trends noted in anxiety and TUG.	affective psycho motor	CY is safe and recruitment feasible. CY may improve mobility and reduce fear of falling.	yes-2 measures/ N/A/no follow up

Boehnke, 2020 [74]	Conduct a feasibility study of AY.	Older adults > 65 yrs., mean age 86.6 ± 4.4 yrs. 26 participants (88% women, 58% AL)	chronic pain, living independently or in AL	medium	AL facility	One group: AY	60 min. 1 x/wk. for 10 wks. Measures: pre, 5 and 10 wks. and 10 wks. post.	Feasibility, retention, safety, pain, anxiety, depression, fatigue, sleep disturbance and physical function.	AY completed by all. Nine with transient muscle pain. Likely to recommend and participate again. Anxiety significantly decr.	affective, psychomotor	This study was safe for and suitable for assisted and independent living elderly adults.	yes-I measure/no/no
Wang, 2016 [75]	Study the efficacy of an AY program on physical function outcomes.	Older adults, mean age 70.7 ± 3.8 yrs. 20 participants	CD	small	university	One grp: AY	60 min. sess 2 x/wk. for 32 wks. Measures: pre, 16 and 32 wks.	Functional performance, flexibility, strength, and balance.	Significant incr Timed Chair Stands, 8' Up and Go, 2-min. Step Test, strength tests. Flexibility and balance	psychomotor	Significant incr physical function and some lower extremity strength occurred.	yes/N/A/no follow up

								unchanged.			
Smith, 2016 [76]	Develop an AY program to improve core strength and balance to reduce falls risk.	Adults >59 yrs., mean age 70.5 ± 7.2 yrs). 20 participants (5 males).	CD, able to walk 150 feet without assistive devices, rural location.	small (sample of 20 with one drop-out)	25-bed community hospital	one grp: AY	50-60 min. 1 x/wk. plus 10 min. HP 3 x/wk. for 8 wks. Measures: pre, 8 and 12 wks.	Feasibility, retention, and adverse events.	Participants attended 7.1 of 8 classes. Nineteen completed follow up; report of 4 falls/mo. pre and 1 fall/mo. at 12 wks.	psycho motor	AY is feasible and acceptable to participants. Suggest RCT for future research.	yes/N/A/no follow up
Litchke, 2012 [77]	To examine the influence of CY on balance, cognition, anxiety, depression, and ADLs.	Adults, age range 59-98 yrs. 19 participants (4 males).	institutionalized	small	two AL facilities	one grp: CY	30 min. 2 x/wk. for 10 wks. Measures: pre and post.	BBS, Short Portable Mental Status Questionnaire, Hamilton Rating Scale for Depression, Hamilton Rating Scale for	No significant change in balance, anxiety, or cognition. ADLs showed a significant effect, suggesting AY may have more benefit in	affective psycho motor	CY with a larger sample size and longer duration may demonstrate benefits to improve overall QoL.	yes-1 measure/N/A/no follow up

							Anxiety, and BI.	early AD. Depression significantly incr.			
Zettergren, 2011 [78]	To examine the impact of AY.	Older adults, mean age 83.4 ± 4.7 yrs. 16 participants.	CD	small	continuing care retirement center	Two groups: AY (n = 8) and C (n = 8, 3 males)	AY: 80 min. 2 x/wk. for 8 wks. C: UC	BBS, TUG, GST, timed floor to stand, balance confidence	AY significantly incr BBS and fast GS. Improved floor to stand and TUG not significant.	psycho motor	AY is a safe and effective alternate intervention for this population.	yes/ yes/ no follow up
Schmid, 2010 [79]	To determine if fear of falling and balance improved after yoga.	Older adults > Adults > 65 yrs., mean age 78.36 ± 8.75 yrs. 14 participants.	Endorse fear of falling, live independently or were employees at a retirement community	small	retirement community	one grp: AY	75 min. sess 2 x/wk. for 12 wks.	BBS, Illinois Fear of Falling Measure, Back Scratch Test, Chair Sit and Reach Test,	Fear of falling decr 6%, static balance incr 4%, and lower-body flexibility incr 34%.	psycho motor	Results indicate that yoga may be an intervention to manage fear of falling and improve balance.	yes-I measure/N/A/no follow up

