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# The Use of Yoga in Occupational Therapy for Neurologically Involved Clients

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# Honors Senior Thesis
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# The Use of Yoga in Occupational Therapy for Neurologically Involved Clients

By

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Living with the long-lasting effects of a cerebrovascular accident (CVA), also known as stroke, has become a reality for millions of Americans in the United States. Reduced upper and lower extremity function, decreased balance and problematic mobility, and reduced daily independence are only a few residual symptoms which can affect function and quality of life for those affected by stroke. Over seven million Americans, ages 20 or older, self-reported having had a stroke in 2018 (The American Heart Association, 2018). Projections indicate that by 2030, an additional 3.4 million Americans over the age of 18 will have had a stroke (Benjamin et al., 2018). Due to these staggering predictions, there is a need for meaningful, effective treatments to promote functioning for these individuals. Occupational therapy (OT) is a profession that plays a central role in filling this need for quality daily living. While OT has many researched and effective interventions for clients who have experienced a stroke, there are additional emerging techniques and therapeutic activities that may be beneficial for clients status post stroke, such as adapted yoga.

As an OT student who has an interest in the practice area of neurology, which includes those with stroke and in optimizing functional capacity and health, I want to better understand what the literature says about how yoga is being utilized in occupational therapy with individuals who are status post stroke. To better understand the plausibility and efficacy of yoga as an intervention strategy, a comprehensive review of the availed literature is warranted. This scoping review will examine the findings of empirical studies which investigated the physical and mental benefits of yoga with the neurologically involved population of stroke.

## Literature Review

In order to best understand how yoga can be used in occupational therapy for stroke, it is important to first define the domain of OT and the specific areas of need which are addressed with neurologically involved clients. As OT is concerned with the continuum of health and wellness versus disease and dysfunction, the notion of rehabilitation will be discussed. Next, a comprehensive understanding of the process and residual symptoms of stroke which affect daily functioning will be detailed. Yoga will then be defined and discussed as one occupation-based treatment strategy for those with stroke. This review begins by describing the scope and role of occupational therapy in stroke rehabilitation.

### The Scope of Occupational Therapy

Occupational therapy is the therapeutic use of everyday life activities (occupations) with individuals or groups to enhance participation in roles, habits, and routines in a variety of settings, such as home and community settings (American Occupational Therapy Association [AOTA], 2014b). OT practitioners are knowledgeable in the interaction between a person, their engagement in meaningful occupations, and the context in which the functional situation occurs. They use this knowledge to create occupation-based intervention plans that promote change or growth for a client by adapting or modifying the environment or objects in the environment, ultimately leading to increased occupational participation (AOTA, 2014a). OT services can be provided for multiple stages of recovery, including habilitation, rehabilitation, and promotion of health and wellness for clients with both disability and non-disability-related needs (AOTA, 2014a). Individuals who have experienced a diagnosis of stroke are one example of a population who receive rehabilitative, health promotion and adaptive interventions from occupational therapy practitioners.

### Stroke

In order to comprehend OT's role in stroke care, it is important to first understand the impact of stroke on a person's health. Before anything was known or discovered about stroke, the term 'apoplexy' was used to describe the experience of sudden paralysis (Sutton, 2008). Johann Jacob Wepfer, a Swiss pathologist and pharmacologist from the1600s, was the first person to investigate apoplexy and isolated brain bleeds in persons who died from apoplexy. He also suggested that apoplexy could be caused by a blockage of one of the carotid and vertebral arteries (Sutton, 2008). This seminal work grounded current day understanding of the mechanisms and causes of cerebrovascular accidents.

Today, stroke is defined as "rapidly developing clinical signs of focal (or global) disturbance of cerebral function, with symptoms lasting 24 hours or longer or leading to death, with no apparent cause other than of vascular origin" (Warlow, 1998, p. 1). A stroke can occur when the blood supply to an area of the brain is suddenly interrupted, or when a blood vessel bursts, leading to blood spilling into the spaces surrounding the brain cells (Sutton, 2008). When blood supply is stopped or when a blood vessel bursts, there is initial damage to the prescribed area of the brain affected by the mechanism. Further compounding the damaging effects of the initial incident is the swelling which occurs to the surrounding tissues (Falvo & Holland, 2018). In order to better understand the residual functional deficits which result from strokes, a more thorough understanding of the mechanisms by which they are caused and the areas in the brain which are compromised is needed.

***Types of Stroke and Symptoms by Location***

Strokes are categorized by cause or mechanism of the event. When there is a blockage of an artery supplying blood to the brain, it is known as an ischemic stroke, and these account for 85% of all strokes (Sutton, 2008; Falvo & Holland, 2018). The most common form of blockage is a blood clot, and classification further details specific types of blood clots. In an embolic ischemic stroke, the clot forms in another part of the body and then moves to the brain; whereas, a thrombotic ischemic stroke occurs when the clot forms in one of the cerebral arteries (Sutton, 2008). Based on the prescribed area of the brain affected, results of the various motor, visual, perceptual, and functional deficits will manifest.

Hemorrhagic strokes result in bleeding in the brain. Aneurysms, or bleeds, resulting from a weak or thin spot in the wall can occur (Boyt Schell et al., 2014). Rupturing of arterial walls, generally due to hypotension, or arteriovenous malformation (AVM) are two other mechanisms for stroke (Boyt Schell et al., 2014; Sutton, 2008). An AVM is a tangle of arteries of veins connected by an abnormal passageway, which increases the likelihood of rupturing. Hemorrhages in the brain cause damage because the presence of blood deprives certain areas of oxygen and increases the pressure on the brain (Falvo & Holland, 2018). Not only does the cause of stroke ultimately effect the person's outcomes, but the area in the central nervous system or brain is also pivotal in determining residual deficits.

The symptoms of stroke can vary based on which hemisphere of the brain the stroke occurs. In right sided strokes, the individual will experience left sided paralysis or weakness, affecting the motor control of the arm and leg (Boyt Schell et al., 2014). Spatial-perceptual deficits, such as loss of depth perception or difficulty navigating their environment due to lack of awareness of stimuli on the left side of their body, is typical. Additionally, memory deficits can manifest. For example, they may not recognize familiar people or places, or they may forget where they placed items. Finally, they may have quick and impulsive behavior (Falvo & Holland,

2018). Conversely, in a left hemisphere stroke, the individual will be faced with right sided paralysis or weakness, language deficits such as aphasia and slow, cautious behaviors. Finally, they will have decreased problem solving (Falvo & Holland, 2018).

There are also a number of symptoms that one will experience while having a stroke, regardless of hemisphere. There may be sudden numbness or weakness of the face, arm, or leg on one side of the body (Edmans, 2010; Boyt Schell et al., 2014). The individual may be suddenly confused or have trouble speaking or understanding speech. In addition, they may have sudden trouble walking, dizziness, or loss of balance and coordination. They may state that they have a sudden severe headache and/or sudden loss or blurring vision in one or both eyes (Edmans, 2010; Schell et al., 2014; Sutton, 2008). These symptoms may be short lived or can last for days, weeks, months, and even years following incident.

***Effects of Stroke***

After experiencing the initial symptoms indicative of stroke, the individual will be faced with various motor, visual, sensory, cognitive, communication, and/or emotional deficits. A diagnosis of stroke affects many facets of the person's ability to function. Motor may be affected, resulting in a complete paralysis (hemiplegia) or weakness (hemiparesis) (Sutton, 2008). Another potential motor manifestation is spasticity, or tightness of the limbs, which if not treated, can lead to the shortening of muscles or tendons, known as contractures (Wolf, 2014). In some cases, the individual may experience 'pusher syndrome' and actively move away from their non-hemiparetic side resulting in loss of balance (Edmans, 2010). Additional movement challenges include impaired coordination, or ataxia, and the inability to perform a movement despite having the physical capabilities to complete it, or apraxia (Boyt Schell et al., 2014). All of the aforementioned motoric problems can impede functional daily life and the performance of such occupations as dressing, toileting, ambulating and transferring safely from one surface to another.

In addition to motor deficits, an individual may have visual and sensory deficits, which can impair touch, temperature, pain, and position sensations. Paresthesia is a condition where tingling, burning, and pain are experienced, interfering with function and creating discomfort (Falvo & Holland, 2018). The individual may also have visual deficits such as hemianopsia where they can only perceive half of their visual field (Pendelton & Schultz-Krohn, 2018). Another prominent deficit of individuals who have had a stroke involves cognition. Generally, they may experience deficits in thinking, awareness, attention, learning, judgement, and memory (Pendelton & Schultz-Krohn, 2018). Cognitive deficits may also result in a perceptual neglect, which is when they are not aware of one side of their body or one side of their visual field (Sutton, 2008). These symptoms in combination make the performance of daily tasks such as dressing, getting to and from bed and basic problem solving very challenging.

