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Effectiveness of Remote Yoga for the Global Population and Implications for Healthcare Integration: A Mixed-Method Global Cross-Sectional Study

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Abstract: Research on the effectiveness and implications of remote yoga for wellness and healthcare across global demographics remains insufficient, limiting its reliability for integration into healthcare interventions. This study explored the effectiveness and implications of remote yoga (teleyoga) delivery modalities compared to traditional in-person practices in the global population. Identifying gaps between traditional and contemporary practices is critical for gaining insights for optimising the integration of remote yoga delivery in healthcare. The study utilised a mixed-methods approach, combining qualitative data from expert interviews with quantitative data from a cross-sectional survey. The qualitative segment focused on identifying gaps in the real-world implications of remote yoga delivery, and the quantitative segment used the Telehealth Usability Questionnaire to measure the participants' experiences and impact. A survey of 1,767 participants, 801 from India and 966 from the United States revealed a positive overall experience with remote yoga. The reliability subscale exhibited a lower positive experience, whereas the other five subscales consistently indicated positive responses. However, significant demographic differences were observed between participants from India and the United States, with significantly higher scores in India. This indicates that the usability and effectiveness of remote yoga require further improvement. This study uniquely addresses several key gaps related to remote yoga delivery using a large sample, mixed-methods approach, and comparing Eastern and Western perspectives to comprehensively assess its usability, satisfaction, and adaptability across diverse demographics. The comparative analysis conducted in this study is essential for enhancing remote yoga's design, usability, and effectiveness and supporting its reliability and validity for integration into mainstream healthcare. Moreover, this study proposes an original framework, Knowledge, Acceptance, Practices, Experiences, and Results (KAPER) designed to introduce systematic delivery and assessment of remote yoga.

Introduction

Yoga has evolved from a sacred practice into a global wellness phenomenon and has gained contemporary relevance for its diverse health benefits (Field, 2016a; Pandurangi et al., 2017). Its widespread appeal and transformative potential highlight its role as both a spiritual practice and holistic health intervention.

The ancient scripture of the Bhagavad Gita and Patañjali's Yoga Sūtras extensively dwell on Yoga's spiritual and physical dimensions. With time, Yoga has

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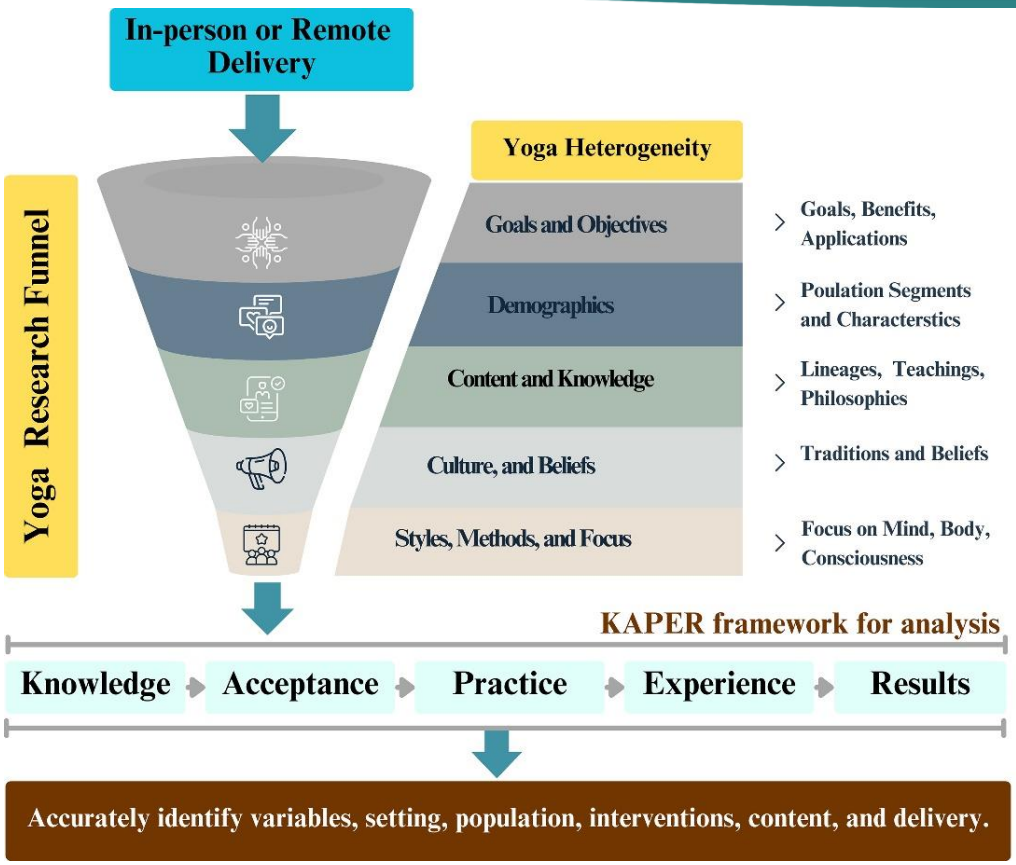

Figure 1. Factors attributing to heterogeneity.

evolved to meet the changing needs of its practitioners, mirroring shifts in societal views of health and spirituality toward a globally integrated wellness discipline. For instance, over the last 500 years, Hatha yoga has gained prominence by emphasising discipline and rigorous physical engagement as essential pathways to spiritual liberation (Satpathy, 2018; Shriya and Dave, 2023). Notably, this century marked a pivotal era for Yoga, characterised by a focus on Hatha yoga and significant adaptations that aligned it with contemporary life rhythms. Key figures such as B.K.S. Iyengar, T.K.V. Desikachar, and Pattabhi Jois played crucial roles in popularising Yoga internationally by introducing distinctive elements that significantly shaped its modern identity. These adaptations have facilitated Yoga's global appeal, making it accessible and relevant to diverse international audiences. Today, yoga thrives as a multifaceted practice, offering various styles tailored to different needs, ranging from rigorous physical workouts to gentle meditative flows and an emphasis on seeking spirituality (Bhagat and Lata, 2018).

There has been a surge in the scientific exploration of yoga, which has significantly deepened our understanding of its impact on wellness and emotional well-being, thereby integrating it into the realm of complementary and alternative medicine and extending its applications in clinical settings (Samuel, 2008). Research across diverse cultural landscapes has consistently highlighted the positive effects of Yoga on physical, mental and spiritual well-being (De Michelis, 2007; Ross and Thomas, 2010). Academic studies have underscored yoga's adaptability and relevance in addressing contemporary health issues, enhancing the quality of life and managing conditions such as chronic pain, diabetes, heart disease and even cancer (Birdee et al., 2008; Woodyard, 2011; Park et al., 2015; Saper and Lemaster, 2017; Tolahunase et al., 2017; Park, Quinker et al., 2019; Cramer et al., 2019). Studies have well documented its efficacy in improving mental health conditions such as anxiety and depression (Cramer et al., 2015; Innes and Selfe, 2016) and muscle Stability (Basak, 2024). Studies have also addressed the impact of Yoga on the immune system (Hsueh et al., 2021). Ongoing research and documentation of Yoga's multifaceted benefits continue to bolster its credibility and utility in improving quality of life and global health resources (Hofmann et al., 2016).

