Original article
Development & Validation of Yoga Based Intervention for Elders with Long Covid

Dr.Vijayakumar PS[1], Sahana AU[2]

[1]HoD, Associate professor, Department of integrative medicine
Sri Devaraj urs academy of higher education and research Tamaka, Kolar
[2]Asst. Registrar Sri Devaraj urs academy of higher education and research Tamaka, Kolar
Corresponded author: Dr. Vijayakumar PS

Abstract

Context: The term "long COVID" refers to a group of symptoms that continue to bother people who have recovered from the SARS-CoV-2 infection. At least 65 million individuals worldwide are estimated to have long COVID. Yoga practices can enhance innate immunity as well as mental health, which supports the use of yoga as an adjunctive therapy for long Covid-19. Yoga's ability to boost immunity may assist to minimize the severity of the sickness by preventing an excessively strong immune response to the cytokine storm, which is a major contributor in the worsening of the condition. **Aim:** This research documents the creation and approval of a yoga-based intervention (YBI) for elderly people with long COVID. **Materials and Methods:** The first part involved developing a yoga-based intervention based on a review of classic literature and recently published research papers. In the second step, 30 subject matter (yoga) experts confirmed the proposed module. The content-validity ratio (CVR) was determined using Lawshe's formula. **Result:** For the development of a yoga-based intervention for seniors with long COVID, appropriate yoga practices were introduced. The final yoga-based intervention module included yoga practices with a CVR ≥ 0.333, which were evaluated by 30 yoga experts and approved in faculty group discussion. **Conclusion:** The yoga techniques were created and approved for YBI for elderly people with long COVID. Thirty yoga experts validated the YBI design using Lawshe's content validity criteria.

Keywords: SARS-CoV-2 infection, critical illness, persistent symptoms, homeostasis, noncommunicable diseases, yoga, adjunctive therapy, immunity, and cytokine storm.

Introduction

The SARS-CoV-2 infection (COVID-19) has spread into a dangerous pandemic that has resulted in a sizable amount of mortality and morbidity globally. Roughly 80% of those affected had mild to moderate disease, while 5% percent of those with severe disease went on to have critical illness (Wu & McGoogan, 2020). A small percentage of COVID-19 survivors develop extra or enduring symptoms that last after weeks or months; this condition is referred to as "long COVID," "Long Haulers," or "Post COVID syndrome."An English, Welsh, and Scottish research study identified three categories of symptoms during Covid-19, there are clusters of symptoms in the respiratory, musculoskeletal, and gastrointestinal systems (Docherty et al., 2020). In a

related discovery, the COVID Symptom Study group identified six symptom clusters as follows: “Flu-like” with no fever; “Flu-like” with fever; gastrointestinal; severe level one with fatigue; severe level two with confusion; severe level three with abdominal and respiratory symptoms (Sudre et al., 2021). Depending on the primary residual symptoms, long COVID may be classified into distinct groups, such as post COVID cardio-respiratory syndrome, post COVID fatigue syndrome, and post COVID neuro-psychiatric syndrome. After recovering from COVID-19, any new symptoms should be appropriately treated to rule out potentially fatal sequelae such as pneumothorax, pulmonary embolism, coronary artery disease, and stroke (Dasgupta et al., 2020). Long COVID can either be ongoing or relapsing and remitting in nature (Nabavi Nikki, 2020). It is possible for one or more acute COVID symptoms to persist or for brand-new symptoms to appear. Depending on how long the symptoms remain, post COVID or long COVID can be divided into two stages: post acute COVID- which occurs when the symptoms last longer than 3 weeks but less than 12 weeks, and chronic COVID- which occurs when the symptoms stay longer than 12 weeks (Trisha Greenhalgh et al., 2020). People who were released after regaining health after acute COVID still had at least one symptom 60 days later. These people showed no symptoms of an acute illness, such as fever. The most common complaints were dyspnea, fatigue, a poor quality of life, joint pain, and chest pain. Coughing, hair loss, a skin rash, palpitations, headaches, diarrhea, neurocognitive issues such as cognitive blunting (also known as "brain fog"), memory and concentration issues, "pins and needles" sensation, insomnia, impaired balance and gait were some additional symptoms. Patients also reported being unable to complete basic daily tasks in addition to suffering from mental health issues such as anxiety, melancholy, and post-traumatic stress disorder (Carfì et al., 2020). The presence of SARS-CoV-2 in CSF shows its neuro-invasive features and there is possible disruption to micro-structural and functional brain integrity in patients recovered fromCOVID-19(Lu Yiping Li et al., 2020). Another study found that three months later, individuals were still feeling weary and out of breath (Arnold et al., 2020). After contracting SARS-CoV-2, individuals may experience worsening of underlying comorbidities such diabetes, hypertension, and cardiovascular disease, necessitating therapy optimization(Trisha Greenhalgh et al., 2020).However, COVID patients with minor disease assert that they have not recovered to their pre-COVID health status(Raveendran et al., 2021). As a result, treating people with protracted COVID requires a multidisciplinary approach, which calls for the creation of a validated and standardized yoga-based intervention for protracted COVID in elderly population, the rationale for which is described in more detail below.

