

## Effect of Yoga on Health Outcomes in Adults with Chronic Stroke

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### Research Summary

Stroke is a leading cause of adult disability (Immink et al., 2014), with 800,000 people in the US affected each year (Baldo et al., 2021), and 7.8 million living with its chronic effects (Centers for Disease Control and Prevention, 2023). Those impacted by stroke experience impaired motor functioning (Immink et al., 2014), decreased mobility and balance (Garrett et al., 2011), and residual cognitive and emotional disability (Schmid et al., 2014), resulting in reduced quality of life (QoL; Chan et al., 2012; Schmid et al., 2014). The impact on mental health includes post-stroke depression affecting 20% to 50% and post-stroke anxiety affecting approximately 25% (Baldo et al., 2021). Yoga interventions employ breathing techniques, meditations, postures (Lai et al., 2022), and/or movements (Chan et al., 2012; Schmid et al., 2014) that are safe, adaptable, cost-effective, and easy to deliver within the community (Garrett et al., 2011). The benefits of yoga include improved physical strength and flexibility (Chan et al., 2014; Schmid et al., 2014), self-management of chronic conditions including stroke (Immink et al., 2014), and overall health and well-being benefits to the individual (Garrett et al., 2011). Because there is a lack of research in any one specific health domain, the following synthesis of literature explores the effect of yoga on various health outcomes in adults who have experienced a stroke.

This review included six quantitative studies (Baldo et al., 2021; Chan et al., 2012; Immink et al., 2014; Ji & Yu, 2018; Lai et al., 2022; Schmid et al., 2014), one qualitative study (Garrett et al., 2011), and one mixed-method study (Bislick et al., 2023). Of the six quantitative, there were five randomized control trials (Baldo et al., 2021; Chan et al., 2012; Immink et al., 2014; Ji & Yu, 2018; Schmid et al., 2014) and one quasi-experimental (Lai et al., 2022). Additionally, participants had a diagnosis of stroke or chronic stroke (Baldo et al., 2021; Bislick et al., 2023; Chan et al., 2012; Garrett et al., 2011; Immink et al., 2014; Ji & Yu, 2018; Lai et al., 2022; Schmid et al., 2014), with three studies further specifying individuals with hemiparesis (Chan et al., 2012; Garrett et al., 2011; Immink et al., 2014) and one study specifying individuals with aphasia (Bislick et al., 2023). Participants were 3 to 9 months post-stroke. Ages ranged from 20 to 85, with most studies having a mean age of 60 (Chan et al., 2012; Immink et al., 2014; Ji & Yu, 2018; Schmid et al., 2014). Gender across the studies included males and females but primarily male-dominant representation (Lai et al., 2022; Baldo et al., 2021; Immink et al., 2014; Bislick et al., 2023; Chan et al., 2012). Participants resided within either a community (Baldo et al., 2021; Bislick et al., 2023; Garrett et al., 2011; Immink et al., 2014; Schmid et al., 2014) or a hospital setting (Chan et al., 2012; Ji & Yu, 2018; Lai et al., 2022).

The studies were conducted at a university (Baldo et al., 2021; Schmid et al., 2014), hospital (Chan et al., 2012; Ji & Yu, 2018; Lai et al., 2022), home or community (Garrett et al., 2011; Immink et al., 2014), and virtually (Bislick et al., 2023) using a group format. The interventions lasted 6 to 12 weeks, with participants attending 1 to 6 times weekly for 30 minutes to 2.5 hours. Facilitation of the interventions were conducted by yoga teachers, instructors, and therapists who were either accredited and/or certified in yoga (Bislick et al., 2023; Chan et al., 2012; Immink et al., 2014; Garrett et al., 2011; Lai et al., 2022; Schmid et al., 2014); an exercise physiologist (Chan et al., 2012); or a trained Mindfulness-Based Stress Reduction (MBSR) instructor (Baldo et al., 2021). Session protocols included didactic (Chan et al., 2012) or educational instruction (Baldo et al., 2021), 30 to 40 minutes of modified asana practice (Chan et al., 2012; Lai et al., 2022), and 5 to 20 minutes of pranayama practice (Chan et al., 2012; Garrett et al., 2011). Modifications included yoga postures (Bislick et al., 2023; Immink et al., 2014; Schmid et al., 2014), seated positions, and modified language (Bislick et al., 2023) made to individualize the practice based on participant's willingness to challenge themselves (Chan et al., 2012). Meditation followed with 20 to 45 minutes (Baldo et al., 2021; Chan et al., 2012; Garrett et al., 2011) of verbally guided meditation practice, and sessions ended with a 5 to 15-minute group discussion (Bislick et al., 2023; Chan et al., 2012; Garrett et al., 2011). Participants also engaged in independent practice at home 1 to 6 times a week (Baldo et al., 2021; Chan et al., 2012; Garrett et al., 2011) using a 40-minute disc with recorded verbal instructions (Chan et al., 2012) or completing homework (Baldo et al., 2021) and self-report measures (Chan et al., 2012). Materials included yoga mats, an instruction manual for further yoga engagement (Chan et al., 2012), meditation compact-discs (Baldo et al., 2021), and yoga balls (Ji et al., 2018). Themes addressed within the studies included mindfulness/mindfulness perceptions, being present at the moment, coping with stress, mental reactivity, interpersonal mindfulness, embracing change, integrating practice into daily life (Baldo et al., 2021), breathing, deep relaxation, meditation, posture, and trunk and limb stretching (Lai et al., 2022), sensory and movement awareness, active and passive relaxation, and positive mood (Immink et al., 2014), asanas, breathwork, meditation, mudras (gestures), affirmations, body awareness, personal transformation, loving-kindness, nature visualizations, pain management, Kirtan Kriya, and energy balancing (Bislick et al., 2023).