Cohen, 2017 [80]	To determine the feasibility of an AY program for people with MS.	Adults, mean age 53.5 8.3 yrs. (range 34-64). 14 participants.	moderate MS-related disability	small	university	one grp: AY	90 min. 2 x/wk. for 8 wks. Measures: pre, 8 and 16 wks.	Feasibility was determined by cost, recruitment, retention, attendance, and safety. Outcomes included MS QoL, fatigue, GS, 6MWT, Nine-Hole Peg Test, Five-Times Sit-to-Stand Test, and Multidirectional Reach.	AY was feasible. Improvements in certain measures of QOL and performance seen at 8 and 16 wks.	affective psychomotor	Further research is needed to study the effectiveness of AY compared with controls or other interventions.	yes/yes/yes some measures
King, 2014 [81]	Describe the reach,	Older adults, mean	Veterans, CA survivors	small	Veterans' Health	one grp: AY	AY 75 min. 2 x/wk. for	Structured interviews, tracking	Group comparison of mean	affective	A minority of older	yes/yes/no follow up

	applicatio n, and effective ness of an AY protocol.	age 65.64 ± 5.15 yrs. 14 particip ants (13 males).	with multiple medical problems		Administ ration		8 wks. plus 15 min. HP at least 5 x/wk. Measures : pre and post.	self-reported symptoms of combat-related posttraum atic stress disorder, depression , anxiety, fatigue, insomnia, and pain.	scores on standardiz ed measures showed no significant differences. Majority of grp reported breathing and relaxation techniques most useful.		veterans expresse d an interest in yoga, but those who did had high rates of attendan ce and HP.	
Schmid, 2016 [82]	Examine the feasibility and benefit of an AY plus occupati onal therapy	Adults, mean age 73.23 ± 7.85 yrs. 13 particip ants (6 males).	chronic stroke, sustained a fall or had fear of falling, were able to stand, had impaired balance	small	universit y	one grp: AY	AY 2 x/wk. for 8 wks.	BBS, the Activities-Specific Balance Confidenc e Scale, fall risk factor managem ent scales	Balance incr 30%. Balance Self-efficacy incr 15%. Each fall risk factor managem ent scales improved,	psycho motor	AY was feasible and safe. There was high attendan ce and little attrition.	yes-some measures/ N/A/no follow up

	intervention.		and were fall risk (BBS ≤46)					were used.	two significantly.			
Bower, 2011 [83]	Test the feasibility and efficacy of AY.	Adult females, mean age 53.8 yrs. (range 46-65). 11 participants.	breast CA survivors	small	university	one grp: AY	90 min. 2 x/wk. for 12 wks. Measures: pre, post and 3 mos. follow up.	Fatigue, depression, SF-36, sleep quality, pain, chair stand score, 8' Walk Test.	AY was feasible and acceptable for breast CA survivors with persistent fatigue.	affective psychomotor	Participants were enthusiastic a and adherence was excellent. Almost all reported continued yoga after intervention.	yes/NA/yes some measures
Vizcaino, 2012 [84]	To investigate the physiological and psychological effect of AY on glycemic	Older adult women, mean age 61.4 yrs. 10 participants.	CD, sedentary with Type 2 DM, experiencing menopause	small	university	one grp: AY	50-60 min. 3 x/wk. for 6 wks. Measures: pre and post.	Anthropometric measures, BP, body composition, Sit n Reach Test, ROM, SLB, blood	Modest decr in body mass, waist circumference, and BMI and an incr in bone	affective psychomotor	Significant decr in STAI were observed following AY.	yes/N/A/no follow up

	status by evaluating changes in cortisol and psychological stress measures.						sampling, biochemical markers, PPS, Diabetes-39 Questionnaire, and STAI.	mineral content, % body fat, and fat mass. No change in physical activity. Decr calorie and protein consumption.			
Miller, 2013 [85]	Determine if people demonstrate a main effect of time with functional mobility improvement after AY.	Adults, mean age 63 (range 55-76). 14 participants with 5 dropouts. 9 final participants	chronic stroke	small	university	one grp: AY	60 min. 2 x/wk. for 12 wks. Measures: pre, 8 and 12 wks.	6 MWT, GS, and spatiotemporal step parameter symmetry.	No significant main effect of time was found with any variables of interest. 6MWT demonstrated a trend	psycho motor	Several spatiotemporal step parameter symmetry ratios demonstrated small to medium effect sizes with	No/N/A/ no follow up

								toward significant change and step length symmetry demonstrated significant change baseline and 12 wks.		the majority (91%) being a negative effect. Larger studies suggested.	
Fouladbakhsh, 2014 [86]	To determine the feasibility of AY and its effect on sleep, mood, salivary cortisol levels and QoL.	Adults. 7 participants.	non-small cell lung CA	small	CA support center	one grp: AY	AY: 40 min. 1 x/wk. for 8 wk. + HP Measures: biophysiological and questionnaires weekly, interviews post.	PSQI, POMS–Brief, a cortisol measurement, SF-36, and dyspnea NRS.	Attendance exceeded 95%, and all practiced at home. Mood, sleep, and QOL significantly improved; salivary	affective psychomotor	AY was feasible. Potential benefits identified. More clinical trials with larger samples stratified by CA stage and	yes-3 measures/ N/A/no follow up

								cortisol decr.		time, and treatment.	
Boulgarides, 2014 [87]	To identify outcome measures that were responsive to change in individuals with PD after AY.	Adults, mean age 65.5 yrs. (range 43-77). 10 participants (7 males).	PD	small	university	one grp: AY	60 min. 1 x/wk. for 8wks. Measures: pre, 8 and 16 wks.	HADS, 30s Chair Stand, Sit-and-Reach Test, and SLB Test.	Differences in time of measure approached significance for the depression subscale of the HADS and the 30s Chair Stand.	affective psycho motor	Suggest study of AY with larger samples of this population.	yes-2 measures/ N/A/no follow up
Park, 2018 [88]	To determine if CY can safely be administered.	Older adults. 8 participants.	CD with mild/ mod or mod/severe dementia	small	not specified	one grp: CY	45 min. 2 x/wk. for 12 wks. Measures: pre, 6 and 12 wks.	Physical function, depression, anxiety, agitation, QoL, and sleep.	Results not statistically significant, though affective scores improved.	affective psycho motor	Larger sample and longer intervention needed.	no/N/A/no follow up