If the stroke occurred on the left hemisphere of the brain, then the individual could have various forms of aphasia. Nonfluent aphasia, or Broca's aphasia, results in articulation problems, hesitancy, and reduced vocabulary and grammar (Falvo & Holland, 2018). On the other hand, they may have fluent aphasia, also known as Wernicke's aphasia, which manifests in effortless speech, relatively normal grammar structures, and increased verbal output, but the content of the information they are communicating doesn't make sense (Pendelton & Schultz-Krohn, 2018). If they have both the inability to use language and also severe difficulty with understanding language, they are known to have global aphasia (Falvo & Holland, 2018). From

a functioning standpoint, the complex and multifaceted symptoms affect many body systems, leading to often long-term rehabilitation needs.

***Occupational Therapy's Role in Stroke Rehabilitation***

When diseases like CVA happen, occupational therapy is necessary in the rehabilitation of those trying to heal from the ill effects of the residual symptoms. Occupational therapy practitioners, therapists and therapy assistants, are an important member of the team for stroke rehabilitation due to the changes in physical, cognitive, and emotional factors that the individual faces, ultimately hindering daily activities. OT is present at all stages of the continuum of care post-stroke, including acute, sub-acute, chronic, and post-rehab at home and in the community (AOTA, 2015). Outcome goals vary depending on the setting, however the goal is to always move the client along the continuum from disease and dysfunction toward health and wellness, as disability is placed along a linear continuum with health (Kostanjek, 2011). Disability is a term that encompasses impairments, activity limitations, and participation restrictions; it involves the negative aspects of the interaction between a person's health conditions and their contextual factors (World Health Organization [WHO], 2001). On the other end of this spectrum is health, which is "a state of complete physical, mental, and social well-being, and not merely the absence of disease or infirmary" (WHO, 2006, p.1). OTs provide services in the realm of disease and dysfunction with the goal of increasing their client's quality of life to move them toward health and wellness.

No matter the setting or stage of recovery, OT practitioners use the OT process when providing service to clients. Once the client has been medically stabilized and is referred to OT services, an evaluation is completed in order to get a better understanding of their priorities and also their limitations. One step of the evaluation includes an occupational profile, which summarizes "the client's occupational history and experiences, patterns of daily living, interests, values, and needs" (AOTA, 2014a, p. S13). An interview is utilized for the occupational profile in order to gather information to understand what's important to the client and to start creating goals with them (AOTA, 2014a). Not only is the initial interview important for better understanding the client, but it is also a good tool to use with individuals, status post CVA, to screen for cognition and aphasia (Edmans, 2010). In addition to interviewing the client to create an occupational profile, the therapist also completes an analysis of occupational performance. In this stage, the client's assets and problems are further identified through the use of functional observation and assessments to gather information about supports and hindrances to occupational performance (AOTA, 2014a). Through functional observation, the therapist can decide what performance components are causing the functional deficits and can implement them into the intervention plan. These functional deficits can either be sensorimotor, cognitive, psychological, or psychosocial (Rowland, 2008). Screenings can be used to further pinpoint deficits (Edmans, 2010).

After the specific deficits of the client are established, the OT practitioner can begin implementing interventions to address those areas. These can include interventions for motor, sensory, cognitive, and perceptual impairments (Edmans, 2010). Rudimentary treatment in stroke rehab can include neuromuscular interventions such as balance training, postural awareness, motor learning, and constraint-induced movement therapy. Musculoskeletal interventions can include strengthening, mobilization/manual therapy, stretching/passive range of motion, edema control, and aerobic exercise (Boyt Schell et al., 2014).

OT practitioners focus on designing intervention activities using the information obtained during the occupational profile that appeal to the client while also addressing their deficits (Wolf, 2014). Clients, status post stroke, often need assistance when doing activities due to the residual effects of their stroke (Wolf, 2014). Therefore, it is important to find an activity that the patient is capable of completing. Yoga is a possible alternative practice that can be used both during rehab and after discharge that can be easily adapted to meet the needs of the individual, whether they have physical or cognitive deficits (Bonura, 2011; see also Wolf, 2014).

**Yoga Background**

Yoga is an ever-growing practice in the Western world that can be used to improve health and wellness for various populations. In order to assess yoga as a potential occupational activity that can be used in the rehabilitation of stroke survivors, it is important to first understand the history of yoga and its implementation into the western world. There are multiple definitions of yoga that range from general to specific. Some describe yoga as "any ascetic technique and any method of meditation" (Eliade, 1969, p. 4), while others provide a more specific definition by describing yoga as experiencing "freedom and spontaneity through the adoption of a specific way of life, defined by ethics, movement, and meditation" (Chapple, 2008, p. 1). No matter what definition, the underlying goal of yoga is the same: to discover truth through experiencing higher consciousness and utilizing specific postures and movement patterns to do so (Vishnu-devananda, 1998). Truth can be experienced through transcendence of the senses and when the mind and intellect cease functioning (Vishnu-devananda, 1998). In its simplest explanation, yoga also uses body movements such as stretching, posing, and bending to improve flexibility, muscle tone and overall strength. With a large number of people leading a sedentary lifestyle, yoga can be used to encourage movement, which is why it is increasingly used in the healthcare system as a form of treatment for various diagnoses.

***The Triple Aim***

Not only are occupational therapists beginning to integrate such activities as yoga into their efforts to normalize muscle tone, improve bilateral use of extremities and promote healthy activities, others are also. Yoga therapists, who empower individuals to progress toward improved health and well-being through the application of the teachings and practices of yoga ("Contemporary Definitions of Yoga Therapy," n.d.), are also becoming a presence in Western health care landscapes. In order to integrate yoga therapy into the healthcare system, a framework called *The Triple Aim* can be followed (Weber & Sculthorp, 2016). The Triple Aim was developed in 2007 by the Institute for Healthcare Improvement (IHI) and is designed as an approach to optimizing health system performance. The three components are "improving the patient experience of care (including quality and satisfaction), improving the health of populations, and reducing the per capita cost of healthcare" ("The IHI Triple Aim," n.d.). While this framework is general for all healthcare, it can have a specific application to the integration of yoga therapy into the healthcare system.

Per the first aim, yoga can improve patient experience of care. Yoga is client-centered as opposed to disease-centered, which empowers clients to take on an active role in their recovery (Weber & Sculthorp, 2016). The versatility of yoga also makes it possible to adapt to a range of populations and in a wide array of therapeutic contexts such as occupational therapy. Additionally, yoga impacts the third aim of reducing costs (Taylor & McCall, 2017). First, it can be delivered in a way that doesn't require additional staff; only minimal costs are associated with

training on adapted yoga for specialized populations such as those with neurological disorders. It also does not require any expensive equipment and when it does require equipment, it is usually only props such as a blanket, a foam wedge, or straps (Weber & Sculthorp, 2016). Yoga therapy can also reduce the recovery time of patients by improving other areas of intervention indirectly, thereby reducing the costs (Weber & Sculthorp, 2016). By applying yoga, in this instance adapted yoga, to *The Triple Aim*, patients and organizations stand to benefit. Rehabilitative efforts for those having experienced stroke can be complimented by offering activities that are appropriate for neuromuscular re-education following incident, but can also be used after discharge as a healthy activity choice. Typically, nearly three-quarters of all stroke cases occur in people over the age of 65, and the risk of stroke also doubles for every decade after the age of 55 (American Heart Association, 2019). Therefore, special considerations for this group of older individuals is necessary when implementing yoga as a treatment.

***Yoga Types for Older Adults***

As yoga becomes more and more integrated into the healthcare system, there are a number of considerations for its use with various populations. Specifically, older adults may not be able to complete yoga in the traditional sense and therefore need certain adaptations when practicing it. There are a number of different forms of yoga, however not all forms are safe for older adults (Table 1).