Health outcomes assessed included the following measures: Geriatric Depression Scale - 15 (GDS15) (Baldo et al., 2021; Chan et al., 2012; Immink et al., 2014); Taiwanese Depression Questionnaire (TDQ) (Lai et al., 2022); State Trait Anxiety Inventory (STAI) (Baldo et al., 2021; Chan et al., 2012; Immink et al., 2014); Berg Balance Scale (BBS) (Immink et al., 2014; Lai et al., 2022); Pain, Enjoyment of Life and General Activity scale (PEG) (Schmid et al., 2014); Satisfaction with Life Scale (Baldo et al., 2021); Repeatable Battery for the Assessment of Neuropsychological Status (RBANS), RAND 36-Item Mindful Attention Awareness Scale, Cognitive Failures Questionnaire, Modified Barthel Index (MBI), and Feedback Related Negativity (FRN) (Ji et al., 2018); 9-Hole Peg Test (9HPT), Motor Assessment Scale (MAS), 2-Minute walk distance (2MWD), and Comfortable gait speed, m/s (CGS) (Immink et al., 2014); Stroke Impact Scale (SIS) (Immink et al., 2014); University of Washington Resilience Scale (UWRS), Modified Perceived Stress Scale (mPSS), Patient Reported Outcomes Measurement Information System (PROMIS), Sleep Disturbance Scale, Pain Interference Scale, and the Comprehensive Aphasia Test (CAT) (Bislick et al., 2023). Two qualitative studies gathered information regarding patient-perceived outcomes through interviews (Bislick et al., 2023; Garrett et al., 2011).

Quantitative results in seven studies indicated significance or change from their established outcomes across a variety of domains, including psychosocial, physical, cognitive, and QoL outcomes (Baldo et al., 2021; Bislick et al., 2023; Chan et al., 2012; Immink et al., 2014; Ji & Yu, 2018; Lai et al., 2022; Schmid et al., 2014). Participants in the experimental groups experienced a significant decrease in depression (Baldo et al., 2021; Chan et al., 2012; Lai et al., 2022) anxiety (Baldo et al., 2021), and significant improvement in overall resilience (Bislick et al., 2023) and QoL (Immink et al., 2014). Participants changed their lifestyles as a result of participating in the yoga intervention and improved their overall health and well-being (Baldo et al., 2021). Another study determined the effects of yoga on chronic stroke with gender and age, determining that depression and balance scores significantly improved in both males and females, but with greater significance in men; and lower depression scores were significantly correlated to balance, indicating greater QoL across all age groups (Lai et al., 2022). Participants experienced significant cognitive improvements (Ji & Yu, 2018) and medium to large effect size in memory and attention (Baldo et al., 2021), establishing that yoga can improve cognitive functioning due to increased oxygenated blood to the brain (Ji & Yu, 2018). However, in a study addressing impacts from aphasia, comparing both control and experimental groups showed no effect of yoga on word fluency or object and action naming (Bislick et al., 2023). Addressing physical outcomes, participants experienced significant improvement in areas of motor functioning (Ji & Yu, 2018), range of motion (ROM) (Schmid et al., 2014), upper extremity strength (Schmid et al., 2014), endurance (Schmid et al., 2014), pain (Bislick et al., 2023; Schmid et al., 2014), and stress and sleep quality (Bislick et al., 2023). Conversely, although hip flexion active ROM improved in one study, it was not significant, with findings in the same study indicating no significance in lower extremity strength (Schmid et al., 2014). Although significance was predominant across the experimental groups in these studies, one study indicated that after completing a post hoc analysis, significance was only determined in physical and memory domains of the Stroke Impact Scale (SIS) (Immink et al., 2014). One study also reported no significance or

significant effects in anxiety state or anxiety trait scores (Chan et al., 2012), and another indicated anxiety, depression, motor function, and other domains of the SIS had no significance, or no significance post hoc analysis (Immink et al., 2014).

