TELEHEALTH AND MEDICINE TODAY

ORIGINAL RESEARCH

Feasibility, Acceptability, and Safety of a Virtually Adapted Yoga and Mindfulness Wellness Program for Adults with Traumatic Brain Injury or Stroke and Their Caregivers At a Level 1 Trauma Center: A Quality Improvement Project

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Abstract

Background. Individuals in the outpatient public health settings with a traumatic brain injury (TBI) and stroke experience ongoing symptoms with diminished quality of life. Research suggests that yoga and mindfulness can be helpful in addressing these symptoms. However, little is known about the feasibility, acceptability, and safety of using virtually deployed integrative approaches in public health for TBI and stroke.

Methods: The participants were medically and psychiatrically stable outpatients with TBI and stroke survivors and/or caregivers. The 6-week "LoveYourBrain" yoga program was adapted for virtual delivery. Participants and program facilitators provided pre- and post-quantitative and qualitative feedback to evaluate the feasibility, acceptability, and safety of the program. Data analysis was conducted with mean satisfaction scores and qualitative content analysis.

Results. Among 46 participants who were registered over 13 months, 35 participated in at least one out of six sessions (TBI = 21, stroke = 9, caregiver = 5), and 23 participants completed at least four sessions. Participants with TBI were younger (mean age: 47 years) than caregivers (mean age: 64 years). Among the participants, 63% were one to 5 years post-injury. Overall participant satisfaction was rated 9.16 out of 10. Facilitator satisfaction was also high, 9.0 out of 10 (SD: 0.71). Minimal adverse events were noted, only one participant required program outreach, and no injury was noted. Content analysis themes revealed five themes: physical and mental health, ease of participation, resilience, and community.

Conclusions: A novel virtual yoga and mindfulness program for TBI and stroke in the public health setting was found to be feasible, acceptable, and safe. This program showed promise for addressing chronic symptom burden and improving the quality of life. Further investigation is warranted.

Plain Language Summary

People living with traumatic brain injury (TBI) or stroke often experience long-term symptoms that impact their quality of life. Our quality improvement project evaluated the feasibility, acceptability, and safety of delivering a live, virtual 6-week yoga and meditation program. Over 13 months, 46 participants enrolled, including TBI survivors, stroke survivors, and their caregivers. Most participants rated the program highly for satisfaction, and minimal safety concerns were reported. Participants shared that the program supported their physical health, mental well-being, resilience, and sense of community. This QI project demonstrates that offering a virtual yoga and mindfulness program for people with TBI, stroke, and their caregivers in a public health setting is safe and feasible.

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Individuals with a traumatic brain injury (TBI) and/or stroke experience impaired ongoing physical, cognitive, emotional, and behavioral symptoms.[1] Additionally, TBI- and stroke-related symptom sequelae can negatively impact caregivers, leading to increased caregiver distress and becoming overwhelmed with feelings of anxiety and stress.[2,3]

Evidence-based research suggests that adapted yoga and meditation practices can offer ongoing supportive physical, emotional, and quality-of-life benefits to those with TBI and stroke, as well as their caregivers.[4–6] Studies note physical benefits of yoga secondary to improved balance, strength, flexibility, and mobility, as well as reduced fatigue.[5,7–9] Additionally, yoga is linked to improved emotional health with associated reductions in anxiety and depression, as well as adjustment to injury.[9–12] Furthermore, research highlights that yoga and meditation practices confer associated improvements in quality of life, such as improved confidence, self-awareness, resilience, connection, and feelings of belonging.[7,13] Specific to program modality, yoga and meditation studies note good feasibility and acceptability with no significant difference in satisfaction or overall improvement between in-person and virtual sessions.[14,15]

Given the benefits of yoga and meditation for brain injury rehabilitation, Zuckerberg San Francisco General (ZSFG), an urban level 1 trauma center, partnered with the "LoveYourBrain" Foundation to implement the brain injury-specific, evidence-based yoga with psychoeducation program, LoveYourBrain (LYB) Yoga©.™. Before the COVID-19 pandemic, ZSFG offered this in-person program for free to patients and their caregivers. The goal of the ZSFG LYB Yoga program is to provide free ongoing wellness classes to promote engagement in health behaviors for urban populations. The LYB Yoga program had been well received and utilized; however, the deployment of this program was adversely impacted during the COVID-19 pandemic due in part to concerns about infection transmission. Therefore, restarting this program during the pandemic required adapting the LYB Yoga curriculum for virtual use.

