What is known from the published literature about yoga interventions delivered in community settings for older adults? A Systematic Scoping Review

Abstract

In recent years, mind-body exercises have arisen as a type of popular physical exercise practiced by older adults in both eastern and western countries. In the last ten years, Yoga has been found to be one of the key physical activity interventions for older adults. There is a need to know more from the published literature about yoga interventions delivered in community settings for older adults. This scoping review synthesized information on intervention contents, outcomes, and summarized data on attrition, adherence, and adverse events for the community health practitioner. Using the Template for intervention description and Replication (TIDieR), and the Population, Intervention, Comparator, Outcome (PICO) checklist, this review identified areas of depth and gaps for yoga interventions researchers.

Keywords**:** older adults; yoga; scoping review; community settings

Background

It is well recognized that physical activity (PA) delays the onset of physical frailty, and could have substantial positive impacts on daily wellbeing, the aging process and the life quality of older adults (King & King, 2010; Whitehead & Blaxton, 2017). Several national and international PA guidelines (e.g., World Health organization's Global Recommendations on Physical Activity for Health) recommends various types of PA to be performed by older adults, and each type of PA provides distinct health benefits. For instance, aerobic PA is associated with better cardiovascular health, muscle-strengthening, and balance activity helps older adults maintain optimal physical functioning and reduce the risk of falling. The recognized value of PA in reducing physical frailty has resulted in the development of numerous PAprogrammes for community-dwelling older adults.

In recent years, mind-body exercises (i.e., Yoga, Qigong) have arisen as a type of physical exercise practiced by older adults in both eastern and western countries (da Silva et al., 2017). Mind-body exercises have the element of muscle-strengthening and balance activities, and when practiced in a flow-like movement for a sustained period, it also has the element of aerobic activity. However, different from muscle-strengthening exercises, balance activity, or aerobic activity, mind-body exercise combines bodily movement with mindfulness, and breathing components (Jones & Rose, 2005).

"Yoga" is recognized as a type of mind-body exercise in the contemporary exercise science discipline. It involves physical bodily movements/postures, breathing awareness, relaxation and meditation (Nayak & Shankar, 2004). Although previous research showed that individuals who practice yoga tend to be younger in age (Cramer et al., 2016); yoga was found to be one of the top five endorsed PA among community-dwelling older adults (da Silva et al., 2017) in recent years. Scoping reviews also documented that yoga interventions

has been found to be one of the key PA interventions for older adults in the last ten years (Taylor et al., 2021). With the rise in popularity, there is an increasing demand for yoga classes to be offered to older adults in community settings. There is thus a need to learn from the published literature about the yoga interventions delivered in community settings for older adults.

Rationale

Previous reviews of yoga interventions literature for older adults focus primarily on specific physical functioning health outcomes (Patel, Newstead, & Ferrer, 2012; Youkhana, Dean, Wolff, Sherrington, & Tiedemann, 2016). The information from these reviews is helpful for enlightening clinical practice but deficient to informing community health practice. To date, no review has systematically mapped yoga intervention research conducted in community settings. Additionally, there is a paucity of review synthesizing the scope of content, outcomes and feasibility of community-based yoga interventions for older adults. Given our interest in yoga interventions: 1) for older adults; and 2) to be delivered as a PA programme and service in community settings, we aim to identify areas of depth and gaps in the existing literature through a scoping review methodology, thus informing future research and provide practical implications to the community health practitioner (Munn, Stern, Aromataris, Lockwood, & Jordan, 2018).

Objectives

Using a scoping review methodology, this review aims to identify the range of yoga interventions contents delivered for older adults in community settings, outcomes associated these interventions, the feasibility of yoga intervention among community-dwelling older adults, and future research direction of community-based yoga interventions. Specific research questions are as follows:

1. What are the intervention contents of community-based yoga interventions for older adults? And how are the interventions tailored for the physical capacity of older adults?
2. What are the outcomes associated with community-based yoga interventions for older adults?
3. How feasible is yoga interventions among community-dwelling older adults as reflected in attrition rate and adherence rate? Any adverse events reported?
4. Based on the current scope of evidence, what are the research gaps requiring further investigation?

Methods

Protocol and Registration

A protocol was prepared in advance and published on the Open Science Framework on 26 October 2021 (https://osf.io/na6mx/).

