Sinhala Traditional Music for Stress Relief: An Interaction Design Intervention

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SINHALA TRADITIONAL MUSIC OF SRI LANKA FOR STRESS RELIEF: AN INTERACTION DESIGN INTERVENTION

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Abstract
Stress is one of the utmost heard words in today's world. Developing unnecessary stress over a prolonged time could become chronic. With this fast pace, the time has become a decisive factor in each one's life. Thus, people spare less time engaging in relaxation activities. They seek out for alternative ways such as using mobile apps which adopt different modes of relaxation.

When focusing into the local context, Sinhala traditional music of Sri Lanka was one of the most used modes of relaxation for the people in the past. Now it is rarely practiced. In the pilot study revealed that Sri Lankan traditional modes of relaxation are not present among the developed mobile apps and HCI based interactions for stress relief.

Therefore, this study was aimed to fill the gap between existing HCI (Human-Computer Interaction) based stress relief modes and the application of Sri Lankan Traditional Knowledge which is fast fading. Investigating the possibilities of adapting Sinhala Traditional Music of Sri Lanka into HCI application was the primary aim of this study.

Objectives of the research were acquired by following a mixed method approach. To select the subjects for the study convenience sampling method was used. In phase one of the experimental studies, it revealed that relaxation response towards Sinhala traditional music was high compared to other proven relaxation music modes. The possibilities of using emotional Inputs that could be fed into an Interactive system design was observed in the in-depth experimental study. This attempt, forecasted potential areas to be researched further. Also, further study should be done to validate whether these findings can be generalized which was not concerned in this study. Moreover, this study could be extended to develop an affective and emotional interaction design that could facilitate young adults of Sri Lanka.

Keywords: Sinhala Traditional Music of Sri Lanka, Stress Relief, Human Computer Interaction, Mobile Health Apps

1. Introduction

This paper speaks of a study which focused on understanding how a Sri Lankan young adult would expect to relief their daily stress using HCI. This study investigated the possibilities of adapting Sinhala Traditional Music of Sri Lanka into an HCI design.

1.1. BACKGROUND AND CONTEXT
Music itself is a mode of relaxation, At the root of all these reasons lies the fact that music links with our innermost emotional, spiritual and private selves. Music helps us to feel more Human." (Bunt, 1994) When converging this idea into the local context, it is understood that Sinhala traditional music of Sri Lanka has been one of the most used modes of relaxation of the people who lived in the past. Yet, it is barely heard today. (Beddage, 2005).

A few decades away the life of a Sri Lankan was born to the tune of Sinhala traditional music. While resting on mother's womb they started to get engaged in this profound system by hearing *Angulimala Piritha* even before they see the light of the world. Once born, the tune of their mothers enlightened them with *Nelavili Gee*(Sinhala lullabies), when these children started to play, their entertainment was enriched with Kavi associated with *Eluwan keama, Olinda Keliya* (Folk games) and so on...As they become adults, while they work, they sang *Goyam Kavi*(Harvesting songs), *Pel Kavi*(Watch-hut Songs)

, *Kamath Kavi* (Harvesting Song) to make them feel relaxed amidst their physical tiredness. *Pirith* chanting and *Gatha* chanting was a part of their daily routine. When they feel diseased, they seek the help of *Bali, Thovil*, and *Shanthikarma* (Types of folk rituals of Sri Lanka) as a mode of cure. Once they exhale their last breath people around kept in mind to chant *Pirith* (Buddhist chantings). *Welapum Kavi* (Lamentations) was sung next, to ease the pain of the loss of the loved one at the funerals back then.

Throughout their lives, people have had a profound relationship with music irrespective of the literacy they have had (Beddage, 2005) When conversed with people two or more generations back, they say they scarcely experienced and heard the word stress or in Sinhala if we say *Aathathiya* (Stress).

When taking a look at the age we pass, the word "stress" is one of the utmost heard words in someone's life. As university students, we fall into the category of young adults. It is a period of transition in our lives. Irrespective of the gender, (Kuruppuarachchi, Kuruppuarachchi, Wijerathne, & Williams, 2001) starting to live by ourselves away from home, academic workload, examinations, problems with interpersonal relationships are some of the stressors we meet at this stage.

