Journal of Ayurveda and Integrative Medicine 14 (2023) 100788

Contents lists available at ScienceDirect

Journal of Ayurveda and Integrative Medicine

journal homepage: http://elsevier.com/locate/jaim

Original Research Article

Designing and validation of Yoga module for workers with prolonged standing

U. Yamuna, Kshamashree Madle, Vijaya Majumdar, Apar Avinash Saoji*

The School of Yoga and Naturopathic Medicine, Division of Yoga and Life Sciences, Swami Vivekananda Yoga Anusandhana Samsthana (S-VYASA Deemed to be University), 19, Eknath Bhavan, Gavipuram Circle, KG Nagar, Bangalore, 560019, India

ARTICLE INFO

Article history:
Received 13 March 2022
Received in revised form
22 July 2023
Accepted 22 July 2023
Available online xxx

Keywords:
Occupational health
Public health
Vascular health
Yoga therapy

ABSTRACT

Background: Prolonged standing is a part of several professions, which can have physical and psychosocial implications. Yoga as a mind-body therapy may be useful to prevent and manage such health issues. However, there is a lack of a standardized yoga module addressing the health issues of workers with prolonged standing.
Objectives: Thus, the present study was undertaken to design and validate a specific yoga module for the target population.
Methods: A yoga module was prepared by reviewing yoga texts for the specific needs of the target population. This was validated for content validity for the experts on a Likert scale.
71 yoga experts validated the module. The content validity ratio (CVR) above 0.70 was considered to be valid.
Results: The validated yoga module consists of joint loosening and strengthening exercises, asana, pranayama and relaxation techniques. The average CVR for the module was found to be 0.80.
Conclusion: The designed yoga module is found to be valid by the experts. The module needs to be assessed for feasibility and efficacy in the target population.

1. Introduction

An individual spends about a third of his day at the workplace during his adult life. The long hours at the workplace make it essential to emphasize workplace wellness. Studies have shown that exposure to chemicals, accidents, physical injuries, and psychosocial factors negatively impact the worker's health. World Health Organization (WHO) reports estimate that 40% of occupational hazards are attributed to accidents, 35% to carcinogens and chemicals, 22% to noise, and ~5% to ergonomic derangements [1]. The World Health Assembly has resolved to have effective strategies to enhance worker's health and implemented a global plan of action for worker's health from 2008 to 2017. The policy recommends creating a healthy workplace by considering work-related physical and psychosocial risks, promoting healthy behaviors, and considering the social and environmental determinants [2]. Enhancing workers' health is also considered beneficial to both the workers and the industry [3].

Epidemiological studies demonstrate the impact of posture during working hours to have several health implications [4–6]. Among the postures for work, whether standing is better or sitting has been a matter of debate. In many scenarios, the nature of work necessitates standing. Some such scenarios include assembly and machining operations, supermarket checkout employees, quality control workers, traffic cops, healthcare staff such as dentists, surgeons, and nurses. Other occupations that require prolonged standing include security officials, defense force personnel, vendors and airport ground staff. Further, the standing posture could be classified into stationary and dynamic standing. Without much movement, the health implications for stationary standing include lower limb blood pooling, discomfort and pain, chronic venous insufficiency, low back pain, and postural hypotension [7,8]. Prolonged standing hours were also associated with increased lower limb blood pressure [9] and risk for hospitalization due to varicose veins [10]. Prolonged standing for more than 4 h is found to be a more important risk factor for varicose veins irrespective of gender

* Corresponding author.
E-mail: aparsaoji@gmail.com
Peer review under responsibility of Transdisciplinary University, Bangalore.

https://doi.org/10.1016/j.jaim.2023.100788

difference [11]. Foot pain pressure threshold also dropped due to working in a standing posture for a prolonged time compared to other postures [12]. Antle et al. attributed the standing-related lower limb discomfort to the vascular origin and back discomfort to the interaction of muscular, vascular, and postural factors [7]. Another common issue associated with prolonged standing was physical fatigue [13]. Psychological stress due to such occupation is also a common factor associated with work-related musculoskeletal disorders [14].