Review Design

The conduct and reporting of this review were guided by the Joanna Briggs Institute guidelines for systematic scoping review (Peters et al., 2015) and PRISMA Extension for Scoping Review (PRISMA ScR) (Tricco et al., 2018), respectively.

Eligibility Criteria

Types of studies: Excluding review articles, studies of any design were considered for this scoping review. This study includes peer-reviewed articles published in English. Publication years was from inception to November 2021; publication language was limited to English. Books, theses or dissertations, conference papers and proceedings and other grey literature

were excluded. Studies that included insufficient data for analysis were excluded. Articles that did not have a full-text version were excluded.

Types of participants: The current research included studies that have recruited community-dwelling older adults aged 55 or above. This includes (but is not limited to) studies that recruit community-dwelling older adults with specific characteristics such as older adults with a sedentary lifestyle, or older adults with OA knee symptoms.

Types of intervention: Studies were included if participants received yoga interventions. Yoga intervention is defined as physical bodily-based exercise with breathing awareness, relaxation, and meditation elements that the contemporary world commonly refers to. "Yoga" intervention which mainly focused on the cognitive or "mindfulness" element, without much emphasis on the physical bodily form were not included in this review.

Information Sources and Search Strategy

A systematic search was conducted in the following electronic databases: CINALHL Complete, SPORTDiscus, Scopus, EBSCO, and Web of Science. The key words/terms used were "community" AND "yoga" AND "older adult*" OR "senior" OR "elder*". The main search was conducted in October 2021.

Search strategies were refined for each database, and the details of the databases and search fields are provided in Supplementary information (Supplementary file 1).

Selection of Sources of Evidence

Upon completing the literature search, all identified articles were exported to Endnote X8 and excel. Duplicates of articles were removed. A two-phase procedure was used to select studies. For phase 1, title and abstract screening were carried out to ensure that the identified studies were potentially suited for review. In phase 2, full texts of all studies identified from phase 1

will be included for full texts screening. The selection of full texts was reviewed by both JLC and JX.

Data Extraction and Charting

The included studies were collated in a Microsoft Excel spreadsheet to extract details of the study. The following data were extracted from each article: authors; publication year; country; design; sample size; age; population subgroups; location; intervention duration; intervention time; frequency; intervention content; intervention delivery; yoga type and instructor qualification; modification for older adult population; intervention delivery; outcome variables; attrition rate; adherence rate.

Quality Assessment for the Included Studies

According to PRISMA Extension for Scoping Review (PRISMA ScR) Checklist (Tricco et al., 2018), a critical appraisal of individual sources of evidence is optional, our systematic scoping review did not perform a critical appraisal for included studies to avoid dismissing the value of the early stage of research which is not yet appropriate for critical evaluation. The systematic scoping review only aim to describe what is currently known about yoga intervention across a variety of community-dwelling older adults to identify gaps and areas of depth in the literature, inform future research activity and provide practical implications to the community health practitioners.

Synthesis of results

Population, intervention (informed by TIDieR), comparator, and outcome (PICO) checklist were used as a framework to guide extracting the content of the intervention.

A numerical summary using descriptive statistics were provided to give an overall presentation of the included studies, which was supplemented by a narrative review, describing the included studies under the specific objectives of the scoping review.

