International Journal of Anatomy and Research,
Int J Anat Res 2024, Vol 12(1):8808-14. ISSN 2321-4287
DOI: https://dx.doi.org/10.16965/ijar.2023.209

Original Research Article

Asana to Anatomy: Unpacking Yoga's Inner Mechanics through Experiential Learning

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ABSTRACT

Background The present study posits that incorporating experiential learning principles into understanding yoga anatomy can bridge the gap between traditional practices and modern anatomical knowledge. The study hypothesizes that experiential learning techniques will result in a deeper, more nuanced understanding of anatomical constraints affecting the execution of specific yoga asanas—Trikonasana (Triangle Pose), Utkatasana (Chair Pose), Virabhadrasana I (Warrior I), and Virabhadrasana II (Warrior II).

Methods: The Yoga Anatomy Workshop, organized under the banner of YOGANATOME, hosted 80 diverse participants who were divided into two rotating groups. Group A served as practitioners performing specific asanas, whereas Group B acted as keen observers. Seasoned instructors facilitated the workshop by focusing on hands-on exploration, postural evaluation, and anatomical considerations. Data were collected using structured worksheets filled out by the observers, capturing aspects such as posture alignment and muscular engagement.

Summary of Results: The analysis revealed various anatomical constraints that affected the performance of the selected asanas. In Trikonasana, 28% had difficulty directing their gaze upward due to sternocleidomastoid muscle stiffness. In Utkatasana, 20% struggled with lumbar vertebral straightening, which is attributed to curvature deviations due to postural alterations. In Virabhadrasana I, 18% of patients faced challenges in arm elevation due to impingement syndrome. In Virabhadrasana II, 24% of patients had knee alignment due to joint restrictions and muscle imbalances. These insights have significant implications for yoga instructors and practitioners, emphasizing the need for individualized and anatomically informed yoga instruction.

KEYWORDS: Experiential learning, Kinaesthetic learning, Yoga, Anatomy, Biomechanical constraints.

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Access this Article online	Journal Information	
Quick Response code	International Journal of Anatomy and Research ISSN (E) 2321-4287 | ISSN (P) 2321-8967 **https://www.ijmhr.org/ijar.htm** **DOI-Prefix:** https://dx.doi.org/10.16965/ijar	
	Article Information	
	Received: 04 Sep 2023	Accepted: 23 Oct 2023
	Peer Review: 09 Sep 2023	Published (O): 05 Mar 2024
DOI: 10.16965/ijar.2023.209	Revised: 08 Oct 2023	Published (P): 05 Mar 2024

INTRODUCTION

Experiential Learning: A Paradigm Shift in Education: The field of education has witnessed a paradigm shift with the emergence of experiential learning. This innovative pedagogical approach challenges traditional passive learning techniques, advocating for a departure from rote memorization and mechanical repetition of facts [1]. Visionaries such as Jean Piaget, Carl Jung, and John Dewey from the 20th century have championed this theory, asserting that genuine and profound learning extends beyond surface-level understanding and necessitates the integration of sensory experiences with cognitive engagement [2]. The merging of feelings, thoughts, perceptions, and cognition forms the foundation of experiential learning, which marks a significant paradigm shift in education.

Experiential Learning and Yoga: The concept of experiential learning has a strong resonance in the world of yoga, a holistic practice that combines physical postures, breathing techniques, and meditation to promote overall well-being. Yoga practice traditionally relies on embodied experiences with practitioners engaging in their senses, emotions, and consciousness to enhance their practice [3]. The concept of "embodied cognition" aligns with the experiential learning model, suggesting that cognition is not merely a function of the brain, but is also influenced by bodily experiences and interactions with the environment [4].