Table 1

*Summary of Yoga Types as Applied to Older Adults*

| **Type of Yoga** | **Main Concepts** | **Concerns Regarding Older Populations** |
|---|---|---|
| Hatha Western | · Typically what is referred to as “yoga” (Hanc, 2009)<br>· Slow, controlled movements to build strength and increase flexibility (Riley, 2004)<br>· Focus on breathing (Riley, 2004) | · Applicable due to emphasis on quality of body postures, alignment, and bilateral integration<br>· Effective for stress relief and relaxation (Hanc, 200) |
| Iyengar | · Emphasis on alignment (Williams et al., 2005)<br>· Slow movements (Bonura, 2011)<br>· Heavy use of props to extend ROM (Hanc, 2001) | · Applicable due to emphasis on body alignment<br>· Props allow beginners to get into positions they otherwise would not be to do (Hanc, 2001) |

| | | |
|---|---|---|
| Vinyasa | · Vigorous, fast movements (Bonura, 2011) | · Not recommended for older adults not in excellent physical condition with no joint or mobility issues (Bonura, 2011)<br>· Fast pace of transitions; does not allow ample time for quality movements and tone normalization |
| Hot Yoga | · High temperatures typically above 100° F (Bonura, 2011)<br>· Slow movements<br>· Emphasis on stretch | · Applicable for older adults with mobility issues (Hanc, 2001)<br>· Should be avoided by individuals with diagnoses contraindicated for heat, such as heart or skin conditions (Bonura, 2011) |

**Perceived Benefits of Yoga Post Stroke**

Existing literature relating to yoga therapy demonstrates a multitude of physical and mental improvements of participants who have experienced a stroke. Almost all research shows positive and significant physical and mental improvements following various yoga treatments, with very few showing non-significant improvements (Garrett et al., 2011; Puymbroek et al., 2014; Harris et al., 2019; Schmid et al., 2012; Schmid et al., 2014; Immink et al., 2014).
A qualitative study of stroke survivors aimed to investigate the experiences and perceived outcomes of a 10-week yoga program involving movement, breathing, and meditation practices (Garrett et al., 2011). In regard to physical improvements, results indicated that seven of the nine participants reported greater sensation following the program, which also improved other areas of functioning. For example, one participant was more aware of her ankle and was therefore able to correct its position when it was in misalignment, potentially having positive carry over during occupational activities such as safer functional gait patterns. Other participants became more focused on not letting their non-affected side take over daily activities (Garrett et al., 2011). In addition to physical improvements, the participants also reported mental improvements. In general, they experienced increased energy, confidence, concentration, and reduced stress. Eight of the nine participants reported feeling more relaxed and calmer after the program, and they related this to the program making them slow down and forcing them to take time for themselves. The participants also implemented the techniques they used outside of yoga classroom by using taught breathing strategies to both calm down when stressed or calm down when trying to go to sleep (Garrett et al., 2011). In addition to relaxation, the program helped participants' cognitive dysfunction by improving concentration and communication, which lead to increased confidence when engaging with others. Finally, the program helped the stroke survivors to become more comfortable with their diagnosis by increasing their self-acceptance despite their limitations, improving their mood, and teaching some participants coping skills they could use to cope with their post-stroke symptoms (Garrett et al., 2011).

Another qualitative study of individuals with chronic stroke aimed to understand the perceived outcomes following an eight-week yoga intervention (Puymbroeck et al., 2014). The focus group results showed similar improvements of sensation perception, especially in the participants' hands and fingers. One participant experienced increased hand function after

previously having difficulty using her fingers due to peripheral neuropathy. In addition to changes in sensation, the results also demonstrated improvements in body structures and function. One participant explained that increased movement in their ankles led to increased stability and control when standing, while other participants were more comfortable with moving around different areas in homes and communities following the yoga program (Puymbroeck et al., 2014). The focus group participants had additional improvements in body function that the researchers were not expecting. Several participants reported improved vision due to an increased mind-body connection. This improved vision led to them participating in other activities, such as reading books. In addition to the unexpected result of improved vision, the study also yielded a reduction in symptoms of comorbidities, such as diabetes causing numbness in the limbs, and an increase in breathing freely without restraint (Puymbroeck et al., 2014). Mental improvements following the program included overall improved emotional regulation. Specifically, they were able to impact and manage the emotions associated with entering back into a society after a stroke and decrease their anxiety due to the calming nature of the program (Puymbroeck et al., 2014).

In another inquiry that utilized focus groups of post-stroke community dwelling adults, researchers set out to determine perceived benefits to yoga participation (Harris et al., 2019). The participants identified various physical benefits, which included flexibility, strength, coordination, and posture. One participant noted that yoga targeted muscles not typically used, while others noted that the yoga benefits were widespread and impacted the whole body. Another important comment was that participants who had experienced permanent loss of function on one body side could visualize the affected limbs moving during yoga (Harris et al., 2019). The study also identified positive mental health effects in addition to physical benefits. The participants reported improvements regarding feeling healthy in mind, and attested these improvements to reduced depression and anger and also feeling more relaxed. The increased relaxation also resulted in improvements in sleep quality (Harris et al., 2019).

Yet another study, a randomized pilot inquiry which examined the impact of yoga-based rehabilitation for people with chronic stroke, found overall balance improvements in participants following an 8-week yoga program (Schmid et al., 2012). Specifically, the yoga group participants received an average score >46 on the Berg Balance Scale (BBS), which indicated they crossed the threshold of balance impairment and fall risk. In addition, the yoga group participants' balance self-efficacy improved following the program which promoted more dynamic activities participation in more challenging environments. While still aware of fall risks, participants were able to grow their confidence in staying balanced (Schmid et al., 2012). Additional benefits were found in a randomized pilot study assessing the change in physical functioning of people with chronic stroke following an eight-week yoga program (Schmid et al., 2014). The yoga program resulted in significant improvements in pain scores, bilateral neck ROM, and bilateral passive hamstring ROM. There were also improvements in hip flexion active ROM, however the results were not significant. There were also noted improvements in upper extremity strength. Conversely, no gains in lower extremity strength were found. Finally, the yoga program resulted in significant improvements in endurance. Specifically, the yoga group demonstrated an increase in the average number of feet walked in 6 minutes (Schmid et al., 2014).

While the previous studies demonstrated that various yoga programs yielded physical benefits, there are other studies that have shown no physical changes after participation in a yoga program. A randomized controlled trial that examined the efficacy of yoga for motor function, mental health, and quality of life outcomes of individuals with chronic post-stroke hemiparesis demonstrated improvements in functional outcomes relating to mobility and balance; however, the results were not statistically significant (Immink et al., 2014). Similar improvements also occurred in the control group. The researchers acknowledge that this lack of change could be a result of an underpowered sample size (n=22). Despite the statistically non-significant change in mobility and balance, there was a significant improvement in the participants' perceived motor function based on the Stroke Impact Scale (SIS). These perceptions described during the post intervention interviews include reports of greater strength and also improved flexibility and sensation in the affected side (Immink et al., 2014). The trial also showed improvements in mental health along with motor improvements. The participants in the yoga group experienced a larger reduction in train anxiety, and their state anxiety scores also decreased. Specifically, there was an 8-point decrease in the mean trait anxiety scores, which represents a clinically significant change. The researchers state that the participants' decreased anxiety could be due to "improvements in awareness of emotional states; development of behavioral strategies to induce calmer states, such as slow deep breathing; and other coping strategies for dealing with the circumstances around stroke-related disability" (Immink et al., 2014, p. 266). This study, in addition to the aforementioned studies, demonstrate the various physical and mental benefits that yoga therapy can yield for those experiencing the residual effects of stroke.

**Summation of Literature Review**

With over seven million adults affected by stroke in the United States in 2018 alone, there is a need for meaningful and effective treatments to address residual physical and mental effects (The American Heart Association, 2018). To address these residual effects, adapted yoga may be effective when implemented into occupational therapy intervention for this population. While some empirical research (Garrett et al., 2011; Puymbroek et al., 2014; Harris et al., 2019; Schmid et al., 2012; Schmid et al., 2014; Immink et al., 2014) has been done to examine the utility of yoga and adaptive yoga for neurologically involved clients, greater understanding of the specifics of such studies is needed.

The purpose of this scoping review is to better understand what the empirical literature reports to be the rehabilitative implications of yoga for the neurologically involved population of adults, specifically those who have experienced CVA. Research questions were: (1) How does the use of yoga as a treatment technique support occupational health and wellness within the scope of occupational therapy practice? (2) What are the outcomes for patients who have utilized adapted yoga as part of their rehabilitation?

## Methodology

To examine the research questions, a scoping review was conducted. The aim of a scoping review is to rapidly map the key concepts and the main sources and types of evidence available in a research area (Mays, Roberts, & Popay, 2001). They are used to address broader topics where a number of study designs may be applicable (Arskey & O'Malley, 2005), which is why it was chosen in place of a systematic review which addresses a more specific topic. Additionally, scoping reviews enable the inclusion of both qualitative and quantitative data

(Peters et al., 2015) which makes this methodology appropriate, as the existing research regarding yoga's use with the neurologically involved population includes both qualitative and quantitative data.

This review was informed by Arskey and O'Malley's (2005) framework for scoping reviews which is a five-step process that includes: (1) identifying the research question, (2) identifying relevant studies, (3) study selection, (4) charting the data, and (5) collating, summarizing, and reporting the results.

**Identifying the Research Question**

The focus of this review was the exploration of existing research regarding the rehabilitative implications of yoga for the neurologically involved population of adults status post CVA. To ensure that a comprehensive view of the literature was captured, the following research questions were formulated: (1) How does the use of yoga as a treatment technique support occupational health and wellness within the scope of occupational therapy practice? (2) What are the outcomes for patients who have utilized adapted yoga as part of their rehabilitation?