Curtis, 2012 [89]	Evaluate participation and satisfaction of an AY program for people with SCI.	adults, mean age 48.4 ± 15.0 yrs. 5 participants (1 male).	SCI, inpatient and CD	small	rehabilitation center	one grp: AY	45-60 min. 1 x/wk. for 8 wks.	Measures of pain, fatigue, psychological factors, and mindfulness with self-report questionnaires and semi-structured interviews.	Qualitative analysis revealed themes regarding expectations, mental, emotional and physical benefits and program satisfaction.	affective psycho motor	Participants highly enjoyed AY. Qualitative data indicate a number of therapeutic benefits (decr stress and pain relief).	N/A

Quasi-experimental/cohort, large (>50 participants)

Quasi-experimental/cohort, medium (>20 and <50 participants)

Quasi-experimental/cohort, small (≤20 participants)

AC: empathic attention control, AD: Alzheimer's Disease, ADLs: activities of daily living, AL: assisted living, AY: adapted yoga, BBS: Berg Balance Scale, BI: Barthel Index, BP: blood pressure, C: control, CA: cancer, CD: community-dwellers, CY: chair yoga, decr: decreased, DM: diabetes mellitus, ED: erectile dysfunction, GST: Gait Speed Test, GDS: Geriatric Depression Scale, grp(s): group(s), HADS: Hospital Anxiety and Depression Scale, HEP: health education program, HP: home practice, IADLs: Instrumental Activities of Daily Living, incr: increased, KOA: knee osteoarthritis, LTC: long term care, mid: middle, min.: minutes, mo.(s.): month(s), mod: moderate, MS: multiple sclerosis, NRS: numeric rating scale, PSQI: Pittsburgh Sleep Quality Index, POMS: Profile of Mood States, PD: Parkinson's Disease, POMS: Profile of Mood States, PPS: Perceived Stress Scale, (+): positive, +: plus, QoL: quality of life, RCT:

randomized control trial, ROM: range of motion, s: second, sess: session, SD: standard deviation, SF-36: 36-item Short-Form Health Survey, SFT: Senior Fitness Test, sign: significant, SLB: Single Limb Balance, SPPB: Short Physical Performance Battery, 6 MWT: Six Minute Walk Test, STAI: State Trait Anxiety Inventory, TUG: Timed Up and Go, UC: usual care, UE: upper extremity, UI: urinary incontinence, WL: wait list, wk.(s.): week(s), WOMAC: Western Ontario and McMasters Osteoarthritis Index, yr.(s.): year(s).

Table 5 Qualitative and Case Series Studies.

First Author, year	Purpose of the Study	Participants (number and age)	Participant Diagnoses	Sample size < 20 = small, 20-50 = medium, >50 = large	Setting	Group Allocation	Methods	Outcome Measures	Results	Bloom's Taxonomy of Learning Domains	Discussion	Treatment effect
August e, 2021, Study 1 [63]	To examine avenues to enhance access to yoga for older veterans.	veterans, median age 64.9 ± 9.4 yrs. 110 participants (99%	cancer survivors	large	medical center	one grp	semi-structured interviews 6, 12 and 18 mos. after a cancer diagnosis.	Interview transcripts	Yoga interest incr from 5.5 to 31.8% following education. Four themes related to negative beliefs/barriers	affective	A portion of older, cancer survivor veterans were interested in yoga but faced access barriers.	yes/N/A/no follow up

		males)						emerged: low knowledge/ skepticism, disinterest/ dislike, physical health barriers and logistical barriers.		Implications for practice and research include increasing knowledge about yoga benefits and addressing barriers.	
Alexander, 2013 [90]	To evaluate the perceived benefits of AY.	Generally healthy older women. 75 participants.	sedentary, OW, post-menopausal women > 45 yrs., with Type II DM	large	university	two grps: AY (n = 38) or control (n = 37)	AY : 90-min. 2 x/wk. plus 30-min. home sess 5 x/wk. Duration 8 wks.	Weekly logs and exit questionnaires.	Four broad themes emerged from content analysis: AY improved overall physical function and capacity. AY reduced stress and enhanced calmness and sleep.	affective psychomotor	AY may have ancillary benefits to improve lifestyle choices. AY may be a useful health promotion strategy in the prevention/ management of chronic disease.	yes/N/A/no follow up