The use of digital technology has further broadened Yoga's reach, facilitating the emergence of remote classes that cater to global audiences in the comfort of their homes. While remote yoga has significantly contributed to its popularity, it also presents challenges in adhering to the discipline and rigor necessitated by in-person yoga practice. As digital platforms adopt and

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transform yoga practice, there is a risk of diluting its authenticity, standards, and philosophical core, reducing it to mere physical exercises under commercial pressures. The present and future landscapes push traditional methodologies toward meeting modern market demands, creating challenges in maintaining the authenticity of in-person Yoga. Moreover, this presents opportunities for improving remote yoga methodology to bridge the gaps with the perceived advantages of in-person methodology.

Before the coronavirus disease 2019 (COVID-19) pandemic, in-person yoga was the standard mode of delivery; however, studies have increasingly adopted remote yoga to deliver interventions. This disparity in the delivery methods raises questions about the assumed comparability of outcomes between the two modes. Furthermore, remote yoga has gained global popularity and enthusiasm as a viable wellness solution. Scientific scrutiny of factors causing heterogeneity and influencing yoga research is required to validate the efficacy of remote yoga for wellbeing and clinical intervention. Some key factors contributing to yoga heterogeneity are summarised in Figure 1.

The current approach and scope of remote yoga evaluation studies, including those on weight loss (Bridges and Sharma, 2017), stress (Falkenberg et al., 2018) and COVID-19 (Thimmapuram et al., 2022), remain limited. Different yoga styles, cultures, lineages, and teaching methods result in heterogeneity. Studies examining yoga must follow the same strict standards and rigor as clinical studies to improve the reliability and efficacy of outcomes (Sherman et al., 2024). Therefore, remote yoga delivery and other heterogeneity factors raise an important question about the validity and reliability of remote yoga studies. Given these factors, we currently lack the scientific validation to assume that remote yoga practice and research are equivalent to in-person intervention studies and vice versa.

Additionally, we must mitigate 'black box' findings regarding yoga interventions and fully specify the yoga intervention in terms of the quality and quantity of its component delivery, such as knowledge, awareness and practice.

Amid the heterogeneity and diversity of yoga practices, cross-sectional studies have explored the comparative effectiveness of yoga style, techniques, practices, and benefits on the yoga population (Wadhen and Cartwright, 2021; Brinsley et al., 2021). Some studies have also addressed the components of knowledge, attitudes, and practices of remote yoga (Graham, 2014). However, in-depth research in this area is lacking. Some studies, primarily conducted during the COVID-19 pandemic, have demonstrated the efficacy of remote yoga (Cramer et al., 2016; Birdee, Ayala, & Wallston, 2017; Mishra et al., 2020; Brinsley et al., 2021; James-Palmer, Anderson, & Daneault, 2022); however, they had small sample sizes and restricted demographics. The lack of large-scale cross-sectional studies on remote yoga, conducted on the global population, leaves unresolved conclusions about the comparability of remote yoga with in-person yoga.

Comparability and reliability issues also highlight the need for a standardised framework that enables rigorous analysis of yoga interventions. As remote yoga spaces lack standardised frameworks, learning models, and practice protocols, conducting comprehensive research and comparing results is challenging, hindering yoga's application in healthcare (Jasti et al., 2020; Waqar-Cowles et al., 2021).

This study aimed to address these issues by conducting a cross-sectional comparative analysis of remote yoga delivery in two culturally diverse populations: the United States (Western culture) and India (Eastern culture). Such an analysis is crucial for understanding the divergence and convergence between traditional in-person and remote yoga modalities. The current study sought to identify perceived differences in global demographics, acquire knowledge to enhance yoga instruction and practices and comprehend the modes and content of delivery, thereby strengthening the integration of yoga into healthcare.

Materials and Methods

Study Design

We used a mixed-methods design, combining qualitative narrative interviews with yoga experts with an online survey targeting yoga practitioners and providers in India and The United States. To ensure methodological rigor, the quantitative survey design adhered to the CHERRIES checklist (Miller et al., 2020) and STROBE guidelines (Castro and Tumibay, 2021).

Participants in this study received no intervention. We disseminated the survey through a multichannel approach, including emails, social media and direct contact with yoga institutions, studios, and organisations. Google Forms hosted the survey with clear guidelines and allowed respondents to revise their answers.

Participant Selection

This study employed stratified sampling across diverse channels. Participants were required to be at least 18 years old, with a minimum of one year of yoga experience. This data collection process lasted from November 2023 to April 2024.

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The Institutional Ethics Committee at the authors' university granted ethical approval for this observational study, ensuring it adhered to the required ethical standards. We secured voluntary participation and mandated electronic informed consent from all survey participants before the survey began. We also obtained consent from all experts participating in the qualitative interviews. Random IDs were then assigned to the participants' data and personal information was removed from the survey records before analysis.

The study's eligibility criteria were as follows: participants needed to be adults (at least 18 years old) with a minimum of one year of yoga practice experience, which ensured that they could provide informed perspectives on their yoga experiences. Additionally, the ability to complete the survey online was a prerequisite, ensuring accessibility and ease of participation for individuals across India and the United States.

We used stratified sampling to recruit participants through social media, phone calls, and emails in order to reach a broad network of individuals, yoga institutions, and studios. This approach facilitated sampling from people with a wide range of demographics, yoga practice characteristics, and experiences with various yoga delivery modes. After removing outliers using Mahalanobis distance, the final sample included 1767 individuals for analysis.

Quantitative Data Collection and Analysis

To assess the usability and effectiveness of teleyoga , we used a tailored version of the Telehealth Usability Questionnaire (TUQ) (Eysenbach, 2004; Nadiyah and Faaizah, 2015), which encompasses a broad perspective on usability and integrates aspects of the technology's utility and user interactions. The TUQ for teleyoga consists of 21 items distributed across the following six key subscales:

1. Usefulness, which gauges participants' views on the benefits of teleyoga, comparing it with traditional in-person yoga sessions
2. Ease of Use and Learnability, which evaluates the teleyoga platform's intuitiveness and user-friendliness and assesses how enjoyable and straightforward the interface is for the users
3. Interface Quality, which focuses on the design and navigational aspects of the system and examines how the interface facilitates user interaction
4. Interaction Quality, which evaluates the effectiveness
5. of the platform's audio and visual communication features, which are crucial for a seamless teleyoga experience
6. Reliability, which measures the consistency and dependability of the teleyoga system, ensuring that it functions smoothly for the users
7. Satisfaction and Future Use, which measures the participants' overall contentment with teleyoga and their inclination to continue using the platform

Participants rated their experiences on a seven-point Likert-type scale (1 = strongly disagree; 7 = strongly agree), with higher scores indicating more favourable responses. Statistical tests and data analyses were performed, including demographic analysis, descriptive statistics, t-tests, chi-square tests, and multivariate variance analysis (MANOVA).

