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Effect of Selected Yoga Interventions on Psycho-Physiological Function in IT Professionals with Chronic Back Pain - A Randomized Controlled Trial

Chinnasamy Vignesh [a], Navaraj Chelliah Jesus Rajkumar [b], Masilamani Elayaraja [c], Hemantajit Gogoi [d], Karuppasamy Govindasamy [e]

[a] Department of Yoga, Faculty of Science and Humanities, SRM Institute of Science and Technology, Kattankulathur, Tamil Nadu, India
https://orcid.org/0009-0005-2129-6941

[b] Department of Yoga, Faculty of Science and Humanities, SRM Institute of Science and Technology, Kattankulathur, Tamil Nadu, India
https://orcid.org/0000-0002-7581-5613

[c]Department of Physical Education and Sports, Pondicherry University, Puducherry, India
https://orcid.org/0000-0002-0022-961X

[d] Department of Physical Education, Faculty of Physical Education and Sport Sciences, Rajiv Gandhi University, Arunachal Pradesh, India
https://orcid.org/0000-0002-3403-1724

[e]Department of Physical Education and Sports Sciences, Faculty of Science and Humanities, SRM Institute of Science and Technology, Kattankulathur, Tamilnadu, India
https://orcid.org/0000-0002-3019-5545

Corresponding Author: Karuppasamy Govindasamy,
Email: gowthamadnivog@gmail.com

Abstract

Purpose: This study sought to explore the effects of specific yoga practices on psycho-physiological function in IT professionals suffering from CLBP.

Material and Methods: IT professionals with CLBP (n=83) were randomly allocated to intervention group (n=41) in which they practiced yoga interventions for 12 weeks, while the control group (n=42) received standard care without any special intervention. Pain intensity, quality of life (QoL), chronic pain self-efficacy, and self-efficacy for managing chronic disease were evaluated

before and after the 12-week intervention period using the brief pain inventory (BPI), rand 36-item health survey, chronic pain self-efficacy scale (CPSS), and 6-item stanford self-efficacy for managing chronic disease (SSMCD-6) scale. Yoga group participants (n=32) demonstrated significant improvements in pain intensity, QoL, chronic pain self-efficacy, and self-efficacy for managing chronic disease compared to the control group (n=34).

Results: Specifically, the yoga group showed a mean reduction in intensity of pain from 6.8±1.2 to 4.2±1.0 ($p<0.001$) on the BPI scale, an increment in QoL scores from 45.6±9.3 to 62.4±10.5 ($p<0.001$), an enhancement in chronic pain self-efficacy from 60.2±8.5 to 78.5±6.7 ($p<0.001$) on the CPSS, and another enhancement in self-efficacy for managing chronic disease from 25.4 ± 4.6 to 32.8 ± 5.2 ($p < 0.001$) on the SSMCD-6 scale.

Conclusion: Selected yoga interventions demonstrated favorable effects on psycho-physiological function in IT professionals with CLBP. Integrating these postures into management strategies for CLBP could offer promising outcomes in terms of pain reduction, enhanced quality of life, and improved self-efficacy for pain management. Further research is needed to validate these findings and explore long-term effects.

Keywords: Yoga, chronic low back pain, health sector, quality of life.

Introduction

Pain in lower back poses a significant public health challenge in contemporary society and ranks among the most common symptoms encountered in orthopaedic and rehabilitation field (Pergolizzi & LeQuang, 2020). Previous research indicates that approximately 80% of individuals will experience pain in lower back at least once in their lifetime, with an annual incidence ranging from 6.3% to 15.3% (Hartvigsen et al., 2018; Knezevic et al., 2021). Notably, individuals aged 40-69 years are at the highest risk, although there is a concerning trend of low back pain showing at younger ages, affecting approximately 1-6% of children aged 7-10 years and around 18% of adolescents aged 11-19 years (Clark & Horton, 2018). According to a global epidemiological survey conducted by James et al. (2018), pain in lower back ranks highest in years survived with disability among all diseases worldwide, significantly impacting both physical and mental health, as well as work capacity, and leading to substantial productivity loss.