Risk for Long Covid

The observation of individuals who have recovered from COVID has shown a few factors that are usually connected to the emergence of persistent COVID. Long COVID is twice as common in women than in men (Nabavi Nikki, 2020). Another risk factor is advanced age (Nabavi Nikki, 2020). Also, having more than five symptoms present during the acute stage of the illness increase the risk of developing long COVID (Sudre et al., 2021). The existence of comorbidities significantly raises the risk of developing post COVID syndrome. Even those with minor symptoms of COVID at first were observed to develop long COVID.

Aetiology of Long Covid

The persistence of symptoms may be caused by the sequelae of organ damage, the varying degree of injury (organ damage), the varying time needed for the recovery of each organ system, the persistence of chronic inflammation (convalescent phase) or immune response/auto antibody generation, the rare persistence of viruses in the body, the non-specific effects of hospitalization, the sequelae of critical illness, post-intensive care syndrome, problems brought on by a corona infection, comorbidities, or unfavorable effects of the drugs used (Colafrancesco et al., 2021; Tay et al., 2020). Persistence of infection can be due to persistent viremia in people with altered immunity (Wu et al., 2020). The effects of COVID-19 on society and the economy also leads to

psychological problems that may hinder the recovery(Gemelli Against Long covid-19 Post-Acute Care Study Group, 2020).

Need of Yoga in Long COVID-19

Yoga is well-liked all around the world since it has components that promote wellness and excellent health. Over the last three decades, research has shown the value of yoga practices, including meditation, in reaching homeostasis in noncommunicable diseases through stress reduction and the promotion of a healthy lifestyle. Through considerable investigation into the connections between the mind and body and how to correct imbalances, a holistic basis for people's health has been formed. Numerous studies have shown that systematic, specific, targeted asana practices, concentrated pranayamas, mantras, and meditation help build a broad-spectrum immune response in the body to fend off viral illness or minimize its severity (Nagendra, 2020).In a study, individuals with HIV-1 infection who engaged in integrated yoga for a month showed a substantial reduction in their viral loads, an increase in the number of CD4 immune cells, and improvements in their psychological states (Naorobibam et al., 2016). A study on healthy people who practiced transcendental meditation found higher numbers of the B-lymphocyte series and natural killer (NK) cells in their blood compared to non-meditators (Xiang et al., 2020). A comparable study found a high correlation between an increase in NK activity during yoga practice and an alpha brain wave activation in the frontal lobe (demonstrating restful awareness), demonstrating the relationship between a calm mind and enhanced cellular immunity (Kamei et al., 2001). According to reports, yoga has been demonstrated to alter brain activity patterns and pain perception. An increase in frontal brain and amygdala activity, as well as an increase in grey matter, were seen after a yoga intervention. The observed increase in brain wave activity might be the reason why yoga training therapies reduce anxiety and improve attention (Desai et al., 2015). A sizable body of research has also suggested that older persons may experience sleep problems as they age, which might further impede cognitive performance. Yogic intervention appears to be therapeutically beneficial in enhancing cognitive functions and improving sleep quality in adults 60 years of age or older (Zhang et al., 2018). The fundamental idea of yoga is the integration of the body, mind, and consciousness. As a psycho-somatic method, it balances a person's life on all planes, including the physical, mental, emotional, and spiritual.