This quality improvement (QI) project presents findings from an evaluation of the feasibility, acceptability, and safety of delivering a live, virtual 6-week yoga and meditation program for adult TBI and stroke survivors, as well as their caregivers.

Methods

This QI project complied with the QI SQUIRE 2.0 (Standards for Quality Improvement Reporting Excellence) guidelines for reporting and evaluation purposes.[16] This project was classified as exempt by our Institutional Review Board, identifying it as a QI initiative.

Participants

Participants were eligible to participate in the virtual LYB program if they met inclusion criteria for the live virtual 6-week LYB program between June 2020 and July 2021 (Figure 1). During the period of evaluation,

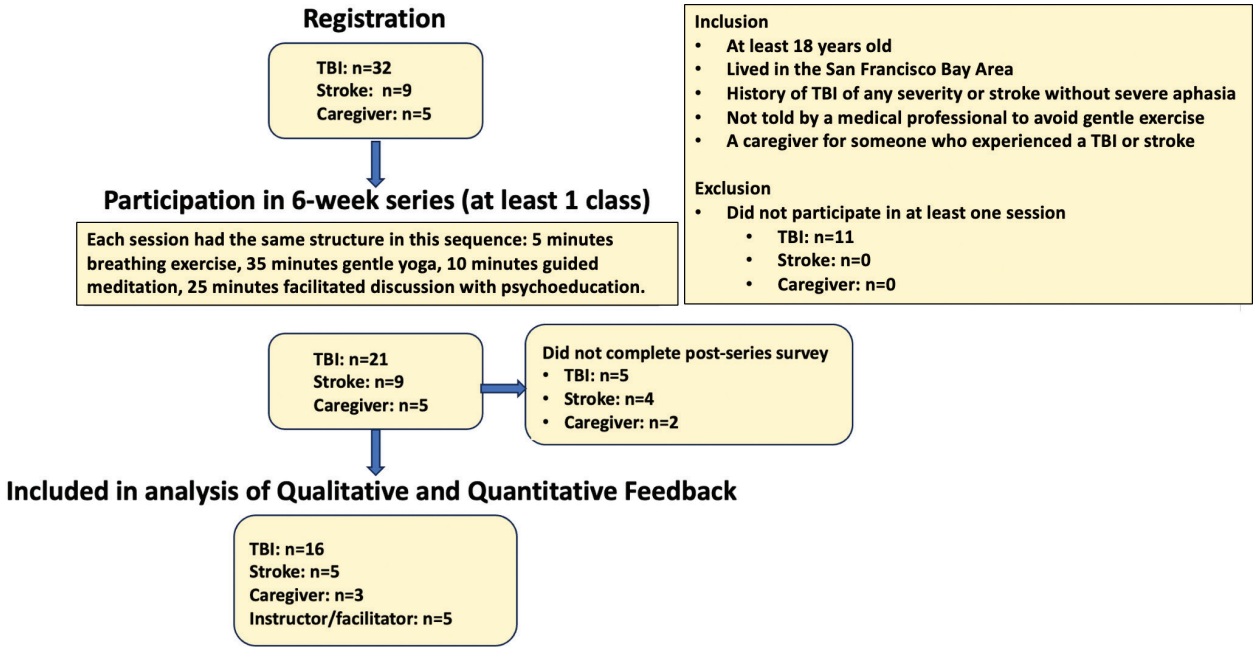

Fig. 1. Flow diagram of participants included in the program evaluation. TBI: traumatic brain injury.

five cycles of the virtual 6-week LYB yoga program were completed.