Chronic low back pain (CLBP) is defined as pain in back lasting for three months or longer (Herman et al., 2023; Kalmykova et al., 2024). Current studies indicate that over 70% of individuals will experience CLBP at least once in their lifetime (Mattiuzzi et al., 2020). This condition impacts not only physical health but also increases the risk of anxiety and depression, ultimately lowering overall quality of life (Wettstein et al., 2019). Subsequently, CLBP has emerged as a major public health issue, responsible for work-related limitations, disability, and significant healthcare costs for both

individuals and society as a whole. Current guidelines uniformly emphasize non-surgical therapy and psychosocial interventions as the cornerstone of treatment for CLBP (Oliveira et al., 2018). Exercise is widely recommended as a non-pharmacological approach to pain relief, with yoga gaining importance as a meditative movement therapy that harmonizes body and mind (Jagadeesan et al., 2022). Tracing back over 4,000 years to ancient India, yoga encompasses physical postures, controlled breathing, relaxation, and meditation, known for its gentle and calming nature (Karlekar et al., 2024; Pramanik et al., 2023a, 2023b). It enhances back muscle strength, flexibility, and balance, offering relief for CLBP. Yoga, with its holistic approach to enhance physical postures, breathing techniques, and mindfulness practices, has emerged as a promising adjunctive therapy for managing chronic back pain (Jagadeesan et al., 2021). Moreover, yoga aids in improving physical function, reducing anxiety, and boosting self-efficacy and pain acceptance, crucial for addressing the multifaceted nature of CLBP (Cramer et al., 2013).

Notably, certain occupational groups, such as IT professionals, experience a higher prevalence of CLBP due to prolonged sitting and sedentary work environments. Despite the widespread recognition of yoga practices as an impactful intervention for CLBP, its efficacy in mitigating it among IT professionals remains understudied. This study explores the impact of yoga interventions on CLBP in IT professionals, aiming to address gaps in existing research and offer customized interventions

Material and methods of research

Study participants

For the recruitment of the participants, flyers were posted in waiting areas of the IT companies and the surrounding communities. Additionally, study advertisements were placed in various targeted social media community groups. Interested persons were further communicated through a WhatsApp group and informed about the trial through messages and visual abstracts. Furthermore, interested individual's demographic details and medical records were gathered using Google Forms (Google Forms, 2023). Using the electronic medical records, we identified IT employees aged 18 to 55 years suffering from pain in lower back persisting for more than 12 weeks and had a mean pain intensity of greater than 4 on a numerical score of 0 to 10 over the preceding 2 weeks. Further, the identified individuals were telephonically contacted and invited to meet with research team for further assessment and written informed consent. Baseline data, including daily

pain intensity recordings for 2 weeks, were collected, and participants were randomized during a subsequent meeting if their average weekly pain intensity remained ≥4.

Exclusion criteria included recent yoga practise, initiation of new pain medication or other treatments for pain within the past month or pregnancy, recent back surgery, non-muscular pathologies, severe neurological issues, sciatica related pain similar to or greater than lower back pain, substance abuse, any systemic or metabolic disease, medical or psychiatric comorbidities and inability to join yoga classes as scheduled.

A total of 124 individuals initially response to our call for the study. From them, 104 were successfully contacted, while 20 were either unreachable or ineligible. Among the 104 contacted individuals, 83 consented and enrolled in the study. In particular, 41 participants were allocated to the yoga group, whereas 42 were designated to the control group. However, 17 individuals dropped from the intervention group after allocation. Finally, 66 participants completed the study and were included for the analyses (Figure 1).

Study design

This pilot randomized controlled trial was conducted among IT professionals with CLBP recruited from two IT sectors situated in a culturally diverse, low-income neighborhood associated with our institution. Participants were randomly allocated to intervention or a usual care control group using a random number generator tool (Urbaniak & Plous, 2024). Treatment assignments were concealed in opaque, sequentially numbered envelopes prepared by a biostatistician (KG) with no participant contact. The Institutional departmental research committee also approved this study (SRMIST/DPESS/17/09/2020).

