



Impact of different Sentiments evoked by Dance on Healthy Volunteer Spectators: A study on selected Sri Lankan Mask Dances

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Abstract: This study investigated the impact of differential sentiments evoked by the mask dances in Sri Lankan Low- Country tradition on spectators' heart rate changes from baseline. Guided by the hypothesis that varying sentiments (or *Rasa*, as described In *Nātyashāstraya of Bharatamuni*) evoke distinct physiological responses, the research addressed the central question: *How do different sentiments arising from Sri Lankan Low Country mask dances influence spectators' heart rates?* This cross-sectional study involved three live mask dance performances *Salu Pāliya*, *Nonchi Kōlama*, and *Kalu Yakā* which incorporates Humor, odious and furious sentiments respectively. Forty-eight healthy volunteers attended to examine the heart rate changes from baseline, and they were recorded using three-channel portable digital ECG monitors, and the data were analyzed quantitatively. Although the selected dances share many stylistic similarities, they differ primarily in mask type, character depiction, and the predominant sentiment conveyed. A reduction in mean heart rate from baseline was noted across all performances. *The odious sentiment produced the greatest decrease* (79.03 ± 16.49 bpm), lowering heart rate by 8.04 bpm, while humor (81.92 ± 18.04 bpm) and furious (83.21 ± 18.06 bpm) elicited smaller reductions of 2.11–3.40 bpm. The most significant variations were found in combinations involving odious sentiment. Overall, the results suggest that sentiments embedded in mask dance traditions exert a measurable influence on spectators' physiological responses. These findings highlight the potential of preserving and promoting such indigenous performing arts to support well-being and contribute to sustainable development through cultural continuity.

Keywords: Audience, Heart rate, Low Country mask dance, Physiological responses, Well-being

Introduction

Dance is a profound form of expression that transcends mere movement. It has been identified as the primary mode of human expression predating written language and other structured art forms. From an anthropological perspective, dance is one of humanity's earliest art forms [1-2].

Dance has for long been recognized as a powerful medium of communication. In prehistoric ages, dance was primarily used as a way of communication both within human communities and to connect with supernatural powers in the ritualistic activities. Lately, it has evolved into a refined art form aimed at self-satisfaction, entertaining royals and aristocrats, as well as appealing to the public other than pleasing supernatural beings. Dance plays a part in human culture by serving as a form of non-verbal communication. Communication occurs in both ritualistic and entertainment contexts, and therefore, it can be defined as serving two major functions: ritualistic ceremonies and entertainment. When dance functions as a ritual the performance aims to please the supernatural being through the ritualistic activities or it directs to connect with the audience or patients who seek protection through the performance. As entertainment,

dance is a performing art whether it is on stage or located in any other places such as homes, courtyards, community gathering places, dance studios or theaters.

In the context of dance as a performing art, the presence of an audience is integral. Performers primarily seek to engage and satisfy those who observe their work during live presentations. Dance is an art that expresses emotions based on human body images and movements [3]. Spectators experience a range of emotions when witnessing a dance performance, and the pleasure derived from it is highly subjective, shaped by individual interests and cultural backgrounds. Dance has the capacity to stimulate the minds of spectators in different ways and at the end they experience pleasure or similar status. Audience members may empathize with the dancers' multisensory engagement and convey multisensory emotional feedback to the dancers through clapping, joining the dance, or booing [4].

The stimulation in the minds of spectators was conceptually explored in Nāṭyaśāstra by Bharatamuni in the second century B.C. in the text named “Nāṭyaśāstra” and in Aristotle’s “Poetics” in the fourth century B.C. Nāṭyaśāstra is one of the most important theoretical analyses of Dance on spectators [5]. Bharatamuni explained it under the concept of *Rasa* (Sentiments), which means the essence or taste of the aesthetic experience/aesthetic flavor /Aesthetic emotion experienced by the audience while watching dancing. *Rasa* (sentiment) simply can be described as the response to art. According to Carter [4], these may be viewed as emotions.

Bharatamuni classifies the “*Rasa*”, sentiments or flavor under eight categories in his Sanskrit text, “Nāṭya Shāstra”. They are Śringara (erotic/amorous), Hāsyā (Comic/humorous), karuṇa (pathetic), Raudra (furious), Vīra (heroic/valorous), Bhayānaka (Terrible/horrific/furious), Bibhatsa (odious/repugnant), Adbhuta (Marvelous/wondrous). According to Nāṭyaśāstra of Bharatamuni the dominant states (Sthāi Bhāvas) of each *Rasa* (sentiment) is known to be as love, mirth, sorrow, anger, energy, terror, disgust and astonishment respectively [5]. This concept was further developed by subsequent scholars, with an additional *Rasa* or sentiments such as *Shānta* (peacefulness or tranquility), *Vāṭsalya* (feelings of paternal love) etc. [6-7]. All these emotional responses occur in the minds of the audience, and there is no concrete evidence to objectively prove such experiences.