Anatomical Understanding in Yoga: A comprehensive understanding of human anatomy is central to effective yoga practice. The interplay between anatomy and yoga posture is intricately woven, with each asana demanding precise muscle engagement, joint alignment, and breathing control. However, anatomical intricacies that influence the execution of yoga poses have not been comprehensively explored in a structured learning environment. While yogic philosophy has long emphasized the importance of alignment and balance, few empirical studies have systematically investigated the impact of anatomical constraints on the execution of specific asanas. Misunderstanding the anatomical aspects can lead to suboptimal execution of poses, diminishing the intended benefits, and even causing injuries. highlighted that practitioners often misinterpret alignment cues, leading to incorrect muscle engagement, potentially increasing the risk of injury. Furthermore, the diversity of body types and physiological differences among individuals necessitates a personalized approach to yoga instruction [5]. Without an empirical understanding of anatomical constraints, instructors may inadvertently prescribe poses unsuitable for certain individuals.

This study sought to bridge the gap between ancient yoga practices and modern Anatomical understanding. By incorporating experiential learning principles, we aimed to provide empirical insights into the most common anatomical constraints encountered during the execution of yoga asanas. This knowledge has immense potential for yoga instructors and practitioners. Instructors can adapt their teaching methods to align themselves with the students' individual anatomical considerations. Practitioners can gain deeper awareness of their own bodies, allowing them to modify poses to suit their unique anatomical structures, ultimately enhancing the safety and effectiveness of their practice.

METHODOLOGY

The methodology employed in the Yoga Anatomy Workshop, organized under the banner of YOGANATOME, aimed to facilitate experiential learning through the exploration of specific yoga asanas, namely the triangle pose (Trikonasana), chair pose (Utkatasana), warrior pose (Virabhadrasana -one), and warrior pose (Virabhadrasana-two).

Participants: A diverse cohort of 80 participants representing various geographical regions, including India, was assembled for the workshop. Among the participants, 50 volunteers actively contributed their insights and experiences through structured worksheets. The participants were divided into two groups, A and B, each comprising an equal number of individuals. This division laid the foundation

Structural Framework: The core of the workshop revolved around the hands-on exploration of Trikonasana and Utkatasana poses, Virabhadrasana, and Virabhadrasana. Group A was tasked with embodying the role of practitioners and engaging physically in the specified asanas under the guidance of experienced instructors. In contrast, Group B transitioned to the role of observant participants, meticulously recording their observations on structured worksheets. This reciprocal arrangement facilitated the experiential architecture that formed the cornerstone of the workshop. By alternating between the roles of the practitioner and observer, participants gained a comprehensive understanding of the interplay between the asanas and anatomy.

Data Collection and Observational Synthesis: The dynamic cyclic participation-observation structure of the workshop facilitated the collection of detailed data. Observers in Group B recorded their observations using structured worksheets, capturing subtleties, such as posture alignment, muscular engagement, and any apparent constraints or inefficiencies in movement. The data collected through these worksheets provided valuable insights into the nuances of asana execution and anatomical influences.

Facilitated learning and constructive inputs: Seasoned instructors with expertise in yoga and anatomy provided guidance and insight throughout the workshop. These facilitators play a pivotal role in offering expert guidance and creating a structured framework for participants to assess their personal practices. Facilitated discussions spanned topics such as posture evaluation, dynamics of muscular contractions, and influence of breath control on asana performance. Instructors further delved into the intricate interactions between different body segments and investigated how yoga postures interact with gravitational forces to yield precise anatomical responses.

In-Depth Analysis of Asanas: The workshop's core lies in the intricate exploration of the Trikonasana and Utkatasana poses, Virabhadrasana, and Virabhadrasana. These poses were selected on the basis of their distinct challenges and engagement with diverse muscle groups. Participants underwent a thorough analysis while performing these poses, addressing anatomical constraints, and exploring the potential for modifications.

Anatomical constraints and rates: The workshop dedicated a segment to delving into the intricate interplay between anatomical limitations and the execution of specific yoga asanas. This segment aims to decode the physiological and biomechanical factors influencing the execution of the Trikonasana, Utkatasana, Virabhadrasana, and Virabhadrasana poses. By revealing the difficulties and prospects inherent in these postures, the workshop sheds light on the complexities of the human body in motion and its interaction with yoga practice.

Ethical Considerations: All participants provided informed consent to participate in the workshop and to use their observations for research purposes. The participants' anonymity and confidentiality were maintained throughout the study.

