Review Article

Hasta Mudras in Yoga and Natyashastra: A Conceptual Review through the Lens of Embodied Cognition and Psychophysiological Correlates

Bhoomika B R [1], Raveesha Sharma[1], Vanitha Shetty[2], Archana K[3]

From, [1]PG scholar, [2]Head of the department, Department of Naturopathy, [3]Professor and Head of the department, Department of Yoga, Alva's College of Naturopathy and Yogic Sciences

ABSTRACT

Background: Hasta mudras are structured hand gestures used in Yoga and Indian classical dance. In yogic traditions, mudras are described as practices that regulate prāṇa and support mental stability. Bharata Muni's Nāṭyaśāstra presents them as a formal system of gesture used to express meaning and emotion in performance. Both traditions emphasize the close connection between body and mind, yet a unified explanation using contemporary cognitive science remains limited. **Materials and Methods:** This narrative conceptual review examined classical yogic texts, Nāṭyaśāstra literature, and peer-reviewed studies related to embodied cognition, gesture research, psychology, and psychophysiology. Relevant theoretical models and available empirical evidence on gestures and yoga mudras were critically reviewed to explore their potential psychological and physiological effects. **Results:** Both Yoga and Nāṭyaśāstra conceptualize hasta mudras as intentional bodily gestures capable of influencing internal states and communication. Embodied cognition provides a useful framework to understand these effects, suggesting that gestures actively shape thought and emotion through sensorimotor processes. Studies on hand gestures and limited clinical research on yoga mudras indicate possible benefits in attention, emotional regulation, memory, autonomic activity, and respiratory function. However, direct evidence focusing on isolated mudra practices remains scarce, and most studies combine mudras with other yogic techniques. **Conclusion:** Hasta mudras may be understood as embodied tools linking movement, intention, and mental states across yogic and performative traditions.

Key words: Yoga, Gestures, Psychophysiology

Hasta mudras are structured hand gestures used in Yoga and Indian classical dance that serve both expressive and regulatory functions. The literal definition of mudra is the manifestation of inner emotions through body, hand, foot, and or finger postures [1]. In traditional yogic texts, mudras are described as practices that help regulate the flow of prāṇa (vital energy), support mental balance, and enhance awareness during yogic practices such as asana, pranayama, and dhyana. They are bodily postures, especially of the hands, that evoke specific mental states and help channel the effects of yogic practices toward internal regulation [2].

Bharata Muni's Nāṭyaśāstra presents hasta mudras as a formal system of communication used to convey objects, emotions, and narrative meaning in performance [3]. According to the theory of abhinaya, expression involves four components: physical gesture (āṅgika), speech (vācika), costume (āhārya), and emotional expression (sāttvika), with hand gestures playing a central role in conveying stable emotions (sthāyībhāva) and aesthetic experience (rasa) [4]. Thus, both Yoga and Nāṭyaśāstra emphasize that the body, especially the hands, functions as a medium through which inner experience is expressed and regulated [3,4].

Modern scientific evidence, such as embodied cognition suggest that body movements and gestures (mudras) do not merely reflect internal mental states but actively shape cognitive and emotional processes [5]. Gestures directly convert mental images into visible representations, communicating concepts that words may not fully capture [6]. Experimental research shows that hand gestures enhance learning, memory, and problem-solving by grounding abstract thinking in physical action [5,7]. Studies also demonstrate that mudras can influence the speaker's own thinking, not just communication with others. Using gestures during explanation improves conceptual understanding, while observing gestures activate similar sensorimotor networks in the brain, supporting emotional and cognitive simulation [8]. These findings suggest that mudras serve as a bridge between bodily action and mental representation.

Beyond communication, preliminary clinical research indicates that yoga mudras, particularly when combined with breathing and meditation, may influence autonomic nervous system activity, respiratory function, emotional regulation, and cardiovascular parameters. However, most available

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Correspondence to: Dr Bhoomika B R, Department of Yoga, Alva's College of Naturopathy and Yogic Sciences.

Email: drbhoomika.nagaraj@gmail.com

studies examine mudras as part of broader yoga interventions, making it difficult to isolate the specific effects of individual gestures [9–11].

Despite increasing interest, direct empirical evidence on isolated hasta mudra practice remains limited. There is a clear need for systemic investigation into how specific hand gestures influence psychological states and psychophysiological responses. Thus, this conceptual review aims to integrate classical yogic and Nāṭyaśāstra perspectives with contemporary gesture and embodied cognition to better understand hasta mudras as embodied practices capable of influencing mental and physiological states.

MATERIALS AND METHODS

Study Design

This study was conducted as a conceptual narrative review integrating classical Indian texts with contemporary scientific literature to examine hasta mudras from the perspectives of embodied cognition and psychophysiological correlates.