Schulz-Heik, 2017 [91]	To evaluate the feasibility, acceptability, and patient-reported effectiveness of AY.	Older adults. 64 participants (47 males).	veterans	large	Veterans Administration Health Care System	one grp: AY	AY: 2-3 x/wk. offered in person/telehealth. Measure: post intervention.	Feasibility, acceptability, and participant survey of effectiveness.	More than 80% of participants with either pain, low energy, depression, or anxiety reported improvements. No difference between grps.	affective psychomotor	AY appears feasible and acceptable, both when delivered in-person and via telehealth. High satisfaction and improvement in multiple problem areas.	yes/no/no follow up
Litchke, 2014 [92]	To explore the meaning of a multisensory CY program.	Adults, mean age 85.8 ± 6.28 yrs. 26 participants (7 males).	adults with AD	medium	three assisted living facilities	one grp: CY	30-55 min. 2 x/wk. for 10 wks. Documentation after each class.	Narrative notes including observations of physical, social/communication, emotional/behavioral, and cognitive	A core category was generated with three sub-categories: (a) characteristics/stages of AD, (b) multisensory design and	affective psychomotor	Study findings tend to support Validation Therapy concepts. Suggest re-evaluation of treatment models.	yes/N/A/no follow up

								function. Audio and video recordings. Caregiver perceptions.	AY format, and (c) expressing connection. Caregivers' noted perception changes and incr joy.			
Papp, 2017 [93]	To explore the experiences with AY intervention.	Older adults, median age 61, range: 44-76 yrs. 20 participants (5 males).	adults with COPD	medium	hospital	one grp: AY	60 min. sessions, 2 x/wk. for 12 wks. Measures: post intervention.	Semi-structured interviews.	Three categories emerged: 1) self-awareness, 2) new knowledge and 3) take control. Participants with improved physical function, breathing, energy and body awareness.	affective psychomotor	Patients with COPD may strengthen their self-awareness and improve control of symptoms, learn new ways of breathing after practicing AY, which may provide a tool to control	yes/N/A/no follow up

										disease symptoms.	
Saravanakumar, 2018 [94]	To examine the acceptability of modified tai chi and yoga programs.	Older adult residents, age range 66-92 yrs. 16 residents (14 females), 10 staff	Frail, older adult residents	small	Aged care facility	Three groups: resident Tai Chi and yoga participants, staff assistants, staff interventionists	30 min. sessions, 2 x/wk. for 14 wks.	Focus group discussions	The overarching theme was appreciation of mind–body approach. Nine subthemes: (a) novel; (b) flow; (c) mindful; (d) gentle; (e) whole body; (f) benefits; (g) worthwhile; (h) feel alive; and (i) calming.	affective psychomotor	The findings reveal that tai chi and yoga programs are appropriate for frail, dependent older people in residential care when modified considering an individual's ability, motivation and preference.	yes/N/A/no follow up
Schaff, 2012 [95]	To study the effects of chair yoga.	Older adults, age range 59-92	CD with dementia	small	senior center	one grp: CY	90 min. 2 x/wk. for 18 mos. Data collectio	Perceptions of balance, posture, physical,	More results to follow (bone mineral	affective psychomotor	CY program was successful with this	yes/no/no

		yrs. (97% females). 15-18 participants.					n throughout duration of intervention.	mental and emotional health.	density, BP, etc.)		study population.	
Bukowski, 2007 [97]	Describe impact of exercise on symptoms associated with KOA.	Older adults, 14 participants (2 males).	KOA	small	university	three grps: AY, exercise, or C	Measures: pre and post.	Low back and hamstring flexibility, quad strength, WOMAC and global assessment questionnaire.	Functional changes and improvement in QoL in both intervention grps.	affective, psychomotor	The results suggest that flexibility, strength, and QOL may improve more or at least as much with AY for this population.	N/A
Park, 2020b [96]	To explore the perceived effects of three interventions.	Caregivers of older adults with dementia,	Older adults with dementia	small	community-based daycare center	one grp: caregiver. 27 intervention particip	45 min. 2 x/wk. for 12 wks. Measures: post intervention.	Focus grp discussion	CY improved memory, mobility, posture, balance and mood. CBE improved communicat	affective psychomotor	Three themes emerged: changes in (a) cognitive symptoms, (b) physical function,	yes/no/ N/A