**Identifying Relevant Studies**

Database selection and search criteria was discussed between myself, as the researcher, and a university librarian. The following databases were selected for this study: CINAHL (Cumulative Index of Nursing and Allied Health Literature), MEDLINE Complete, OT Search, and PubMed. Search terms and phrases used within the databases included: ("yoga" OR "yoga therapy" OR "yoga exercise") AND "occupational therapy" AND ("stroke" OR "cerebrovascular accident" OR "cva") and ("yoga" OR "yoga therapy" OR "yoga exercise") AND ("stroke" OR "cerebrovascular accident" OR "cva"). Reference lists of initially selected research were also hand searched for any additional sources not yielded from the databases.

When selecting articles from the chosen databases, I established a number of inclusion and exclusion criteria. Inclusion criteria included articles that were: (1) published in or after 2010, (2) peer-reviewed, (3) written in English, (4) dealing with populations of adults or older adults, and (5) inclusive of content centering on yoga or adapted yoga in inpatient or outpatient neurological rehabilitation. Exclusion criteria was helpful in omitting literature that: (1) involved pediatric populations, (2) focused on the use of hot yoga, and (3) addressed other diagnostic categories within and outside of neurology.

**Study Selection**

Using the key search descriptors in the selected databases, 307 total sources were identified. Each abstract was screened, and a total of 30 articles were chosen for further review after exclusion of irrelevant and duplicated articles. The full text of each article was obtained in order to further assess them for eligibility, and I applied the inclusion and exclusion criteria to all the citations. A total of 12 articles were deemed eligible for inclusion in the scoping review.

**Charting the Data and Collation**

Summaries of each of the 12 articles were recorded relating to the author(s), year of publication, discipline, study design, study purpose, subjects/participants, intervention (including type of yoga used, if given), and outcomes of the intervention. Once summarized, the outcomes of each of the studies were synthesized into four themes and thirteen subthemes. The twelve articles came from a number of different disciplines; five of the twelve came from occupational therapy, three were from the health sciences, and four were interdisciplinary (including the fields

of OT, physical therapy (PT), recreational therapy, social work, yoga therapy, and medicine). These studies are further discussed in the following results section.

## Results

Articles chosen for inclusion in the final analysis represented a diverse range of outcomes. These outcomes were synthesized, resulting in the emergence of four common themes: physical changes, psychosocial influences, occupational participation, and connection of mind and body. The theme of physical changes included the subthemes of balance, mobility, range of motion (ROM), pain, endurance, strength, comorbidities, and disability level. The theme of psychosocial influences included the subthemes of depression, anxiety, emotional regulation, relaxation, and quality of life (Appendix A). Development of these themes helped me to understand the common outcomes for clients status post stroke who have participated in a yoga program.

### Physical Changes

Multiple physical changes were noted in nine of the twelve studies, or seventy five percent of the availed literature (Atler et al., 2016; Garrett et al., 2014; Harris et al., 2018; Hinsey et al., 2016; Immink et al., 2014; Portz et al., 2018; Puymbroeck et al., 2014; Schmid et al., 2012, 2014). Not only did quantitative outcomes demonstrate the improvements in physical fitness of the subjects following participation in a yoga intervention, but the participants also described their perceived improvements in various physical domains in qualitative studies. Across the studies, the subthemes of balance, mobility, range of motion (ROM), pain, endurance, strength, comorbidities, and disability level were discussed.

#### *Balance*

One of the most common outcomes resulting from the differing yoga interventions was the subtheme of balance. Five of these studies demonstrated positive and significant changes in the area of balance with only one showing non-significant improvements. For example, a randomized pilot inquiry, coming out of the field of OT, which examined the impact of yoga-based rehabilitation for those with chronic stroke revealed overall improvements in balance after an eight-week yoga program (Schmid et al., 2012). The subjects had completed all stroke rehab, and their average age was 63.1. After completion of the intervention, the subjects participating in the yoga group experienced significant improvements on Berg Balance Scale (BBS) scores, which is a scale that assessed balance and fall risk levels in older community-dwelling adults (Blum & Korner-Bitensky, 2008). Specifically, their scores averaged to >46, which represents a lower threshold of balance impairment and fall risk. The subjects in the yoga group also demonstrated significant improvements on balance self-efficacy on the Activities-specific Balance Confidence (ABC) Scale (Schmid et al., 2012), which is a measure of fear of falling while performing selected activities (Talley et al., 2007). An additional inquiry coming out of OT revealed balance improvements by also utilizing the BBS and ABC scale. This noncontrolled pretest-posttest pilot study design aimed to assess the change in balance, balance confidence, and fall risk factor management after an eight-week yoga intervention (Hinsey et al., 2016). Subjects in the study had to be at least six months post stroke who had completed all stroke rehabilitation, and their average age was seventy three years old. After the modified yoga program which included modified physical postures, breathing exercises, and meditation, BBS scores significantly increased from an average of 32.77 to an average of 42.66,

while ABC Scale scores significantly increased from an average of 53.34 to 62.06 (Hinsey et al., 2016).

Despite the improved BBS scores in these two studies, there was other research completed that showed contradictory results. A randomized controlled trial aimed to assess the efficacy for motor function, mental health, and quality of life outcomes for clients with chronic poststroke hemiparesis (Immink et al., 2014). Subjects had to be at least 9 months post stroke and have completed all stroke rehabilitation, and their average age was 56.1. After administration of a ten-week adapted yoga group, the subject's BBS scores revealed no significant changes in static or dynamic balance (Immink et al., 2014).

A number of qualitative studies have also evaluated participant's perceived improvements with balance. One qualitative phenomenological inquiry had the purpose of investigating the personal experiences and perceived outcomes of participation in a yoga program for stroke survivors (Garrett et al., 2011). The participants were adults at least nine months post stroke who had completed all stroke rehabilitation, and their ages ranged from thirty two to eighty five. They completed a ten-week adapted yoga program which included ninety minute classes and a home program, and they were interviewed following completion. Overall, they reported improved balance after the program (Garrett et al., 2011). Another qualitative study aimed to explore participants' perceived changes in their abilities and activities following participation in an eight-week yoga program (Atler et al., 2016). These participants reported improved physical abilities and specifically mentioned improved balance under this category (Atler et al., 2016). All studies but one demonstrated balance improvements after completion of a yoga program, and they also revealed that participants believed their balance had improved from enrollment.

***Mobility***

Another common subtheme found throughout a number of studies was changes in mobility. For the sake of this section, I define mobility as the ability to move easily and freely. One qualitative inquiry that came out of OT aimed to understand the perceived outcomes following an eight-week yoga intervention for individuals with chronic stroke (Puymbroeck et al., 2014). The participants in this study, who were at least six months post stroke and had a mean age of sixty five, reported improvements in stability following the program. This improved stability led to improved confidence and activity participation, such as moving around the house more (Puymbroeck et al., 2014). Qualitative results were also found in another study; however, these results were contradictory. This mixed methods study had three aims of studying changes to physical fitness following an eight-week yoga program, exploring participants' perceptions of changes in physical fitness, and comparing their perceptions with the quantified findings (Portz et al., 2018). It was an interdisciplinary study that involved the fields of social work, OT, and recreational therapy. The participants included in the study were at least 6 months post stroke and were an average age of seventy three. Seven of the thirteen participants in this program reported improved gait speed and walking, specifically improved ability and duration in those areas. However, four participants reported no change in fitness or activity. They attested this to the fact that it was difficult to recognize the changes in themselves (Portz et al., 2018).

Additional studies yielded quantitative data in regards to mobility. The aforementioned Portz et al. (2018) mixed methods study also utilized the 10 meter walk test to evaluate gait speed. The results of this test improved for the participants, however these improvements were

not significant (Portz et al., 2018). Additionally, the randomized controlled trial conducted by Immink et al. (2014) revealed no significant change of Comfortable Gait Speed (CGS) scores, which is indicative of ambulatory function. Despite the nonsignificant improvements relating to mobility in these two studies, the Hinsey et al. (2016) revealed significant improvements of some assessments while also having non-significant improvements on others. The researchers of this study utilized five fall risk factor management assessments related to mobility. Two of these assessments (Falls Management Behavior Questionnaire and Fall Prevention Strategies Survey) revealed significant improvements. The other three assessments (Falls Control Scale, Fall Prevention and Management Questionnaire, and Falls Management Scale) showed improvements, however they weren't significant (Hinsey et al., 2016). Regarding the subtheme of mobility, the findings vary, making it difficult to determine the efficacy of yoga for improving mobility in those status post stroke. One study had all positive benefits related to mobility, one had all nonsignificant changes, and two revealed both positive and negative changes.

***Range of Motion***

Range of motion was a physical change subtheme and was found in three of the twelve articles for a total of 25% of the articles in the literature capture. Range of motion in this section refers to any changes in the movement patterns of both arms, legs, necks and other body parts. In the qualitative study conducted by Puymbroeck et al. (2014), the participants reported improved ROM in their upper extremity (UE), specifically mentioning improvements in their arm and shoulder. They also reported increased ROM in their lower extremity (LE). They connected their increased ROM to improved confidence and activity, such as moving around the house more (Puymbroeck et al., 2014). The Atler et al. (2016) qualitative study also demonstrated participants' perceived improvements in ROM, as the thirteen participants reported overall improvements in this area during the focus groups and interviews.