Similarly, the effect of performances on the audience has been discussed in western philosophy too. Aristotle's concept of “*Katharsis/Catharsis*”, introduced in his seminal work *Poetics* (Fourth century B.C.), refers to the emotional cleansing or purgation experienced by the audience through art, particularly tragedy drama. This idea is central to Aristotle’s theory of drama and its psychological impact [8]. He argued that through the representation of pity and fear in tragedy, audiences undergo a process of emotional release, leading to a restoration of balance and psychological health. This concept reflects the power of performance to influence spectators' psychological status.

In western philosophy later to Aristotle, a similar status to *Rasa* was described as “sublime” by Longinus, the Greek critic [9]. Although the sublime is often associated with literature, all three concepts *Rasa* (sentiment), purgation, and the sublime refer to states experienced by the spectator, reader, or listener.

As a performing art, dance is deeply connected to its audience, evoking aesthetic experiences in various ways. Apart from this aesthetic experience or pleasure dance is widely recognized for providing psychological and physiological benefits that extend. In a broader perspective, from early ages people believed that dance has the power to neutralize the mind, restore balance, and promote inner peace.

Most of the beliefs of physiological impact of dance often elude scientific proof because they depend on subjective and cultural interpretations of art. And they lack quantifiable parameters for emotions like pity, fear, or aesthetic enjoyment. These philosophical concepts have been conceived in eras that did not prioritize empirical methods. Recently many studies and research have supported this phenomenon, demonstrating its effects within various cultural contexts. Scholars are increasingly exploring the benefits of dance for both performers and spectators. The physiological effects of dance on spectators can manifest in various ways, and advancements in modern technology have enabled more precise measurement of these responses.

Recent studies have highlighted the profound psychological and physical benefits of dance for spectators. Dance movement therapy, health related psychological and physical outcomes, dance as a physical exercise for patients with various illnesses and psychological impacts are some of the common research topics of recent time [10-11]. Dance serves not only the performer’s therapeutic needs but also impacts spectators by stimulating their physical and psychological senses.

Literature from studies done has shown that people react differently to different forms of dance and that it directly affects and give rise to external and internal changes in the human body [12,13,14]. The combination of body movements, gestures, and rhythm in dance can evoke emotions that form an aesthetic experience [12].

Christensen & Calvo-Merino's study explored how observing dance activates neurons and engages the motor system, leading to physiological responses such as increased heart rate and muscle activation in spectators [15]. Processes underlying the aesthetic experience have also been investigated [16-17] and these studies investigated neuroaesthetics of watching dance in different contexts.

Heart rate and heart rate variability (HRV) analysis is emerging as an objective measure of regulated emotional responding. A team of researchers have investigated the influence of specific emotions (Amusement, Anger and Fear) on the pattern of cardiac activities, and found that amusement led to a decreased heart rate [18]. These studies suggests that different dance has potential in changing spectators' physiological conditions.

As dance is always connected with both the performer and the audience, it is important to analyze the factors that may have an impact on stimulation of the audience. Especially, as the Sri Lankan local ritual dances are believed to be based on physiotherapeutic aspects, scientific investigations are much needed. Although dance has been a part of human life in Sri Lanka from ancient times to the present, both in ritualistic and entertaining aspects, no proper investigations have been conducted to examine its scientific impact on spectators. While both the psychological and physiological effects of watching dance have been widely studied globally, such investigations remain largely unexplored within the Sri Lankan context.

At present, Sri Lankan dances are predominantly appreciated for their cultural and entertainment value, while their potential therapeutic applications have received little scientific attention. Given the rich heritage of Sri Lankan dance traditions, it is important to investigate their potential contributions to human health and well-being through rigorous scientific research. Establishing an evidence base for the therapeutic benefits of these culturally significant practices could support the development of accessible, culturally appropriate, and non-pharmacological approaches to health promotion. By exploring the physiological effects of Sri Lankan mask dance, this research may contribute to expanding evidence-based strategies that integrate traditional cultural practices into holistic health promotion and preventive healthcare.