Search strategy

A comprehensive literature search was performed without restriction on publication year. Electronic databases including PubMed, Web of Science, Scopus, Google scholar and Research Gate were searched. In addition, grey literature was explored through institutional repositories and unpublished academic works from universities such as Gangubai Hanagal University, Sangeet Natak Academy, Nalanda Nritya Kala Kendra, and Dr. B.A.M. University. Along with this, searched for the conference proceedings in IOP Publishing and AIP Conference.

The following keywords and combinations were used: mudras, hasta mudras, yoga mudra, psychophysiology, yoga mudra autonomic functions, cognition hand gestures, Natyashastra, attention gesture, natyashastra psychophysiology, gestures psychophysiology, gestures emotions, gesture simulation, gesture learning, mudras psychology. Filters for English language and human studies were applied in PubMed and Web of Science.

Classical yogic texts (including Haṭha Yoga Pradīpikā and Yoga Darśana) and Nāṭyaśāstra from Bharata muni literature were reviewed using authentic translations and traditional commentaries.

Study Selection

The initial search yielded approximately 225 records. After removal of duplicates and screening of titles and abstracts, around 60 articles were assessed for retrieval, and after applying exclusion criteria, 20 articles/reports were removed, which gave the 40 articles or reports as eligible ones. Finally, 26 sources were included in the review, comprising randomized controlled trials (RCTs), observational studies, narrative and conceptual reviews, academic articles, case studies, traditional classical texts, and scholarly books.

Inclusion and Exclusion Criteria

Studies published in English, involving human subjects, and relevant to hasta mudras, yoga mudras, gesture cognition, embodied cognition, or classical Indian treatises were only included. Both empirical research and authoritative traditional sources were considered.

Studies involving animal models, published in languages other than English, focusing on unrelated yoga practices, or consisting of opinion blogs or non-academic material were excluded.

Data Synthesis

Given the conceptual nature of the review and heterogeneity of included sources, findings were synthesized narratively. Classical descriptions of mudras were interpreted alongside contemporary cognitive and psychophysiological research to develop an integrated theoretical framework. The literature search and study selection process were conducted in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines to ensure transparency and reproducibility (Figure 1).

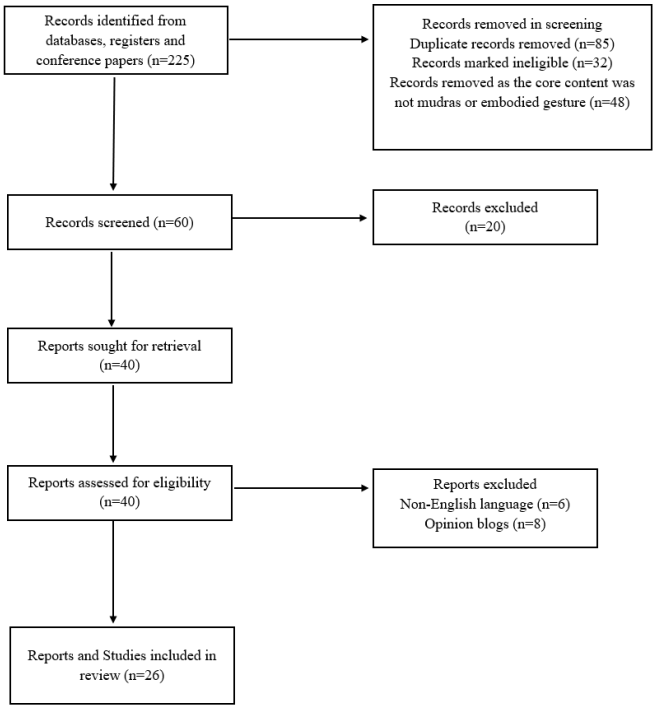

Figure 1: PRISMA flow diagram illustrating the identification, screening, eligibility, and inclusion of studies in the conceptual narrative review.

RESULTS

Conceptual foundations of mudras

Mudras are structured bodily gestures, most performed with the hands, that are traditionally used to influence internal

states and convey meaning [5]. In Hatha Yoga, mudras are described as advanced practices that support the regulation of the body-mind system. Classical texts state that while mastery of asana and pranayama promotes vitality, physical health, and emotional balance, refinement of mudras and bandhas is associated with higher levels of mental stability and well-being. As stated in verse 8 of the 3rd chapter in Hatha Yoga, Mudras are not limited to hand positions alone; they involve coordinated body posture, breath control, and focused attention, highlighting their role as integrated embodied practices [2,12]. Yoga philosophy views the body as an essential medium for awareness rather than an obstacle to it. Through sustained mudra practice, individuals develop increased bodily awareness, improved sensory regulation, and enhanced attentional stability [13]. Within this holistic framework, physical posture, breathing patterns, and mental focus work together to reduce mental distraction and support cognitive clarity.