A tailored made yoga practices for CLBP was developed for IT employees with limited or no previous exposure to yoga by a trained yoga instructor for this present study (MP), and the principal investigator (CV). We obtained necessary information from the relevant literature and their expertise to draft the intervention, which was refined through focal group discussion, and pilot testing in non-study yoga classes. The final validated protocol (Table 1) comprised five asanas, three breathing exercises, and two relaxation postures. The total period of the protocol was 60 minutes, and it was practised every day for 12 weeks.

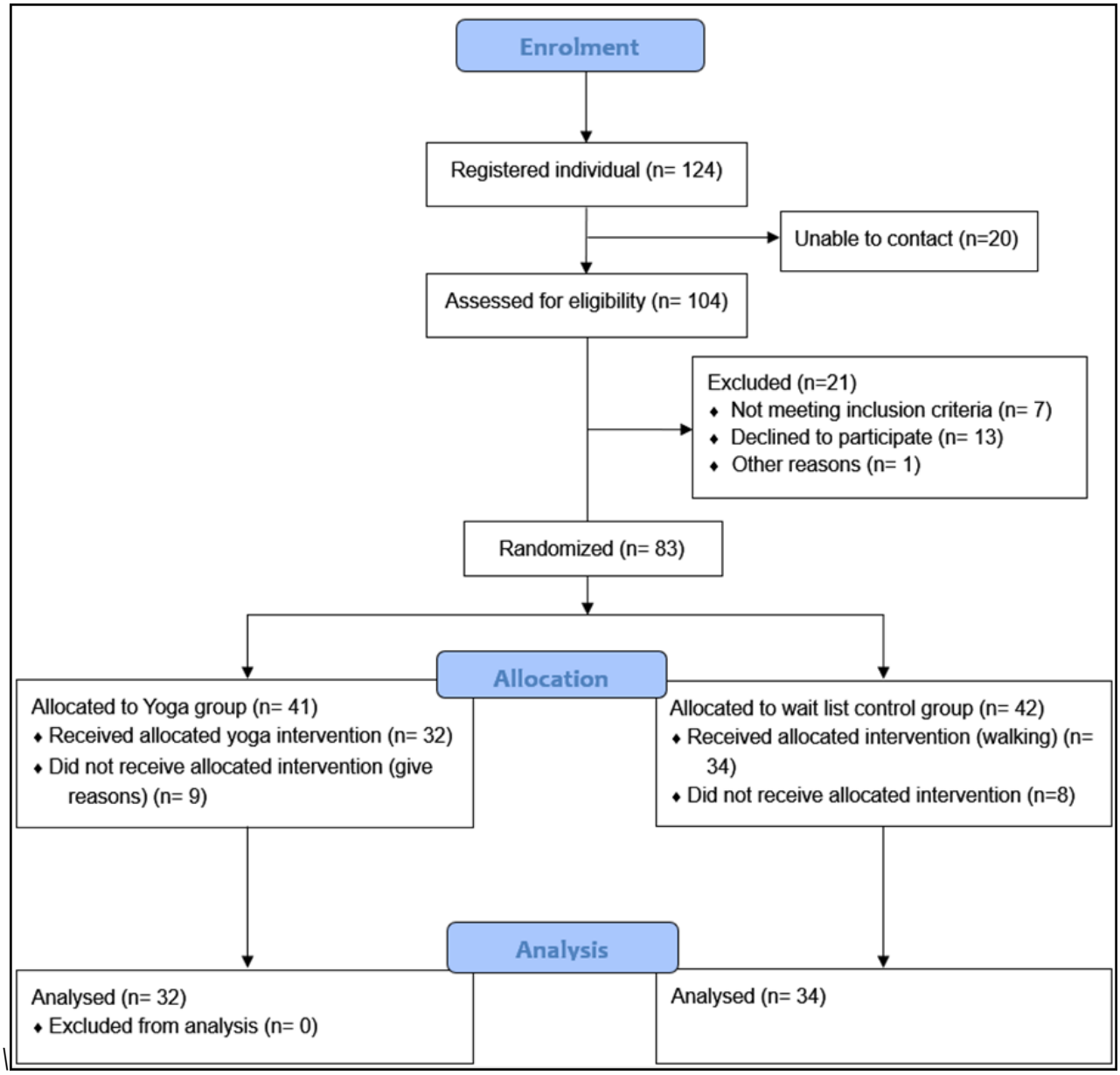

Figure 1. CONSORT Flow Chart

Participants in the control group continued to receive their usual care without any special intervention throughout the duration of the study. Moreover, they were also given with an educational book outlining self-care management strategy for pain in lower back, which had been utilized in previous studies. Participants of the control group were advised not to initiate any new medication or therapy for pain during the study duration. Following the 12-week assessment period, control group participants were permitted to engage in the yoga intervention.