Qualitative Data Collection and Analysis

In the qualitative segment of the study, in-depth interviews were conducted with 20 yoga experts, evenly divided between The United States and India. These interviews aimed to explore the essence of traditional in-person yoga, adhering to guidelines regarding qualitative interview adequacy (Von Elm et al., 2007). This diverse group of experts, aged 45–85 years, offered rich perspectives across different life stages and yoga lineages, including Advaita Vedanta, Shivanada, the Ramakrishna Mission, Chaitanya Mahaprabhu, Kundalini, Iyengar, Krishnamacharya, Desikachar, Kripalu yoga, and Vini yoga. Their backgrounds ranged from yoga academics and experts to spiritual leaders with over 25 years of experience, providing a broad spectrum of insights. The interview method was chosen to gain insight into personal narratives, experiences, opinions, and attitudes (Parmanto et al., 2016).

After obtaining informed consent from each participant, the interviews were conducted using video and audio recording tools. This approach allowed us to capture detailed narratives, experiences, and opinions, offering a comprehensive view of traditional yoga practice and philosophy. Qualitative data analysis involved a combination of notetaking, summarisation, and advanced natural language processing tools to process the interviews. A keyword analysis was conducted to extract prevalent themes and insights, facilitating a deeper understanding of the nuances of traditional yoga practices as perceived by experts.

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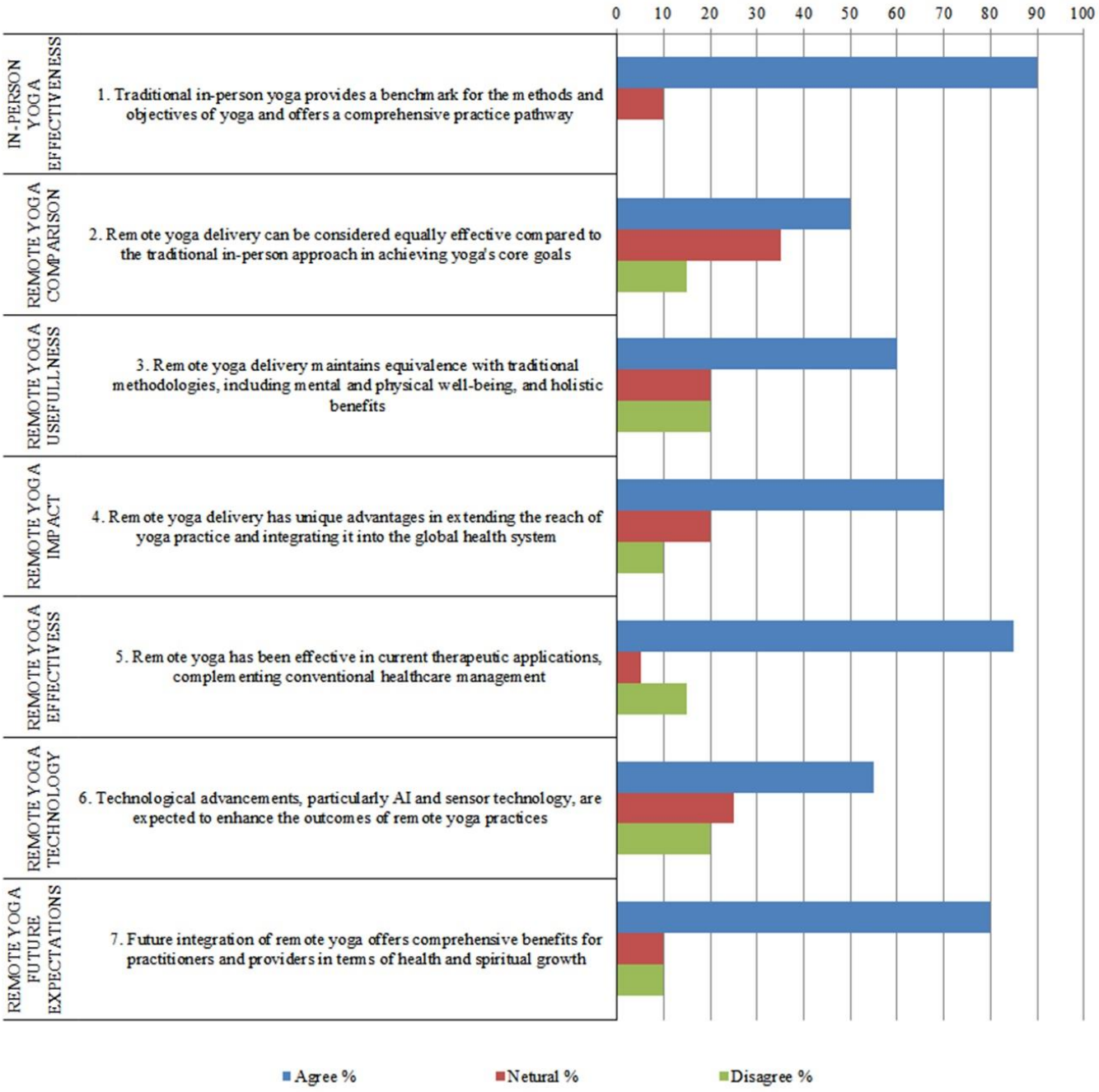

Figure 2. Qualitative narrative analysis.

Results

Qualitative Analysis

The analysis highlights the key contrasts between traditional (in-person) and remote yoga deliveries. The experts emphasised the value of one-on-one interaction, personalised guidance, and the integration of yoga philosophy in traditional settings. The experts noted that in-person sessions promoted community learning, emphasised individual character development, and tailored teaching to the learners' progress. In contrast, experts perceived remote yoga as more modular, limiting sensory experiences and personal connections, despite its popularity in regular practice and specific therapeutic applications. The experts emphasised the lack of a holistic approach in remote sessions, which often focused on asanas and pranayama, and highlighted the challenges of conveying yoga's philosophical depth in these formats.