A report by the World Health Organization for the Prevention of Musculoskeletal disorders related to the workplace recommends proper ergonomics and behavioral measures [15]. Some other measures to prevent prolonged standing-related health issues include using floor mats, altering the position between standing and sitting, using softer shoes or shoe inserts, and hosiery or stockings [16]. Exercise also has been beneficial to alleviate the pain related to prolonged standing in the workplace [17]. Han et al. observed increased work efficiency and reduced pain relating to prolonged standing due to a hamstring stretch exercise intervention [18]. Leg movements have effectively reduced lower limb swelling and discomfort in such professionals [19]. Thus, exercises could be an effective means for minimizing the physical hazards relating to prolonged standing. However, additional means are required to minimize the psychosocial issues associated with prolonged standing at workplaces.

Yoga, an ancient Indian Mind-Body practice, has been beneficial in multiple domains of life. Yoga practices involve physical postures, breathing practices, meditation, and a healthy lifestyle. It has been effectively used for managing musculoskeletal health issues such as low back pain [20,21], lower limb pain [22], and fatigue [23]. Yoga is known to reduce stress and enhance well-being in the workplace [24]. Yoga has also been helpful in other professions such as health professionals [25], computer professionals [26], defense personnel [27], and sportspersons [28,29]. However, there is no standardized yoga protocol available for addressing the issues of prolonged standing at the workplace. Thus, the current study was undertaken to design and validate a yoga module for such professionals with the objectives of:

1. Strengthening the lower limb, pelvis and back muscles
2. Reduce musculoskeletal pain, especially in the lower back, neck, knees, and shoulders
3. Improve the venous drainage from the lower limb
4. Reduce psychological stress and fatigue
5. Enhance work efficiency

2. Methods

2.1. Study Design

The investigators prepared a yoga module specifically designed to address the health issues in the target population. The yoga module was then sent to the experts to validate the practices' usefulness on a Likert scale. The content validity was assessed using Lawshe's formula.

2.2. Designing of yoga protocol

The investigators reviewed the ancient [30,31] and contemporary yoga texts [32,33] to identify and design a yoga module based on the specific health implications in the target population. During the design, other clinicians were also consulted, such as orthopedics and psychiatrists, who had prior exposure to yoga therapy. The yoga module included loosening exercises, breathing exercises, strengthening exercises, relaxation techniques, asana, pranayama, and meditation techniques.

2.3. Process of validation

2.3.1. Defining an expert for validation

An expert was defined as a yoga clinician possessing at least a medical undergraduate (Bachelor of Naturopathy and Yogic Sciences: BNYS)/postgraduate (Doctor of Medicine: MD) or doctoral (Ph.D.) degree in Yoga with a minimum experience of two years in clinical practice.

2.3.2. Methodology for validation

A google form was created for all the practices with a choice on a Likert scale consisting of five options for defining the usefulness of the said practice for the stated objectives (not at all, a little, moderate, very much, extremely). The experts reached out through emails for validating the same. Practices rated "very much" and "extremely" were considered essential practices for content validation.

2.4. Statistical analysis

The data was organized in Microsoft Excel version 2019. The cutoff value of 0.42 was calculated by applying Lawshe's formula for the content validity ratio (CVR). According to Lawshe's formula, we have $CVR = (Ne - N/2)/N/2$, where Ne = total number of essentials for each practice, and N = total number of panelists.

3. Results

3.1. Yoga therapy experts

A total of 71 experts with experience ranging from 2 to 22 years (median experience = 7 years) responded to the validation request. The characteristic features of the experts are expressed in Table 1:

3.2. Content validity ratio

We had fixed CVR at a minimum of 0.70 to include the practice in the final module. From the responses received from the experts, two practices, i.e., *Padangushthasana* (CVR = 0.54) and *Navasana* (CVR = 0.68), were excluded. The rest of the practices were included in the module. The average CVR for the yoga module was found to be 0.80. The details of individual practices and overall CVR are illustrated in Table 2. The details of the intervention along with their approximate duration and sequence are depicted in Table 3.

4. Discussion

Occupational safety and health is a major concern in today's environment [2]. Yoga has become popular for its health benefits in health and disease [34,35]. Several studies on yoga in workplace wellness have demonstrated its beneficial role in maintaining and optimizing health. Yoga is found beneficial in reducing musculoskeletal pain and visual discomfort in computer professionals

Table 1
Details of the experts for validation of the yoga module.

