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Opinion

# Yoga: A Potential Adjunct Therapy to Current Rehabilitation Pathways in Cardiac Conditions and Stroke

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**Abstract**

Yoga is a form of movement-based mindfulness practice that enhances the mind-body connection to benefit overall health and well-being. Although the practices of yoga are ancient traditions in the Buddhist and Hindu philosophies, scientific research regarding the impacts of yoga among people with poor cardiovascular and cerebrovascular health has only recently been undertaken. In this article, we highlight the current evidence on the potential

impact of yoga on physical and psychological well-being for older adults living with cardiac conditions or stroke.

**Keywords**
Yoga; mindfulness; elderly; stroke; heart failure; rehabilitation

## 1. Introduction

Globally, cardiac conditions and stroke are leading causes of mortality and morbidity affecting more than 25% of older adults particularly those over the age of 65 years [1, 2]. Moreover, the prevalence of anxiety, depression and emotional distress in older adults living with the consequences of cardiac conditions or stroke is large (between 30-50%), in particular for those with multiple comorbidity [3-8]. The lack of ability to self-manage the physical and psychological impacts of stroke or heart disease, lack of knowledge on coping strategies, and increased fear of experiencing another event leads to reduced medication adherence, poor quality of life, and social isolation [9-12].

Traditional rehabilitation and prevention strategies, including physical or pharmaceutical interventions, are strongly recommended to improve optimal functioning after a cardiac or stroke event [13, 14]. Exercise has well-documented health benefits, but survivors of cardiac conditions or stroke often find it difficult to participate in, or follow, exercise regimens particularly when they are physically frail, or have additional comorbidities and vulnerable psychosocial health [15-17]. Traditional cardiac rehabilitation strategies primarily focus on physical recovery, as well as secondary prevention of cardiovascular disease through lifestyle behaviour modifications. Nonetheless, attendance at traditional outpatient-based cardiac rehabilitation programs is poor, particularly amongst those who are older [18-21]. Indeed, older age and the presence of comorbidities reduce the likelihood of referral to exercise-based cardiac rehabilitation programs [17]. Traditional stroke rehabilitation strategies are also exercise-driven and often designed to optimise functional motor performance [22]. There is a growing interest to direct survivors of stroke to cardiac rehabilitation programs, but the benefits of such programs are unclear [23, 24]. Many older adults are missing out on current rehabilitation strategies that support physical and psychological recovery following life-changing cardiovascular and cerebrovascular events [25].

## 2. The Components and Potential Benefits of Yoga

Yoga originated from Buddhist and Hindu philosophies and has been a traditional Indian spiritual practice for thousands of years [26]. Regardless of its origins, yoga has recently become popular in many western countries as an alternate method to physical and mental well-being [27-29]. Yoga is proposed to provide benefits by the promotion of mindfulness through low-impact movement, breathing and meditation [30, 31]. The physical component of yoga involves low-impact movements that are combined with breathing techniques and mindfulness meditation. Mindfulness meditation, through focused attention, is essentially mental training that allows an individual to be in the

current moment, thereby regulating emotions, help with acceptance of events, problems, and negative thoughts [32].

There is emerging evidence that yoga, a form of movement-based mindfulness intervention, might be a promising adjunct activity in addition to contemporary rehabilitation strategies to support the needs of people living with cardiac conditions or stroke [29, 33-35]. Some of the benefits provided by yoga including improving flexibility, strength, balance, emotional regulation, overall well-being and reducing stress, are common to other forms of physical activity [33, 36-40].

In this paper, we highlight the current evidence for the potential benefits of yoga in improving risk factor profiles in older adults living with cardiac conditions or stroke. While previous articles have covered aspects of this topic for stroke or cardiac conditions separately, none have brought these together into a single opinion article focusing on older adults with these conditions as provided here.

## 3. Changes to Cardiovascular and Cerebrovascular Risk Profiles

There are many common modifiable risk factors associated with cardiac conditions and stroke, including hypercholesterolemia, hypertension, diabetes, physical inactivity, unhealthy diet, cigarette smoking, being overweight or obese, excessive alcohol intake and mood disorders [41]. As more studies are undertaken, there is emerging albeit preliminary evidence that yoga can ameliorate some of these risk factors in adults generally, and specifically in older adults with chronic disease. Often older adults living with cardiac conditions or stroke have more than one risk factor which adds to the complexity of developing successful lifestyle and behaviour action plans to improve survival.