Setting

The live, virtual LYB program was sponsored by ZSFG. The ZSFG Department of Neurosurgery partnered with the LYB Organization as a clinical affiliate to adapt the LYB yoga curriculum into an online format.

Recruitment

Participants were referred to the LYB program by both ZSFG and out-of-network clinical providers. Program promotion and recruitment to the program were accomplished primarily through telephone outreach, listservs, and word of mouth.

In addition, many participants were engaged in disease-specific support groups within the broader ZSFG TBI program, which helped both to recruit to the program and provide continued support after the LYB program ended.

Participants interested in attending the free 6-week series contacted the registered nurse and completed online registration. Participants were then screened for eligibility, and if they met program eligibility requirements, they received the virtual Zoom meeting information before starting the series.

Intervention

Each virtual LYB session included at least two facilitators (a psychoeducation facilitator and a yoga instructor) (Table 1). The administration and evaluation of the LYB program was led by a registered nurse who attended the training as well as all LYB classes. The program evaluation nurse and social worker roles were existing roles in the department, whereas the ZSFG Department of Neurosurgery additionally compensated the yoga instructors as consultants for each session. All program facilitators completed a 20-h comprehensive yoga training offered by the LYB organization to certify them as qualified accessible yoga and meditation facilitators for the brain injury community.

Measures and Data Collection

Demographic, self-reported injury characteristics and quantitative health outcomes were collected via electronic survey before attending each LYB yoga program. Program feedback was collected after each LYB cycle. Participant pre- and post-quantitative and qualitative feedbacks were collected to inform the evaluation for feasibility and acceptability of the program. Facilitator feedback was also collected to evaluate the acceptability and safety of delivering the program virtually.

Table 1. Staffing and related duties for virtual yoga and meditation series

Program Lead/Clinical Coordinator Role (0.50 FTE)
• Participate in program management/development and program evaluation
• Manage registration process, communicates series dates with participants, yoga instructors, and stakeholders
• Serve as point of contact for questions about registration and participation, series sessions, safety concerns, staffing, etc.
• Attend virtual sessions with yoga instructor and facilitate psychoeducation
Screening and Safety Duties
• Program lead/clinical coordinator screens participates to ensure eligibility and appropriateness to participate
• Obtain emergency contact information from participants in case of medical emergency, and share with facilitator prior to initial yoga session
• If safety concern arises, program lead/clinical coordinator follow safety protocol to ensure participant safety
Program Evaluation Duties
• Determine appropriate duration and structure for each series
• Adapt yoga practice to ensure safety during each session based on participant limitations
• Evaluate program content and structure with facilitators at the end of 6-week series to discuss highlights and challenges
• Obtain participant and facilitator feedback at the end of each series
• Discuss and implement program iterations and pivots based on facilitator and participant feedback
Clinical Social Worker Role and Duties (1 hour per week during series)
• Facilitate psychoeducation during each virtual session
• Provide post-series feed back to program lead/clinical coordinator
Yoga Instructor Role and Duties (1 hour per week during series)
• Facilitate yoga practice during each virtual session
• Provide post-series feedback to program lead/clinical coordinator

FTE: full-time equivalent.

To assess feasibility, we described the total number of eligible participants who signed up, the number of participants who attended at least one class, the number of participants who attended at least four of the six LYB sessions within a series cycle, and the number of programs canceled due to low enrollment (i.e. less than five people). This is consistent with a prior LYB program evaluation studies.[10]

Acceptability was assessed among participants and facilitators using both qualitative and quantitative methods. Quantitatively, satisfaction was evaluated using a 1 to 10 Likert scale question: "On a scale from 1 to 10, how would you rate this program?" with lower scores indicating lower satisfaction. Qualitative questions included the following: (1) How did the ZSFG yoga and meditation series add value to your care and/or recovery? (2) What was your experience participating in the series virtually? (3) How can the virtual

program be improved? Participants who did not complete the program were asked to respond to the question, "Why did you not attend or complete the ZSFG LYB program?"