		mean age 70 (range 54-81). 8 participants.				ants: CY (n = 8), MI (n = 10), or CBE (n = 9)			ion, cognition, physical function, sleep and mood. MI improved communication.		and (c) mood, behavioral symptoms, and sleep disturbance.	
Park, 2012 [22]	To study the effects of a non-pharmacological intervention.	Older adults, mean age 77 ± 3.6 yrs. 7 participants	CD with KOA	small	University Continuing Education Center	one grp: CY	45 min. sessions 2 x/wk. for 8 wks. Measures: pre, 4wks. and 8wks.	WOMAC, Center for Epidemiologic Studies Depression Scale, and focus group.	Decr stiffness and incr physical function. No change in pain or depression.	affective psychomotor	Recommend larger studies, RCTs and study of home programs.	yes/no/N/A
Awdish, 2012 [98]	To study the effects of a nonpharmacological intervention.	Adults. 3 participants.	adults with pulmonary artery hypertension	small	academic hospital	no grp: individual CY sessions	CY: sess modified for each to include basic 12 min. sequence and	6MWT, O2 sats, Health Promoting Lifestyle Profile II, and physical function.	Subjects experienced decr anxiety and joint pain.	affective psychomotor	CY is feasible and safe. Larger scale study indicated.	yes/no/N/A

		guided-meditation. Frequency per tolerance. Duration 8 wks.
	Qualitative/case-series, large (>50 participants)	
	Qualitative/case-series, medium (>20 and <50 participants)	
	Qualitative/case-series, small (≤20 participants)	

AD: Alzheimer's Disease, AY: adapted yoga, BP: blood pressure, CBE: chair-based exercise, CD: community dwellers, COPD: chronic obstructive pulmonary disease, CY: chair yoga, decr: decreased, DM: diabetes mellitus, grp(s): group(s), incr: increased, KOA: knee osteoarthritis, min.: minutes, mod: moderate, mo.(s.): month(s), MI: music intervention, N/A: not applicable, OW: overweight, sess: sessions, 6MWT: Six Minute Walk Test, x/: times per, sats: saturation, wk.(s.): week(s) WOMAC: Western Ontario and McMasters University Osteoarthritis Index, yr.(s.): year(s).

3. Results

The search yielded 3147 titles, Covidence removed 140 duplications. An additional 2730 articles were removed via screening of the titles and abstracts, leaving 277 full text articles for consideration. Upon further investigation 66 quantitative and 9 qualitative studies met the inclusion criteria. Frequency counts of summary statements are provided for the data columns in Tables 2-5. Of the 75 studies, 26 were published in complementary therapy/yoga journals, 20 in geriatric journals, 13 in physical therapy journals, three in cancer journals, two in orthopedic/pain journals and 11 in general journals, including two dissertations. This review included 32 RCTs, 13 large, 14 medium and five small. There were three large, five medium and three small quasi-experimental, six medium and 15 small cohort studies. There were three large, two medium and four small qualitative studies and 2 case-series studies.

3.1 Participants

There were 2964 participants among the 75 studies. The median sample size was 25.5 (range 3-131); the mean sample size was 40. One study had three participants who were not grouped together [98], 28 studies had one group with chair/adapted yoga as the intervention [22-24, 32, 63, 70, 72, 73, 75-77, 79, 80-93, 96], 38 studies had two groups [25, 27, 28, 30-32, 34, 36-38, 40-46, 48-54, 56-62, 64, 66, 67, 71, 78, 90] and 8 studies had three groups [29, 35, 39, 47, 55, 65, 69, 94, 97]. If a study had two groups, the second group served as a control, typically either waitlist or education [25, 27, 28, 30-32, 34, 36-38, 40-46, 48-54, 56-62, 64, 66, 67, 71, 78, 90]. If there were three groups, a second intervention was compared to chair yoga; interventions included Reiki, chair exercise, resistance training or tai chi [29, 35, 39, 47, 55, 65, 69, 94, 97] One study categorized the three groups according to pain site and type, with all of the participants receiving the same intervention [69]. The majority of the studies (n = 46) included participant sex as part of the demographic profile; 29 studies did not. Fifteen studies included only females [28, 36, 39, 46, 48, 49, 52, 55, 61, 62, 71, 83, 84, 90, 94] and one study included only males [70]. Ten studies had 1-24% males [25, 27, 28, 39, 51, 64, 65, 73, 89, 92], another 10 had 25-49% males [25, 34, 38, 58, 69, 73, 74, 92, 95, 97] and 10 studies had greater than 50% males as participants [27, 29, 32, 53, 54, 60, 76, 89, 92, 93]. All of the study participants were older adults, 11 studies did not report additional age information [37, 46, 52, 57, 68, 86, 88, 90, 91, 97, 99]. Six studies provided an age range [28, 35, 41, 77, 94, 95], seven studies included participants with a mean age 50-59 years [36, 51, 66, 67, 69, 80, 83], 19 studies with a mean age of 60-69 [25, 40, 42, 43, 48, 50, 56, 59, 63, 70, 71, 73, 81, 84, 85, 87, 93], 21 studies with a mean age of 70-79 [22, 27, 29, 30, 32-34, 38, 39, 46, 53-55, 58, 60, 72, 75, 76, 79, 82, 96] and 10 studies included participants with a mean age greater than 80 years [44, 47, 49, 61, 62, 64, 65, 74, 78, 92]. The majority of these studies, 22 [29, 33, 35, 38, 41, 44, 45, 50-52, 59, 62, 64, 71, 73, 75, 76, 78, 79, 80, 84, 90] of 75, were focused on community dwelling older adults, 11 of which were healthy. Orthopaedic diagnoses (n = 16), and cognitive impairment (n = 9) [37, 39, 47, 60, 68, 88, 92, 96, 97] accounted for the next largest diagnostic categories. The orthopaedic diagnoses were lower extremity osteoarthritis (n = 13) [22, 25, 27, 28, 30-32, 34, 46, 53, 65, 66, 95], vertebral impairments (n = 2) [55, 72] and osteopenia (n = 1) [48]. The remaining diagnostic categories include cardiopulmonary disorders (n = 5) [42, 43, 57, 93, 98], neurologic disorders (n = 7) [40, 56, 80, 82, 85, 87, 89], cancer (n = 8) [36, 63, 67, 70, 81, 83, 86], institutionalized [49, 61, 77, 94] and chronic