The body and mind's defenses need to be boosted in post pandemic era. There is now some data that suggests yoga activities might strengthen the body's much-needed immunity and keep its homeostasis in a healthy state (Nagendra, 2020). Maintaining excellent respiratory health is essential to preventing mortality from COVID since the upper respiratory tract acts as the point of entry for the SARS-CoV-2 viral infection. Numerous results of scientific investigations show that practicing yoga regularlyoften improves lung function in people with COPD (Gautam & Dada, 2021). For LONG COVID-19, yoga has been associated with a variety of cardioprotective advantages that lower the risk of lung and heart damage. In the early stages of COVID-19, yoga's anti-inflammatory, anti-oxidant, and immune-boosting benefits may have an indirect antiviral effect (Bahrampour et a., 2020). Since melatonin is used to treat viral infections, the apparent association between yoga and increased melatonin activity may be another factor supporting the beneficial effects yoga in COVID-19 infection (GHTF, 2004). Thus, Yoga practice has the potential to enhance innate immunity as well as mental health, which supports its use as an adjunctive therapy for long COVID-19. By limiting an excessively strong immune response to the cytokine storm, which is a major component in the disease's aggravation, yoga's ability to boost immunity may assist to lower the severity of the condition.

Materials and Methods

The first part of thisstudyinvolved developing a yoga-based intervention based on a review of classic literature and recently published research papers in the area of Yoga and Covid-19. In the second step, 30 subject matter (yoga) experts confirmed the proposed module. The content-validity ratio (CVR) was determined using Lawshe's formula.

Step 1- Under the guidance of well-known yoga masters, the researcher examined a variety of yoga scriptures in order to comprehend the basis for an integrated approach to yoga therapy and create an evidence-based yoga intervention for long COVID. Then, we collated the therapeutic corrective measures suggested by several texts (Patanjali Yoga Sutra, Hatha Yoga Pradipika, Hatharatnavali, Bhagavad Gita). The construction of a need-based table of practices for long-term holistic development in all five aspects of personality (Pancha kosha model of yoga) was based on the hatha yoga literature. To create a list of all the methods used during this research, publications (books and research journal articles) on yoga for COVID and post-COVID rehabilitation were also researched. This yielded 57 practice items.

Step 2- To determine if a system, service, or product complies with standards and requirements for its intended purpose, Lawshe's content-validity ratio (CVR) is used for validation (Lawshe, 1975). Because there isn't a standardized yoga intervention for post-COVID rehabilitation, we came to the conclusion that there is a need for a tried-and-true evidence-based yoga intervention for long COVID. This led to the planning and execution of the present validation investigation.

Step 3- A focused group discussion (FGD) with 30 subject matter experts (SMEs) was organized to validate the 57-item intervention. The SMEs included doctors of medicine in yoga, doctors of philosophy in yoga with at least 6-7 years of relevant experience, and yoga therapists (MSc in yoga) who have been continuously active in teaching the IAYT (integrated approach of yoga therapy) techniques to patients of all ages for more than 8 years. The content validity was scored by these 30 SMEs in an independent manner on a three point scale (0–2), with not necessarily obtaining a 0, useful but not essential receiving a 1, and essential receiving a 2. Following validation, the data were analyzed using Lawshe's CVR (Lawshe, 1975).

Statistical Analysis

Each of the 57 practices was evaluated by 30 SMEs. For all 57 items, Lawshe's CVR was computed using the

$$CVR = \frac{N_e - \left(\frac{N}{2}\right)}{\frac{N}{2}}$$

formula (Lawshe, 1975):

In the formula, Ne is the number of SME panelists who indicated "essential" and N is the total number of SME panelists. According to Lawshe's significance table, the value of CVR for 20 SMEs is equal to 0.333, meaning that all items with CVR > 0.333 are appropriate and necessary for the module.

Results

CVR was established for each of the 57 first practices. The planned intervention included 34 yoga practices with a CVR of 0.333. At a faculty group discussion, all practices that met the cut off CVR for 30 experts were addressed and accepted by all participants (FGD). The final intervention module was created as a result.

Table 1: The following table contains the CVR for each practice on the initial YBI list.