OBSERVATIONS

The Yoga Anatomy Workshop, focused on the exploration of Trikonasana (triangle pose) and Utkatasana (chair pose), yielded valuable insights into the anatomical constraints and challenges faced by participants during these yoga postures. The results provide a comprehensive understanding of the prevalence of these challenges and offer implications for practical modifications and enhanced anatomical awareness.

Trikonasana (Triangle Pose) Analysis:

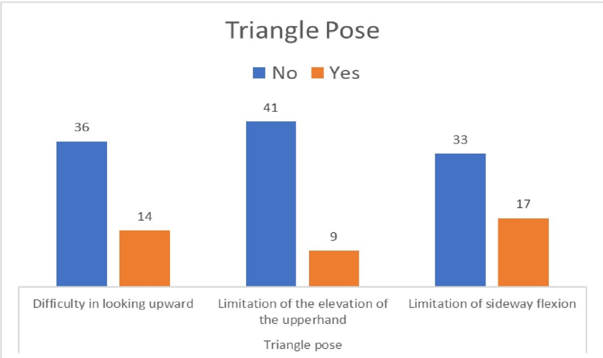
Gazing Upward Challenges: An analysis of Trikonasana revealed that 28% of participants encountered difficulties while attempting to direct their gaze upward. This challenge stems from the stress experienced by the waist during stretching. Stiffness of the sternocleidomastoid muscles (SCM) and other paired muscles linking the sternum, clavicle, and mastoid process have been identified as contributors(6).

The limited range of motion for upward gaze was associated with tightness of the SCM and weakened neck flexor muscles [7].

I. Elevation of the upper-hand constraint:

Approximately 18% of the participants faced difficulties in elevating their movements during Trikonasana. This limitation was attributed to the tightness of the glenohumeral joint, which influences the scapular rhythm and kinematics. Posterior joint capsule constriction and lack of coordination among pivotal muscles such as the serratus anterior and trapezius were identified as potential factors impeding upper extremity elevation [8].

The role of scapulohumeral muscles in proper glenoid positioning and joint function is underscored [9].



II. Lateral flexion impedance. Sideway flexion presented a challenge for 34% of the participants during Trikonasana. Effective engagement of the trunk and hamstring muscles has emerged as a decisive factor for maintaining this posture. Individuals with abbreviated hamstring muscles encounter disruptions in spinopelvic rhythm, curtailing hip mobility, and inducing amplified lumbar spine movement. This movement pattern potentially contributes to persistent lower-back discomfort [10].

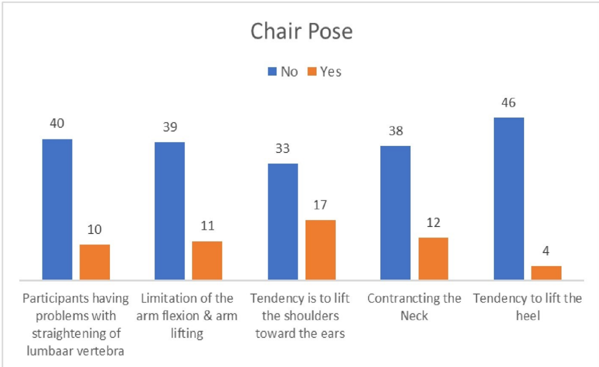
Utkatasana (chair-pose) analysis

I. Lumbar Vertebra Straightening Hurdle:

Approximately 20% of the participants in the chair pose faced challenges while attempting to straighten their lumbar vertebrae. This limitation often results from curvature deviations due to postural alterations, leading to the straightening of the lumbar curvature. The role of the vertebral column in upholding body alignment and posture has been emphasized, and faulty posture can contribute to changes in spinal curvature [11].

II. Constraints on Arm Flexion and Elevation: Approximately 22% of the participants were unable to flex and raise their arms adequately during chair pose. Disparities in the muscles responsible for lowering and lifting the arm have been noted as potential factors contributing to arm movement difficulties (12).

Weakened or impaired function of muscles, such as the serratus anterior, trapezius, and rotator cuff muscles, could disrupt the coordinated pattern of arm elevation.(13). The tightness of the pectoralis minor also disrupts arm elevation in the chair posture.