---------- Figure 1----------

Results

Study Characteristics

The results of the search are presented in the PRISMA flow diagram (Figure 1). In all, 41 studies were retained (5 mixed-method studies (Adams, Crowe, Van Puymbroeck, Allison, & Schmid, 2019; K. M. Chen, Tseng, Ting, & Huang, 2007; Kim, Chee, DeStefano, Broome, & Bell, 2021; Park & McCaffrey, 2012; Tatum, Bradley, & Igel, 2011), 2 qualitative studies (G. K. Alexander, Innes, Selfe, & Brown, 2013; Patel, Akkihebbalu, Espinoza, & Chiodo, 2011), 34 quantitative studies (G. Alexander et al., 2012; Brenes et al., 2020; Bucht & Donath, 2019; K.-M. Chen et al., 2009; K.-M. Chen & Tseng, 2008; K. M. Chen et al., 2008; Cheung, Wyman, & Savik, 2016; Choi & Sohng, 2018; DiBenedetto et al., 2005; Gothe, Kramer, & McAuley, 2014, 2017; Gothe & McAuley, 2016; Greendale, Huang, Karlamangla, Seeger, & Crawford, 2009; Huang et al., 2019; Kertapati, Sahar, & Nursasi, 2018; Lee, Nam, & Kim, 2016; Lindahl, Tilton, Eickholt, & Ferguson-Stegall, 2016; McCaffrey, Park, & Newman, 2017; McCaffrey, Taylor, Marker, & Park, 2019; Miller, Der Ananian, Hensley, & Ungar, 2017; Ni et al., 2014; Noradechanunt, Worsley, & Groeller, 2017; Pandya, 2020; Park, McCaffrey, Newman, Cheung, & Hagen, 2014; Park et al., 2020; Salem et al., 2013; Schmid, Van Puymbroeck, & Koceja, 2010; Smith, Mross, & Christopher, 2017; Tiedemann, O'Rourke, Sesto, & Sherrington, 2013; Vaishali, Kumar, Adhikari, & UnniKrishnan, 2012; D. S. Wang, 2010; M.-Y. Wang, Greendale, Yu, & Salem, 2016; Yao & Tseng, 2019; Zettergren, Lubeski, & Viverito, 2011)). The mean age of all the included studies was 68.85,

minimum mean age was 59 and maximum mean age was 84. The publication years ranged from 2005 to 2021. The majority of the studies were conducted in the U.S.A (i.e., twenty-eight) (Adams et al., 2019; G. Alexander et al., 2012; G. K. Alexander et al., 2013; Brenes et al., 2020; Cheung et al., 2016; DiBenedetto et al., 2005; Gothe et al., 2014, 2017; Gothe & McAuley, 2016; Greendale et al., 2009; Huang et al., 2019; Kim et al., 2021; Lindahl et al., 2016; McCaffrey et al., 2017; McCaffrey et al., 2019; Miller et al., 2017; Ni et al., 2014; Park & McCaffrey, 2012; Park et al., 2014; Park et al., 2020; Patel et al., 2011; Salem et al., 2013; Schmid et al., 2010; Smith et al., 2017; Tatum et al., 2011; D. S. Wang, 2010; M.-Y. Wang et al., 2016; Zettergren et al., 2011), five from Taiwan (K.-M. Chen et al., 2009; K.-M. Chen & Tseng, 2008; K. M. Chen et al., 2008; K. M. Chen et al., 2007; Yao & Tseng, 2019), two from Australia (Noradechanunt et al., 2017; Tiedemann et al., 2013), two from Korea (Choi & Sohng, 2018; Lee et al., 2016), one from India (Vaishali et al., 2012), one from Germany (Bucht & Donath, 2019), one from Indonesia (Kertapati et al., 2018), one from cities across four countries (Mumbai, Singapore, Pretoria and Nairobi) (Pandya, 2020).

Research question 1: Content of community-based yoga interventions for older adults

Content of community-based yoga interventions varies across different studies. Although they are all yoga interventions, the type of yoga delivered differs. Not all intervention has meditation component. Some intervention content focus on the physical health aspects like balance, strength, and some focus on more abstract concept like body awareness. Not all interventions tailored the intervention to the physical capacity of older adults and different studies utilized different amount of yoga props to support the yoga posture prescribe to older adults. Supplementary file 2. contains the details of the content of community-based yoga intervention for older adults in each study.

Yoga Type

Among all forty-one studies, five of them are yoga program for older adults developed or evaluated by expert panel (12.2%) (K.-M. Chen et al., 2009; K.-M. Chen & Tseng, 2008; K. M. Chen et al., 2008; K. M. Chen et al., 2007; Yao & Tseng, 2019). Five studies did not specify what Yoga type they are referring to (12.2%) (Lee et al., 2016; Pandya, 2020; Smith et al., 2017; Vaishali et al., 2012; D. S. Wang, 2010). The rest of the studies encompass "Hatha Yoga" (n=12, 29.3%) (Adams et al., 2019; Brenes et al., 2020; Cheung et al., 2016; Gothe et al., 2014, 2017; Gothe & McAuley, 2016; Greendale et al., 2009; Lindahl et al., 2016; Park et al., 2020; Salem et al., 2013; Schmid et al., 2010; M.-Y. Wang et al., 2016), "Hatha Yoga based on Iyengar method" (n=8, 19.5%) (G. Alexander et al., 2012; G. K. Alexander et al., 2013; DiBenedetto et al., 2005; Huang et al., 2019; McCaffrey et al., 2017; Park et al., 2014; Patel et al., 2011; Tiedemann et al., 2013), "Chair yoga" (9.8%) (Kertapati et al., 2018; Kim et al., 2021; McCaffrey et al., 2019; Park & McCaffrey, 2012; Park et al., 2020), "Kripalu Yoga" (n=1, 2.4%) (Zettergren et al., 2011), "Thai Yoga" (n=1, 2.4%) (Noradechanunt et al., 2017), "Sauna Yoga" (n=1, 2.4%) (Bucht & Donath, 2019), "Vinyasa yoga" (n=1, 2.4%) (Ni et al., 2014), and "Rewind Yoga" (n=1, 2.4%) (Miller et al., 2017).