Changes in ROM following a yoga program were also reported quantitatively in another study. Data analysis from a randomized pilot study aimed to assess change in physical functioning after eight weeks of therapeutic yoga, specifically changes in pain, ROM, strength, and endurance (Schmid et al., 2014). This study was interdisciplinary and came from OT, PT, recreational therapy, yoga therapy, and medicine. Following the yoga intervention, the subjects demonstrated significant improvements in bilateral neck ROM and passive bilateral hamstring ROM, which were measured using a goniometer. There were also improvements in hip flexion active ROM, however these results were not significant (Schmid et al., 2014). These inquiries show overall improvements in ROM. Not only was there quantitative data that revealed improved ROM following participation in a yoga program, but the participants themselves also reported increased ROM.

***Pain***

Only one of the twelve articles addressed changes in level of pain, for eight percent of the capture. The data analysis of the randomized pilot study conducted by Schmid et al. (2014) used the PEG scale after the eight-week yoga intervention for their forty seven subjects. This scale assesses pain intensity and interference in the areas of pain, enjoyment, and general activity (Krebs et al., 2009). The yoga intervention led to significant improvements in the PEG scores, as they decreased from an average of 12.2 down to 8.9 (Schmid et al., 2014). Unfortunately, this was the only study that had a focus on changes in pain levels. Due to the

lack of additional research in this area and the smaller sample size, the results are less generalizable.

***Endurance***

There were three articles, or 25 % of the total, that discussed the changes in endurance after differing yoga programs. Endurance in this subtheme is primarily defined in terms of walking distance and duration, as well as generalized stamina. The eight-week yoga intervention conducted by Schmid et al. (2014) coming out of the field of OT resulted in significant improvements in the average number of feet walked by their forty seven subjects in the 6-minute walk test. On the contrary, there was no significant improvement in the modified 2-minutes step test (Schmid et al., 2014). There was also another inquiry that revealed significant improvements in the 6-minute walk test. After the eight-week yoga program conducted for the interdisciplinary Portz et al. (2018) mixed methods study, the subjects increased the average number of feet walked from 473.93 feet to 524.35 feet which indicates a statistically significant improvement. During the qualitative interview portion of this same study, the participants also reported improved endurance and walking, specifically improved ability and duration (Portz et al., 2018). The final study showed both positive and negative perceptions of participants in regards to their endurance. After the eight-week yoga program conducted by Atler et al. (2016), most of the thirteen participants, who were at least six months post stroke, revealed that the program had improved their endurance. There was one participant that reported it caused more fatigue (Atler et al., 2016). Overall, however, the results of these studies reveal that participation in a yoga program can improve endurance.

***Strength***

Another subtheme found throughout various studies was changes in strength. Both qualitative and quantitative studies demonstrated general improvements in participants' strength following completion of a yoga program. The data analysis conducted by Schmid et al. (2014) revealed significant improvements in UE strength through improved arm curl test scores. This randomized pilot study also resulted in improvements in LE strength demonstrated by improved scores on the chair stand test, however they weren't significant (Schmid et al., 2014). The mixed methods study from Portz et al. (2018) also utilized the arm curl test and chair stand test to assess an eight-week yoga program's impact on strength. There were significant improvements on both tests, revealing the program improved both UE and LE strength of subjects. During the qualitative interview portion, the participants also reported that they perceived improvements in strength because of participation (Portz et al., 2018).

Additional perceived improvements of strength were noted in other qualitative inquiries. One of these studies aimed to explore the perceived barriers and benefits to yoga participation among community-dwelling adults who had experienced a stroke at least six months prior (Harris et al., 2018). The focus groups that were conducted revealed that the participants believed their strength had improved as a result of the program. Specifically, they reported that they began using muscles that they hadn't used since the stroke (Harris et al., 2018). The participants in the Garrett et al. (2011) phenomenological study also reported feeling improved strength. They specifically stated feeling stronger and more agile as a result of the yoga program (Garrett et al., 2011). The findings of these inquiries suggest that yoga can be a useful intervention to increase the strength of clients status post stroke.

***Comorbidities***

An unexpected result of yoga participation was improved vision. No studies gave quantitative data to show changes in vision following the yoga intervention, however there was a qualitative study where participants reported vision changes as a result of the program. During the focus groups conducted by Puymbroeck et al. (2014), multiple participants shared that they perceived their vision had reached normalcy after being damaged from their strokes. This improved vision led them to increase their participation in various activities, such as reading (Puymbroeck et al., 2014). Interestingly, this was the only article out of the twelve that discussed the topic of vision.

In this study, participants also mentioned other improvements in the symptoms of their comorbidities, which they attributed to the yoga program. One participant described improvements in her diabetic complications, such as numbness of arms and legs. Another participant with peripheral neuropathy reported increased sensation perception in their hands and fingers (Puymbroeck et al., 2014). While the study didn't set out to assess the intervention's impact on participants' comorbidities, there were unexpected improvements in these areas.

### *Disability Level*

One of the twelve articles, at eight percent of capture, discussed the subtheme of disability level. The randomized pilot study conducted by Schmid et al. (2012) that came out the OT, recreational therapy, physical therapy, yoga therapy, and medicine fields utilized the Modified Rankin Scale (mRS). This assessment is used to grade disability on six levels from no symptoms to severe disability (Quinn et al., 2008). After the eight-week yoga intervention, there was a significant increase in the number of people who were identified as independent on the mRS (Schmid et al., 2012). Interestingly, this is the only inquiry which evaluated changes in disability level as a result of a yoga program.

## Psychosocial Influences

In addition to the theme of physical changes, the theme of psychosocial influences also emerged. More specifically, the subthemes of depression, anxiety, emotional regulation, relaxation, and quality of life were discussed in a number of studies (Atler et al., 2016; Chan et al., 2012; Garrett et al., 2011; Harris et al., 2018; Immink et al., 2014; Puymbroeck et al., 2014; Puymbroeck et al., 2012; Schmid et al., 2012).

### *Depression*

Changes regarding depression were discussed in two of the twelve inquiries at sixteen percent of the literature availed. Interestingly, both studies used the Geriatric Depression Scale (GDS15) which is an assessment used to diagnose depression in the geriatric population (Yesavage, 1988). One article was a randomized controlled trial which aimed to evaluate changes in self-reported symptoms of depression and anxiety and to evaluate the feasibility of the six-week yoga intervention in terms of adherence and safety (Chan et al., 2012). The subjects who participated in the yoga plus exercise group had significant reductions on the self-reported scores of depression on the GDS15, however there were no other significant effects on this assessment (Chan et al., 2012). The randomized controlled trial completed by Immink et al. (2014) also utilized the GDS15 after a 10-week yoga program, however there were no significant effects on scores. Although the difference wasn't significant, there was a trend for the yoga group to have larger decreases on the assessment than the control group (Immink et al., 2014). The impact of yoga on depression remains inconclusive, as not all of the results were significant. However, there was an overall trend toward a positive impact on depression levels.

### *Anxiety*

Another common subtheme for psychosocial influences was the impact on state and trait anxiety. State anxiety refers to one's reaction in a specific moment in time for a specific situation, while trait anxiety refers to a trait of someone's personality (Endler & Kocovski, 2001). The quantitative studies that discussed this topic used the State-Trait Anxiety Inventory (STAI), which is a self-report rating scale that measures state anxiety (STAI-Y1) and trait anxiety (STAI-Y2) (Vigneau & Cormier, 2008). The Chan et al. (2012) randomized controlled trial used this inventory to assess anxiety, in addition to depression. After the six-week yoga program that was completed by subjects who were at least six months post stroke and who had completed all stroke rehabilitation, there were two clinically relevant reductions of state anxiety on the STAI-Y1 among the fourteen subjects. There was only one clinically relevant reduction in trait anxiety on the STAI-Y2 (Chan et al., 2012). The randomized controlled trial completed by Immink et al. (2014) also utilized the STAI after their ten-week yoga program. There were no significant main effects for state anxiety, but the mean state anxiety scores decreased to below the cutoff score of 39 indicating no presence. As for trait anxiety scores, changes were not significant, however there was an 8-point decrease in mean scores which represents a clinically significant change (Immink et al., 2014).

Only one qualitative study in the scoping review discussed changes in anxiety. The focus groups conducted in the research of Puymbroeck et al. (2014) aimed to discuss the participants' perceived outcomes following the eight-week yoga program. The participants reported a decrease in anxiety as a result of the intervention (Puymbroeck et al., 2014). Surprisingly, this was the only qualitative study in which the participants mentioned changes relating to anxiety.