In classical Indian dance and drama, Bharata Muni's Nāṭyaśāstra presents hasta mudras as a systematic language of expression. Hand gestures are classified into asamyukta (single-hand) and samyukta (double-hand) mudras, each representing specific objects, actions, or emotions. These gestures form the core expressive vocabulary of performance by enabling the communication of emotional states (bhāvas) [3]. According to Nāṭyaśāstra, psychological states exist and are influenced through gesture and expression. Bharata Muni describes multiple psychological states (bhāvas), including joy, sorrow, fear, anger, disgust, surprise, and tranquillity, which are expressed and regulated through bodily gestures, facial expression, and hand movements. These states are categorized into stable emotions (sthāyī bhāvas), transitory emotions (vyabhicāri bhāvas), and involuntary responses (sāttvika bhāvas). Hasta mudras form a core component of physical expression (āṅgika abhinaya), enabling performers to externalize internal emotional experiences and evoke corresponding responses in observers [3].

Modern gesture research supports this traditional view by demonstrating that hand movements actively participate in cognitive processing and emotional representations by integrating motor activity with mental simulation [10]. In comprehensive ethnographic studies, hasta mudras have been documented across yoga and Indian classical dance traditions as gestures that convey meaning, support communication, and are believed to influence physical and emotional states [14]. The concept of 'Hasta Mudra Therapy' has been described in the literature as an emerging alternative therapy in which structured hand gestures are analyzed in relation to physiological systems, including the nervous, muscular, and sensory systems, suggesting potential therapeutic applications beyond expressive art [15]. Thus, across both Yoga and Nāṭyaśāstra traditions, mudras are understood as intentional bodily configurations that influence emotional balance and cognitive processes and share the view that posture, attention, emotion, and cognition are closely interconnected.

A Mind-Body Approach to Hasta Mudras

Evidence from cognitive psychology indicates that hand gestures actively participate in thinking and emotional regulation rather than functioning as passive expressions. Gestures support learning, memory, and conceptual processing by engaging sensorimotor systems that interact with cognitive and affective networks.

Experimental studies demonstrate that producing gestures can enhance problem solving, improve memory retention, and facilitate understanding, suggesting that bodily movement contributes directly to cognitive processing. Within this framework, hasta mudras may be understood as structured, intentional gestures that engage sensorimotor pathways and influence attention, emotion, and physiological regulation. Hostetter and Alibali described gestures as embodied simulations in their Gesture-as-simulated action theory, in which physical movements activate neural representations associated with perception and action, thereby shaping subjective experience [5]. McNeill proposed that hand movements are closely linked with speech and thought, forming an integrated system of communication and cognition [6]. Traditional yoga and Nāṭyaśāstra practices reflect this body–mind integration through the coordinated use of hand gestures, posture, breath awareness, and focused attention. Sustained mudra practice may promote attentional stability and emotional balance by reinforcing bodily awareness and intentional regulation [16].

Taken together, embodied cognition offers a practical framework for interpreting hasta mudras as active regulatory tools rather than symbolic gestures alone. Repeated engagement in mudra practice may influence psychological and psychophysiological states through interconnected motor, sensory, and emotional systems, providing a plausible mechanism for their potential effects on mental clarity and well-being.

Psychological and Psychophysiological Correlates of Gestures

Available evidence suggests that hand gestures can influence cognitive and emotional processes [10]. Although research specifically isolating yoga mudras remains limited, traditional sources propose that mudra practice affects physiological regulation, including increased energy levels and enhanced cerebral circulation [9]. Few clinical studies have examined mudras as standalone interventions. However, emerging evidence indicates potential psychophysiological benefits. In an RCT involving individuals with bronchial asthma, a 12-week intervention combining pranayama with six hasta mudras (including Mugula, Prāṇa, and Apāna Vāyu) resulted in significant improvements in peak expiratory flow rate and

breath-holding time compared with controls [17]. Additional small-scale studies and clinical observations have reported reductions in perceived stress and blood pressure following regular mudra practice. For example, Apāna Vāyu Mudra, traditionally used for anxiety management and cardiovascular regulation, has been associated with a decrease in systolic and diastolic blood pressure when practiced with meditation [18].

Mudra therapy involves sustained or gentle activation of specific muscles and pressure points, which may influence neurophysiological, endocrine, and autonomic pathways [19]. Classical traditions describe mudras as balancing five elemental principles, fire (Agni), air (Vāyu), earth (Pṛthvī), space (Ākāśa), and water (Jala); each represented by a finger [14]. From an embodied cognition perspective, even subtle changes in hand posture can provide sensory feedback that alters emotional and cognitive states. Together, these findings suggest that hasta mudras may produce measurable psychophysiological effects, including changes in respiratory function, cardiovascular parameters, and emotional regulation. These preliminary observations support the need for systematic research examining heart rate variability, autonomic balance, and neural activity to clarify the mechanisms underlying mudra-based interventions.