Swamini Dr. Brahmaprajnananda Saraswati highlighted traditional yoga's profound, immersive nature, emphasising that the guru is pivotal in the transformative journey. Dr. Phil Goldberg raised concerns regarding the authenticity of yoga practices and cautioned against the possible pitfalls of aligning them with unsuitable gurus (Graham, 2014). Swami Dr. Medhananda discussed the adaptability of the Guru-Shishya tradition in Western contexts, whereas Vinni Grover, an 85-year-old yoga teacher, stressed the importance of mental determination in learning from diverse sources. Dr. Bhavit Bansal recognised the

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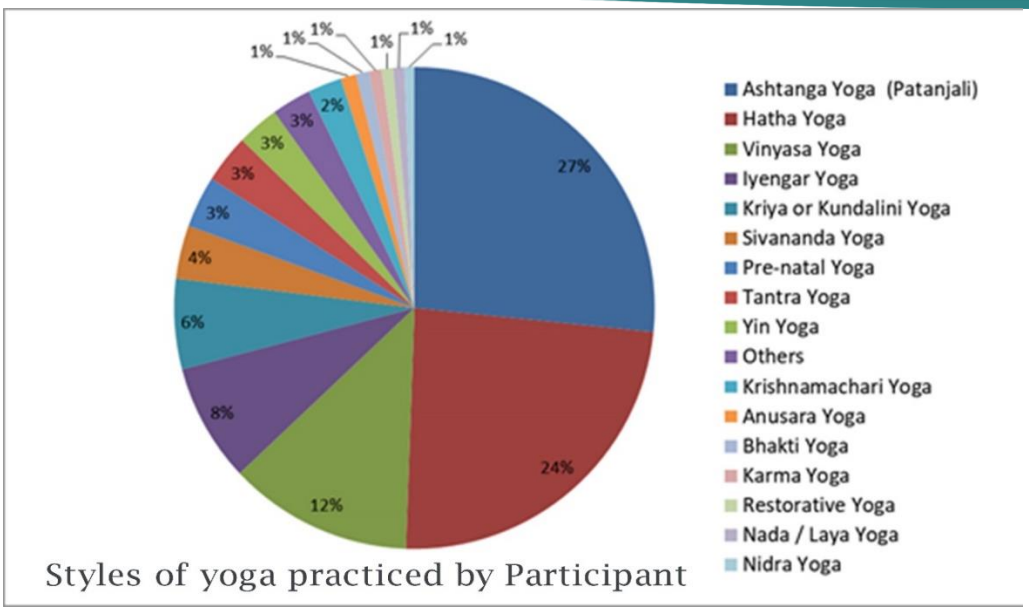

Figure 3. Styles of yoga practiced by Participant.

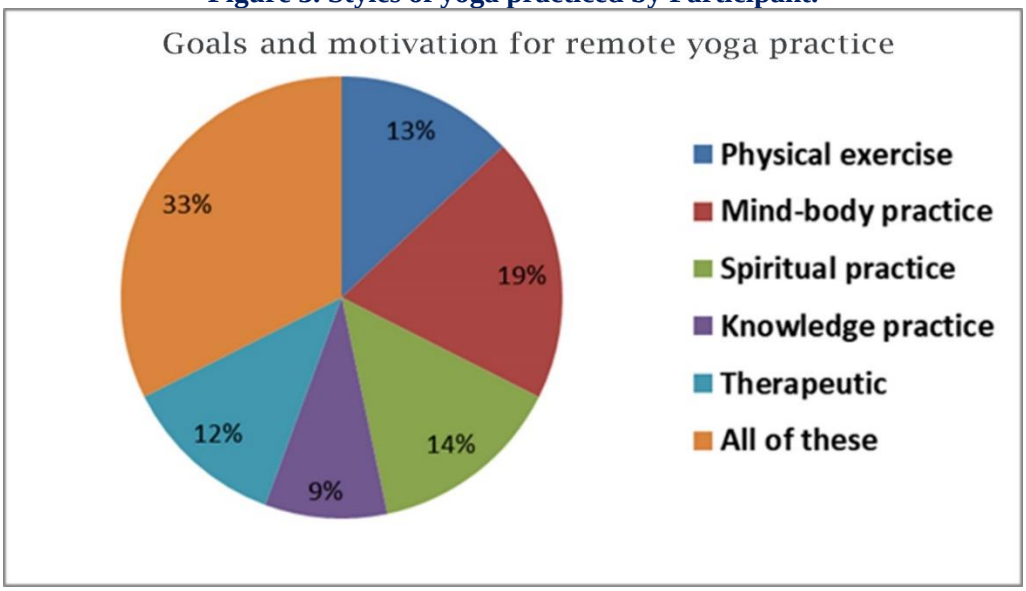

Figure 4. Goals and motivation for remote yoga practice.

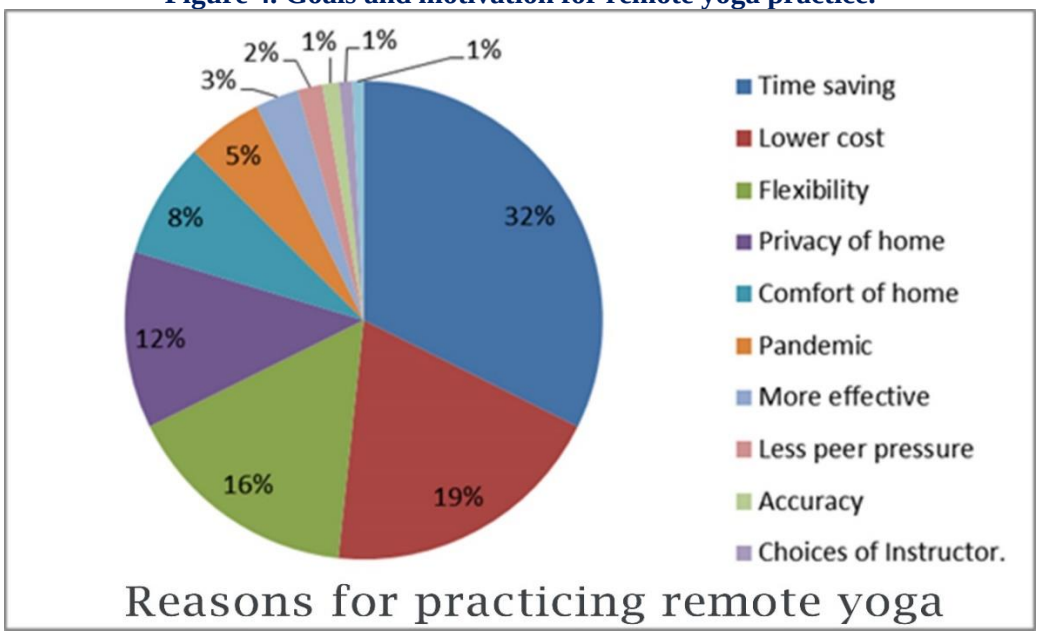

Figure 5. Reasons for practicing teleyoga.

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Table 1. Participant characteristics.