Given this experimental knowledge gap, this study was conducted taking in three mask dances of the Low-Country dance tradition in Sri Lanka to examine the impact of Heart Rate of spectators as a baseline study. Hypothesizing that different kinds of sentiments can elicit varied physiological responses, this study focused on a specific problem: How do different types of sentiments that arise in mask dances from Sri Lanka's Low Country tradition affect the heart rate of spectators in distinct ways? Aligned with this central problem, this study aimed to explore the impact of different sentiments as depicted in the three selected Low Country mask performances on the heart rate of healthy volunteer spectators.

The idea of this preliminary study was to explore the possibility of using different kinds of sentiments through dance performances as a way of stress relief and especially therapy for individuals depending on the results obtained. Since the impact of Sri Lankan dance on human physiology has not been previously studied, this study serves as baseline research to collect primary data on its physiological effects on apparently healthy individuals as the first step.

Sri Lanka is home to three primary dance traditions: Kandyan dance, Low Country dance, and Sabaragamuwa dance [19]. Each of these traditions encompass unique rituals known as *Shānthikarma* or *Yāthu Karma* which is a traditional ritual which incorporates dance and magical activities in repelling evils and invoking blessings for individuals, communities, or specific areas. In these performances, dance serves as a central element of ritualistic performance. These Sinhalese cultural rituals are believed to possess healing powers and have been practiced since prehistoric times.

Beyond its ritualistic practices, dance has also been used as a means of entertainment, as evidenced in the Royal Courts and folk-art traditions. Today, most dance forms are performed on stage with the primary focus on entertainment than for ritualistic aims.

Among the three main dance traditions in Sri Lanka this research was limited to the Low-Country dance tradition, which prevails mainly in the Southern and Southern coastal areas, including *Galle*, *Matara*, and *Hambantota*, as well as the *Raigama region*. One of the most distinctive features of the Low-Country tradition is the use of masks representing various superhuman and mythological characters. These masks portray a wide range of characters, including demons, devils, mythical birds, mythological reptiles and some other animals, and even certain human characters. Additionally, the Low Country dance tradition encompasses a vibrant folk drama form called *Kōlam Nātaka* which is considered as mask dance style. But the *Kōlam* Dance tradition, which is a special folk art tradition prevails in southern coastal area of Sri Lanka and mainly focuses on entertaining the audience. Compared to folk rituals, the masks used in *Kōlam Nātaka*, depict both mythological and human characters. Rituals as well as this form

of folk drama (Kōlam dance) practiced in low country tradition incorporates masked performances heavily for both ritualistic and entertainment purposes.

According to the Pernet [20] "masks are universal. Its origin goes back to the dawn of time. When it comes to the rituals it represents a spirit and the wearer becomes the spirit it represents". Masks are frequently utilized in rituals, and beyond these ceremonies, they serve various purposes in drama and dance as well. As per the Cambridge dictionary a mask is used to cover all or part of the face that protects, hides, or decorates the person wearing it [21]. Mask is a tool that can cover the face, worn as a disguise, or to amuse or frighten others. It's easy to evoke different sentiments with masks than using original facial expressions of the dancer. According to Álvarez [13], dance's artistic value depends on technique mastery, style, and formal choreographic accomplishment. Elements such as stage setting, costumes, props, music, make up etc. further enhance their aesthetic appeal in both ritualistic and performative contexts. Each of these artistic expressions contribute to the theme and significance of dance. Among them masks play an important role in dance as they help reinforce the theme or message of the performance.

Masks are used to evoke a range of emotions such as anger, laughter, wonder, fury, heroism and more in Sri Lankan ritual dances. Depending on the character that the mask represents, dance movements vary and they evoke different sentiments and moods in spectators' minds.

The reasons for choosing mask dance for this study are to check the different impact on heart rate of healthy volunteer spectators include the following:

- Masks limit changes in facial expressions across different data collection conditions, whereas dances without masks allow facial expressions to vary in various circumstances.
- Masks highlight the thematic elements of a performance, shifting focus away from the dancer's natural facial expressions. In contrast, selected non-mask dances showcase the dancers' authentic facial expressions.
- The use of masks during dance performances obscures the dancer's identity, which can affect audiences' emotional reactions. In contrast, dances performed without masks allow the dancer's identity to be visible.

The chosen mask dances for this study are:

1. *Salu Pāliya dance* (A Humorous dance)
2. *Kalu Yakā dance* (A dance signifying fear)
3. *Nonchi kōlama* (A repugnant and humorous dance)

The selected mask dances for this study have similar common features in performance. They are:

- Wearing masks
- Using dialogues
- Using short poems rhythmically
- Interaction between the masked dancer and the drummer with dialogues
- Interaction between the masked dancer and the audience through movements
- Inclusion of dramatic component
- Widely popular in Sri Lankan contemporary stage

Apart from these similarities, selected mask dances possess their own distinct characteristics, and none of them are identical to another. The main difference between each is the predominant sentiment or emotion (As per the Indian concept *Rasa*) that they evoke through the dance. The characters they portray through dance vary from one another.