pain (n = 2) [69, 74]. The remaining three studies included participants with a history of falls, insomnia or veterans [54, 58, 91].

3.2 Dosing and Intervention

The duration of each intervention session ranged from 15-120 minutes, with 10 having sessions 30 minutes or less [36, 37, 43, 47, 50, 66, 67, 77, 92, 94], 15 with 45-minute sessions [22, 27, 30, 31, 33-35, 39, 54, 64, 65, 86, 88, 89, 96], 25 with 50- 60-minute sessions [25, 28, 41, 45, 46, 48, 49, 51-53, 55, 57, 59, 60, 68, 69, 71, 73-76, 84, 85, 87, 93], and 16 with > 60-minute sessions [29, 31, 38, 42, 44, 52, 56, 62, 70, 78-81, 83, 90, 95] and another 9 were unspecified [40, 58, 61, 63, 82, 91, 97, 98]. Forty of the studies held intervention sessions twice weekly [22, 27, 30, 32, 33, 35, 37, 39-41, 47, 49, 51-53, 57, 61-65, 68, 70, 73, 75, 77-85, 88, 90, 92-95], two met 2-3 times a week [49, 91], 19 studies met once per week [29, 31, 35, 38, 42-44, 46, 50, 55-57, 66, 69, 74, 76, 86, 87, 89], most of which were supplemented with a home program, 11 met three times per week [25, 28, 36, 48, 54, 59, 60, 67, 71, 72, 84], and three were unspecified [63, 96, 98]. Study intervention durations ranged from six weeks to 18 months; the most common duration was eight weeks (n = 31) [22, 25, 27, 30, 32, 33, 34, 36, 40, 42, 44-46, 50, 52, 53, 63-65, 67, 68, 73, 76, 78, 80-82, 86, 87, 89, 90], followed by 12 weeks (n = 19) [31, 37-39, 43, 48, 51, 54, 57, 58, 60, 62, 66, 79, 83, 85, 88, 93, 96] and 10 weeks (n = 6) [41, 55, 69, 74, 77, 92]. Chair yoga interventions were described as including breathwork, meditation and yoga with the participant seated in a chair; some interventions identified specific yoga styles, with hatha as the most common. Ten study interventions encouraged/included a home exercise program as part of the protocol [29, 44-46, 56, 57, 67, 76, 81, 90].

3.3 Setting

Fifty-six studies were conducted in the United States [22, 27-30, 32-35, 40-46, 51-54, 57, 63-93, 95-98], two studies in the countries of Germany [36, 50], Portugal [49, 61], Australia [47, 56], Sweden [55, 93], Taiwan [60, 62] and Thailand [48, 71]. One study was conducted in the countries of the Czech Republic [31], Japan [37], the United Kingdom [38] New Zealand [94], Indonesia [59], Greece [39], and Israel [58]. Studies were primarily conducted across community centers (n = 21) [27, 30-32, 34, 35, 38, 39, 41, 49, 50, 53, 56, 57, 61, 62, 64-66, 79, 95], hospital facilities (n = 25) [37, 42-44, 47, 58, 60, 63, 67-70, 73, 74, 76-78, 81, 86, 89, 91-94] and universities (n = 23) [22, 25, 29, 36, 40, 45, 46, 48, 51, 52, 54, 59, 71, 72, 75, 80, 82, 83-85, 87, 90, 97], two university community facilities [28, 55], one community hospital [96], one academic hospital [98] and two settings were unspecified [33, 88].

3.4 Bloom's Learning Domains

Seventy of the 75 studies included some measure of psychomotor function. Types of measures were highly varied among studies spanning from physiologic and impairment to functional to fitness performance measures. There was no single outcome measure common among studies. The most common impairment measured was balance via the Berg Balance Scale, followed by the Functional Reach and Single Limb Balance Tests. Gait was the most common functional activity measured using the Timed Up and Go Test, 6 Minute Walk Test and other gait assessments for speed and endurance. Self-reported measures were used for pain, fatigue and dyspnea, sleep, fragility and arthritis

symptoms. The Western Ontario and McMaster University Osteoarthritis Index was the most prevalently used measure for osteoarthritis.