Qualification	No of experts	Experience in years (mean ± SD)
BNYS	51	7.34 ± 4.80
MD	17	6.35 ± 4.18
PhD	02	8.00 ± 1.41
Total	**71**	**7.12 ± 4.58**

Table 2
Details of the Content Validity Ratio of each practice following validation.

Practice	CVR value	Practice	CVR value
Loosening Exercises		Quick Relaxation Technique	0.77
Neck movements	0.96	Deep Relaxation Technique	0.87
Shoulder rotation	0.75	**Average CVR**	**0.83**
Shoulder shrugs	0.85	*Asana*	
Elbow movements	0.81	*Ardha chakrasana*	0.83
Wrist movements	0.77	*Trikonasana*	0.79
Knee rotation and tightening	0.85	*Parivritta trikonasana*	0.73
Ankle rotation	0.83	*Padahasthasana*	0.91
Feet movements	0.91	*Veerabadrasana*	0.75
Toe and heel walking	0.87	*Vrikshasana*	0.85
Side lying leg lifts	0.89	*Garudasana*	0.73
Average CVR	**0.85**	*Utkatasana*	0.79
Breathing Exercises		*Gomukhasana*	0.70
Hand stretch breathing	0.81	*Vakrasana*	0.73
Hands in and out	0.87	*Ardhamatsyendrasana*	0.73
Ankle stretch	0.70	*Baddhakonasana*	0.77
Setubandasana breathing	0.79	*Upavishta Konasana*	0.77
Bhujangasana breathing	0.73	*Pawanamukthasana*	0.75
Tiger breathing	0.73	*Sarvangasana*	0.81
Average CVR	**0.77**	*Vipareetakarani*	0.79
Strengthening Exercises		*Matsyasana*	0.75
Alternate leg raise	0.85	*Bhujangasana*	0.73
Hip abduction and adduction in supine	0.73	*Shalabasana*	0.73
Hamstring stretch with rope support in supine	0.75	*Dhanurasana*	0.77
Quadriceps stretch with wall support	0.75	**Average CVR**	**0.77**
Single and both leg raising with maintenance at 10, 30, 45, 60 and 90°	0.79	***Pranayama* and Meditation**	
Single straight leg raise to 90° followed by rotation of the same leg	0.73	*Nadisuddhi Pranayama*	0.91
Average CVR	**0.77**	*Brahmari Pranayama*	0.89
Relaxation Techniques		*Nadanusandana*	0.81
Instant Relaxation Technique	0.85	**Average CVR**	0.87

Table 3
Details of the Yoga intervention with duration and sequence.

Sl no	Intervention	Frequency	Time (min)
1	**Loosening exercises**		
	Neck movements, Shoulder rotation, Shoulder shrugs, Elbow movements, Wrist movements, Knee rotation and tightening, Ankle rotation, Feet movements, Toe and heel walking, Side lying leg lifts	5 counts for each practice	10
2	**Relaxation techniques**		
2.1	Instant Relaxation Technique (IRT)		1
2.2	Quick Relaxation Technique (QRT)		2
2.3	Deep relaxation technique (DRT)		4
3	**Breathing exercises**		
	Hand stretch breathing Hands in and out, Ankle stretch, *setubandhasana* breathing, *bhujangasana* breathing Tiger breathing, Alternate leg raise	5 counts for each practice	4
4	**Strengthening exercises**		
	Hip abduction and adduction in supine, Hamstring stretch with rope support in supine, Quadriceps stretch with wall support, Single and both leg raising with maintenance at 10, 30, 45, 60 and 90°, Single straight leg raise to 90° followed by rotation of the same leg	5 counts for each practice	4
5	**Asana**		
	ardha chakrasana, trikonasana, parivritta trikonasana, padahasthasana, veerabhadrasana, vrishchikasana, garudasana, utkatasana, gomukhasana, vakrasana, ardhamatsyendrasana, baddhakonasana, upavishta konasana, pavanamuktasana, sarvangasana, vipareetakarani, matsyasana, bhujangasana, shalabhasana, dhanurasana	15–30 s Posture hold for each practice	20
6	***Pranayama* and other practices**		
6.1	*Nadishuddhi pranayama*	9 rounds	3
6.2	*Bhramari pranayama*	9 rounds	3
6.3	*Uddiyana* bandha	1 round	1
6.4	*Nadanusandhana*	3 rounds	3
7	**OM meditation**		5
	TOTAL		60

Note: Practices were given in graded manner and also timings varied based on the proficiency of practice.