Kalu Yakā, (Figure 01) which translates to "Black Demon", is a devil dance form attached to *Sanniyakuma* ritual intended to instill fear in the audience. The *Kalu Yakā* represents a powerful and malevolent spirit believed to cause various illnesses, misfortunes, and mental disturbances [22]. In traditional *Shānthikarma* (healing rituals), the *Kalu Yakā* is invoked, confronted, and symbolically exorcised through intricate masked dance performances. The purpose of the ritual is to appease or expel the demon, thereby restoring health and balance to the affected individual.



Figure 01- Kalu Yakā dance.

Kalu Yakā's (Figure 01) mask is typically large, dark-colored, and fearsome, with bulging eyes, sharp teeth, and exaggerated facial features to provoke fear and awe. The dancer wears a black top and cloth and a carry a sword (not a real sword) in his hand. Once he enters the stage, he attempts to evoke fear in the audience by imitating actions of cutting or striking them with his sword without actual contact. Gradually, the audience grows accustomed to the devil character as it engages in comedic behavior and delivers specific lines that serve to alleviate initial apprehension, thereby facilitating the intended psychotherapeutic effect.

Salu Pāliya (*Salu* meaning cloth or *shalwar* and *Pāliya* meaning the performance) is a well-known comedy character (Figure 02) in Sri Lanka's Low-Country ritual dance traditions. This is associated with the *Sanniyakuma* ritual. It is a mask dance performed with dialogues recited by the dancer and accompanied by a drummer. This dance typically aims to entertain and amuse spectators during traditional rituals. The mask of *Salu Pāliya* (Figure 02) is characterized by an expansive, toothy smile, pronounced features, and a markedly cheerful expression. This dance, performed in devotion to Goddess *Pattini*, symbolizes the rhythmic movement of her shawl [22]. The design is intentionally silly and light-hearted to make the audience laugh. He wears white shawl around his shoulders and a dress made from synthetic material as a skirt.



Figure 02- Salu Pāliya.

Nonchi kōlama (Figure 03) is a traditional mask dance known for its ability to both entertain and evoke a sense of odious/disgust in the audience through the performers' dialogues and movements. This dance is attached to the Kōlam *Nātaka tradition*, one of the Sri Lankan famous folk-dance traditions. Normally *kōlam* dance is focused merely on entertaining the audience. *Nonchi kōlama* portrays elderly, toothless woman with exaggerated features like sunken cheeks and dim eyesight and saggy breasts. The top is arranged to reveal a cloth piece or ornament that is designed to resemble a sagging breast. The loose jacket through which one can see her saggy breasts arouses a disgusting feeling. The character is typically depicted as the wife of the royal messenger (*Anabera Kārayā*) and is known for her comical behavior and witty dialogue. Her character serves to entertain the audience through humor as well as a repugnant feeling. The *Nonchi* character is one of the most popular mask dances, known for evoking the sentiment of odious or repugnant/ disgust (*Bībhatsa rasa*) throughout the performance through the dancer's external expressions and gestures. This portrays actions such as coughing, having a runny nose, urinating, and breastfeeding children publicly. No other performance in the Low-Country tradition predominantly portrays this sentiment to such an extent.



Figure 03- Nonchi kōlama.

All three dances evoke sentiments (*Rasa*) of humor, fury, and odious/repugnant respectively, with humor being a common element across all. Even in the *Kalu Yakā* dance, the performance concludes with humorous acts intended to dispel the fear associated with the devil character. In Sri Lankan ritual practices, there is often an effort to reduce the fear of demonic by making these characters more familiar and less threatening to the afflicted person. Accordingly, the *Kalu Yakā* character bridges the emotional distance with the patient through humorous dialogues and interaction at the end. He offers prayers to the patient or the audience through the recitation of poems and dialogues.

In traditional Sri Lankan folk rituals, women are not permitted to perform. Consequently, the female character in Nonchi Kōlama is portrayed by a male dancer to preserve the integrity of the original form.