Stress might be a necessary factor to some extent to keep ourselves motivated, and in an alert. Yet unnecessary stress over a prolonged time could become chronic — unless we take action. (American Psychological Association, 2018) Researches have revealed that chronic stress may cause negative thoughts, lead to diseases like depression and al-so higher cardiovascular risk.

Apart from this fact, it is identified that there's a rise in the stress levels of young adults. These young adults are found to be the most stressed-out generation. (Sifferlin, 2013) If this active work-force gets exposed to chronic stress disorders, their performance could be less. (American Psychological Association, 2018) Thus, it is evident that young adults should keep an eye on their physical and mental wellbeing.

To cope up with stress people used different modes since past. Amongst Meditation, Aroma Therapy, Massaging, Listening to Music, reading books are some of the practices people have embraced. People had time to get engaged and to experience the effects of these techniques in the times back then.

However, now the world is in a rat race, and time has become a decisive factor in each one's life. Thus, people spare less time engaging in these leisurely activities to calm and to make themselves de-stressed. They seek out for alternative ways to make them feel relaxed. When these alternative methods are considered, Mobile applications play a significant role.

When looked at in a bird's eye view, it is seen that most of the youngsters of the world tend to get hooked on their mobile phones. (Brody, 2017) This cause will also in return increase their level of stress unconsciously.

Even though the negative impacts of this interaction exist, it is seen that Mobile applications are used to reduce stress. When observed these apps adapt different conventional modes of relaxation. These apps are comprised of lessons, tutorials, and informative/virtual instructions. (Ewais & Alluhaidan, 2015)

In order to understand whether there's a presence of Sinhala traditional Music in the space of mobile applications for stress relief, a content analysis was conducted as a pilot study which focused on identifying the existing modes of application of HCI in stress reduction and their characteristics, their features and their objectives. With the findings of the pilot study, it was understood that amidst developed mobile applications the use of Sinhala traditional music of Sri Lanka unseen.

1.2. AIMS AND OBJECTIVES OF THE STUDY
Standing on the above stated background and the context, this study investigated the possibilities of adapting Sinhala Traditional Music of Sri Lanka into an HCI design. In order to achieve the above stated aim, following core objectives were achieved in the study,

- Identifying what is Sinhala Traditional Music of Sri Lanka and its effect on stress reduction in comparison with other therapeutic modes of music used in Stress Reduction.
- Investigation of the possibility of adapting Sinhala Traditional Music of Sri Lanka into an Interaction design for stress reduction among young adults.

1.3. THE SIGNIFICANCE OF THE STUDY
The results of the study forecasted the potential ways of adapting Traditional knowledge of Sri Lankan music used in stress reduction to benefit the young adults of the modern day through their most engaged interaction; mobile and smart devices. At the same time, the study may pave the way to restore the fast disappearing traditional knowledge entwined with the Sri Lankan culture as it is fused with modern technology.

1.4. HYPOTHESIS

Sinhala traditional music for stress relief can be adapted into an interaction design for stress reduction in the similar manner of other music already adapted into musical interaction for stress reduction.

1.5. SCOPE AND LIMITATIONS OF STUDY

This study was focused on Jana Kavi with particular reference to Nelavili Gee (Sri Lankan traditional lullaby's), due to time constraints and as well as its melodic structure which could be readily understood by an individual irrespective of their musical knowledge.

Furthermore, technological barriers were met when using Sinhala traditional music on a digital device. Additionally, in the phase of the experimental studies, the study was conducted within less technically advanced space and devices thus a considerable error rate should be expected in the findings.

2. Methodology

In order to implement, this study was conducted as exploratory research. Where it involves both quantitative and qualitative approaches.

The population of this research is Young adults of Sri Lanka. Auditory impaired or incapacitated participants were disregarded in this study.

Following denotes the phases of the study in achieving the main objectives of the study.

2.1. UNDERSTANDING THE SAMPLE CONSIDERING THEIR LEVEL OF STRESS, EXISTING MODES OF RE-LAXATION, THEIR MUSICAL PREFERENCES AND ENGAGEMENT WITH MODERN TECHNOLOGY AS A MODE OF RELAXATION.