### *3.1 High Blood Pressure, Diabetes, Cholesterol and Body Mass*

Hypertension is the most common risk factor in older adults with cardiac conditions or stroke. Emerging studies highlight the benefits of yoga in reducing blood pressure in older adults [42]. In a study of older adults with metabolic conditions who completed a one-year intervention with three hourly yoga classes per week, participants had a clinically and statistically significant mean reduction in systolic and diastolic blood pressure when compared to the control group (systolic blood pressure: 6.5mmHg vs 2.6mmHg; diastolic blood pressure: 3.6mmHg vs 1.6mmHg), and improved quality of life [43]. In another study of 170 people with heart disease randomly allocated to yoga and non-yoga groups, those in the yoga group had significantly greater improvements in systolic ($p$<.002) and diastolic blood pressure ($p$<.009) at 6 months post-intervention [44].

There is varying evidence of yoga on improving diabetic and blood cholesterol profiles, and reducing body fat, in adults with these risk factors [43, 45, 46]. In the comparative study of 170 people with heart disease, those in the yoga group showed significantly greater improvements in total cholesterol ($p$<.0001), low density lipoprotein (LDL) levels ($p$<.04) and triglycerides ($p$<.00001) [44]. A study of people with diabetes similarly demonstrated significant improvements in blood cholesterol, as well as in blood glucose.[45] On the contrary, no improvement in blood glucose or cholesterol levels was gained through yoga for people with metabolic syndrome [43]. In terms of body fat, significant improvements from yoga have been seen in studies of people with heart disease [44]. However, many of these studies are not conducted exclusively in individuals who are older, or in those living with cardiac conditions or stroke. Most studies are further limited by small trial

sample sizes, heterogeneity in their design, unclear or high risk of bias on several domains, and low to moderate quality of study designs [33].

### *3.2 Smoking Cessation*

While smoking is a major risk factor for cardiac conditions or stroke, cessation of smoking has proved to be a highly effective strategy for improved health, and prevention of recurrent events [47]. The evidence of yoga as a therapy for smoking cessation in older adults diagnosed with cardiac conditions or stroke is scarce. In studies that assessed the potential for yoga and mindfulness to support smoking cessation, the interventions produced changes in smoking behaviour, and in predictors of smoking behaviour such as, decreased number of cigarettes smoked, lower levels of cravings and attitudinal changes regards smoking. However, definite conclusions on their benefits for smoking cessation is not possible due to the lack of well-designed studies [48].

### *3.3 Unhealthy Diet and Excessive Alcohol*

To our knowledge there have been no studies designed to assess the effectiveness of yoga on unhealthy diet or alcohol consumption in older adults living with cardiac conditions or stroke.

### *3.4 Other Cardiovascular Indicators*

Both heart rate variability and endothelial function are also indicators of cardiovascular health. In a recent randomised controlled trial involving 80 heart attack survivors, participants in a 12-week yoga-based cardiac rehabilitation program had favourable effects on heart rate variability (HRV) compared to participants in a standard care cardiac rehabilitation involving only education [49]. In a pilot study involving 33 people who were in a 6-week yoga program, those with an established heart disease ($n$=10) observed a modest improvement in endothelial function from pre- to post-program ($p<.09$) [50].

## 4. Benefits on Psychological Health

Stress, anxiety and depression are commonly experienced in older adults living with cardiac conditions or stroke, and predict recurrent events and further comorbidities [4, 51-53]. Negative thoughts trigger the amygdala in the brain and cause heightened anxiety, and a stress response thereby affecting recovery [54].

Several strategies have been suggested for the treatment of anxiety and depression in patients with cardiac conditions or stroke such as pharmacotherapy, psychotherapy, and physical exercise [55, 56]. However, these strategies might not be effective or ideal for some older adults with severe comorbidities. For example, antidepressant medications may be beneficial for some patients with cardiac conditions or stroke, but many of these drugs either interact with medications or have adverse cardiovascular effects (e.g. high blood pressure, abnormal heart beats) [57]. For these reasons, their use is limited in older adults with cardiac conditions or stroke.