Two qualitative outcomes included perceived psychosocial and physical outcomes (Bislick et al., 2023; Garrett et al., 2011). For psychosocial themes, participants reported increased feelings of relaxation and decreased fatigue, stress, and anxiety (Bislick et al., 2023; Garrett et al., 2011). Participants also commented on having increased energy, improved concentration, and confidence (Garrett et al., 2011). Amongst physical outcomes, participants reported perceived physical improvements, including strength, ROM, walking ability, and reconnecting and accepting a different body (Garrett et al., 2011). Additionally, one study included pre- and post-questionnaires to determine perceptions regarding whether yoga could help participants and if the yoga intervention helped (Bislick et al., 2023). The themes that emerged from these questionnaires included participants pre-intervention feeling as though yoga could make them feel relaxed, grounded, and provide physical benefits and post-intervention participants stating they felt included in a community, calm, and that their goals were met and wanted to continue participating in yoga (Bislick et al., 2023).

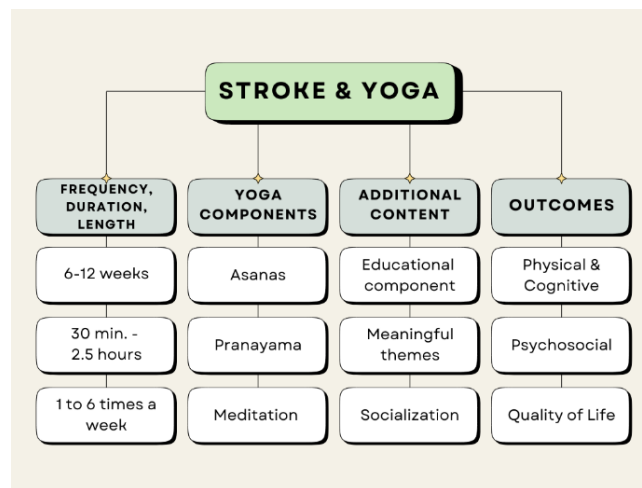
Common limitations across the studies included small sample sizes (Baldo et al., 2021; Bislick et al., 2023; Garrett et al., 2011; Immink et al., 2014; Ji & Yu, 2018; Lai et al., 2022), no control group (Bislick et al., 2023; Immink et al., 2014), using only self-report measures (Baldo et al., 2021; Chan et al., 2012), and lack of diversity (Baldo et al., 2021; Lai et al., 2022). Other limitations included the presence of bias (Schmid et al., 2014), the use of unblinded methods (Schmid et al., 2014), the use of convenient sampling (Immink et al., 2014), and no randomization or follow-up once the experiment finished (Lai et al., 2022). Future research recommendations included looking at long-term outcomes (Lai et al., 2022; Schmid et al., 2014), using yoga as a modality with other populations to increase health benefits (Bislick et al., 2023; Immink et al., 2014), adding outcome measures of balance, feelings of wholeness, Zen, acceptance, and QoL (Bislick et al., 2023; Schmid et al., 2014), including a larger sample size with broader diversity (Baldo et al., 2021; Bislick et al., 2023; Chan et al., 2012), adding a third study arm (Baldo et al., 2021; Immink et al., 2014; Lai et al., 2022), adding a double-blinded study (Schmid et al., 2014), using fewer self-reports (Baldo et al., 2021), identifying the components of a yoga intervention to develop a standardized protocol (Bislick et al., 2023), and recruiting participants with clinically relevant levels of mood disorder, having longer intervention periods, and using research designs that include mental-health assessments for comparison between the intervention and control groups (Chan et al., 2012).

Despite limitations, the significant positive results within this literature review indicate that yoga can provide significant benefits across various health outcomes, including physical, social, emotional, and cognitive domains. Recreational therapists (RTs) with specialized training in yoga should consider the use of yoga interventions in rehabilitation protocols for individuals with chronic stroke, as these positive outcomes can lead to improved QoL across the lifespan.

### Knowledge Translation Plan

Yoga has been shown in the literature to improve functioning, overall wellness & QoL. Although the literature is not expansive across all health domains, several studies addressed similar health outcomes, determining significance & benefit to the participant. Yoga is safe, easily adaptable, & cost-effective (Garrett et al., 2011). RTs should consider using yoga with adults who have experienced a stroke to improve physical, mental, social, & cognitive functioning.

Implementation recommendations include a frequency of 1 to 6 times a week for 30 minutes to 2.5 hours (yoga components & additional content), lasting 6 to 12 weeks. Due to the variation, RTs should consider adjusting length, frequency, & duration to meet the feasibility of their agency and the needs of individual participants. Structuring the intervention in a group format is helpful as it provides a social component & can enhance QoL (Immink et al., 2014; Chan et al., 2012). The variety of yoga poses and positions offer additional considerations for the RT. Still, each session should include warm-up exercises, the main yoga exercise component (e.g., asana, pranayama), & a cool down (Lai et al., 2022). Incorporating educational components (e.g., coping with stress and embracing change) are another consideration, as they can support specific outcomes & promote overall health & well-being (Baldo et al., 2021). The RT can also encourage at-home practice and provide the necessary equipment to assist with maintaining progress (Baldo et al., 2021; Chan et al., 2012; Garrett et al., 2011). Using both standardized & self-report measures are helpful to determine outcomes & perceived benefits experienced by the participant.



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