Table 01: Key Characteristics of the Selected Dance Forms

Characteristics	<i>Kalu Yakā</i>	<i>Salupaliya</i>	<i>Nonchi kōlama</i>
Use of a mask	Yes	Yes	Yes
Drumming	Yes	Yes	Yes
Singing	Yes (Moderate)	Yes (Moderate)	Yes (Moderate)
Dialogues	Yes	Yes	Yes
Masculine character	Yes	Yes	No
Feminine character	No	No	Yes
Character representation	Mythological character	Mythological character	Human Character

Table 02: Predominant Rasa or sentiments/emotions of the Selected Dance Forms

Sentiment	<i>Kalu Yakā</i>	<i>Salupaliya</i>	<i>Nonchi kōlama</i>
Humor (Hāsya rasa)	Yes (less)	Yes (Highly)	Yes (moderate)
Fear (<i>Bhayānaka</i>)	Yes	No	No
Odious (<i>Bībhatsa rasa</i>)	No	No	Yes (Highly)

The selected mask dances were drawn from the Low Country dance tradition, chosen for their ability to evoke profound emotional responses through performance. They were chosen regardless of their original performance context and objective. However, the original objectives of performing these dances have been diminishing in recent times as most rituals now aim to entertain the audience rather than to heal individuals suffering from mental or physical ailments. The selected mask dances are widely popular dances among Sri Lankan contemporary stage aiming to entertain the audience despite their ritualistic aims.

Due to the lack of scientific evidence supporting the healing effects of ritualistic dances, many of dance practices have gradually evolved into forms of entertainment rather than being recognized for their therapeutic potential. Sri Lankan ritual dances are traditionally believed to possess the ability to promote healing of both mental and physical illnesses; however, these claims have not yet been thoroughly investigated through scientific research. Beyond the ritualistic aspects, the dance movements themselves may also offer therapeutic benefits. In Sri Lanka, research examining these potential effects remains limited, and public understanding continues to rely largely on folkloric beliefs that have not been validated by scientific evidence. Therefore, this study primarily aims to draw attention to the potential influence of dance on human physiology and to encourage further scientific investigation into its possible applications in therapeutic and healing interventions.

This research provides an opportunity to systematically investigate diverse forms of dance as therapeutic interventions, extending their relevance beyond traditional ritualistic functions. Additionally, it aims to contribute to the preservation and advancement of Sri Lankan cultural heritage within a scientific framework, particularly considering the challenges posed to cultural continuity by rapid technological progress. The findings will facilitate the promotion of indigenous performing arts, support well-being and contributing to sustainable development by ensuring cultural continuity.

Materials and Methods

Population, sample and sampling method

Healthy volunteer participants were chosen as the audience and recruited in 2023 from among the academic and non-academic staff members of the University of Sri Jayewardenepura, Sri Lanka. The sample comprised forty-eight male and female subjects aged between twenty and sixty years. Recruitment was voluntary and non-coercive, conducted through a local advertisement. Eligibility was determined based on medical history and specific inclusion and exclusion criteria. Informed consent was obtained prior to participation through an information sheet and a signed consent form provided before the session.

Volunteers who did not give history of any chronic diseases and who are not on any medications were included in the sample. Those who have history of converting to a trance like state, persons who have done dancing as a subject in schools/university or ones who are actively involved in dancing were excluded. Furthermore, volunteers whose baseline ECG showed abnormal changes in rhythm or rate, patients on medication which can affect heart rate and person with known thyroid disorders were also excluded.

Method of data collection

The experiment included three distinct mask dance performances, each exhibiting unique characteristics and sentiments. Participants were invited to observe the above-mentioned dance forms *Salu Pāliya*, *KaluYakā* and *Nonchi kōlama* dance. They were performed specially for this research and conducted in the setting of a live dance performance. The participants gave their consent and watched the performances for about twenty-one to twenty-four minutes, with each performance lasting seven to eight minutes.

A secure area was designated for the attachment and removal of ECG leads to the spectators, which was carried out by a trained nurse from the University Medical Centre. During the performances, volunteer spectators wore portable, three-channel digital ECG monitors that enabled continuous heart rate recording throughout the observation period. They were given sufficient time (ten to fifteen minutes) to become familiar with the ECG leads attached to their bodies. This normalization period allowed them to acclimatize to the presence of the machines enabling them to fully engage and appreciate the performance. All dance sessions were video-recorded, and any major changes observed, if any, in the ECG were later cross-referenced with the corresponding segments of the dance performances.

Three spectators were tested in each performance session, with two sessions conducted per day. To maintain consistent environmental conditions, all sessions were held before 12 noon. Data collection for all 48 participants was completed over a period of eight days. Professional dancers and drummers were chosen for the study, with each dancer participating in no more than two sessions daily.

Statistical analysis was performed using SPSS for Windows statistical package. Both descriptive and quantitative approaches were used to summarize study characteristics and outcomes. To analyze data one way ANOVA was used and dependent variables among different groups and within groups was examined.