### *Emotional Regulation*

The subtheme of emotional regulation was discussed in three of the qualitative studies included in the review. The qualitative findings of Puymbroeck et al. (2014) from the field of OT discussed how the participants felt that their emotional regulation improved following the eight-week program. They linked their improved emotional regulation to feeling more in control of themselves and their reactions. They found this to be empowering and described it as increasing their overall life satisfaction (Puymbroeck et al., 2014). In addition, the focus groups of Harris et al. (2018) revealed that the participants, who were at least six months post stroke and had completed all rehabilitation, found the breathing and meditation components of the yoga program as a positive influence in their lives. They reported that it helped to lessen their panic in certain situations (Harris et al., 2018). The final inquiry that discussed emotional regulation was the phenomenological study completed by Garrett et al. (2011), which included participants who were at least nine months post stroke and had completed all stroke rehabilitation. After the ten-week yoga program, the participants reported improved overall mood. They also reported that their coping skills had improved (Garrett et al., 2011). In these two qualitative studies, all changes related to emotional regulation were positive.

### *Relaxation*

Yoga interventions also impacted relaxation based on the findings of various inquiries. While no assessments were completed to quantitatively assess relaxation, there were many participants that had perceived improvements in this area. Participants, who were community-dwelling and at least six months post stroke, reported an overall healthy feeling in focus groups

conducted by Harris et al. (2018). They also described the yoga and breathing techniques learned as a means of relaxation (Harris et al., 2018). The Garrett et al. (2011) interviews also discussed the topic of relaxation with their participants who were at least nine months post stroke. Eight of the nine participants reported feeling more relaxed and calm. They also described using the learned techniques to calm themselves in other situations and to bring on sleep at night (Garrett et al., 2011). Finally, the focus groups and interviews conducted by Atler et al. (2016) revealed that participants felt that their relaxation had improved following the eight-week yoga interventions. While the participants across the various studies utilized the techniques learned in the program in varying ways, they all led to increased relaxation.

***Quality of Life***

The final psychosocial influence was related to quality of life of those status post stroke. Two of the inquiries included in the review utilized the Stroke Specific Quality of Life (SS-QOL) scale. The first was the randomized pilot study conducted by Schmid et al. (2012) that came out of the fields of OT, PT, recreational therapy, yoga therapy, and medicine. The changes in scores on the scale were not significant, however there was a trend towards significant improvements for subjects in the yoga group (Schmid et al., 2012). The other study that utilized the SS-QOL scale was an inquiry aimed at determining whether participation in an eight-week yoga program improved activity, participation, and quality of life for those with chronic stroke (Puymbroeck et al., 2012). After participation in the program, there were significant improvements on the SS-QOL scale, which the researchers attested to the intervention.

In addition to the SS-QOL scale, the Stroke Impact Scale (SIS) was used in another study. This scale is a self-report questionnaire that incorporates the dimensions of function and health-related quality of life by assessing eight different domains (Lai et al., 2002). The randomized controlled trial by Immink et al. (2014) administered this questionnaire before and after the eight-week yoga program. The results indicated significant increases on the mean physical and memory domains, however there were no significant effects evident for the emotion, communication, and social domains (Immink et al., 2014). Overall, these two yoga interventions lead to a general improvement of quality of life even though the results were not all significant.

**Occupational Participation**

The theme of occupational participation also emerged following synthesis of the articles included in the scoping review. Two studies, both involving the field of OT, revealed improved participation using differing assessments, while two demonstrated improvements through qualitative data. With four articles identified, this is 33 % of the capture. The ICF Measure of Participation and ACTivities (IMPACT) was utilized in the study completed by Puymbroeck et al. (2012). This assessment is a self-report measure that assesses a client's limitations in activities and participation (Post et al., 2008). Following the eight-week yoga program, there were significant improvements in the IMPACT scores (Puymbroeck et al., 2012). Another study used an additional participation assessment; The Reintegration to Normal Living (RNLI) index evaluates the consequences of disease on a client's return to normal life (Daneski et al., 2003). The aim of the study that utilized this index was to investigate the effects of yoga and self-management interventions on community reintegration as well as perceived activity constraints and to examine the relationship between these two areas (Bolster et al., 2018). After the eight-

week program, there were significant increases in RNLI index scores, specifically in the areas of perception and satisfaction with community reintegration (Bolster et al., 2018).

Two additional studies coming out of OT identified a positive impact on participation through qualitative findings. The focus groups conducted by Puymbrock et al. (2014) discussed the topic of participation. The participants reported increased participation in basic life situations which led to them returning to their previous roles, such as taking out the trash. They also noted an increased ability to participate in social situations due to the fact that they developed close friendships during the yoga group. The unexpected improvement in their vision as a result of the program also led them to increase their participation in activities such as reading (Puymbroeck, 2014). Improved participation was also discussed in the study conducted by Atler et al. (2016). The participants reported enhanced engagement in everyday activities after the eight-week program. Specifically, they increased the quality and quantity of daily activities by doing more or engaging longer. They also expressed that they increased participation by doing the activities differently through modifying themselves or the environment (Atler et al., 2016). Every study that discussed the effect of yoga on occupational participation for those status post stroke identified positive changes, indicating that yoga can improve this area of a client's life.

**Connection of Mind and Body**

The final theme identified is that of changes regarding connection of mind and body. A basic tenet of yoga practice is transforming the mind and the body into one being (Farhi, 2011), so it is not surprising that this is an area that participants in various studies identified improvements. In the Harris et al. (2018) focus groups, the participants reported improved connection of the mind with the body and the mind with the heart. This improved connection helped them to integrate their more and less affected sides of the body that they described as disconnected after their stroke (Harris et al., 2018). Participants in the Garrett et al. (2011) phenomenological study also stated that the disconnection they felt after their stroke had improved, and they attested this increased connection to improved sensation and body awareness. They also reported that they felt more aware of their body physically and sensually and more attached to it emotionally (Garrett et al., 2011). In both studies that addressed changes in mind and body connection, the participants identified all positive changes.

**Summation of Findings**

This scoping review found that existing literature on the topic of yoga's use for clients status post stroke discussed the four themes of physical changes, psychosocial influences, occupational participation, and connection of mind and body. While the themes of physical changes and psychosocial influences are addressed in a large number of inquiries, there is not as much literature available to support yoga's impact on occupational participation and connection of mind and body. Four of the twelve articles discussed occupational participation while only three discussed the connection of the mind and body. Implications for occupational therapy practice and the impact of these findings will be discussed in the following section.

## Discussion

There is ample research in regard to interventions that are effective for patients status post CVA, however there is a limited amount of information about the use of yoga as an intervention for this population. While OT was the field that was most represented in the scoping review, there were only five inquiries that were OT specific and three interdisciplinary studies that involved OT along with other fields. The remaining four studies came from the health

sciences. This demonstrates the lack of evidence available about yoga's use as an occupational therapy intervention. As various professions, specifically occupational therapy, continue to investigate intervention approaches for those status post stroke, there is an apparent need for further research on this topic. This study is a step toward understanding the effectiveness of yoga as an intervention approach based on what studies have already been conducted, but this information is only applicable to those who have completed all inpatient and outpatient stroke rehab as that is the population the inquiries focused on. Therefore, additional investigations are warranted to further assess the possible benefits of yoga and to assess how it can be implemented into other stages of rehabilitation.

**Interpretation of Findings**

Stroke can lead to various residual symptoms affecting a number of body systems and mental functions. Therefore, healthcare professionals who are treating these impacted body and mental functions must choose interventions that address a number of symptoms at once. Consistent with the literature review, these twelve citations included a wide array of physical changes, psychosocial influences, and impacts on occupational participation and connection of the mind and body. Every study included in the review addressed more than one residual symptoms of those affected by stroke. These findings suggest that yoga is an intervention approach that can be used to address a number of factors at once and contributes to the holistic care of the person post stroke.

The outcomes of the various yoga programs varied. A majority of the outcomes, no matter what theme they fell under, indicated positive changes after participation in a yoga program. Some of these results were not significant despite showing improvements, however, making them less valid and generalizable. This scoping review suggests that the overall effect of yoga on various residual symptoms of stroke is positive, however there is not sufficient evidence available to accept yoga therapy as a valid intervention for clients status post stroke. Specifically, additional research should be conducted evaluating yoga's effect on occupational participation and connection of mind and body, as there were few studies that addressed these areas in the review. Overall, the scoping review followed the same general pattern of positive response to yoga as did each individual study that was examined.

**Strengths and Limitations**

This scoping review contained many points of strength that aided in the credibility of the study. First, broad inclusionary criteria were chosen to allow the largest variety of publications to be included. A library liaison was consulted to aid in the determination of search terms and online databases. Specific databases were selected during this consultation to increase the breadth of inquiries included in the review. The data extracted from the articles was recorded and managed in a systematic and organized manner by using an online spreadsheet. This recorded data was effectively mapped in order to answer the two research questions. Finally, the utilization of Arskey and O'Malley's framework for a scoping review acted as a guide to the study. This established rigor of methodology and consistency of study selection.