Table 1. Details of the Yoga protocol for CLBP

No	Yoga intervention	Duration and frequency
1.	Asanas (postures)	
	1.1 Tadasana	5 min and 5 rounds
	1.2 Triyaka tadasana	5 min and 5 rounds (Each side)
	1.3 Bhujangasana	5 min and 5 rounds
	1.4. Settubandhasana	5 min and 5 rounds
	1.5 Uttan padasana	5 min and 5 rounds (Each leg)
2.	Breathing techniques	
	2.1 Bhramari pranayama	5 minutes
	2.2 Bhasthrika pranayama	5 minutes
	2.3 Sheetali pranayama	5 minutes
3.	Relaxation posture	
	3.1 Shavanasa	5 minutes
	3.2 Meruvakrasana	5 minutes

Outcome variables.

Brief pain inventory.

The brief pain inventory (BPI), a validated tool by Cleeland and Ryan (1994), was utilized to measure the severity of pain and its interference in daily activities. Comprising two subscales, namely pain severity and pain interference, it offers a comprehensive assessment of pain's impact. The severity subscale includes four items, each rated from 0 to 10, indicating current and past-week pain intensity. Similarly, the interference subscale comprises seven items, assessing the degree to which pain disrupts various life aspects, with scores ranging from 0 to 10, where lower scores signify milder pain severity or less interference.

Rand 36-item health survey.

The rand 36-item health survey, a validated tool by Hays et al. (1993), was employed to measure the participant's quality of life (QoL). This survey comprises 36 items across eight domains, covering physical and mental health, limitations in daily activities, and functional aspects like housework and mobility. A total score, ranging from 0 to 100, is calculated by taking the average of the scores from the eight domains, where higher scores reflect a better quality of life.

Chronic pain self-efficacy scale and Stanford self-efficacy for managing chronic disease.

To evaluate self-efficacy in managing chronic pain, two assessments, i.e.; chronic pain self-efficacy scale (CPSS) and stanford self-efficacy for managing chronic disease (SSMCD-6) were administered. The CPSS, validated by Daniali et al. (2017) is utilized in individuals with chronic pain, comprising three domains

and a total score. These domains encompass self-efficacy in managing pain, physical function, and coping with symptoms, with participants rating their confidence levels on a scale from 0% to 100% for each item. Likewise, the SSMCD-6 consists of six items assessing confidence levels in pain and chronic disease management, with scores ranging from 0% to 100%, where higher scores signify greater self-efficacy (Daniali et al., 2017).

Statistical analysis.

The data were presented as means along with their standard deviations (SD) or numbers with frequency. The normality was assessed using the Shapiro-Wilk test, and as per the results, the data were found to be normally distributed. Demographic variables between the groups were compared using t-tests or chi-square test. Paired t-test was used to assess within-group differences and to compare mean between pre and post intervention scores. Effect sizes (d-Cohen) were calculated with mean and SD. Effect sizes were interpreted using predefined thresholds: 0.20 indicated a small effect, 0.50 a moderate effect, 0.80 a large effect, and 1.30 a very large effect (Cohen, 1988). All statistical analysis was conducted using R software, with a significance value set at $p<0.05$ (R Core Team, 2020).

Results of the study

Demographic data for the 66 participants are summarized in Table 2. There appeared to be no differences in demographic characteristics between the two groups.