Demographic Factor	Category	Participant%		
		India (East) n=801	United States n=966	Total N n=1767
Connection to yoga	Yoga Student - Undergraduate Level	7.4%	4.3%	11.7%
	Yoga Scholar - MS, PhD Level	7.8%	2.3%	10.1%
	Regular Practitioner - No Formal Yoga Degree	11.2%	12.5%	23.8%
	Yoga Teacher, Master or Guru	12.5%	25.9%	38.4%
	Yoga Expert and Professors	6.5%	9.5%	16.0%
	Total	45.5%	54.5%	100.0%
Experience of practicing yoga	Less than 2 years	6.4%	7.0%	13.4%
	2–5 years	13.5%	6.4%	19.9%
	5–10 years	8.7%	6.4%	15.1%
	Over 10 years	16.9%	34.8%	51.6%
Yoga lineage (Guru)	Yes	20.4%	21.0%	41.5%
	No	18.1%	28.3%	46.5%
	Maybe	6.9%	5.2%	12.1%
Age group	18–25	10.6%	4.6%	15.2%
	26–35	11.6%	8.5%	20.0%
	36–45	10.8%	11.0%	21.8%
	46–55	8.9%	14.7%	23.6%
	56–65	s2.3%	10.4%	12.7%
	66–75	1.0%	4.3%	5.3%
	75+	0.3%	1.0%	1.4%
Sex	Female	23.5%	42.4%	65.9%
	Male	22.0%	12.1%	34.1%
Marital status	Single	20.6%	20.1%	40.7%
	Married	23.7%	27.2%	50.9%
	Other	1.2%	7.2%	8.4%
Highest level of education	High School Diploma	3.1%	3.2%	6.4%
	Technical Diploma	1.3%	3.3%	4.6%
	Bachelor's Degree (BA/BS)	12.8%	19.1%	31.9%
	Master's Degree (MA, MSc)	21.1%	21.2%	42.4%
	PhD or Post-Doctoral Degree	3.4%	4.7%	8.1%
	Other	3.8%	3.0%	6.8%
Education/training in yoga science	Short Term Course	5.2%	7.0%	12.2%
	Certificate in Yoga	6.1%	9.1%	15.2%
	Diploma Course	3.9%	16.0%	19.9%
	Bachelor's Degree in Yoga	6.1%	2.6%	8.7%
	Master's Degree in Yoga	11.7%	5.8%	17.5%
	PhD or Post-Doctoral Degree	2.8%	1.9%	4.7%
	None	9.6%	12.2%	21.7%
Manage a yoga center/studio	Yes	23.1%	27.5%	50.6%
	No	18.0%	23.1%	41.1%
	Previously but not currently	4.4%	4.0%	8.3%
TUQ yoga provider or receiver	Yoga Provider/ Instructor	28.6%	30.8%	59.4%
	Yoga Receiver/Participant	16.9%	23.7%	40.6%
Remote yoga experience	Less than 6 months	9.8%	8.0%	17.8%
	Less than 1 year	6.3%	6.0%	12.3%
	1–3 years	15.1%	20.1%	35.2%
	More than 3 years	14.3%	20.4%	34.7%
	Total	45.5%	54.5%	100.0%

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potential of remote yoga delivery to reach a broader audience, offering new avenues for therapy and health innovation.

We systematically examined expert opinions across seven critical areas; Figure 2 illustrates their perspectives on remote yoga delivery systems and the anticipated future outlook for remote yoga. A total of 85% of the experts strongly agreed that remote delivery is effective in therapeutic healthcare settings.

The experts stated that traditional yoga prioritises immersive learning, a personalised guru-disciple relationship, tailored progression, and lifelong transformation with 'vairagya' (detachment). Moreover, the West is increasingly embracing the yoga philosophy, suggesting that remote self-guided methodology is a viable form of practice. Remote yoga offers accessibility to various teachings, complements traditional practices, enables broader global outreach, and necessitates careful transition to preserve the depth of yoga practice.

In contrast to the Indian emphasis on the integral role of the guru, Western practice views gurus more as need-based guides than as lifelong spiritual mentors. Despite its shortcomings pertaining to in-person interactions, remote yoga received praise for its widespread dissemination and ability to inspire a global audience. There was optimism regarding technology-enabled remote yoga; however, in-person guidance was considered essential for more profound meditation and a more advanced yoga experience.

The experts agreed on remote yoga's value in therapeutic applications and integrated health benefits, acknowledging its role as a stepping stone for practitioners aspiring to investigate the higher dimensions of yoga through traditional in-person practices.

Demographic Characteristics

Table 1 and Figures 3, 4, and 5 demonstrate a balanced engagement between India and The United States, with 801 and 960 students completing the study. Marital status varied, with 47% being single, 45% married, and 8.4% undeclared. Notably, the survey predominantly attracted female respondents (65.9%). However, the Indian sample had a higher proportion of male participants (65%). Regarding yoga styles, most (51%) practiced Ashtāngạ or Hatha yoga, whereas 12% embraced Viniyoga and 8% followed Iyengar yoga (Figure 3). Diverse goals fuelled participants' yoga practices, with 33% seeking holistic benefits, 13% focusing solely on physical gains, and 12% utilising yoga for therapy (Figure 4). Regarding the motivation for adopting remote yoga, 33% valued its time-efficiency benefits, 25% found it cost-effective, and 16% appreciated its flexibility benefits, driven by considerations of privacy, comfort, and the influence of the COVID-19 pandemic (Figure 5).

An interesting aspect emerged on the topic of education, with 18% pursuing formal education in yoga, which was more prominent in India (24%) than the United States (6%). Furthermore, 52.5% of the participants held positions as yoga masters, gurus, or experts, indicating the growing recognition of yoga as a global professional education. Participants exhibited significant experience in yoga, with 64.7% practicing for over five years and 32% in The United States reporting over 10 years of experience, surpassing 16.8% in India. Over 40% of the participants indicated adherence to specific yoga lineages. Notably, 37.5% of the participants belonged to the 18–35 age group.

Quantitative Data Analysis

In the quantitative phase of this study, the TUQ was utilised to assess the usability and effectiveness of remote yoga. The validity and reliability of the TUQ were confirmed through confirmatory factor analysis (CFA) and reliability testing (Cronbach alpha = 0.909) in an initial subset of 100 responses.

The TUQ showed strong internal consistency and content validity, with standardised correlation coefficient values for the subscales ranging from 0.369 to 0.733, thus affirming its reliability (Table 2). The high Cronbach's alpha value of 0.909 further demonstrated the questionnaire's robustness. The absence of multicollinearity confirmed the independence of the variables. Normality was assessed by analysing skewness and kurtosis values, examining histograms, and utilising Q-Q plots while considering the limitations of large sample sizes.

Table 2. Item correlation matrix and scale reliability.