Measures of affect were reported in 57 of the 75 studies. Measurement included the qualities of anxiety, stress, mood, fatigue, life satisfaction, morale, well-being, self-compassion, self-esteem, self-efficacy, depression, anger, personality and quality of life. These measures were self-report. Some measures were quality-specific, but also were varied amongst the studies. Moss conducted a RCT to examine the feasibility and effectiveness of a mindfulness-based stress reduction program on 39 elders in a continuing care community. The chair yoga group practiced for 120 minutes once per week, supplemented with 25-30 minutes of daily exercise for eight weeks. The intervention group showed significant improvement in acceptance and psychological flexibility and in role limitations due to physical health and verbally reported increased awareness, less judgement, and greater self-compassion compared to the control group [44]. Toise also conducted an RCT to examine the feasibility and effectiveness of a chair yoga program for patients with implantable cardiac defibrillators. Total shock anxiety and anxiety significantly decreased for the yoga group, but increased for the control group. Compared to the control, the yoga group had greater overall self-compassion and greater mindfulness. Exploratory analyses utilizing a linear model (R2 = 0.98) of observed device-treated ventricular (DTV) events revealed that the expected number of DTV events in the yoga group was significantly lower than in the control. AY had a 32% lower risk of experiencing device-related firings at the end of follow-up compared to the control group [42].

3.5 Affective, Cognitive and Psychomotor Learning Domains

There was one study in which all three learning domains were addressed by the outcome measures. Oken conducted a study to determine the effect of yoga on cognitive function, fatigue, mood, and QoL in seniors. There were no effects on cognitive and alertness measures, but adapted yoga improved physical and QoL measures compared to exercise and control [29].

3.6 Affective and Psychomotor Learning Domains

Of the 51 studies with both affective and psychomotor outcome measures, large studies included nine RCTs [27, 29, 31, 32, 33, 34, 36-38], two quasi-experimental [58, 60] and two qualitative studies [90, 91]; these studies were predominantly conducted with patient populations of community dwelling older adults with lower extremity osteoarthritis and determined that chair yoga can reduce pain, improve mood but had no impact on frailty measures [27, 32, 33, 36] Several of these studies were conducted in community-based facilities, senior housing, university and medical centers. One of the qualitative studies found that delivering adapted yoga to a wide range of patients within a healthcare setting appears to be feasible and acceptable. These results were the same for either delivery mode, in-person or telehealth, with participants reporting high levels of satisfaction and improvement in multiple problem areas [94].

Studies of moderate size included 11 RCTs [39-41, 43, 45-47, 49-52], five quasi-experimental [61-66], four cohort [69, 70, 73, 74] and two qualitative studies [92, 93] Populations included sedentary older adults and community dwellers, COPD, knee osteoarthritis, chronic stroke and frail adults with impaired cognition. Study sites included community centers, universities and outpatient clinics/hospitals.

Three RCTs [55-57], one quasi-experimental [67], eight cohort [77, 80, 83, 84, 86-89] four qualitative [94-97] and two case series studies [22, 98] were small. Sites included universities, community and cancer centers. Study populations included lower extremity cancer, osteoarthritis, community dwellers, Alzheimer's, pulmonary hypertension and COPD, neurologic disorders and impaired cognition.

3.7 Cognitive and Psychomotor Learning Domains

Of the 75 studies, there were nine that specifically targeted older adults with dementia/Alzheimer's [37, 39, 47, 60, 68, 88, 92, 95, 96] Only two studies reported using a cognitive measure [39, 95], and another measured dementia quality of life [47] One study reported both psychomotor and cognitive measures [39]. In this RCT of 49 women with mild cognitive impairment, it was determined that the resistance group had better results than the chair yoga group and that the chair yoga group had better results than the control group. The interventions were provided twice weekly for 12 weeks. The authors suggest a longer study duration in future research.

3.8 Psychomotor-only Learning Domain

Seventeen studies used only psychomotor outcome measures. There were three large [25, 28, 30], one medium [48] and two small RCTs [53, 54], one large [59] and two small quasi-experimental [66, 68] and eight small cohort studies [71, 72, 75, 76, 78, 79, 82] McCaffrey, 2019 compared chair yoga with chair exercise in a small RCT of 18. Both groups had significant increases in the TUG and WOMAC, with no differences between groups [68].

3.9 Affective-only Learning Domain

There were five studies reporting outcome measures pertaining to the affective learning domain; study types included one large and two medium RCTs, one small cohort and one large qualitative study. Bonura conducted a large RCT to assess the effect of chair yoga on the psychological health of older adults. Chair yoga improved more than the other two groups in anger, anxiety, depression, well-being, self-efficacy and self-efficacy for daily living [35]. Similar results were found with the other studies with community dwelling, implantable cardiac defibrillator, and veterans [42, 44, 63, 81].