Analytic Strategy

Feasibility was calculated based on the percentage of eligible participants who attended at least four of the assigned LYB sessions within a series cycle. Acceptability quantitative feedback was calculated based on mean satisfaction scores. Qualitative acceptability was evaluated using thematic analysis methods with independent coding by authors MDN and MG.[17]

Results

Initial Steps and Intervention Evolution

The ZSFG Yoga and Meditation Program was initially designed and completed in person before the COVID-19 pandemic. However, due in part to COVID-19 infection transmission concerns, the LYB program evolved to a live virtual format, which is the focus of this project.

To deploy the program virtually, several modifications were made, primarily related to ensuring safe participation and reducing electronic screen fatigue. The virtual series class length was shortened to 75 minutes (90 minutes prior) to reduce electronic screen fatigue. The LYB yoga program techniques were modified to be performed while seated with simplified movement sequences. The program-registered nurse educated and trained the yoga facilitators regarding safety factors to consider. Best practices were emphasized at the outset during each session. For example, staff instructed participants to drink water for adequate hydration, pacing exertion, using chairs without rollers, and using a pillow for support. In addition, staff frequently asked participants during sessions if they were in physical discomfort and, if so, change positions for greater ease.

Safety

The program registered nurse visually monitored safety considerations throughout the LYB program with participant follow-up as needed. In addition, the registered nurse sought to ensure safety fidelity and provided live supervision and feedback to facilitators during and after each LYB series. Furthermore, at the time of registration, participants were required to provide an emergency contact and the address of where they were planning to engage in the LYB series.

During the program deployment, minimal adverse events were noted, although there was one instance where a participant required program outreach. Of interest, the nurse noted that one participant appeared to faint briefly while seated. The nurse urgently reached out to the patient and their emergency contact for further assessment and to determine if additional medical care was needed, which was determined not to be necessary. The participant experienced no injury and went onto safely complete the LYB session and series. No other incidents were reported to and observed by LYB program staff. Upon conclusion of the LYB program, the facilitator's formal evaluation was administered—an open-ended questionnaire survey focused on safety concerns about the program's virtual format.

Four of the five instructors (80%) reported no safety concerns. One non-yoga instructor expressed lingering questions about their role as a facilitator if a patient had an acute alteration in mental status. The overall themes in the feedback suggested the participant screening, safety training and protocols, program staffing and related discipline mix, and program modifications were adequate.

Participant Characteristics

The majority of the participants who enrolled in the virtual ZSFG yoga and meditation program were TBI survivors (60%), with the remainder being stroke survivors (26%) or caregivers (14%) (Table 2). Among those participants with TBI, 80% had experienced their most recent TBI in the last 0 to 5 years, and 100% of stroke participants experienced their stroke in the last 0 to 5 years. In addition, 86% of TBI participants and 89% of stroke participants reported ongoing chronic symptoms from injury. All caregivers who participated in the program were caregivers/family of a participant with TBI.

Feasibility

Over the course of the virtual LYB program, five, 6-week series were completed. Overall, 46 participants registered, and 100% were eligible to participate (Figure 1). Of the participants who registered, 76% ($n = 35$) attended at least one class, while the remaining 24% ($n = 11$) either canceled or were no-shows. Among those who attended the series, 66% ($n = 23$) completed at least four of the six LYB sessions within a series cycle. None of the program series was canceled due to low enrollment. Each class had an average of ten participants, with attendance ranging from 5 to 16 participants.

Among the 12 participants who did not complete the series, 75% ($n = 9$) were TBI participants, 17% ($n = 2$) were stroke participants, and 3% ($n = 1$) were caregivers. Nine participants responded to the feedback question of why they were unable to complete the series. Reasons for not completing the series included scheduling conflicts with work or school ($n = 3$), yoga being too easy/not challenging enough ($n = 2$), personal reasons ($n = 1$), yoga was not adapted to people with one-arm paralysis ($n = 1$), forgetting meeting days ($n = 1$), and only joining once as a guest to accompany a family member with TBI.