	SS1**	SS2**	SS3**	SS4**	SS5**	SS6**
SS1	1	0.665*	0.613*	0.500*	0.369*	0.601*
SS2	0.665*	1	0.731*	0.600*	0.492*	0.645*
SS3	0.613*	0.731*	1	0.723*	0.623*	0.726*
SS4	0.500*	0.600*	0.723*	1	0.716*	0.733*
SS5	0.369*	0.492*	0.623*	0.716*	1	0.655*
SS6	0.601*	0.645*	0.726*	0.733*	0.655*	1

*Correlation is significant at the 0.01 level (two-tailed).
**Subscales: SS1, Usefulness; SS2, Ease of Use and Learnability; SS3, Interface Quality; SS4, Interaction Quality; SS5, Reliability; SS6, Satisfaction and Future Use.

As shown in Table 3, except for the reliability subscale for the United States population, which had a mean score of 3.89 (SD 1.4), the mean scores on all other sub-scales exceeded 4.0, indicating generally positive experiences with remote yoga delivery. Moreover, the

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Table 3. Descriptive statistics.

Category		SS1*	SS2*	SS3*	SS4*	SS5*	SS6*	Total TUQ
India	Mean	5.390	5.157	5.039	5.083	4.671	5.152	5.082
	N	807	807	807	807	807	807	807
	SD	1.100	1.186	1.234	1.197	1.299	1.252	1.006
	% of Total N	45.70%	45.70%	45.70%	45.70%	45.70%	45.70%	45.70%
United States	Mean	5.536	5.166	4.810	4.521	3.894	4.797	4.787
	N	960	960	960	960	960	960	960
	SD	1.072	1.198	1.328	1.366	1.401	1.417	1.089
	% of Total N	54.30%	54.30%	54.30%	54.30%	54.30%	54.30%	54.30%
Female	Mean	5.513	5.141	4.862	4.698	4.148	4.903	4.878
	N	1162	1162	1162	1162	1162	1162	1162
	SD	1.098	1.209	1.328	1.347	1.443	1.427	1.093
	% of Total N	65.80%	65.80%	65.80%	65.80%	65.80%	65.80%	65.80%
Male	Mean	5.385	5.202	5.016	4.930	4.442	5.067	5.007
	N	605	605	605	605	605	605	605
	SD	1.062	1.158	1.209	1.257	1.322	1.201	0.993
	% of Total N	34.20%	34.20%	34.20%	34.20%	34.20%	34.20%	34.20%
Yoga Provider	Mean	5.470	5.127	4.888	4.822	4.270	4.995	4.929
	N	1048	1048	1048	1048	1048	1048	1048
	SD	1.1043	1.19591	1.3087	1.3527	1.42197	1.3924	1.10255
	% of Total N	59.30%	59.30%	59.30%	59.30%	59.30%	59.30%	59.30%
Yoga Receiver	Mean	5.469	5.212	4.954	4.713	4.217	4.907	4.912
	N	719	719	719	719	719	719	719
	SD	1.062	1.185	1.263	1.272	1.391	1.299	0.999
	% of Total N	40.70%	40.70%	40.70%	40.70%	40.70%	40.70%	40.70%
Total	Mean	5.469	5.162	4.915	4.778	4.249	4.959	4.922
	N	1767	1767	1767	1767	1767	1767	1767
	SD	1.087	1.192	1.290	1.321	1.409	1.355	1.061
	% of Total N	100%	100%	100%	100%	100%	100%	100%

*Subscales - SS1: Usefulness, SS2: Ease of Use & Learnability, SS3: Interface Quality, SS4: Interaction Quality, SS5: Reliability, SS6: Satisfaction and Future Use

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Table 4. The percentage of responses was categorized as positive or negative for each item and subscale.

	Positive Response >4	Negative or Neutral Response	Mean	SD	Median
Remote yoga improves access to yoga services	75.83%	24.17%	5.31	1.504	6.00
Remote yoga saves travel time to physical location	85.17%	14.83%	5.80	1.316	6.00
Remote yoga provides for my wellness and health needs	73.85%	26.15%	5.23	1.425	6.00
Subscale 1: Total Usefulness	78.29%	21.71%	5.45	1.142	5.67
Remote yoga platform was simple to use	79.97%	20.03%	5.55	1.355	6.00
Remote yoga platform was easy to learn	76.63%	23.37%	5.34	1.452	6.00
I could learn yoga using remote yoga services	56.99%	43.01%	4.58	1.735	5.00
Subscale 2: Total Ease of Use and Learnability	71.19%	28.81%	5.16	1.233	5.33
Interaction with this remote yoga delivery is pleasant	64.97%	35.03%	4.99	1.542	5.00
I like using the remote yoga delivery	65.20%	34.80%	4.94	1.664	5.00
Remote yoga delivery is simple and easy to understand	72.33%	27.67%	5.23	1.436	6.00
Remote yoga delivery can do everything I want it to be able to do	54.90%	45.10%	4.48	1.705	5.00
Subscale 3: Total Interface Quality	64.35%	35.65%	4.91	1.324	5.00
I could easily interact with the yoga instructor using the remote yoga session	58.52%	41.48%	4.61	1.776	5.00
I could hear the yoga instructor clearly using the remote yoga session	73.97%	26.03%	5.20	1.495	6.00
I was able to express myself effectively during remote yoga	56.42%	43.58%	4.58	1.746	5.00
I could see the remote yoga instructor as if we were practicing yoga in person	58.40%	41.60%	4.69	1.764	5.00
Subscale 4: Total Interaction Quality	61.83%	38.17%	4.77	1.354	5.00
Instructions and value provided over the remote delivery are the same as in-person practice	46.35%	53.65%	4.10	1.869	4.00
Whenever I made a mistake using the remote yoga delivery, I could recover easily and quickly	55.12%	44.88%	4.58	1.636	5.00
The remote yoga delivery gave error messages that clearly told me how to fix problems	41.65%	58.35%	4.05	1.726	4.00
Subscale 5: Total Reliability	47.71%	52.29%	4.24	1.438	4.33
It is comfortable to communicate with the instructor during remote yoga	54.39%	45.61%	4.53	1.767	5.00
Remote yoga is effective for mind-body wellness	67.52%	32.48%	4.97	1.607	5.00
I will use remote yoga in the future	71.70%	28.30%	5.18	1.630	6.00
Overall, I am satisfied with the remote yoga delivery	67.97%	32.03%	5.08	1.640	5.00
Subscale 6: Total Satisfaction and Future Use	65.39%	34.61%	4.94	1.408	5.00
Total - All Subscales	64.79%	35.21%	4.91	1.106	4.94

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Table 5. Multivariate tests.