Ethical considerations

The study followed the Declaration of Helsinki guidelines and received ethical approval (ERC reference number 17/19) from the Research Ethics Committee of the Faculty of Medical Sciences of University of Sri Jayewardenepura, Sri Lanka. The participants provided their informed written consent to participate in this study.

Results and discussion

General characteristics of the study population

The study population consisted of forty-eight volunteers which included thirty-two females and sixteen males. The mean age of the study participants was 36.02 (± 9.16 SD) years with an age range of twenty-three to fifty-six years (Table 3)

Table 3: Age distribution of the study participants

	Number	Percentage (%)	Mean Age ($\pm$ SD)	Age range (Years)
Male	16	33	35.53 (9.00)	24 - 54
Female	32	67	36.60 (9.47)	23 - 56
Total	48	100	36.24 (9.23)	23 - 56

Changes in heart rate during the mask dance performances

According to the measurements that were taken by ECG monitors mean baseline heart rate was 85.28 (± 11.55 SD) beats per minute. The results indicated a reduction in mean heart rate from the baseline heart rate in all forms of mask dancing in the study. The mean decrease from baseline heart rate is given in Table 4.

Table 4: Mean Reduction in Heart Rate Across Different Dance Forms

Dancing form	Mean heart rate after watching the performances (beats per minute/bpm)	Reduction of heart rate from mean baseline after watching performances (beats per minute/bpm)
<i>Salupāliya</i>	81.92 (18.04)	3.40
<i>Kalu Yakā</i>	83.21 (18.06)	2.11
<i>Nonchi kōlama</i>	79.03 (16.49)	8.04

*Mean basal heart rate = 85.28 (± 11.55 SD) beats per minute.

According to the results obtained from healthy volunteers, a reduction in mean heart rate was observed across all dances after each dance type. Among the selected mask dances, *Nonchi kōlama* (79.03 ± 16.49 bpm) elicited the greatest decrease in heart rate, with reductions of 8.04 bpm. In contrast, *Salu pāliya* (81.92 ± 18.04 bpm), *Kalu Yakā* (83.21 ± 18.06 bpm), were associated with comparatively smaller reductions, ranging from 2.11 to 3.40 bpm.

Table 5: Comparison of mean heart rates and mean difference from baseline in heart rates when watching the three types of dance forms

Comparison	Dance types compared	Mean difference from baseline (BPM)	±SD (BPM)	Significance (p-value) *
Mean heart rates	Salu - Kalu	-1.216	4.022	0.042
	Salu - Nonchi	3.246	4.545	0.001
	Nonchi - Kalu	-4.462	5.674	0.001
Mean differences from baseline	Salu - Kalu	-1.232	4.027	0.039
	Salu - Nonchi	3.271	4.542	0.001
	Nonchi - Kalu	4.502	5.679	0.001

Salu = Salupaliya dance form; Kalu = *Kalu Yakā* dance form; Nonchi = *Nonchi kōlama* dance form;

* Paired sample t-test; Significant at $p < 0.05$

The comparison of mean heart rates and mean differences from baseline among the three dance types *Salu Pāliya*, *Kalu Yakā*, and *Nonchi kōlama* reveals statistically significant variations. When comparing *Salu Pāliya* and *Kalu Yakā*, the mean heart rate difference was -1.216 ± 4.022 BPM ($p = 0.042$), indicating a slightly lower heart rate during *Kalu Yakā*. Between *Salu Pāliya* and *Nonchi kōlama*, the mean difference was 3.246 ± 4.545 BPM ($p = 0.001^*$), showing a significantly greater heart rate decrease during *Nonchi kōlama*. The comparison between *Nonchi kōlama* and *Kalu Yakā* showed the largest difference (-4.462 ± 5.674 BPM, $p = 0.001^*$), confirming that *Nonchi kōlama* induced the greatest heart rate reduction among the three performances.

Similarly, the mean differences from baseline followed the same trend. *Nonchi kōlama* again showed the highest mean decrease (4.502 ± 5.679 BPM, $p = 0.001^*$), followed by *Salu Pāliya*, while *Kalu Yakā* showed the least change (-1.232 ± 4.027 BPM, $p = 0.039^*$).

Discussion

All audience members reported enjoying the performance, although their feedback differed based on their personal interests. Since the volunteers are not currently involved in aesthetic pursuits due to their professional commitments, they especially valued the performances and acknowledged their significant cultural importance.