Intervention Structure

Most interventions are composed of three to four major components, which are 1) postures, 2) breathing exercise, 3) relaxation, and or 4) meditation. Only four studies consisted of postures only (Huang et al., 2019; Ni et al., 2014; Schmid et al., 2010; Tiedemann et al., 2013), or postures and breathing exercises (Greendale et al., 2009; Salem et al., 2013; Vaishali et al., 2012; D. S. Wang, 2010). One study has a massage and stretching "warm down" component (Lee et al., 2016). Two studies have a discussion or sharing component (Cheung et al., 2016; Smith et al., 2017).

Key Elements and Focus of Yoga Interventions

Balance, strength, flexibility, range of motion, movement and mobility are the key elements or focus of community-based yoga intervention for older adults (Ni et al., 2014; Park et al., 2020; Patel et al., 2011; Schmid et al., 2010; Tatum et al., 2011; Tiedemann et al., 2013; M.-Y. Wang et al., 2016). Other focus includes breath control/awareness (Pandya, 2020; Smith et al., 2017), progressive difficulty (Adams et al., 2019; Gothe et al., 2014, 2017; Gothe & McAuley, 2016; Greendale et al., 2009; Ni et al., 2014; Schmid et al., 2010; Tiedemann et al., 2013; Vaishali et al., 2012; M.-Y. Wang et al., 2016), proprioceptive awareness (Greendale et al., 2009), alignment (McCaffrey et al., 2017; Park et al., 2014; Smith et al., 2017), body awareness (McCaffrey et al., 2017; Park et al., 2014; Smith et al., 2017; Zettergren et al., 2011), stress reduction (McCaffrey et al., 2017; Park et al., 2014), socialization (Kim et al., 2021), pain management (Kim et al., 2021), centering (Brenes et al., 2020; DiBenedetto et al., 2005; Pandya, 2020; Smith et al., 2017), learning (Pandya, 2020), inner watchful awareness (Pandya, 2020), postural control (Zettergren et al., 2011), pelvic floor function (DiBenedetto et al., 2005; Huang et al., 2019), and non-competition culture (Smith et al., 2017) .

Tailoring of The Intervention Content to The Physical Capacity of Older Adults

Twenty-four studies (54.5%) tailored the yoga intervention to the physical capacity of older adults (Adams et al., 2019; G. Alexander et al., 2012; G. K. Alexander et al., 2013; K.-M. Chen et al., 2009; K.-M. Chen & Tseng, 2008; K. M. Chen et al., 2008; K. M. Chen et al., 2007; Cheung et al., 2016; DiBenedetto et al., 2005; Greendale et al., 2009; Huang et al., 2019; McCaffrey et al., 2017; McCaffrey et al., 2019; Ni et al., 2014; Park & McCaffrey, 2012; Park et al., 2014; Patel et al., 2011; Salem et al., 2013; Schmid et al., 2010; Smith et al., 2017; Tatum et al., 2011; Tiedemann et al., 2013; M.-Y. Wang et al., 2016; Zettergren et al., 2011). Among these studies, the most common tailoring feature is to have modification of yoga postures to the varying physical capacity of older adults. Modifications of postures are usually supported by walls, chairs or yoga “props” like belts, blocks, blankets, etc. Besides

modifying postures, some studies provided one extra instructor to adjust participants' postures and prevent any possible harm to the participants (K.-M. Chen et al., 2009; K.-M. Chen & Tseng, 2008; K. M. Chen et al., 2008; K. M. Chen et al., 2007) and one study ensures the yoga intervention to be organized in a small class size (i.e., N=9) (Cheung et al., 2016).