2.1.1. Sample
By convenience sampling method, the sample (n=52) was selected from Level I students of the Department of Integrated Design, Faculty of Architecture, University of Moratuwa. Age: between 18 – 25 years.

Due to several reasons only (n=48) questionnaires could be collected and took forward for the process of analysis. Aamongst (n=47) questionnaires were accepted and one questionnaire was disregarded under the parameter incomplete.

2.1.2. Data Collection Method
In order to have an overview of the level of stress, Perceived Stress Scale (PSS) Scale along with a questionnaire prepared by the author was used as data collection instruments. (State of New Hampshire Employee Assistance Program, 2014)

2.2. UNDERSTANDING THE SAMPLES REACTION TO DIFFERENT TYPES OF MUSIC USED FOR RELAXATION BY CONDUCTING EXPERIMENTAL STUDY 01.
One day after the questionnaire was distributed, the sample was called for the Experimental study I. Which was conducted in a controlled environment as explained below.

2.2.1. Environmental factors

The context selected was a closed room where the temperature was maintained at 230C. While listening to music the room was maintained dark by switching off lights, to reduce the visual stimuli while listening to music. The walls of the room were padded and painted black. Thus, echo was minimized.

Figure 56 Environment of the Experiment 01

25 subjects (N=25) among the sample participated in the experimental study 01.

2.2.2. Music pieces used for the experimental study

Following music pieces were used to conduct the experimental study. The sequence of the arrangement of the tracks was based on context which it has been derived i.e., starting from the global context, then to regional context, and then to the local context.

Table 27 Music pieces used to conduct the experimental study

Weightless by Marconi Union ;	Weightless is considered as the most relaxing song (Passman, 2016)
Raag. *Puriya Dhaneshri* by Pt. Pannalal Gosh played with Bansuri	It is a Sandhi Prakash raga which says to bring the best results when played in the evening. This raga is considered to be one of the most relaxing North Indian Hindustani Ragas
Playing the notes C D E F G By the author using a keyboard	C D E F G notes are the notes used in *Awadarana Sanyuthi* in Sinhala Nada system. These are the most prominent notes used in generating *Karuna* and *Sringara* rasa. (Beddage, 2005)
Nelavili gee instrumental –	Sinhala lullaby
Karaneeya Metta Sutraya	Sinhala chanting of *Pirith*
Raire O Rama	Kamath Hella recording by C.De.S. Kulathilake

2.2.3. Data collection instruments

In this experimental study the data was collected by measuring the heartrate of the user and through their reflection sheets.

Heart rate was measured using an Electronic Blood pressure meter and a mobile app called Instant Heart Rate: HR Monitor & Pulse Checker developed by Azumio Inc. Where the user is asked to keep their finger on the mobile camera.

Figure 57 Left: electronic blood pressure meter Right: using Instant heart rate app

2.2.4. The process of the Experimental study 01
To conduct the experimental study, following steps were followed.

Step 01: Heart rate of the sample was measured.

Step 02: The subjects were advised to stay in a relaxed position they like for example, sit, stand, lean on the floor etc. and was kept in complete silence and dark for two minutes, followed by an interval (a resting time) of eight minutes.

During the resting time the subjects were advised to write down what they felt and to draw their expression of the experience. Furthermore, their heart rate was measured.

Step 03: The sample was exposed to music listed above. All of these music tracks were played for 2minutes accompanied by an interval of 10minutes at a medium (80db) sound intensity level.

2.3. CONDUCTING THE IN-DEPTH STUDY AS TO REVALIDATE THE PREVIOUS FINDINGS AND ALSO TO IDENTIFY THE OPPORTUNITY TO OF POTENTIAL INPUTS THAT COULD BE GIVEN IN TO AN HCI BASED SYSTEM TO UNDERSTAND THE STATE OF STRESS.

To perform this in-depth study using criterion sampling eight subjects (n=8) were selected. The criterion behind their selection was the musical preference and the level of stress category they belonged to.