Table 2. Demographical Details of the study participants

Variables	Yoga Group n=32	Wait list control N=34
Age (years)	38.45±10.25	37.80±9.54
Sex(M/F)	18/14	19/15
Height (cm)	156.30±26.80	151.33±29.50
Weight (kg)	79.50±12.40	77.40±11.44
BMI (kg/m2)	30.24±5.52	29.88±4.92

From the results, Figure 2 reveals, participants in the yoga intervention group experienced a substantial reduction in pain intensity, with a large effect size (Cohen's d= 2.65) based on the mean reduction from 6.8±1.2 to 4.2±1.0 on the BPI scale (p=0.01). This effect size suggests a substantial decrease in pain severity following the intervention. Furthermore, participants reported a significant increase in QoL (Figure 3), supported by a large effect size (Cohen's d=2.30) based on the mean increase from 45.6±9.3 to 62.4±10.5 on the Rand-36 QoL score (p=0.02). This

improvement indicates meaningful enhancements across various domains of participants' well-being. Additionally, participants demonstrated notable improvements in self-efficacy related to managing chronic pain and disease, with substantial effect sizes noted on both the CPSS (Figure 4) and the SSMCD-6 scale (Figure 5). The increase in CPSS scores (p=0.01) from 60.2±8.5 to 78.5±6.7 yielded a large effect size (Cohen's d=3.05), while the improvement in SSMCD-6 scores (p=0.01) from 25.4±4.6 to 32.8±5.2 corresponded to a large effect size (Cohen's d=2.26). These effect sizes highlight the meaningful enhancements in participants' confidence in managing their health conditions and coping with symptoms. Contray to the intervention group, individual in the control group did not exhibit significant improvements across the assessed outcome measures.