Table 2. Demographics and injury characteristics of participants, $N = 35$

Demographics and characteristics	TBI ($n = 21$) $n \pm$ SD (%)	Stroke ($n = 9$) $n \pm$ SD (%)	Caregiver ($n = 5$) $n \pm$ SD (%)
Age (mean ± SD); (min–max)	47.3 ± 14.3 years (22–69 years)	55.11 ± 16.3 years (29–73 years)	64.6 ± 10.5 years (48–74 years)
• Female	12 (57%)	7 (78%)	3 (60%)
TBI severity		N/A	N/A
• Mild (GCS 13–15)	11 (52%)		
• Moderate (GCS 9–12)	5 (24%)		
• Severe (GCS 3–8)	5 (24%)		
Injury event		N/A	N/A
• Assault	2 (9.5%)		
• Fall	5 (24%)		
• MVA	6 (28.5%)		
• Sports-related[1]	3 (14%)		
• Other trauma[2]	5 (24%)		
Self-reported LOC		Unknown	N/A
• Yes	13 (62%)		
• No	3 (14%)		
• Unknown	5 (24%)		
Time since injury			N/A
• <12 months	7 (33%)	0 (0%)	
• 1–5 years	10 (48%)	9 (100%)	
• 6–10 years	2 (9.5%)	0 (0%)	
• >11 years	2 (9.5%)	0 (0%)	
Assistive device*			
• Yes	4 (19%)	4 (44%)	
• Cane	3 (14%)	3 (33%)	
• Brace	1 (5%)	1 (11%)	
• Walker	1 (5%)	1 (11%)	
• Wheelchair	0 (0%)	2 (22%)	
Chronic symptoms from injury*			N/A
• Yes	18 (86%)	8 (89%)	
• PCS	11 (52%)	N/A	
• Light Sensitivity	13 (14%)	1 (11%)	
• PTSD	9 (43%)	1 (11%)	
• Seizures	1 (5%)	0 (0%)	
• Hemiparesis	2 (10%)	5 (56%)	
• Hemiplegia	0 (0%)	2 (22%)	
Repeat series**		3 (33%)	
• Participated in 2 or less	4 (19%)	1 (11%)	
• Participated in 3 or more	3 (14%)	2 (22%)	3 (60%)

SD: standard deviation; GCS: Glasgow Coma Scale; LOC: loss of consciousness; PCS: postconcussive syndrome; PTSD: post-traumatic stress disorder; TBI: traumatic brain injury.

[1]Includes sports-related, leisure-related, or crushing injury; [2]Includes bicycle versus auto, bicycle versus ground, pedestrian versus auto, motorcycle collisions, struck by or against an object, and work-related.

*Some participants reported use of multiple assistive devices and/or chronic symptoms from injury. **Participants completed the series (attended at least 4 sessions or more).

Acceptability

Overall participant satisfaction was rated 9.16 out of 10 (SD: 1.32). Facilitator satisfaction was also high, 9.0 out of 10 (SD: 0.71).

Qualitatively, the participant's LYB program experience was overall positive. All participants expressed one or more positive opinions about the program. Only one-third expressed one or more negative opinions about the LYB program. Key themes were synthesized based on participant feedback and depicted in Figure 2 as a tree map showing both positive and negative feedbacks representing the frequency of each category. Additional comments to improve the program included more frequent and longer classes.

Discussion

Individuals with TBI and/or stroke experience impaired ongoing physical, cognitive, emotional, and behavioral symptoms, which, research suggests, can benefit from integrative approaches such as yoga and meditation.[4–10]

Our program revealed that virtual yoga and meditation classes are feasible and acceptable. Our QI initiative enhances the understanding of how virtual programs can be effectively implemented in urban public health settings to support individuals with brain injury and/or stroke, as well as their caregivers. The recruitment efforts and end-to-end collaboration between the existing support groups and the LYB program helped buffer care transitions and recruit participants to the LYB program, which participants noted was helpful.