Use of Props

Nineteen studies (46.3%) explicitly mentioned the use of yoga props in their interventions (G. K. Alexander et al., 2013; Bucht & Donath, 2019; DiBenedetto et al., 2005; Gothe et al., 2017; Gothe & McAuley, 2016; Huang et al., 2019; McCaffrey et al., 2017; McCaffrey et al., 2019; Park et al., 2014; Park et al., 2020; Patel et al., 2011; Salem et al., 2013; Schmid et al., 2010; Tatum et al., 2011; Tiedemann et al., 2013; M.-Y. Wang et al., 2016; Yao & Tseng, 2019; Zettergren et al., 2011). Chairs are the most used prop, some studies also utilized wall, belts/straps, blocks, and blankets on top of chairs. One study used resistance band in their intervention (Schmid et al., 2010).

Research Question 2: Outcomes Associated with Community-based Yoga Intervention for Older adults

Figure 2 illustrates outcomes associated with community-based yoga intervention. In terms of quantitate data, physical health outcomes were frequently investigated, whereas spiritual health outcome has never been investigated quantitively. Quantitative and qualitative data could be found in outcomes such as physical, clinical, wellness & lifestyle, psychological and social. Spiritual heath as outcome of yoga intervention was only evident in one study which collect qualitative data. Supplementary file 3 provides an overview of all instruments and methods used to assess the following health outcomes.

Physical Health Outcomes

Balance, mobility/gait speed, upper body strength, lower body strength, aerobic endurance, agility, dynamic balance, lower body flexibility, upper body flexibility, range of motion, lower extremity joint angles, joint moments of force, muscle activities, physical functioning performance were physical health outcomes measured in the included studies (Adams et al., 2019; Bucht & Donath, 2019; K.-M. Chen & Tseng, 2008; K. M. Chen et al., 2008; Cheung et al., 2016; Choi & Sohng, 2018; DiBenedetto et al., 2005; Gothe et al., 2014; Greendale et al., 2009; Lee et al., 2016; Lindahl et al., 2016; McCaffrey et al., 2017; McCaffrey et al., 2019; Miller et al., 2017; Ni et al., 2014; Noradechanunt et al., 2017; Park et al., 2014; Park et al., 2020; Patel et al., 2011; Salem et al., 2013; Schmid et al., 2010; Smith et al., 2017; Tatum et al., 2011; Tiedemann et al., 2013; D. S. Wang, 2010; M.-Y. Wang et al., 2016; Zettergren et al., 2011).

Improvement in overall physical function and capacity as qualitative themes were found in four studies (G. K. Alexander et al., 2013; K. M. Chen et al., 2007; Patel et al., 2011; Tatum et al., 2011).

Clinical Outcomes

Clinical outcomes are measurable changes in health, function or quality of life that result from health intervention (NHS, 2022). Fall, osteoarthritis symptoms, pain, type 2 diabetes mellitus, agitation, incontinence, spinal health indicator, independence, floor transfer ability/difficulty were clinical health outcomes measured in the included studies (Bucht & Donath, 2019; Cheung et al., 2016; Greendale et al., 2009; Huang et al., 2019; Kertapati et al., 2018; McCaffrey et al., 2017; McCaffrey et al., 2019; Park & McCaffrey, 2012; Park et al., 2014; Patel et al., 2011; Schmid et al., 2010; Smith et al., 2017; Tatum et al., 2011; Vaishali et al., 2012).

Perceived reduction in fall, pain management and reduction in medication as qualitative themes were found in four studies (Adams et al., 2019; K. M. Chen et al., 2007; Park & McCaffrey, 2012; Patel et al., 2011).

Wellness & Lifestyle Outcomes

Body composition, physical activity level, sleep, and general health/well-being were measured in the included studies (G. K. Alexander et al., 2013; Brenes et al., 2020; Bucht & Donath, 2019; K.-M. Chen & Tseng, 2008; K. M. Chen et al., 2008; K. M. Chen et al., 2007; Cheung et al., 2016; Choi & Sohng, 2018; Greendale et al., 2009; Kim et al., 2021; Lindahl et al., 2016; Noradechanunt et al., 2017; Park et al., 2020; Yao & Tseng, 2019).