4. Discussion

The results of this scoping review support the use of chair/adapted yoga as an intervention for older adults; the majority of the studies had positive, if not significant results. Studies investigating chair/adapted yoga as an intervention for older adults consist of fairly robust study design, with RCTs and cohort studies predominating. That said, most of these studies compared chair/adapted yoga to a control group rather than another intervention and ten included follow-up data collection [27, 30, 32, 34, 35, 37, 42, 45, 46, 64] Of the 75 studies included in this review, 15 reported follow-up. [27, 30, 32, 34, 35, 37, 42, 45, 46, 64, 68, 74, 80, 83, 95].

Seniors of all ages from 50 to 80+ participated in chair yoga programs. The most common dose was 2x/week for 8 weeks for 50-60 minutes. The majority of the interventions were performed in community, university and hospital settings. The body of literature represents participants from the

continents of North America, Europe, Asia, and Australia. Generally speaking, the findings of this study are consistent with previous reviews and meta-analyses; yoga can have a positive impact on psychomotor, affective and cognitive domains. Of these reviews, five were exclusive to yoga [16, 17, 99-101], while the others included other mind-body, breathing and exercise interventions for adults and children [1-3, 5, 6, 18] The review by McCall involved older adults with acute and chronic health conditions, the review by Sivaramakrishnan involved older adults and Sieczkowska's review was focused on those with rheumatic arthritis. Both meta-analyses demonstrated support for yoga as an intervention with large effects for emotional, social, health and physical function; neutral support for mental health, pain and vitality [16, 17, 101]. While none of these reviews were exclusive to chair/adapted yoga, some of the studies in this current review were included in those previous [25, 35, 39, 46, 47, 49, 51, 56, 65, 66, 72].

The affective and psychomotor domains of learning are well represented among the outcome measures across these studies. It has been demonstrated that the intervention of chair/adapted yoga has the capacity to improve physical impairments, functional mobility and capacity, affective characteristics such as mood, sleep and stress as well as social aspects including quality of life and life satisfaction. Though not extensively studied, there exists no support that yoga has the capacity to improve cognitive function However, chair/adapted yoga can improve the physical and affective aspects of someone with impaired cognitive function [37, 47, 60]. The findings suggest that yoga can be used to complement traditional medical and therapy interventions and, in many cases, has already done so [32, 37, 47, 68, 96]. With the rising costs of healthcare and the reduction in traditional therapy services, chair/adapted yoga has been demonstrated to be a feasible and acceptable form of treatment for the older adult population. Physical and occupational therapists should continue to partner with yoga instructors to bring chair/adapted yoga to community-based settings. Chair/adapted yoga can be performed both by patients and their caregivers alike, thereby offering an activity that both can experience together.

The literature included in this review spans more than ten years and sufficiently provides evidence of its use with a variety of diagnoses, as well as community dwelling well-elders. Further study should explore additional patient diagnoses including neurologic, orthopedic, and cardiopulmonary. While knee osteoarthritis has been extensively studied, disorders of the shoulder have not. The neurologic diagnosis of stroke, Parkinson's disease and dementia/Alzheimer's have received some attention from chair/adapted yoga, while other diagnoses such as multiple sclerosis, spinal cord injury and traumatic brain injury have not. Future research should consider introducing a second intervention to better understand the comparison of yoga with other exercise forms or therapy interventions to determine if it could sufficiently be substituted or used as an adjunct. Standardizing chair/adapted yoga interventions as per diagnostic population may also be of interest to future researchers/practitioners. This would include research to determine the best frequency, intensity and time (FIT) prescription. Given the ramifications of the current pandemic, work to explore delivery modes should also continue; two studies included in this review have investigated use of telehealth [91] and digital video disc [36]. Studies with more follow-up are also recommended.

4.1 Limitations

This scoping review was limited to chair/adapted yoga for older adults. There may be other types of yoga interventions used with older adults, not included in this review. Meditation, yoga nidra, Ayurveda are other yoga practices that were omitted from this review that could potentially benefit

this population. This review excluded literature pertaining to traditional yoga practice. Furthermore, this review was intentionally limited by date to reflect current literature of the past 10 years. It is possible that there is additional evidence to support chair/adapted yoga preceding this time frame. This study did not include those that were not peer-reviewed or in the English language. A meta-analysis to statistically determine the effects of chair/adapted yoga to enhance physical and/or affective function was not performed, but could be done in the future.

5. Conclusions

The quality of literature supporting chair/adapted yoga is fairly substantial as evidenced by RCTs, quasi-experimental and cohort study types. The evidence to support chair/adapted yoga as an intervention for older adults is relatively also substantial, both community dwelling and those with certain physical and psychological diagnoses. It is recommended that this intervention continue to be utilized and studied with this population.

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Author Contributions

Dr. Veneri, primary researcher, is responsible for the study design, search and review of the literature, data extraction and analysis, and is the primary author. Dr. Gannotti, second researcher, is responsible for search and review of the literature, data extraction and analysis.

Competing Interests

The authors have declared that no competing interests exist.

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