Practice List	CVR
Greevasanchalana (Neck Movements)	0.866
Skandasanchalan (Shoulder Movements)	0.8
ManibandhaSanchalana (Wrist Movements)	-0.133
Katisanchalana (Waist Movements)	0.2
Janusanchalana (Knee Movements)	-0.066
Padasanchalana (Ankle Movements)	0
Hands in and out breathing	1
Hand Stretch breathing	1
Ankle Stretch Breathing	0.2
Tiger Breathing	1
Shashankasana Breathing	0.666
Straight leg raising breathing	0.333
Chair Suryanamaskar	0.533
Tadasana	0.133
Ardha Chakrasana	0.437
Ardhakatichakrasana	0.933
Konasana	0.266
Marjariasana	0.533
Janu Shirshasana	0.2
UttanMandukasana	0.133
Gomukhasana	-0.466

Sarala Matsyendrasana	0.4
Trikonasana	0.466
Ustrasana	0.733
Bhujangasana	0.933
Shalabhasana	0
Vakrasana	0.133
Paschimottanasana	0.2
Savasana	0.933
Setubandhasana	0.6
Sarvangasana	0.2
Pavanamuktasana	0.866
Viparita Karani	-0.333
Sarala Matsyasana	0.333
Nadi Shuddhi Pranayama	0.866
Bhastrika Pranayama	0.133
Bhramari Pranayama	0.866
Ujjayi Pranayama	0.533
Sectional Breathing	0.733
Surya Anuloma-Viloma	-0.333
Sukha Pranayama	-0.266
Chandra Anuloma-Viloma	0
Jalandhara Bandha	0.2
Uddiyana Bandha	0.2
Nadanusandhana	0.733
Yoga Nidra	0.6
IRT	0.533
QRT	0.533

DRT	0.933
MSRT	0.733
Cyclic Meditation	0.4
Om Meditation	0.866
Kapalbhati	0.333
Jal Neti	0.6
Vaman Dhauti	-0.066
LSP	0.533
Trataka	0.133

Table 2: The yoga intervention practices with content validity ratio ≥0.333. The below table gives the final YBI module for long COVID in elderly population.

Practice List	**CVR**
Greevasanchalana (Neck Movements)	0.866
Skandasanchalan (Shoulder Movements)	0.8
Hands in and out breathing	1
Hand Stretch breathing	1
Tiger Breathing	1
Shashankasana Breathing	0.666
Straight leg raising breathing	0.333
Chair Suryanamaskar	0.533
Ardha Chakrasana	0.437
Ardhakatichakrasana	0.933
Marjariasana	0.533
Sarala Matsyendrasana	0.4
Trikonasana	0.466
Ustrasana	0.733

Bhujangasana	0.933
Savasana	0.933
Setubandhasana	0.6
Pavanamuktasana	0.866
Sarala Matsyasana	0.333
Nadi Shuddhi Pranayama	0.866
Bhramari Pranayama	0.866
Ujjayi Pranayama	0.533
Sectional Breathing	0.733
Nadanusandhana	0.733
Yoga Nidra	0.6
IRT	0.533
QRT	0.533
DRT	0.933
MSRT	0.733
Cyclic Meditation	0.4
Om Meditation	0.866
Kapalbhati	0.333
Jal Neti	0.6
LSP	0.533

Discussion

A complete yoga intervention was developed in the current study using traditional literary sources and input from experts. Our thorough examination of ancient yogic books turned up no specific references to yogic practices that might help older people with long COVID. Thus, yoga practices that can slow down aging and enhance general quality of life were narrowed down. The majority of the ancient literature provides ways to obtain these advantages. However, more emphasis is placed on enhancing health through various yogic practices in more contemporary hatha yogic texts (Gharote et al., 2007). The benefits of yogic techniques and the significance of posture adjustments to improve responsiveness in the elderly are explored (Digmbar, 1998). Breathing issues are one of the primary concerns of LONG COVID-19 patients, which the patients felt to be significantly improved with pranayama (Kathiresan, 2021). Anuloma-viloma pranayama balances the flow of