Effect		Value	*F*	P	Partial Eta Squared
Intercept	Pillai's Trace	0.96	6554.032	<.001	0.957
India or United States	Pillai's Trace	0.09	29.683	<.001	0.092
Sex	Pillai's Trace	0.01	3.085	<.005	0.01
Provider (Instructor) or Receiver (Practitioner)	Pillai's Trace	0.01	2.031	<.059	0.007
India or United States × Sex	Pillai's Trace	0	1.081	<.372	0.004
India or United States × Provider (Instructor) or Receiver (Practitioner)	Pillai's Trace	0.01	2.686	<.013	0.009
Sex × Provider (Instructor) or Receiver (Practitioner)	Pillai's Trace	0	1.150	<.331	0.004
India or United States × Sex × Provider (Instructor) or Receiver (Practitioner)	Pillai's Trace	0	1.316	<.246	0.004

*Hypothesis *df*=6, Error *df*=1754.

overall mean score of the participants in India (5.08, SD 1.01) was higher than that of the participants in The United States (4.79, SD 1.09).

Additionally, male participants reported a slightly higher total mean score (5.01, SD 0.99) than female participants (4.88, SD 1.09). Yoga providers and receivers showed similar satisfaction levels, with mean scores of 4.93 (SD 1.1) and 4.91 (SD 1.0), respectively.

The usefulness subscale emerged as the highest-rated aspect of remote yoga, with a mean score of 5.47 (SD 1.09), whereas the ease of use and learnability subscale also received a high score of 5.16 (SD 1.19). In contrast, the reliability subscale had the lowest overall mean score of 4.25 (SD1.41), with a particularly low mean score of 3.89 (SD 1.4) for the United States cohort, suggesting a comparatively lower perceived reliability of remote yoga in that region.

We further examined Likert-type scale responses to determine the overall percentage of positive responses. Responses indicating 'agree' or 'strongly agree' were categorised as positive across all demographic groups. Conversely, we classified 'neutral', 'disagree', and 'strongly disagree' responses as negative. As illustrated in Table 4, participants reported significantly positive experiences (scores greater than four) with teleyoga across all scale items.

The quantitative findings revealed that 64.8% of the participants reported positive experiences (mean score 4.91), indicating the increasing acceptance and future growth of remote yoga delivery. However, the results pertaining to the subscales revealed large gaps, particularly for interaction quality (62%, mean score 4.77), total reliability (48%, mean score 4.24) and total satisfaction (64.79%, mean score 4.94), showing that remote yoga delivery could be further improved.

The t-test results, percentage of positive responses, and mean response values were sufficiently strong to warrant further investigation into the differences across the subscales and cross-sectional factors.

To examine the significance of the differences between the Indian and United States populations for individual survey items, each subscale, and total scores, MANOVA was performed (Table 5). Significant differences were observed between the populations and sexes (P<.05). There was also an interaction between the population and the provider-receiver role.

Discussion

To the best of our knowledge, no global studies have explored the implications of remote yoga across the East and West. This study fills this gap by analysing the adoption of remote yoga among the culturally diverse population of the East and West. There is a growing body of scientific research focusing on the positive outcomes of yoga interventions for a range of health issues (Woodyard, 2011; Cramer et al., 2015; Innes and Selfe, 2016; Hofmann et al., 2016; Saper and Lemaster, 2017; Tolahunase et al., 2017; Bridges and Sharma, 2017; Falkenberg et al., 2018; Cramer et al., 2019; Hsueh et al., 2021; Thimmapuram et al., 2022). However, yoga studies often lack diversity and precise quantitative and qualitative measures, limiting their accuracy and potential

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for replication. Such studies only provide generic analyses, weakening the support for healthcare integration and restricting most studies to the academic realm (Birdee et al., 2008; Graham, 2014; Park et al., 2019; Wadhen and Cartwright, 2021; Brinsley et al., 2021).

The adoption of remote yoga has presented a significant challenge for integrating yoga into complementary healthcare due to its deviation from traditional in-person practice. Considering the existing disparities between remote and in-person yoga methodologies, yoga intervention studies must consider the delivery modes as a significant variable. These two modes must be viewed as similar but not equivalent until the correlation between remote and in-person yoga has been established.

agreed on the overall usefulness of remote yoga delivery for meeting healthcare needs.

Global diversity and heterogeneity have implications for remote yoga delivery, as the demographic analysis reveals. Multivariate analysis revealed significant differences across subscales between Indian and United States populations. Tailoring yoga practice and interventions to the target population's goals, needs, and characteristics is one way to address these differences while optimising delivery. Overall, the usefulness and acceptance of remote yoga suggest that it is well-positioned as a valuable adjunct to contemporary medicine, offering alternative interventions and significantly contributing to global health paradigms. Given the widespread heterogeneity of yoga, impeding its