III. Tendency to Elevate the Shoulder toward the ear: A significant 34% of the participants exhibited a tendency to elevate their shoulders toward their ears during the chair pose. The upper trapezius muscles have been identified as key contributors to this movement [14]. The relationship between physical tension and psychological stress was explored, highlighting the potential of mindful movements and relaxation techniques to alleviate such tension.

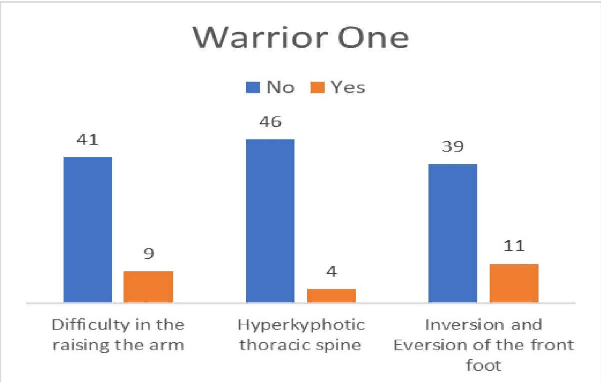
Increased cervical lordosis: Approximately 24% of the participants experienced difficulties associated with increased cervical lordosis during chair pose Abnormalities in one region of the spine correlated with compensatory changes in other regions, indicating the body's attempt to maintain overall balance and function [15].

Heel-elevation propensity: A subset of the participants (8%) demonstrated a tendency to elevate their heels during a chair pose. This inclination was attributed to shortened plantar flexor muscles [16].

Warrior 1 (Virabhadrasana I) Pose Analysis

The analysis of the Warrior 1 pose, also known as Virabhadrasana I, revealed the specific challenges and constraints experienced by participants during this foundational yoga posture.

I. Difficulty in arm elevation: Approximately 18% of participants faced challenges in fully extending their arms to their sides during the Warrior 1 pose. Impingement syndrome, characterized by inflammation or irritation of the shoulder joint tendons or bursae during arm raising, has been noted as a potential factor. This impingement syndrome leads to discomfort and restricted range of motion, particularly during the arm-raising phase of the pose(17).

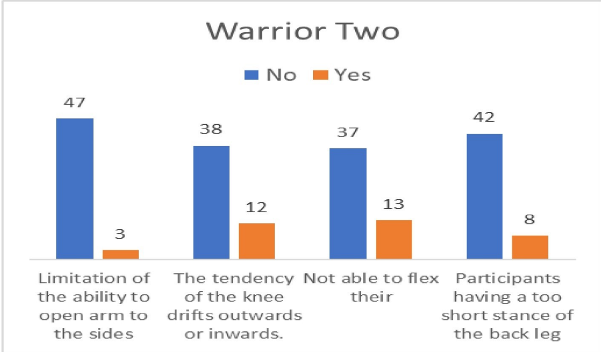


II. Exaggerated Kyphotic Thoracic Spine: Approximately 8% of participants exhibited an exaggerated kyphotic thoracic spine in the Warrior 1 position. This spinal curvature entails excessive rounding of the upper back, potentially limiting mobility, and compromising alignment. Practitioners with an exaggerated kyphotic thoracic spine may struggle to maintain the upright posture required for the pose [18], affecting the balance and engagement of the core muscles.

III. Front-foot inversion and eversion: Approximately 22% of participants displayed inversion and eversion of the front foot during the Warrior 1 pose. These foot deviations were attributed to underlying ankle conditions such as sprains or instability. Inversion signifies inward foot rolling, whereas eversion signifies outward foot rolling. Such deviations in foot alignment influence the pose stability and weight distribution.

Warrior 2 (Virabhadrasana II) Pose Analysis

The Warrior 2 pose, also known as Virabhadrasana II, presents distinct challenges and considerations during its execution, providing insight into the complex interplay between anatomy and practice.