[36,37], stress levels in nurses [38], and even enhancing lung functions in farmers, who are suffering due to chronic pesticide exposure [39]. Therefore, it is apt to create a specific yoga module to address the problem of workers who undergo prolonged standing.

The current study was an attempt to design and validate a yoga module specifically designed to address the health issues of workers who need to stand for a prolonged time. Such subjects face several health issues such as venous insufficiency, lower limb and back pain, fatigue, and psychological problems. The study's design was done by the investigators keeping in mind the specific health issues of the target population. The designed integrative yoga module contained loosening, breathing, and strengthening

exercises, asana, pranayama, meditation, and relaxation techniques. A total of 71 yoga experts responded. The content validation ratio was performed by applying Lawshe's formula for the Content Validation Ratio [40]. Two practices were excluded from the initially designed module. The average content validation ratio (CVR) for the final yoga module was found to be 0.80. All the experts opined that the yoga module would help addressing the health implications of prolonged standing. According to Lawshe, CVR above 0.42 is considered good enough [40]. However, in the present study, we set the cutoff value for the CVR at 0.70. Thus, the yoga module can be considered valid.

The present study was similar in methodology to earlier studies to validate yoga modules for various settings. For many of these studies, the number of experts validating the modules is limited. The strength of the current study is that a large number of experts ($n = 71$) opined about the yoga module. Also, keeping a strict cutoff value for the CVR above 0.70 helped us validate the module rigorously. A limitation is the absence of a phlebologist in the experts who designed or validated the module. Also, including clinicians from other disciplines other than yoga, such as orthopedics or psychiatrists as well as occupational health experts could have made the module more robust.

This validated yoga module needs to be tested for feasibility and efficacy in future studies. A separate randomized clinical trial is registered with the Clinical Trial Registry of India for the efficacy study by the authors. Following such a yoga module may aid in the overall well-being of the professionals at the workplace and minimize occupational hazards due to prolonged standing. Such professions include police and defense personnel, assembly line workers, store-keepers, etc. Thus, the designed yoga module may be helpful in many occupational settings.

Funding

The study has not received funding from any funding agency.

CRediT author statement

UY was involved in Writing - Original Draft, Review & Editing, KM was involved in Methodology, Project administration, Data Analysis, Writing - Original Draft, Review & Editing, VM was involved in Writing - Original Draft, Review & Editing, AAS was involved in Conceptualization, Data Analysis and interpretation, Review & Editing and Supervision.

Declaration of AI-assisted technologies in the writing process

During the preparation of this work, the authors used Grammarly® Premium in order to check the spelling and grammar. After using this tool/service, the authors reviewed and edited the content as needed and take full responsibility for the content of the publication.

Declaration of competing interest

The authors declare no conflict of interest.

Acknowledgment

The authors gratefully acknowledge the suggestions of Dr. Ragavendrasamy B., Asst. Medical Officer, Govt. Hospital, Udumalpet for our study.