Yoga may be an effective non-invasive adjunct strategy for the management of stress, anxiety and depression [58, 59]. Three pilot studies have demonstrated that yoga has mental health benefits, in terms of improved mood, increased confidence, and reduced stress and anxiety, for people with heart disease [40], heart failure [39], and stroke [59]. Evidence suggests that the mechanisms by

which emotional regulation is attained by yoga is via the hypothalamic–pituitary–adrenal (HPA) axis which then reduces cortisol levels in plasma, as well as reduced sympathetic nervous system tone, increase vagal activity, and elevate brain gamma-Aminobutyric acid levels, thereby reducing stress and improving emotional regulation [60-63]. Yoga seems to create awareness of emotions and acceptance, which assists with letting go of negative experiences, and builds confidence in those with poor psychological health.

**5. Inability to do Intense Physical Activity**

Promoting physical activity is a recommended evidence-based strategy for older adults. Recommendations include at least 30 minutes of moderate intensity exercise on most days of the week, and strength training two or three times a week [64]. However, the evidence supporting the intensity of physical activity for older adults with a cardiac condition or stroke is unclear. Older adults with compromised heart function, significant residual physical impairments from stroke, or with comorbid conditions that impact on physical health such as chronic obstructive pulmonary disease (COPD), peripheral vascular disease (PVD), or arthritis, are often unable to participate in intense physical activities [65]. Yoga may represent an appropriate adjunct to current exercise intensive rehabilitation strategies for older adults with chronic illness, particularly those with comorbid conditions [66]. Yoga can be tailored to suit the mobility or disability levels of each participant whereby modifications, such as chair-based yoga for those requiring or desiring more support, is feasible [40, 67].

**6. Social Isolation**

People who live alone may suffer from social isolation which tends to disproportionately affect older adults. Social isolation and loneliness are strongly associated with poor physical health and reduced psychological wellbeing [11, 12]. This is particularly problematic in those living with cardiac conditions or stroke, potentially leading to inappropriate lifestyle choices including unhealthy diet, high alcohol consumption, excessive smoking, social withdrawal and reduced physical abilities, each further contributing to poor mental health [11, 12].

In recent times, people around the world are more than ever asked to socially isolate because of the novel coronavirus (COVID-19) pandemic, particularly older adults who are highly vulnerable and susceptible to the illness. The impact of social isolation is heightened in these unprecedented times, and the uncertainty of the pandemic on individuals' mental health is concerning [68]. In those older adults who are impacted by social isolation, there are obvious signs of psychological distress and fears of illness, death, and countless uncertainties about the future. In these circumstances, yoga can be delivered via virtual platforms, thereby potentially helping to regulate risk factors, alleviate symptoms of psychological distress and improve quality of life in older vulnerable adults.

**7. Conclusions and Future Directions**

In this article, we have highlighted the current evidence on the potential impact of yoga on physical and psychological well-being for older adults living with cardiac conditions or stroke. Available evidence suggests a potential positive impact of yoga on some modifiable cardiovascular and cerebrovascular risk factors in vulnerable older adults. Yoga can help to reduce stress,

depression and anxiety and can possibly be an appropriate, feasible and adjunct form of rehabilitation therapy for older adults who are unable or unwilling to participate in other traditional physical training programs. The physiological mechanisms underlying the observed clinical effects of yoga on cardiovascular risk remains unclear. Future well-designed randomised clinical trials are warranted to determine the feasibility and efficacy of yoga in older adults with cardiac conditions or stroke. These trials should consider a rigorous design, larger sample sizes, should assess frequency and duration of yoga sessions, adherence of patients to yoga sessions, relevant patient outcomes, and include sufficient follow-up periods. The use of yoga as a stand-alone therapy in the older vulnerable population needs to be further explored.

**Author Contributions**

TT and DAC conceived the outline for the article. TT wrote the initial draft. JC, BM, DAC contributed to the first draft. All authors read, contributed to and approved the final version.

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**Competing Interests**

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