While there were a number of points of strength, this scoping review also had limitations that may have impacted the quality of the results. First, the review was completed by one researcher, which didn't allow for data triangulation to increase the rigor of the results. In addition, inclusion of other databases during the search may have yielded additional publications. Despite a library liaison being consulted prior to the search process, a seeming

dearth of literature specific to the purpose was yielded. The studies included in the review did not contain consistent yoga interventions and none mentioned the specific type of yoga they used for their interventions, so the outcomes may have varied based on program administration. Therefore, the results found in this scoping review may not be applicable to all yoga programs. Finally, the yoga interventions in the twelve inquiries were all attended by individuals who had completed both inpatient and outpatient stroke rehabilitation. Results of the review would therefore not be applicable to other stages of rehabilitation.

### Implications for Occupational Therapy

A majority of the inquiries included in this scoping review did not make direct connections to occupational therapy practice. Therefore, a gap in the literature was identified, indicating that yoga's application to occupational therapy needs to be further researched. Until additional studies are completed that specifically link occupational therapy and yoga therapy, yoga is not a proven intervention that can be used by OT practitioners with their neurologically involved clients, specifically those with stroke. Many variables exist when working with this population as well, including type and extent of stroke, comorbidities and secondary diagnoses, residual impairments, wide variability of symptoms based upon mechanism, and extent of stroke, just to name a few. Timing of the interventions most likely play a role in the success of yoga's utility with neurologically involved clients.

### Future Research

Future research should be aimed at analyzing the effectiveness of yoga as a treatment approach for the neurologically involved population of stroke, as this is still an emerging area of research and the number of available inquiries is limited. Specifically, the application of yoga for occupational therapy needs to be further studied, as limited research is available connecting the two. Additional research should also expand the sample size of participants, consider the timing of yoga as an intervention, and standardize the yoga practice utilized that best suits the needs of this population, thereby making the results more generalizable for practice.

## Conclusion

Analysis of the 12 articles demonstrated the need for further research on the impact of yoga as a treatment approach for clients status post stroke. Specifically, there is a need for further research involving its application to occupational therapy practice.

The literature demonstrated varying effects of yoga intervention surrounding chosen themes of physical changes, psychosocial influences, occupational participation, and connection of mind and body. While a majority of subthemes revealed areas of improvements as a result of yoga, some were deemed not statistically significant. Additionally, two participants across the various studies revealed no or negative change specific to mobility and endurance. Interestingly, the inquiries also utilized different types of yoga interventions. Therefore, the results may have varied based on administration of the program.

The outcomes of the various studies demonstrate a general trend towards improvements of physical and mental symptoms for those who have experienced a stroke, warranting further research. Due to these studies being an emerging area of research, additional investigations are needed to further analyze the effectiveness of yoga as a treatment approach for this population Considerations should also include specific training that OTs would need to execute adapted yoga classes, staffing considerations to provide adequate assistance to clients for safe

demonstration of postures, as well as the timing in the person's recovery when yoga would be most appropriate and impactful.

References


American Heart Association. (2019). *2019 Heart Disease and Stroke Statistical Update Fact Sheet Older Americans and Cardiovascular Diseases* [Fact sheet]. Retrieved from https://professional.heart.org/idc/groups/ahamah-public/@wcm/@sop/@smd/documents/downloadable/ucm_502138.pdf

American Occupational Therapy Association. (2014a). Occupational therapy practice framework: Domain and process. *American Journal of Occupational Therapy*, *68*(Suppl.), S1–S48.

American Occupational Therapy Association. (2014b). Scope of practice*. American Journal of Occupational Therapy, 68*(Suppl. 3), S34-S40.

American Occupational Therapy Association. (2015). *The role of occupational therapy in stroke rehabilitation* [Fact sheet]. Retrieved from https://www.aota.org/About-Occupational-Therapy/Professionals/RDP/stroke.aspx

Arskey, H., & O'Malley, L. (2005). Scoping studies: Towards a methodological framework. *International Journal of Social Research Methodology 8*(1), 19-32.

Atler, K. E., Puymbroeck, M. V., Portz, J. D., & Schmid, A. A. (2017). Participant-perceived outcomes of merging yoga and occupational therapy: Self-management intervention for people post-stroke. *British Journal of Occupational Therapy, 80*(5), 294-301.

Benjamin, E. J., Virani, S. S., Callaway, C. W., Chamberlain, A. M., Chang, A. R., Cheng, S., Chiuve, S. E., Cushman, M., Delling, F. N., Deo, R., de Ferranti, S. D., Ferguson, J. F., Fornage, M., Gillespie, C., Isasi, C. R., Jiménez, M. C., Jordan, L. C., Judd, S. E., Lackland, D., Lichtman, J. H., ... Muntner, P. (2018). Heart disease and stroke statistics- 2018 update: A report from the American Heart Association. *Circulation 137*(12), e67-e492.

Blum, L., & Korner-Bitensky, N. (2008). Usefulness of the Berg Balance Scale in stroke rehabilitation. *Physical Therapy, 88*(5), 559-566.

Bolster, R. A., Puymbroeck, M. V., Atler, K. E., Dickman, J., Hinsey, K. M., & Schmid, A. A. (2018). Yoga and self-management for people with chronic stroke: Effect on community reintegration and perceived activity constraints. *American Journal of Recreational Therapy, 17*(2), 20-26.

Bonura, K. B. (2011). The psychological benefits of yoga practice for older adults: Evidence and guidelines. *International Journal of Yoga Therapy 21*, 129-142.

Boyt Schell, B. A., Gillen, G., & Scaffa, M. E. (2014). *Willard and Spackman's occupational therapy* (2nd ed.). Baltimore, MD: Lippincott Williams & Wilkins.

Contemporary Definitions of Yoga Therapy. (n.d.). Retrieved from https://www.iayt.org/page/ContemporaryDefiniti

Chan, W., Immink, M. A., & Hillier, S. (2012). Yoga and exercise for symptoms of depression and anxiety in people with poststroke disability: A randomized, controlled pilot trial. *Alternative Therapies, 18*(3), 34-43.

Chapple, C. K. (2008). *Yoga and the luminous: Patañjali's spritual path to freedom.* Albany, NY: State University of New York Press.

Daneski, K., Coshall, C., Tilling, K., & Wolfe, C. D. A. (2003). Reliability and validity of a postal version of the Reintegration to Normal Living index, modified for use with stroke patients. *Clinical Rehabilitation, 17,* 835-839.

Edmans, J. (2010). Occupational therapy and stroke (2nd ed.). Chichester: Blackwell Pub.

Endler, N. S., & Kocovski, N. L. (2001). State and trait anxiety revisited. *Journal of anxiety disorders, 15*(3), 231-245.

Eliade, M. (1969). *Yoga: Immortality and freedom.* Princeton, NJ: Princeton University Press.

Falvo, D. & Holland B. E. (2018). *Medical and psychosocial aspects of chronic illness and disability* (6th ed.). Burlington, MA: Jones and Bartlett Learning.

Farhi, D. (2011). *Yoga mind, body, and spirit: A return to wholeness.* Holt Paperbacks.

Garrett, R., Immink, M. A., & Hillier, S. (2011). Becoming connected: The lived experience of yoga participation after stroke. *Disability and Rehabilitation, 33,* 2404-2415. https://doi.org/10.3109/09638288.2011.573058

Hanc, J. (2009). Which yoga is right for you? Retrieved from https://www.aarp.org/health/fitness/info-09-2009/which_yoga_is_right_for_you_.html

Harris, A., Austin, M., Blake, T. M., & Bird, M. L. (2019). Perceived benefits and barriers to yoga participation after stroke: A focus group approach. *Complementary Therapies in Clinical Practice, 34,* 153-159. https://doi.org/10.1016/j.ctcp.2018.11.015

Immink, M. A., Hillier, S., & Petkov, J. (2014). A randomized controlled trial of yoga for chronic poststroke hemiparesis: Motor function, mental health, and quality of life outcomes. *Topics in Stroke Rehabilitation 21*(3), 256-271.

Kostanjsek, N. (2011). Use of The International Classification of Functioning, Disability and Health (ICF) as a conceptual framework and common language for disability statistics and health information. *BMC Public Health 11(*Suppl. 4), S3-S9.

Krebs, E. E., Lorenz, K. A., Bair, M. J., Damush, T. M., Wu, J., Sutherland, J. M., Asch, S., Kroenke, K. (2009). Development and Initial Validation of the PEG, a Three-item Scale Assessing Pain Intensity and Interference. *Journal of General Internal Medicine, 24*(6), 733–738.

Lai, S., Studenski, S., Duncan, P. W., & Perera, S. (2002). Persisting consequences of stroke measured by the Stroke Impact Scale. *Stroke, 33,* 1840-1844.