Perceived improvement in body weight, energy and motivation, sleep, diet and health and well-being as qualitative themes were found in five studies (Adams et al., 2019; G. K. Alexander et al., 2013; K. M. Chen et al., 2007; Kim et al., 2021; Park & McCaffrey, 2012; Patel et al., 2011).

Psychological Health Outcomes

Depression, anxiety, worry, stress, life satisfaction, hope and morale were measured as psychological health outcomes in the included studies (Brenes et al., 2020; K. M. Chen et al., 2008; Choi & Sohng, 2018; Lindahl et al., 2016; McCaffrey et al., 2017; Noradechanunt et al., 2017; Park & McCaffrey, 2012; Park et al., 2014; Park et al., 2020; D. S. Wang, 2010).

Reduction of stress, anxiety, depression, enhancement of calmness, relax feeling, improvement in confidence and self-esteem as qualitative themes were found in three studies (G. K. Alexander et al., 2013; Patel et al., 2011; Tatum et al., 2011) .

Exercise-related Psychological Constructs

Outcome expectations and benefits, physical activity enjoyment, intention to continue, leisure constraints, perceived fitness, perceived exhaustion were exercise-related psychological constructs measured in the included studies (Adams et al., 2019; Cheung et al., 2016; Kim et al., 2021; Lindahl et al., 2016; Noradechanunt et al., 2017; Tatum et al., 2011).

Spiritual Health Outcomes

Spiritual health emerged as a theme in one study (Patel et al., 2011).

Others Health Outcomes

Quality of life (Bucht & Donath, 2019; Cheung et al., 2016; Greendale et al., 2009; Park et al., 2020), cognitive outcomes (Gothe et al., 2014, 2017; Pandya, 2020; Yao & Tseng, 2019), physiological (K.-M. Chen & Tseng, 2008; K. M. Chen et al., 2008; Lindahl et al., 2016) and social outcomes (Adams et al., 2019; Kim et al., 2021; McCaffrey et al., 2017; Patel et al., 2011; D. S. Wang, 2010) were other health outcomes measured in the included studies.

---------- Figure 2----------

Research question 3: Attrition, Adherence and Adverse events

Attrition, adherence, and adverse events data are important acceptability and feasibility data to both community health practitioners and researchers. Community health practitioners can make use of the following data to understand how well their program is being delivered and researcher can make use of the data to design future experimental studies. Supplementary file 4. contains the details of attrition, adherence, and adverse events.

Attrition and adherence rates are shown in table 1. *Attritions*: Overall attrition was 6.89% across a total of 30 intervention groups that provided the data. For the 19 studies which have provided reasons for dropouts, the top three reasons for dropping out during intervention

were health conditions, family obligations, and time conflicts. Other reasons include relocation, no longer interested, accident, travel, unwillingness to continue, death during the intervention, and difficulty of the intervention. *Intervention adherence*. Two indexes were mainly used to assess adherence rate: one is average attendance, and the other one is the percentage of participant adhering to 75% of all the intervention sessions. The overall median adherence to the scheduled number of intervention sessions was 83% across 22 yoga interventions, while the overall median adherence to 75% to the scheduled number of interventions was 74% across 7 yoga interventions.

Summary of adverse events

From the 41 studies included in this review, 23.3% (n=10) explicitly reported that no adverse events had occurred (Cheung et al., 2016; Gothe & McAuley, 2016; Lindahl et al., 2016; McCaffrey et al., 2017; McCaffrey et al., 2019; Park et al., 2014; Park et al., 2020; Patel et al., 2011; Schmid et al., 2010; Smith et al., 2017), 9.3% (n=4) reported adverse events recorded in the intervention group (Brenes et al., 2020; Huang et al., 2019; Park & McCaffrey, 2012; Tiedemann et al., 2013), while 67.4% (n=29) did not report information regarding the adverse events (Adams et al., 2019; K.-M. Chen et al., 2009; K.-M. Chen & Tseng, 2008; K. M. Chen et al., 2008; K. M. Chen et al., 2007; Gothe et al., 2014, 2017; Greendale et al., 2009; Kertapati et al., 2018; Kim et al., 2021; Miller et al., 2017; Noradechanunt et al., 2017; Pandya, 2020; Salem et al., 2013; Tatum et al., 2011; Vaishali et al., 2012; D. S. Wang, 2010; M.-Y. Wang et al., 2016; Yao & Tseng, 2019). Among those studies which reported the occurrence of adverse events among participants, the most common adverse events reported are musculoskeletal events.