air through both nostrils, clears minor blockages, and lowers blood pressure and pulse rate (Sawant, 2021). The asana that is advised to long COVID-19 patients should be simple to do in order to minimize post-exertion malaise as weariness is one of the most common LONG COVID-19 symptoms. The practice of isometric asana has been linked to a significant reduction in fatigue in CFS patients, which is confirmed by changes in blood biomarkers (Takakura et al., 2019). Patients with COVID-19 have demonstrated that meditation significantly reduces a range of inflammatory markers (Castle et al., 2021). By boosting neuroplasticity, particularly through the processes of relaxation and attention training, meditation may hasten the recovery of long COVID-19 patients (Skeide, 2010). It may be convenient to nurture a healthy mind and feel higher well-being with mindfulness meditation in addition to its potential to address clinical issues (Tang et al., 2015). Numerous studies have demonstrated that Bhramari pranayama aids COVID-19 patients in controlling their tension and mental exhaustion as well as their melancholy, anxiety, and insomnia. In contrast to a silent expiration, humming generates a vibration that calms the nervous system and the mind, increasing nasal nitric oxide by 8–21 times. Nitric oxide works as a vasodilator to increase blood flow to the organs, lower arterial inflammation, and fortify the immune system, all of which aid in the elimination of viruses and other parasitic organisms (Sawant, 2021). The strategies outlined above are only a handful of the existing ones that have been shown to be very successful in treating post-COVID syndrome. However, if yoga is done consistently, it may have magnificent and incredible effects, harmonizing all planes of existence and fostering well-being. Thus, evidence supports the use of yoga as a complementary therapy for long COVID-19 since it can enhance both innate immunity and mental wellness.

Conclusion

A comprehensive and traditional literature-based Yoga intervention module was developed to facilitate recovery from the multidimensional symptoms of long covid in elders. The Yoga module was validated by 30 experts. The final module could be used as an intervention in elders with long covid, further studies are advocated totest the efficacy of the intervention.

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Conflicts of interest

There are no conflicts of interest.

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References

1. Wu, Z., McGoogan, J.M (2020). Characteristics of and important lessons from the coronavirus disease 2019 (LONG COVID-19) outbreak in China: summary of a report of 72,314 cases from the Chinese Center for Disease Control and Prevention. JAMA, 323: 1239-1242.

2. Docherty, A.B., Harrison, E.M., Green, C.A., Hardwick, H.E., Pius, R., Norman, L., et al. (2020). Features of 20 133 UK patients in hospital with long covid-19 using the ISARIC WHO Clinical Characterisation Protocol: prospective observational cohort study. BMJ, 369.

3. Sudre, C., Lee, k., Lochlainn, M. et al. (2021).Symptom clusters in covid 19: a potential clinical prediction tool from the COVID Symptom study. app Sci Adv, 7 (12); 4177.

4. Dasgupta, A., Kalhan, A., Kalra, K (2020).Long term complications and rehabilitation of LONG COVID-19 patients J Pakistan Med Assoc, 70: S131-S135.

5. Trisha Greenhalgh, Matthew Knight, Christine,A.,'Court, Maria Buxton, Laiba Husain (2020). Management of post-acute long covid-19 in primary care BMJ, 370: 3026.

6. Carfi, A., Bernabei, R., Landi, F (2020). Persistent symptoms in patients after acute LONG COVID-19 J Am Med Assoc, 324; (6):603-605.

7. Lu Yiping Li, Xuanxuan Geng, Daoying Mei, Nan Wu, Pu-Yeh Huang, Chu-Chung Jia, Tianye Zhao, Yajing Wang, Dongdong Xiao, Anling Yin, Bo (2020). Cerebral micro-structural changes in LONG COVID-19 patients - an MRI-based 3-month follow-up study. EClinicalMedicine: 100484.

8. Arnold, D.T., Hamilton, F.W., Milne, A. et al (2020). Patient outcomes after hospitalization with LONG COVID-19 and implications for follow-up: results from a prospective UK cohort thorax Published Online First:216086.

9. Raveendran, A. V., Jayadevan, R., & Sashidharan, S. (2021). Long COVID: an overview. Diabetes & Metabolic Syndrome: Clinical Research & Reviews, 15(3): 869-875.