References

[1] World Health Organization. About occupational health. Occup Health (Auckl); 2017. http://www.who.int/occupational_health/about/en/ (accessed June 11, 2018).
[2] WHO | Healthy workplaces: a WHO global model for action. World Health Organization (ISBN 9789241599313); 2015.
[3] Sparks K, Brian F, Cooper CL. Well-being and occupational health in the 21st century workplace. J Occup Organ Psychol 2001;74:489–509.
[4] Gerr F, Marcus M, Monteilh C. Epidemiology of musculoskeletal disorders among computer users: lesson learned from the role of posture and keyboard use. J Electromyogr Kinesiol 2004;14:25–31. https://doi.org/10.1016/j.jelekin.2003.09.014.
[5] Punnett L, Wegman DH. Work-related musculoskeletal disorders: the epidemiologic evidence and the debate. J Electromyogr Kinesiol 2004;14:13–23. https://doi.org/10.1016/j.jelekin.2003.09.015.
[6] Sauter SL, Schleifer LM, Knutson SJ. Work posture, workstation design, and musculoskeletal discomfort in a VDT data entry task. Hum Factors J Hum Factors Ergon Soc 1991;33:151–67. https://doi.org/10.1177/001872089103300203.
[7] Antle DM, Côté JN. Relationships between lower limb and trunk discomfort and vascular, muscular and kinetic outcomes during stationary standing work. Gait Posture 2013;37:615–9. https://doi.org/10.1016/j.gaitpost.2012.10.004.
[8] Kabe I, Tsuruoka H, Tokujitani Y, Endo Y, Furusawa M, Takebayashi T. Investigation of postural hypotension due to static prolonged standing in female workers. Sangyo Eiseigaku Zasshi 2007;49:122–6.
[9] Antle DM, Cormier L, Findlay M, Miller LL, Côté JN. Lower limb blood flow and mean arterial pressure during standing and seated work: implications for workplace posture recommendations. Prev Med Reports 2018;10:117–22. https://doi.org/10.1016/j.pmedr.2018.02.016.
[10] Tuchsen F. Prolonged standing at work and hospitalisation due to varicose veins: a 12 year prospective study of the Danish population. Occup Environ Med 2005;62:847–50. https://doi.org/10.1136/oem.2005.020537.
[11] Messing K, Kilbom A. Standing and very slow walking: foot pain-pressure threshold, subjective pain experience and work activity. Appl Ergon 2001;32:81–90.
[12] Balasubramanian V, Adalarasu K, Regulapati R. Comparing dynamic and stationary standing postures in an assembly task. Int J Ind Ergon 2009;39:649–54. https://doi.org/10.1016/j.ergon.2008.10.017.
[13] Bongers PM, DeWinter CR, Kompier MAJ. Psychosocial factors at work and musculoskeletal disease. Scandianvian J Work Environ Heal 1993;19:297–312. https://doi.org/10.2307/40966152.
[14] Luttmann Alwin, Jager M, Caffier G, Liebers F. Preventing musculoskeletal disorders in the workplace. Geneva: World Heal Organ Rep; 2003. p. 1–38. http://www.who.int/iris/handle/10665/42651.
[15] Waters TR, Dick RB. Evidence of health risks associated with prolonged standing at work and intervention effectiveness. Rehabil Nurs 2015;40:148–65. https://doi.org/10.1002/rnj.166.
[16] Nelson-Wong E, Callaghan JP. Changes in muscle activation patterns and subjective low back pain ratings during prolonged standing in response to an exercise intervention. J Electromyogr Kinesiol 2010;20:1125–33. https://doi.org/10.1016/J.JELEKIN.2010.07.007.
[17] Han H-I Il, Choi H-SS, Shin W-SS. Effects of hamstring stretch with pelvic control on pain and work ability in standing workers. J Back Musculoskelet Rehabil 2016;29:865–71. https://doi.org/10.3233/BMR-160703.
[18] Lin YH, Chen CY, Cho MH. Effectiveness of leg movement in reducing leg swelling and discomfort in lower extremities. Appl Ergon 2012;43:1033–7. https://doi.org/10.1016/j.apergo.2012.03.002.
[19] Cramer H, Lauche R, Haller H, Dobos G. A systematic review and meta-analysis of yoga for low back pain. Clin J Pain 2013;29:450–60. https://doi.org/10.1097/AJP.0b013e31825e1492.
[20] Tekur P, Singphow C, Nagendra HR, Raghuram N. Effect of short-term intensive yoga program on pain, functional disability and spinal flexibility in chronic low back pain: a randomized control study. J Alternative Compl Med 2008;14:637–44. https://doi.org/10.1089/acm.2007.0815.
[21] Deepeshwar S, Tanwar M, Kavuri V, Budhi RB. Effect of yoga based lifestyle intervention on patients with knee osteoarthritis: a randomized controlled trial. Front Psychiatr 2018;9:180. https://doi.org/10.3389/fpsyt.2018.00180.
[22] Kiecolt-Glaser JK, Bennett JM, Andridge R, Peng J, Shapiro CL, Malarkey WB, et al. Yoga's impact on inflammation, mood, and fatigue in breast cancer survivors: a randomized controlled trial. J Clin Oncol 2014;32:1040–9. https://doi.org/10.1200/JCO.2013.51.8860.
[23] Hartfiel N, Havenhand J, Khalsa SB, Clarke G, Krayer A. The effectiveness of yoga for the improvement of well-being and resilience to stress in the workplace. Scand J Work Environ Health 2011;37:70–6. https://doi.org/10.5271/sjweh.2916.
[24] Saoji AA. Yoga: a strategy to cope up stress and enhance wellbeing among medical students. N Am J Med Sci 2016;8:200–2. https://doi.org/10.4103/1947-2714.179962.
[25] Telles S, Dash M, Naveen KV. Effect of yoga on musculoskeletal discomfort and motor functions in professional computer users. Work 2009;33:297–306. https://doi.org/10.3233/WOR-2009-0877.