Research question 4: Gaps requiring further research

Table 2 has consolidated the content of the interventions of the included studies into (PICO) framework: population; intervention (informed by TIDieR); comparator; and outcome.

The current scope of evidence highlighted three important areas that warrant further research. They are the sub-group of the older adults population, yoga types and outcome measures. The review revealed that most experimental studies delivered in community settings were conducted among healthy independent older adults, only some experimental studies attempted to investigate the effect of yoga interviews among community-dwelling older adults with health conditions like osteoarthritis and type 2 diabetes. The review also revealed that diverse types of yoga interventions were investigated in experimental studies, whether specific type of yoga interventions is more superior than others among the older adults group warrant further investigation. Lastly, most studies investigated the physical and clinical effects of yoga interventions, only one-third of the included studies investigated psychological effect, and only study investigated spiritual health effect. Further studies need to pay more attention to these outcomes.

---------- Table 2----------

Discussion

This scoping review has systematically consolidated, and synthesized information from published literature on what is known, about yoga intervention, for older adults in community settings. The main objectives of the study were to provide synthesized information for community health practitioners and identify gaps for researchers.

Content of community-based yoga intervention for older adults

The review identified eleven types of yoga for older adults delivered in community settings. Within the eleven types of yoga, there are yoga protocols developed by multidisciplinary health experts, hatha yoga, chair yoga, non-specific yoga programs and 7 distinctive forms of yoga based on certain schools or styles. While it will be of interest to the community health practitioner to know which type of yoga method or school might be more effective than others in terms of specific health outcomes, there is currently not adequate evidence in the literature for meta-analysis. For example, there exist only one study on “Kripalu Yoga” (M.-Y. Wang et al., 2016; Zettergren et al., 2011), “Thai Yoga” (Noradechanunt et al., 2017), “Sauna Yoga” (Bucht & Donath, 2019), “Vinyasa Yoga” (Bucht & Donath, 2019), “Rewind Yoga” (Miller et al., 2017), “Glenmore Ageless” (Tatum et al., 2011), “Floor-seated Yoga Program” (Choi & Sohng, 2018). Only “Iyengar yoga” appeared in 19.5% of the included studies (G. Alexander et al., 2012; G. K. Alexander et al., 2013; DiBenedetto et al., 2005; Huang et al., 2019; Tiedemann et al., 2013). Although impossible to perform a meta-analysis based on different types of yoga schools/styles. This review, however, identifies important intervention content moderators that might be meaningful for meta-analytic subgroup analysis. For example, 54.5% of the yoga intervention has provided details on how they tailored the yoga postures to the physical capacity of older adults, and 56.1% of the studies have made use of yoga props to provide extra support to older adults’ yoga postures. Recent

systematic review finds the use of yoga props able to address age-related physical limitations (Denham-Jones, Gaskell, Spence, & Pigott, 2022), future meta-analyses may treat this as moderator to assess effectiveness of yoga intervention for older adults.

Outcomes Associated with Community-based Yoga Intervention for Older adults

The current study provided an overview of different health outcomes associated with community-based yoga intervention for older adults in qualitative, quantitative, and mixed-method studies. Yoga, which this review defines, is a form of "mind-body exercise" recognized by contemporary exercise disciplines. While there is no surprise that the "body" component (i.e., physical health outcomes) such as fitness parameters and physical functioning outcomes are frequently investigated in the current review, it is surprising that the "mind" component of yoga (i.e., psychological health) received relatively less attention in the included studies. Yoga intervention included in this review involves a combination of physical form (i.e., physical bodily movements/postures) and non-physical form (i.e., breathing awareness, relaxation, and meditation). Although the non-physical form, has the potential to affect psychological health outcomes positively, it is strange that an unequal amount of attention was on psychological health outcomes in the literature. Globally, over 20% of older adults suffer from psychological health problems like depression and anxiety (World Health Organization, 2022). Untreated or inadequately treated mental health problem amplifies functional disabilities (Souci et al., 2006) and negatively impacts the quality of life of an individual (Lopez, Mathers, Ezzati, Jamison, & Murray, 2006). For psychological health variables like depression, meta-analysis revealed that all types of supervised exercise intervention (i.e., aerobic exercise, resistance training, qigong/tai chi) has significant moderate effect in treating depression (Heinzel, Lawrence, Kallies, Rapp, & Heissel, 2015), yet currently there is inadequate primary studies to conduct meta-analysis to study the effects

of yoga interventions on depression. This review identifies an important gap in the literature regarding the lack of investigation on psychological health effects of yoga interventions.