DISCUSSION

This review integrates classical yogic texts and Nāṭyaśāstra descriptions with contemporary research on gesture and embodied cognition to evaluate hasta mudras as structured mind-body practices. The main conceptual finding is that hasta mudras combine intentional hand configurations with posture, breath awareness, and attention to form an embodied practice that can influence cognitive and emotional states [2, 3, 5]. Gesture research supports the idea that hand movements are not merely symbolic but can actively participate in cognitive processing and emotional regulation [6, 7].

Several empirical and applied studies offer preliminary support for psychophysiological effects associated with mudra practice. Narrative reviews, RCTs, and clinical observations have reported associations between mudra practice and improvements in respiratory function, reductions in perceived stress, and modest decreases in blood pressure when practiced alongside meditation [9,17,20]. Studies of classical dance training also suggest that coordinated gesture, breath, and posture training (for example, in Bharatanatyam) support concentration, emotional expression, and psychosocial well-being [21].

Together, these results provide tentative empirical and applied support for the embodied role of hasta mudras. At the same time, the evidence base remains limited and mixed. Many published reports involve small samples, combined interventions (mudras with pranayama, asana, or meditation), and heterogeneous outcome measures, which prevent confident attribution of effects to isolated mudra practice [9, 17]. For instance, in yoga, Jnana mudra (knowledge gesture) is performed inwardly to improve wisdom consciousness. Whereas, in Nāṭyaśāstra it is a visually identical handshape called hamsa gesture, which represents performing meditation, memorizing, thinking, or writing [22, 23]. Several reports are observational, descriptive, or rooted in traditional claims that lack objective physiological measures, and high-quality RCTs focused specifically on individual mudras are rare. The conceptual literature on gesture and cognition is strong, but direct translational studies linking specific hasta mudras to defined neural or autonomic mechanisms are scarce.

Methodological consideration and future direction

Studying hasta mudras in a scientific setting presents unique challenges, as these gestures are subtle and are usually practiced alongside āsana, prāṇāyāma, or mantra, making it difficult to isolate their individual effects. Most existing studies examine mudras together with breathing or meditation practices, which highlight the need for future research to define and test mudra interventions more clearly.

Carefully designed experiments comparing psychological or physiological outcomes with and without mudra gestures, using neutral hand positions as controls, may help clarify their specific role. Neuroimaging studies could explore brain activity during individual mudras, while simultaneous monitoring of heart rate, skin conductance, and EEG may provide insight into associated autonomic and neural responses [24]. Qualitative approaches can also be valuable in understanding how practitioners experience mudras, allowing subjective reports to be meaningfully linked with objective measures.

From an embodied cognition perspective, experimental tasks could be developed to test simulation hypotheses, for example, whether performing Kartari Mukha (scissor gesture) activates brain regions related to cutting actions, or whether observing dance mudras evokes motor cortex responses like those seen during active performance. Techniques such as transcranial magnetic stimulation and mirror-neuron paradigms may further help clarify these mechanisms. On the physiological side, wearable sensors could track changes in breathing patterns or vagal tone during sustained mudra practice. In addition, integrating modern analytical approaches such as motion capture with machine learning and EEG connectivity analyses may reveal subtle gesture-related effects that are not captured by self-report alone [24].

Progress in this field will depend on close collaboration between Nāṭyaśāstra scholars, cognitive neuroscientists, and movement therapists, combining traditional knowledge with experimental rigor. Since embodied movement therapy already uses dance gestures in clinical contexts, it may also serve as a practical foundation for future research designs. Overall, advancing this area will require integrating humanities-based insight with neuroscience and physiology to

better map how mudras are represented and regulated within the brain–body system.

This review is inherently selective and does not follow a systematic review or meta-analytic methodology. The available literature on hasta mudras is limited and fragmented, with many claims derived from traditional texts or small-scale observational reports rather than large, controlled clinical studies. The review relied on existing translations and secondary interpretations of classical sources, which may introduce interpretive bias. Although some traditional writings describe activation of specific brain regions through mudra practice, these assertions currently lack empirical validation. In addition, embodied cognition represents only one of several theoretical frameworks within cognitive science. Accordingly, the present synthesis should be viewed as preliminary. We acknowledge that, by conventional scientific standards, the evidence linking individual mudras to specific psychological or physiological outcomes remains weak and requires further rigorous investigation.

CONCLUSION

From this review, it can be interpreted that hasta mudras can be considered as embodied practices that integrate hand gestures, posture, breath, and attention, with preliminary evidence suggesting potential psychological and psychophysiological benefits. While traditional frameworks and emerging cognitive science offer plausible mechanisms, current empirical support remains limited. Further well-designed interdisciplinary research is needed to clarify their clinical relevance and underlying neurophysiological processes.

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