Mays, N., Roberts, E., & Popay, J. (2001). Synthesising research evidence. In N. Fulop, P. Allen, A. Clarke, & N. Black (Eds.), *Studying the organisation and delivery of health services: Research methods.* London: Routiedge.

Pendelton, H. M. & Schultz-Krohn, W. (Eds.). (2018). *Pedretti's occupational therapy: Practice skills for physical dysfunction.* St. Louis, MO: Elsevier, Inc.

Peters, M. D. J., Godfrey, C. M., Khalil, H., McInerney, P., Parker, D., & Soares, C. B. (2015). Guidance for conducting systematic scoping reviews. *International Journal of Evidence-Based Healthcare*, *13*(3), 141–146.

Portz, J. D., Waddington, E., Atler, K. E., Puymbroeck, M. V., Schmid, A. A. (2018). Self-management and yoga for older adults with chronic stroke: A mixed-methods study of physical fitness and physical activity. *Clinical Gerontologist, 41*(4), 374-381.

Post, M. W. M., de Witte, L. P., Reichrath, E., Verdonschot, M. M., Wijhuizen, G. J., & Perenboom, R. J. M. (2008). Development and validation of IMPACT-S, an ICF-based

questionnaire to measure activities and participation. *Journal of Rehabilitation Medicine, 40,* 620-627.

Puymbroeck, M. V., Allsop, J. A., Miller, K. K., & Schmid, A. A. (2014). ICF-based improvements in body structures and function, and activity and participation in chronic stroke following a yoga-based intervention. *American Journal of Recreation Therapy, 13*(3), 23-33.

Puymbroeck, M. V., Schmid, A., Miller, K., & Schalk, N. (2012). OA10.03. Improved activity, participation, and quality of life for individuals with chronic stroke following an 8-week yoga intervention. *BMC Complementary & Alternative Medicine, 12*(Suppl. 1), O39.

Quinn, T. J., Dawson, J., Walters, M. R., & Lees, K. R. (2008). Variability in Modified Rankin scoring across large cohort of international observers. *Stroke, 39*(11), 2975-2979.

Riley, D. (2004). Hatha yoga and the treatment of illness. *Alternative Therapies in Health and Medicine 10*(2), 20-21.

Rowland, T. J., Cooke, D. M., & Gustafsson, L. A. (2008). Role of occupational therapy after stroke. *Annals of Indian Academy of Neurology 11*(5), 99-107.

Schmid, A.A., Miller, K.K., Puymbroeck, M.V., & DeBaun-Sprague, E. (2014). Yoga leads to multiple physical improvements after stroke, a pilot study. *Complementary Therapies in Medicine 22,* 994-1000. https://dx.doi.org/10.1016/j.ctim.2014.09.005

Schmid, A. A., Puymbroeck, M. V., Altenburger, P. A., Schalk, N. L., Dierks, T. A., Miller, K. K., Damush, T. M., Bravata, D. M., & Williams, L. S. (2012). Poststroke balance improves with yoga: A pilot study. *Stroke 43*(9), 2402-2407.

Sutton, A. L. (Ed.). (2008). *Stroke sourcebook* (2nd ed.). Detroit, MI: Omniographics, Inc.

Taylor, M. J. & McCall, T. (2017). Implementation of yoga into therapy into U.S. healthcare systems. *International Journal of Yoga Therapy 27,* 115-119.

Talley, K. M. C., Wyman, J. F., & Gross, C. R. (2007). Psychometric properties of the Activities-Specific Balance Confidence Scale and the Survey of Activities and Fear of Falling in older women. *Journal of American Geriatrics Society, 56*(2), 328-333.

The IHI Triple Aim. (n.d.). Retrieved from http://www.ihi.org/Engage/Initiatives/TripleAim/Pages/default.aspx.

U.S. Department of Health and Human Services. (2018). *Physical Activity Guidelines for Americans, 2nd edition.* Washington, DC: U.S. Department of Health and Human Services.

Vigneau, F., & Cormier, S. (2008). The factor structure of the State-Trait Anxiety Inventory: An alternate view. *Journal of Personality Assessment, 90*(3), 280-285.

Vishnu-devananda, S. (1988). *The complete illustrated book of yoga.* New York, NY: Random House, Inc.

Warlow, C. P. (1998). Epidemiology of stroke. *The Lancet 352*(3), 1-4.

Weber, K. K. & Sculthorp, B. (2016). Yoga therapy: Meeting the Needs of the Triple Aim. *International Journal of Yoga Therapy 27*(1), 22-26.

Williams, K. A., Petronis, J., Smith, D., Goodrich, D., Wu, J., Ravi, N., Doyle, E. J., Jr., Juckett, R. G., Kolar, M. M., Gross, R., & Steinberg, L. (2005). Effect of Iyengar yoga therapy for chronic low back pain. *Pain 115,* 107-117.

Wolf, T.J. (Ed.). (2014). *Stroke: Interventions to support occupational performance.* Bethesda, MD: American Occupational Therapy Association, Inc.

World Health Organization. (2001). International classification of functioning, disability, and health: ICF. World Health Organization.

World Health Organization. (2006). Constitution of the World Health Organization (45th ed.). Retrieved from http://www. afro.who.int/index.php?option=com_docman&task=doc_ download&gid=19&Itemid=2111WHO 2006

Yesavage, J. A. (1988). Geriatric Depression Scale. *Psychopharmacology Bulletin, 24*(4), 709-710.

Appendix A

Appendix A

*Emerging Themes of Articles Included in Scoping Review*

| Authors | Primary Findings | Related Themes |
|---|---|---|
| Harris et al. (2019) | • Perceived benefits in whole body effects, feeling healthy in mind, and connected in body | • Physical (strength)<br>• Mind/ Body Connection<br>• Psychosocial (emotional regulation)<br>• Psychosocial (relaxation) |
| Chan et al. (2012) | • Decrease in Geriatric Depression Scale (GDS) scores<br>• Clinically relevant reductions of state and trait anxiety on State-Trait Anxiety Inventory-Y1 (STAI-Y1) and STAI-Y2 | • Psychosocial (depression)<br>• Psychosocial (anxiety) |
| Puymbroeck et al. (2014) | • Perceived improvements in body structures and function<br>• Perceived improvements in activity and participation | • Physical (mobility)<br>• Physical (ROM)<br>• Physical (vision)<br>• Physical (comorbidities)<br>• Occupational Participation<br>• Psychosocial (anxiety)<br>• Psychosocial (emotional regulation) |

| | | |
|---|---|---|
| Schmid et al. (2012) | • Significant improvements in Berg Balance Scale (BBS) scores<br>• Significant increase in number of people identified as “independent” on Modified Rankin Scale (mRS)<br>• Trend toward significant improvement on Stroke Specific Quality of Life (SSQoL) | • Physical (balance)<br>• Physical (disability level)<br>• Psychosocial (quality of life) |
| Schmid et al. (2014) | • Significant improvements in pain scores, bilateral neck ROM, passive bilateral hamstring ROM, UE strength, endurance | • Physical (ROM)<br>• Physical (pain)<br>• Physical (endurance)<br>• Physical (strength) |
| Puymbroeck et al. (2012) | • Significant improvements in International Classification of Function Measure of Participation and Activity (IMPACT) and SSQoL | • Occupational Participation<br>• Psychosocial (quality of life) |
| Immink et al. (2016) | • No significant changes in BBS, Comfortable Gait Speed (CGS), GDS, STAI-Y1<br>• Significance approached on STAI-Y2 score Significant increases on select Stroke Index Scale (SIS) domains | • Physical (balance)<br>• Physical (mobility)<br>• Psychosocial (depression)<br>• Psychosocial (anxiety)<br>• Psychosocial (quality of life ) |

| | | |
|---|---|---|
| Garrett et al. (2011) | • Perceived benefits in physical, mind/body connections, and psychosocial elements | • Physical (balance)<br>• Physical (strength)<br>• Mind/Body Connection<br>• Psychosocial (emotional regulation)<br>• Psychosocial (relaxation) |
| Bolster et al. (2018) | • Significant increases in Return to Normal Living Index (RNLI) and activity constraints questionnaire (ACQ) | • Occupational Participation |
| Hinsey et al. (2016) | • Significant improvements in BBS and Activities-Specific Balance Confidence (ABC) | • Physical (balance)<br>• Physical (mobility) |
| Portz et al. (2018) | • Significant improvements in 6 min. walk/ chair stand test/and arm curl tests<br>• Increased 10m walk test, but not significant<br>• 7 participants reported positive change after intervention, and 4 reported no change | • Physical (mobility)<br>• Physical (endurance)<br>• Physical (strength) |
| Atler et al. (2017) | • Perceived improvements in physical abilities, relaxation, and engagement in everyday activities | • Physical (balance)<br>• Physical (ROM)<br>• Physical (endurance)<br>• Occupational Participation<br>• Psychosocial (relaxation) |