Restricted Arm Opening: An analysis of the Warrior 2 pose highlighted that approximately 6% of the participants faced difficulty in fully extending their arms to their sides. This limitation is associated with contracture deformities resulting from the inflexible joints. Impaired flexibility of the pectoralis minor has been identified as a potential factor restricting the required range of motion for stretching the arms parallel to the ground [19].

Outward or Inward Knee Deviation: Warrior 2 posed challenges for approximately 24% of the participants due to knee alignment issues. Deviation of the knee outward or inward indicated deviations from optimal tibiofemoral alignment. This was linked to factors such as joint restrictions, hip abductor muscle imbalances, and structural variations that affect pose stability and efficacy [20].

Limited Hip Flexion: Approximately 26% of participants encountered challenges associated with hip flexion during the Warrior 2 pose. Limitations in hip flexion were attributed to tense hamstrings, which disrupted overall body alignment and muscle coordination [21]. This constraint affects the pose's visual aesthetics and hampers the engagement of the lower body muscles.

Short Back Leg Stance: Data revealed that 16% of the participants displayed a shorter stance on the back leg in the Warrior 2 position. Stiffness of the adductor muscle group has emerged as a primary contributing factor. This stiffness restricted the ability to maintain an elongated stance, influencing back leg positioning and overall pose alignment.

DISCUSSION

Summary of Key Findings: The Yoga Anatomy Workshop illuminated several key aspects of the relationship between anatomy and yoga practice. Specific attention was focused on the anatomical complexities of certain yoga asanas, such as Trikonasana, Utkatasana, Virabhadrasana I, and Virabhadrasana II. Challenges in alignment, muscular engagement, and joint mobility were observed. The data indicated that anatomy significantly influences the comfort, efficacy, and safety of yoga practice.

Interpretation and Explanation: Our results affirm that a nuanced understanding of anatomy can meaningfully improve yoga practice, echoing previous research on the importance of anatomical education in physical exercises [22].

Challenges in alignment and engagement in postures, such as Warrior 1, were linked to specific anatomical constraints, such as Impingement Syndrome, thereby corroborating earlier studies on the subject [17]. These results support the efficacy of the experiential learning model, demonstrating that informed modifications can help overcome physical challenges.

Comparison with Previous Studies: Literature has widely explored the physical and psychological benefits of yoga [23]; however, our study adds to the smaller body of work that focuses specifically on the anatomical details that contribute to these benefits [24]. Our findings, particularly regarding the misunderstanding of alignment cues and individualized anatomical constraints, align closely with the gaps identified in earlier research but provide a more targeted empirical foundation.

Pedagogical Implications: The anatomical insights from this study can meaningfully inform yoga instruction. According to Yardley et al. (2019) [22], individualized teaching approaches result in better educational outcomes, and our findings support this claim in the context of yoga. Teachers can adapt their cues and adjustments based on a student's specific anatomical challenges, thereby ensuring safer and more effective practice.

Limitations and Future Research: This study has some limitations consistent with the challenges faced by similar research efforts. The sample size was small and may not be representative of a larger population. Additionally, self-reporting and observational methods are inherently biased. In future research, biomechanical measurements could provide more objective data, and machine-learning techniques could offer a more nuanced analysis.

CONCLUSION

This study underscores the necessity of incorporating anatomical knowledge into yoga practice and instruction. These findings have far-reaching implications for both practitioners and instructors, emphasizing the importance of a tailored, anatomically informed yoga approach. This study adds empirical support to the ongoing discussion on the intersection between anatomy and yoga, as articulated in previous research.

Recommendations: In light of these findings, specialized training programs for yoga instructors focusing on anatomy and biomechanics are highly recommended. This initiative aligns with previous calls for improved education in this field. A digital repository can be developed to disseminate these insights more widely.

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Mukta Consul: Review of literature search

Conflicts of Interests: None

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How to cite this article: Ekta Khandelwal, Mrithunjay Rathore, Soumitra Trivedi, Pragna Domadia, Mukta Consul. Asana to Anatomy: Unpacking Yoga's Inner Mechanics through Experiential Learning. Int J Anat Res 2024;12(1):8808-8814. **DOI:** 10.16965/ijar.2023.209