10. Colafrancesco, S., Alessandri, C., Conti, F., Priori, R (2020).LONG COVID-19 gone bad: a new character in the spectrum of the hyperferritinemiasyndrome?.Autoimmun Rev, 19 :102573.

11. Tay,M.Z.,Poh, C.M.,Rénia, L., MacAry, P.A., Ng, L.F.P (2020). The trinity of LONG COVID-19: immunity, inflammation and intervention. Nat Rev Immunol, 20:363-374.

12. Wu, F., Wang, A., Liu, M., et al. (2020).Neutralizing antibody responses to SARS-CoV-2 in a LONG COVID-19 recovered patient cohort and their implications

13. GemelliAgainst Long covid-19 Post-Acute Care Study Group (2020). Post-LONG COVID-19 global health strategies: the need for an interdisciplinary approach. Aging ClinExp Res, 32(8):1613-1620.

14. Naoroibam, R., Metri, K.G., Bhargav, H., Nagaratna, R., Nagendra, H.R (2016).Effect of integrated yoga (IY) on psychological states and CD4 counts of HIV-1 infected patients: A randomized controlled pilot study. *Int J Yoga,* 9:57–61.

15. Xiang, Y.T., Yang, Y., Li, W., Zhang, L., Zhang,Q,. Cheung, T., et al. (2020). Timely mental health care for the 2019 novel coronavirus outbreak is urgently needed. *Lancet Psychiatry,*7:228–9.

16. Kamei, T., Toriumi, Y., Kimura, H., Kimura, K (2001). Correlation between alpha rhythms and natural killer cell activity during yogic respiratory exercise. *Stress Health,* 17:141–5.

17. Desai, R., Tailor, A., Bhatt, T (2015).Effects of yoga on brain waves and structural activation: a review. Compl. Ther. Clin. Pract, 21(2):112-118.

18. Zhang, Y., Li, C., Zou, L., Liu, X., Song, W (2018). The effects of mind-body exercise on cognitive performance in elderly: a systematic review and meta-analysis. *Int. J. Environ. Res. Public Health,*15:2791.

19. Gautam, S., Dada, R (2021). Yoga may prevent cytokine storms in LONG COVID-19. Coronaviruses, 2 (3):284-288.

20. Bahrampour, K.,Juybari, M.H.,Pourhanifeh, A., Hosseinzadeh, K., Hemati, S.,Mehrzadi (2020). Melatonin potentials against viral infections including LONG COVID-19: current evidence and new findings. Virus Res., 287.

21. Global Harmonisation Task Force (2004). - Quality Management Systems - Process Validation Guidance. *GHTF/SG3/N99-10*;2:3.

22. Gharote, M.L., Devnath, P., Jha, V.K (2007). Hatha Tattva Kaumudi: A treatise on Hatha Yoga by Sundara Deva.Lonavla, India TheLonavla Yoga Institute (India).

23. Digambar Ji, S., Kokaje, R.S (1998).Hathapradipika of Svatmarama, Lonavla, India. Kaivalyadhama, S.M.Y.M. Samiti.

24. Kathiresan, N., Arunthathi,R.,Venugopal, V., Narayanaswamy,K., Manavalan, N., Maheshkumar, K (2021). "It is the best part of our Hospital life": a Qualitative analysis on the impact of Yoga and Naturopathy as a Complementary therapy in the management of LONG COVID-19. Asian J. Psychiatr, 64 :102789.

25. Sawant,R.S.,Zinjurke, B.D., Binorkar, S.V (2021). Preventive aspect of ayurveda and yoga towards newly emerging disease LONG COVID-19. J. Compl. Integr. Med., 18 (4): 667-678.

26. Takakura, S., Oka, T., Sudo, N (2019). Changes in circulating microRNA after recumbent isometric yoga practice by patients with myalgic encephalomyelitis/chronic fatigue syndrome: an explorative pilot study. Biopsychosoc. Med., 13: 29.

27. Castle, R.D., Williams, M.A., Bushell, W.C., Rindfleisch, J.A., Peterson, C.T., Marzolf, J et al. (2021). Implications for systemic approaches to LONG COVID-19: effect sizes of remdesivir, Tocilizumab, melatonin, vitamin D3, and meditation. J. Inflamm. Res., 14: 4859-4876.