[26] Highland KB, Schoomaker A, Rojas W, Suen J, Ahmed A, Zhang Z, et al. Benefits of the restorative exercise and strength training for operational resilience and excellence yoga program for chronic low back pain in service members: a pilot randomized controlled trial. Arch Phys Med Rehabil 2018;99:91–8. https://doi.org/10.1016/j.apmr.2017.08.473.
[27] Hakked CS, Balakrishnan R, Krishnamurthy MN. Yogic breathing practices improve lung functions of competitive young swimmers. J Ayurveda Integr Med 2017. https://doi.org/10.1016/j.jaim.2016.12.005.
[28] Polsgrove MJ, Eggleston BM, Lockyer RJ. Impact of 10-weeks of yoga practice on flexibility and balance of college athletes. Int J Yoga 2016;9:27–34. https://doi.org/10.4103/0973-6131.171710.
[29] Muktibodhanada S. Hatha yoga pradipika: light on Hatha Yoga. 2nd ed. Munger, Bihar: Yoga Publications Trust; 2002.
[30] Taimni I. The science of yoga: the yoga-sūtras of patañjali in Sanskrit with transliteration in Roman, translation and commentary in English. Theosophical Publishing House; 1999.
[31] Iyengar B. BKS iyengar yoga the path to holistic health: the definitive step-by-step guide. DK. 2014.
[32] Nagarathna R, Nagendra HR. Yoga for promotion of positive health. Bangalore: Swami Vivekananda Yoga Prakashana; 2000.
[33] Lawshe CHA. Quantitative approach to content validity. Person Psychol 1975;28:563–75. https://doi.org/10.1111/j.1744-6570.1975.tb01393.x.
[34] Bhat S, Varambally S, Karmani S, Govindaraj R, Gangadhar BN. Designing and validation of a yoga-based intervention for obsessive compulsive disorder. Int Rev Psychiatr 2016;28:327–33. https://doi.org/10.3109/09540261.2016.1170001.
[35] Govindaraj R, Varambally S, Sharma M, Gangadhar BN. Designing and validation of a yoga-based intervention for schizophrenia. Int Rev Psychiatr 2016;28:323–6. https://doi.org/10.3109/09540261.2016.1151404.
[36] Hariprasad VR, Varambally S, Varambally PT, Thirthalli J, Basavaraddi IV, Gangadhar BN. Designing, validation and feasibility of a yoga-based intervention for elderly. Indian J Psychiatr 2013;55. https://doi.org/10.4103/0019-5545.116302\rIJPsy-55-344[pii].
[37] Naveen GH, Rao MG, Vishal V, Thirthalli J, Varambally S, Gangadhar BN. Development and feasibility of yoga therapy module for out-patients with depression in India. Indian J Psychiatr 2013;55:S350–6. https://doi.org/10.4103/0019-5545.116305.
[38] Patil NJ, Nagarathna R, Tekur P, Patil DN, Nagendra HR, Subramanya P. Designing, validation, and feasibility of integrated yoga therapy module for chronic low back pain. Int J Yoga 2015;8:103–8. https://doi.org/10.4103/0973-6131.158470.
[39] Pise V, Pradhan B, Gharote MM. Validation of yoga module for children with intellectual disabilities. Ind Psychiatr J 2017;26:151–4. https://doi.org/10.4103/ipj.ipj_80_17.
[40] Ram A, Raghuram N, Rao RM, Bhargav H, Koka PS, Tripathi S, et al. Development and validation of a need-based integrated yoga program for cancer patients: a retrospective study. J Stem Cell 2012;7:269–82.