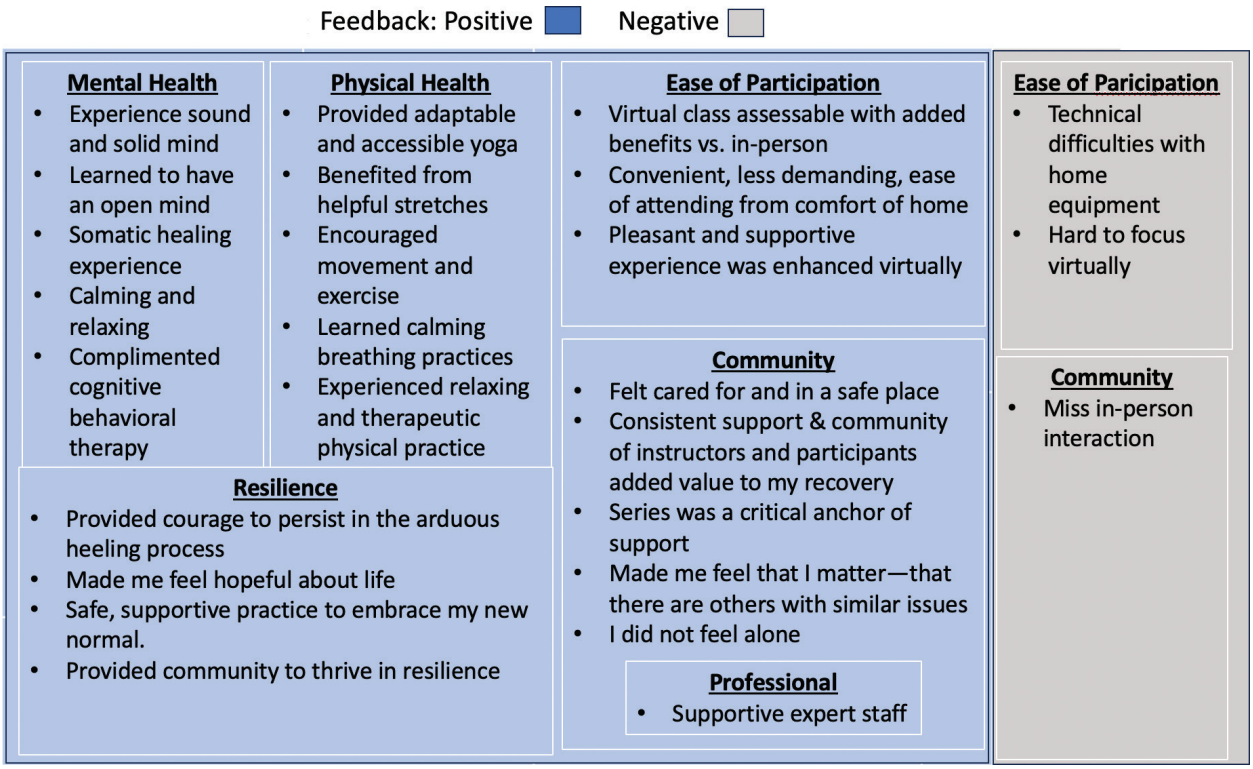

Fig. 2. Tree map of participant feedback question. "What was your experience like participating in the virtual series?" *Many participants had experiences in one or more categories. (TBI: $n = 11$, stroke: $n = 4$, caregiver: $n = 3$). Key themes depicted were synthesized from participant quotes, with each box size representing the frequency of the category.

Table 3. Feasibility and acceptability results

Feasibility	Total	TBI	Stroke	Caregiver
Attended at least 1 session (did not complete series)	76% $n = 35$	66% $n = 21$	100% $n = 9$	100% $n = 5$
Attended at least 4 or more sessions (completed series)	66% $n = 23$	57% $n = 12$	78% $n = 7$	80% $n = 4$
Acceptability (± SD)				
Series satisfaction (1–10; 10 highest score, mean and SD)	9.16 [1.32]	9.3 [1.10]	8.6 [2.19]	9.3 [1.10]

SD: standard deviation; TBI: traumatic brain injury.