The selected mask dances in this study were *Salu Pāliya*, *Nonchi*, and *Kalu Yakā*, which predominantly represent the sentiments of humor (*Hāsya rasa*), odiousness (*Bībhatsa rasa*), and fear (*Bhayānaka rasa*), respectively, while also temporarily expressing other sentiments. Each sentiment has the potential to evoke an aesthetic experience in spectators, ultimately leading to a sense of pleasure or fulfillment.

According to the results obtained from the heart rate data of healthy volunteers, a reduction in the mean heart rate was observed across all three mask dance performances (Table 4). These findings suggest that the performances influenced the physiological responses of the audience. Regardless of their predominant *rasa* or other distinguishing characteristics, all three dance forms were associated with a decrease in spectators' heart rates. According to the mean decrease from the baseline heart rate, *Nonchi kōlama* showed the greatest reduction, while *Kalu Yakā* recorded the least. *Nonchi kōlama* evokes a combination of disgust and humor throughout the performance through its striking appearance and expressive movements. *Salu Pāliya*, on the other hand, predominantly evokes humor throughout the performance and resulted in a heart rate reduction which is considerably higher than the decrease observed during the *Kalu Yakā* dance. Previous research indicates that heart rate tends to be significantly lower during amused conditions compared to angry, fearful, or neutral states [23], a trend that is also reflected in our findings. However, in the present study, *Nonchi kōlama*, which incorporates both disgust and humor, produced the greatest reduction in heart rate, while performances associated solely with humor was ranked second.

Kalu Yakā, a devil character, begins with fear-inducing scenes but which ends on a neutral note recorded the smallest decrease in heart rate. Although fear (*Bhayānaka Rasa*) is regarded as one of the aesthetic sentiments in Bharata Muni's theory, transforming fear into an artistic and pleasurable experience was less effective in reducing the audience's heart rate. This low-country dance tradition, often referred to as "Devil Dance," places strong emphasis on the representation of demon-like characters within ritualistic performances. Although these dances were originally embedded in healing and magical practices, many have now been adapted to the contemporary stage, where their entertainment value is often prioritized over their ritual significance. The *Kalu Yakā* dance showcases diverse emotional tones throughout its performance. As highlighted earlier, Sri Lankan ritual dances were developed with psychotherapeutic intentions, aiming to familiarize the community with demon and thereby reduce fear associated with them. Traditionally, these rituals were performed by Sinhalese communities to seek protection from malevolent spirits. It is believed that the devils themselves appear during the rituals to bless the afflicted individuals, known as *Athurayā* (the patients).

This narrative structure continues in modern staged performances. Initially, feelings of fear and fury are evoked through dramatic gestures such as the demon character mimicking cutting or striking actions with a sword eliciting intense emotional responses from the audience. In this research, we observed noticeable behavioral reactions in some spectators during such moments, indicating heightened arousal. However, as the performance progresses, the demon character gradually adopts a more empathetic demeanor, engaging the audience in playful dialogue. This transition reassures viewers that the character ultimately aims to heal and remove the misfortunes he is believed to have caused.

Despite its terrifying nature and the furious emotion, it provokes, the *Kalu Yakā* dance also demonstrated a notable capacity to reduce the audience's heart rate. Previous research has shown that negative emotions typically increase heart rate, whereas positive emotions have a more variable effect [23]. In our study, the *Kalu Yakā* performance initially elicited negative emotions but concluded with positive elements, resulting in an overall decrease in heart rate from baseline. The pronounced negative emotions at the beginning may explain why the *Kalu Yakā* dance showed the least reduction in heart rate compared to other performances.

Compared to the other two characters, *Kalu Yakā* showed the least decrease in heart rate due to the intense and furious acts displayed beginning of the performance. Nevertheless, these findings suggest that even ritual performances portraying devil characters can promote physiological relaxation, ultimately contributing to a calmer state of mind.

Even though all dance forms led to a reduction in spectators' heart rates, the comparison among the three mask dances revealed statistically significant variations (Table 5), suggesting that their distinct characteristics influence the audience's physiological responses in different ways. The selected dances vary in the predominant sentiment or *Rasa* they evoke *Odious*, *Humor*, and *Terror*, respectively ranging from the greatest to the least reduction in heart rate. However, all three share similar features, such as the use of dialogues, masks, short poems, and audience interaction other than the predominant *Rasa* or sentiment.

Since this comparison showed statistical significance (Table 5), it can be assumed that the predominant sentiment or *Rasa* evoked by each dance contributes to the differentiation observed among the forms. The most significant variations were found in combinations involving *Nonchi kōlama*. The mean heart rate and mean difference from baseline were similar between *Salu Paliya* and *Nonchi kōlama*, as well as between *Kalu Yakā* and *Nonchi kōlama*. These results suggest that *Nonchi kōlama* had the strongest impact on reducing the audience's heart rate compared to the other two mask dances.