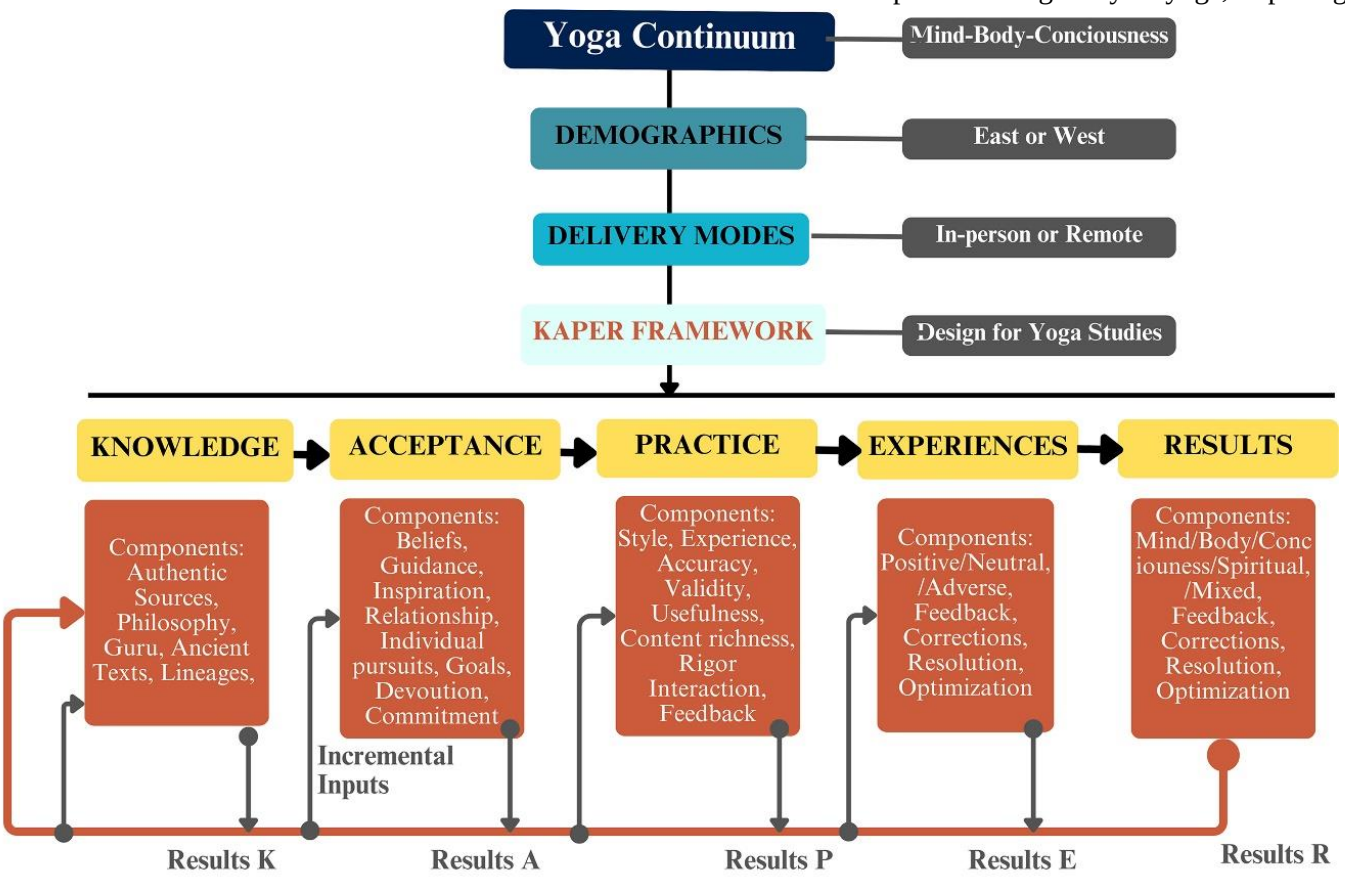

Figure 6. KAPER framework for yoga delivery.

The quantitative findings of this study underscored the promising rates of acceptance and future prospects of remote yoga delivery. However, the results showed significant gaps among the subscales, particularly in the areas of interaction quality, total reliability, and total satisfaction, indicating the need for further improvements in remote yoga delivery methods.

The experts, supporting our quantitative findings, supported our quantitative findings, emphasised the importance of connection (interaction quality), authenticity, and reliability differences between traditional and remote yoga. Despite the gaps, the experts strongly

reliability, it is imperative to adopt a structured framework for designing and implementing yoga studies. This framework should systematically account for and analyse practice and delivery parameters and mind-body inputs. This framework must have the ability to treat yoga as a process that yields incremental outcomes. Such a framework would improve the comparability and reliability of studies and mitigate the 'black box' approach.

Instruction models, such as the Analysis, Design, Development, Implementation, and Evaluation framework (ADDIE) (Waqar-Cowles et al., 2021), are used for

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providing instructions remotely. Many fields have successfully deployed existing structured online learning models, which are based on the ADDIE framework (Waqar-Cowles et al., 2021). However, remote yoga lacks a systematic model of delivery and instruction as well as protocols for standardisation.

We propose an outline of the Knowledge, Acceptance, Practices, Experiences, and Results (KAPER) framework (Figure 6) as a means to achieve these objectives. Although this model is not based on empirical results, it represents an independent development project aimed at creating a structured framework for yoga instructions. The KAPER framework initiative is an integrative process that can facilitate the design, instructions, measurement, delivery, analysis, and optimisation of yoga interventions.

The highlight of this model is the modular approach to yoga that assesses and optimises each phase as the participant journeys through the yoga process. This model reflects cognitive progress during the learning or practice of yoga, contrasting with the end-to-end methodology and discrete assessments of yoga interventions. It emphasises rigorous scientific inquiry into the multifactorial, multistage nature of the yoga process.

Healthcare providers, yoga therapists, and wellness practitioners can derive actionable insights from this study, particularly regarding the crucial role of customisation in the effectiveness of remote yoga interventions. This study emphasises the need to move away from a one-size-fits-all approach to yoga therapies and assessment of outcomes. The recommended therapies for interventions must be tailored to local preferences and yoga cohorts in order to address specific objectives, enhance engagement, and achieve positive health outcomes. Remote yoga delivery must be designed to improve positive scores across all subscales, with a strong focus on reliability, participant interaction, and interface quality. Refining the delivery design, methodology, and technology and encouraging continuous evaluations can achieve these improvements.

These findings deepen researchers' and academics' understandings of the influence of location and sex on the reception of remote yoga. This study paves the way for further cross-cultural research exploring how different norms and practices affect the adoption and effectiveness of yoga in digital health interventions. Such research is vital for developing inclusive and effective health strategies capitalising on the unique benefits of yoga.

Conclusion

We analysed the usability and satisfaction levels of remote yoga practices as well as their key determinants across diverse demographics in both the Eastern and Western contexts by using a mixed-methods approach that integrated qualitative insights with a quantitative analysis. Our large sample study, encompassing data on the demographics, knowledge, attitudes, practices, and experiences of the East and the West, facilitated a nuanced comparison between traditional and remote yoga modalities, highlighting teleyoga's versatility and broad appeal.

Participants reported high levels of satisfaction, citing the convenience and user-friendliness of remote sessions, which save time and maintain the quality of practice, making yoga more accessible, especially in communities lacking resources or specialised programs. Yoga experts, therapists, and instructors reflected optimism regarding the future potential of remote yoga. This uniform satisfaction across various yoga styles and demographic groups underscores the crucial role of remote yoga in promoting holistic well-being and its potential to meet a wide range of wellness and healthcare needs.

Moreover, the study identified existing limitations in remote yoga delivery, presenting opportunities to enhance its effectiveness and applications. Systematic examinations confirmed that teleyoga interventions could be efficacious, reinforcing its stature as a holistic and impactful delivery method. These findings should guide technology developers and designers in creating solutions that adhere to universal design principles while reflecting cultural and regional nuances, ensuring that technological advancements align with users' wellness aspirations.

We urge healthcare stakeholders, scholars, yoga providers, and app developers to leverage these findings to guide future strategic empirical research. This study not only supports the customization of yoga practices to meet specific demographic and experiential needs but also encourages continued exploration into the integration of yoga into global health strategies, ensuring that it remains a valuable resource for enhancing well-being across diverse populations. As we move forward, expanding the KAPER framework could standardise methodologies that enable the outcomes of studies to be relevant to global populations and reinforce the integration of remote yoga with global healthcare systems.

Limitations

The exclusive use of an online survey may have introduced limitations, such as the exclusion of individuals with limited Internet access and non-English speakers, particularly in diverse linguistic regions such as India. This study concentrated on the impact of yoga

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delivery modalities, excluding outcomes related to specific yoga therapies. Recognising these limitations is crucial for enhancing the scope of future research. To address these limitations, future research should cover specific yoga therapy outcomes and implement longitudinal studies for a more comprehensive understanding.

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Conflict of Interest

The authors declare no conflict of interest.

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