Main qualitative findings suggest that participants experienced the LYB program as inclusive and a safe space to talk about and get support regarding their challenges with community reintegration and symptom management. Furthermore, they noted that having access to a like-minded community helped them to learn tools to manage their distress.

Future Studies

Future studies looking to implement a virtual program such as LYB should consider the technological challenges that may be particularly common to underserved populations.

Our program found that safety considerations were important elements to both participants and facilitators. We found that virtual yoga and meditation were safe, with no instances of injury to participants. Future programs of this type should include medical professionals to assist in program safety protocol development, staff training, and participant monitoring to ensure safety throughout the program. Of note, the nursing scope of practice is particularly well aligned to inform program needs such as participation appropriateness, symptom and safety identification, protocol development and deployment, and monitoring and should be integrated into program staffing to optimize safe participation.

Given the limited financial resources common to underserved public health populations, offering a LYB-type program free of cost was commonly commented on in participant feedback as being incentivizing. When we compared the cost for virtual versus in-person, we found that a virtual format was far less costly from a staffing, supplies, and venue perspective. Given the limited financial resources in public health, virtual programs such as LYB may be a unique opportunity to bring more robust care resources in the context of these constraints.

Limitations

Limitations of this QI project include a small convenience sample within a single public health setting. Our program participants were primarily within 5 years post-injury, so the generalizability to those who are greater than 5 years from their injury is limited. As a QI project without a control group, this project was not designed to assess efficacy. Additionally, the virtual nature of the intervention may limit its feasibility and acceptability for individuals who have limited internet access, severe psychosocial issues such as homelessness, or cognitive impairments that affect the ability to engage with video conferencing platforms like video telehealth.

Key Learnings

This QI project led us to the following conclusions. See Table 1 for staffing considerations and role duties for implementing a virtual yoga and meditation program.

- A virtual yoga and meditation program is feasible and acceptable among adults with TBI, stroke, and caregivers at an urban level 1 public trauma center.
- Offering this virtually deployed program, such as LYB, is safe and acceptable for those with ongoing symptoms after TBI and stroke, as well as their caregivers.
- Staffing for programs such as this should include medical staff and a yoga instructor. Professionals should receive additional training with access to ongoing consultation to adequately facilitate disease-specific psychoeducation.
- Obtaining streamlined pre- and post-feedback is necessary for program evaluation. Participants who completed the program expressed that this program added value to their care and recovery. Specifically, individuals noted an enhanced sense of community and self-perceptions of physical wellness, resilience, and emotional wellness.

Conclusion

Individuals with a TBI and stroke experience impairing ongoing symptoms in the outpatient public health settings. Virtually adapted yoga and meditation practice is a feasible, acceptable, and safe intervention to consider for symptom management in public health TBI and stroke populations. Additional studies are warranted to understand the efficacy of virtually deployed integrative approaches regarding symptom response compared to controls, as well as understand at what point in the disease trajectory integrative approaches can be optimally useful.

Funding

None

Conflicts of Interest

None

Contributors

Dr. Diaz Nelson: Conceptualization (lead); writing—original draft (lead); formal analysis (lead); writing—review and editing (equal). Ms. Goodell: methodology; conceptualization (supporting); writing—review and editing. Dr Weyer-Jamora: methodology; supervision; conceptualization (supporting); writing— original draft (co-lead); writing—review and editing (equal).

Data Availability Statement (DAS), Data Sharing, Reproducibility, and Data Repositories

Data from this QI project are not publicly available due to patient confidentiality and institutional policy. Interested parties may contact the corresponding author for additional information, subject to privacy and institutional restrictions.

Application of AI-Generated Text or Related Technology

None

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