The study by Wu and colleagues reported no significant difference in heart rate between anger (or fear) and the neutral emotional category [18]. However, within the Eastern aesthetic framework proposed by Bharata Muni, the notion of a "neutral" emotion does not exist; instead, this state is more closely aligned with *Śānta Rasa* the sentiment of tranquility which was later further articulated by Abhinavagupta in his commentary *Abhinavabhāratī* [6]. In contrast to Wu et al.'s findings, our study demonstrated that all three sentiments elicited a significant reduction in heart rate, suggesting that different emotional expressions in dance uniquely influence the spectators' physiological responses during the aesthetic experience.

Nonchi kōlama is associated with the *Kōlam Nātaka* tradition of the Low Country in Sri Lanka, while the other two dance forms are ritual performances connected to devil rituals (*Yak Thovil*). *Kōlam Nātaka* is a form of folk theatre primarily intended to entertain spectators rather than produce any magical or ritualistic effect. However, both ritual performances end with brief acts depicting prayers for good fortune, reflecting a more magical and spiritual tone compared to *Nonchi kōlam*, which primarily evokes odious/repugnance and humor.

These results suggest that *Nonchi kōlama*, which primarily focuses on entertaining the audience, has a greater influence on altering heart rate than the other two mask dances that originated from ritual performances.

Since this study was conducted as a baseline investigation with limited scientific evidence on audience physiological responses to dance, these findings should be further explored using a wider range of dance forms to allow for more generalized conclusions. As demonstrated in this study, dance has the potential to induce physiological changes in spectators, and different sentiments (*rasas*) vary in their capacity to evoke physiological responses. These findings suggest that this experimental approach can be applied in a variety of contexts, including contemporary stage performances that primarily emphasize entertainment, ritualistic performances which focused the healing practices, and therapeutic practices. The findings of this study can serve as baseline evidence supporting the use of dance as a means of promoting human physical and mental well-being.

Conclusion

This study was conducted to investigate the varying impact of mask dances in the Sri Lankan Low Country tradition on heart rate on healthy volunteer spectators. The findings emphasize that regardless of dance forms heart rate varied with a noticeable decrease being observed. Although each dance evokes different sentiments or *Rasas* and possesses unique features, every performance demonstrated the ability to reduce spectators' heart rates.

Among the selected mask dances, with most features being similar; the primary differences lay in the character represented by each mask and the predominant sentiment it conveyed throughout the performance. These variations in mask type, character, and evoked sentiment appear to account for the differing impacts on participants' heart rates. These results suggest that *Nonchi kōlama* had the strongest calming physiological effect with respect to heart rate on spectators, while *Kalu Yakā*, despite its intense and fear-evoking character, still contributed to a measurable relaxation response.

The results indicate that dances eliciting humor or odious tend to lower heart rate more effectively. Overall, the findings suggest that *Rasas* (sentiments) have a measurable influence on audiences' physiological responses, providing empirical support for Bharata Muni's theory of *Rasa*.

Given the close association between Sri Lankan cultural dances and the tourism sector, these insights can be strategically applied to advance the industry while highlighting their effects on human well-being. The promotion of cultural tourism centered on Sri Lankan indigenous dance has the potential to make a substantial contribution to the national economy while supporting the preservation, sustainability, and transmission of these indigenous dance traditions to future generations. Amid rapid technological advancements and the growing popularity of contemporary dance forms, traditional dances are becoming increasingly distant from audiences. By promoting the scientific significance of these indigenous cultural practices, they can be preserved both as a form of entertainment and as therapeutic practices within the community. The results will help advance indigenous performing arts, foster well-being, and aid sustainable development by preserving cultural traditions for future generations.

This study serves as a baseline investigation and provides a foundation for future research aimed at establishing the scientific value of dance in both entertainment and ritualistic contexts. The findings demonstrate that dance has the potential to influence human physiological responses, particularly in relation to specific emotional states. Future studies should expand on these findings by examining a broader range of physiological parameters and employing more comprehensive experimental designs to further validate the therapeutic and scientific significance of dance. This research provides a foundation for demonstrating how Sri Lankan dance can be utilized to enhance human well-being rather than serving solely as a source of entertainment. Based on these findings, future research can further explore the role of Sri Lankan dance in promoting physical, mental, and social well-being. This study also supports the view that dance is not merely an art form but a valuable tool for improving human well-being and contributing to national development.

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