Yoga, although non-religious-based, showed the potential to improve spiritual health in one of the included studies in this review. Qualitative data from one study found perceived enhancement in spiritual health after participating in yoga intervention (Patel et al., 2011); participants felt more in touch with their self and more peaceful. Spiritual health is being recognized by research that has the unique power to coordinate the physical, mental and social dimensions of people (Vazifeh doust, Hojjati, & Farhangi, 2020). Spirituality improved subjective well-being and quality of life, particularly among older adult groups (Aglozo, Akotia, Osei-Tutu, & Annor, 2021) through increasing their capacity to endure stressful events like chronic disease, and loss of family members in late life (Zimmer et al., 2016). Although more evidence is needed to know more about the effectiveness of yoga intervention in enhancing spiritual health, this is an important finding from this scoping review. This illustrates that yoga intervention is uniquely different from other forms of exercise form such as aerobic exercise, resistance training and stretching activity in which spiritual health benefit was seldom reported. Also, spiritual health is one of the important indicators of successful aging (Bhattacharyya, Molinari, & Andel, 2022) .

Attrition and Adherence and Adverse events

The median adherence rate of community-based yoga interventions of 83% identified in the current review is encouraging. The average adherence rate is higher that identified in a meta-analytic review of fall prevention exercise programs for community-dwelling older adults (i.e., 66%) (Osho, Owoeye, & Armijo-Olivo, 2018). A high or adequate adherence is important as previous literature showed that adherence levels >80% have a higher magnitude effect on health outcomes (Osho et al., 2018).

The median attrition rate of community-based yoga interventions of 6.89% identified in the current review is encouraging. This attrition rate could be considered as low as research found out that exercise intervention for older adults could experience an approximate 50% attrition rate in the first 3-6 months (Dishman, 1991).

The current study found the most common adverse events from community-based yoga participation were musculoskeletal events, similar to the physical exercise interventions for community-dwelling older adults from a meta-analytic review (Giné-Garriga, Roqué-Fíguls, Coll-Planas, Sitja-Rabert, & Salvà, 2014). The understanding of common adverse event is important as it is an important source of evaluating the safety of an intervention (Wayne, Berkowitz, Litrownik, Buring, & Yeh, 2014).

Limitations and Strengths

This review has two major limitations. Firstly, the review only focuses on "Yoga" as a type of physical exercise in the contemporary exercise science discipline, while "Mindful Yoga" or "Mindfulness Yoga," which primarily focus on the cognitive and psychological component, is not considered in this review. Secondly, the heterogeneous nature of yoga types and the limited number of studies prevented us from conducting a meta-analysis to analyze the extent of the effects.

This review provided an overview of all the different types of community-based yoga interventions for older adults documented in the literature and synthesized an overview of all the outcomes associated with these yoga interventions. It provides the community-health practitioners with information on attrition, adherence, and adverse events to consider when organizing community-based yoga intervention. The scoping review also identified important gaps for future research.

Conclusion and Future Research Directions

This review identified that currently, there is a limited number of experimental studies conducted among community-dwelling older adults suffering from certain illness conditions. There was only a minimal number of studies investigating the effects of yoga classes offered in community settings that treat specific health outcomes such as osteoarthritis, type 2 diabetes, hyperkyphosis, dementia, post-menopause, falls, elevated worry, and urinary incontinence. It is noteworthy to highlight that although yoga, is considered a form of physical exercise in the contemporary exercise science discipline. Medical practitioners could prescribe yoga to treat specific clinical symptoms in traditional Indian medical systems (Frawley, 2008). In the future, more studies could focus on investigating the effects of community-based yoga intervention on specific health outcomes among older adults. For intervention content and delivery, the current review identified major yoga types, providers, delivery mode, session time, frequency, and duration being studied in the literature. These provide important clues for moderator analysis for meta-analysis in the future. For outcomes measures, the review highlighted most evidence that investigated the effects of community-based yoga for older adults on “bodily” outcomes; an unequal amount of attention was on the “mind” outcomes (i.e., psychological) and spiritual outcomes; future research may pay more attention to these outcomes.