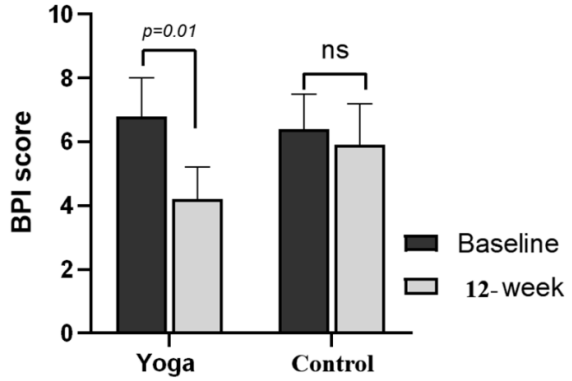

Figure 2. BPI score before and after intervention

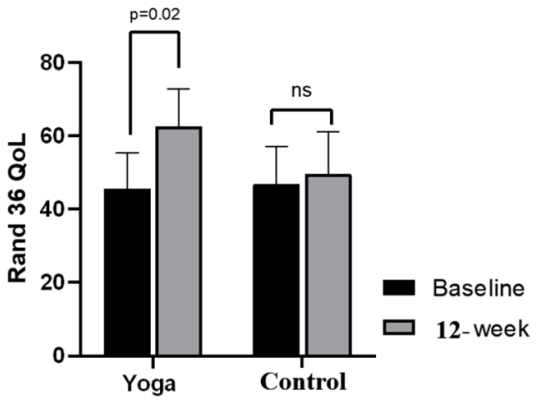

Figure 3. Rand- 36 QoL score before and after intervention

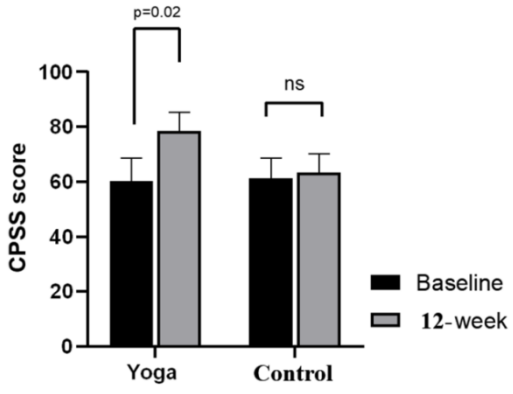

Figure 4. CPSS score before and after intervention

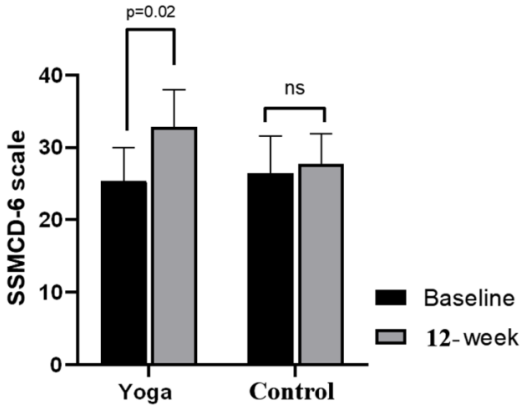

Figure 5. SSMCD 6 score before and after intervention

Discussion

In the current study, we investigated the effectiveness of the intervention in improving various Psycho-Physiological outcome measures in IT professionals with chronic back pain. The study's results were supported by large effect sizes observed on the BPI, Rand-36 QoL, CPSS, and SSMCD-6 scales. This study has substantial suggestions for the development and execution of interventions to improve pain management and quality of life for IT professional with chronic pain and disease. A comparable study was also undertaken by Schmid et al. (2019), revealing the effectiveness of yoga for people with chronic pain in improving pain interference and other measures, suggesting positive effects of yoga on chronic pain management (Schmid et al., 2019). Another study by Tekur et al. (2012) compares the effects of short-term (seven days) residential yoga programs versus physical exercise programs on CLBP patients. Their findings showed a significant reduction in pain, anxiety, depression, and improvements in spinal mobility in the yoga group compared to controls. A feasibility and acceptability of delivering hatha and restorative yoga interventions to active-duty military personnel with CLBP and chronic neck pain (CNP) study indicated high levels of participant satisfaction and retention rates, with promising improvements in pain severity, disability, quality of life, grip strength, and balance (Groessl et al., 2022). A prior investigation revealed significant reductions in pain and disability scores, increased flexibility, and core muscle strength after a 12-week yoga intervention for CLBP in low-income participants. Moreover, changes in plasma TNF-α levels and brain imaging analysis suggest potential mechanisms underlying the efficiency of yoga in addressing chronic low back pain (Colgrove et al., 2019). Another randomized trial compared early intervention with kundalini yoga, strength training, or evidence-based advice for chronic back and neck pain among workers (Brämberg et al., 2017). While primary outcomes didn't show significant differences, adherents to yoga and strength training exhibited reduced sickness absenteeism; secondary analyses suggest potential benefits of these interventions, emphasizing the importance of adherence to exercise programs (Brämberg et al., 2017). An overview for systematic reviews on yoga's efficacy for CLBP showed promising evidence on yoga effectively in CLBP-related pain and functional disability (Zhang et al., 2023).

Yoga has increasingly been recognised as an effective intervention for managing CLBP and our study

validates this recognition. Our research offers evidence supporting the efficacy of yoga interventions in enhancing pain management and quality of life among IT professionals experiencing CLBP. However, we recommend further research to confirm the long-term effectiveness of yoga intervention to ascertain the applicability of the findings to different patient populations. The study's sample size was relatively limited, and thus, the findings may not be applicable to all patient populations experiencing chronic pain or other such condition.

Conclusion

The results of this study suggest that selected yogic postures may offer a promising adjunctive therapy for managing chronic back pain by improving pain intensity, quality of life, chronic pain self-efficacy, and self-efficacy for managing CLBP among the IT professionals. Further research is warranted to validate these findings and explore the long-term effects of yogic interventions on chronic back pain management, as well as to investigate the potential mechanisms underlying the observed improvements in psycho-physiological function. Additionally, future studies could explore the feasibility and acceptability of incorporating yogic postures into existing pain management strategies in diverse patient populations and healthcare settings.

Authors Contributions

Conceptualization, V.C, N.C.J.R, M.E; methodology, V.C, N.C.J.R, M.E; software, M.E, H.G, K.G; check, M.E, H.G, and K.G; formal analysis, M.E, H.G, K.G;; investigation, V.C, N.C.J.R; resources, .E, H.G, K.G; data curation, V.C, N.C.J.R, M.E, H.G, K.G; writing - rough preparation, M.E, H.G, K.G; writing - review and editing, H.G, K.G; visualization, N.C.J.R, M.E; supervision, N.C.J.R, M.E; project administration, V.C, N.C.J.R; receiving funding, K.G and H.G All authors have read and agreed with the published version of the manuscript.

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Conflicts of interest

The authors declare no competing interests.

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