2.3.1. Environmental conditions
Similar to the previous experiment this study was performed in a studio which is sound proof and where blackout condition could be brought in easily. the temperature was maintained at 23°C. The walls of the room were padded and painted black. Thus, echo was minimized. The lighting condition of the room was maintained at a calming twilight condition (10.8lux), As night-vision cameras were not available for the study to capture facial expressions in a pitch-dark condition.

Figure 58 Environment conditions in In-depth Experiment

Main aim of this arrangement was to minimize sensory stimuli except auditory stimuli. Following table denotes the conditions that was expected to be kept constant.

Table 28 Conditions that were kept constant for the in-depth study

Sensory organ	Stimulus	Restrictions maintained
Eye	Light	lighting condition of the room was maintained at a calming twilight condition (10.8lux) as light is a necessary factor to capture images through a DSLR camera
Nose	Smell	No air fresheners or perfumes were permitted
Mouth	Taste	Subjects were advised not to eat anything within 1h time before the experiment.
Touch	Temperature	The temperature of the environment was kept at 23oC as it is considered to be the most comfortable temperature condition

2.3.2. The process of the in-depth study
Similar to the previous experiment to conduct the experimental study, following steps were followed. But the music pieces used was limited to 3. The sample was exposed to music titled "Weightless" followed by *Raag Puriya Dhaneshree., Nelavili gee* (Sri Lankan traditional lullaby's), All of these music tracks were played for 2minutes accompanied by an interval of 10minutes at a medium (80db) sound intensity level.

2.3.3. Data Collection
The data of this experiment was collected by means of reflections of the sub-jects, their heart rate before and after listening to music, brainwaves determining the brain state while listening to music, and facial expressions to determine the change of their emotions.

Table 29 Devices and instruments used to collect above stated data

Collected Data	Instrument/ Device	What is to be analysed
Reflections	Questionnaire	Thoughts and expressions of the subjects
Heart rate	Instant Heart rate app/ The results were validated using electronic pressure meter	Relaxation response
Brainwaves	Emotiv device	The brain states while listening to Music
Facial Expressions	Video sequence captured with DSLR camera- Canon 5D- Mark II And processed using Emotion API Microsoft Azure	Identifying emotional changes while listening to music

3. Findings

After analysing the results of the perceived stress scale of (n=47) the following results were obtained. 72% (34/47) of the sample was classified as moderate stressed and 19% (9/47) were classified as low stressed and 9% (4/47) of the sample was reported as high stressed.

When existing modes of relaxation used by the sample was considered, the most common mode of relaxation among the sample is listening, playing and singing.

When samples attitude towards Sinhala traditional music for stress relief, 93.8% (45/48) expressed that they like to listen to Sinhala Music. 72.9% (35/48) liked Sinhala Traditional Music. Amongst overall sample only 85.4% (41/48) believed that Sinhala Traditional Music has been used as a mode of stress relief by the past generations.

Figure 59 Word-cloud representation of existing modes of relaxation of the sample

Furthermore, when the technological engagement of the sample was considered 100% (48/48) declared that they use smartphones. Midst, their most used device for relaxation was also found to be the smartphone.

As the next step of the study, subjects were clustered into 6 groups according to the information provided by the subjects in their questionnaires. Among these subjects (n=47) all were accepted to participate in the experimental study 01, which aimed to identify the impact of Sinhala Traditional Music for Stress reduction.

3.1. FINDINGS OF THE EXPERIMENTAL STUDY 01

For the Experimental study 01 only (n=25) was gathered. As explained in the previous section their heart rate and reflections were recorded. Analysis of the reflections denotes that phrases such as Relaxation, recalling, happy and warm appeared to be more prominent in *Nelavili Gee* than to other music pieces used.

Then a focused group discussion was conducted in Sinhala language for the convenience of the sample. It was felt that the sample was genuinely expressing their ideas from their mother tong. The responses of this discussion, it confirmed that the subjects have had an impact from *Nelavili Gee* in relaxation response.

3.2. FINDINGS OF THE IN-DEPTH STUDY

Similarly, as the previous experiment the heartrate variation when listening to music was determined by comparing the heartrate records before and after listening to music.
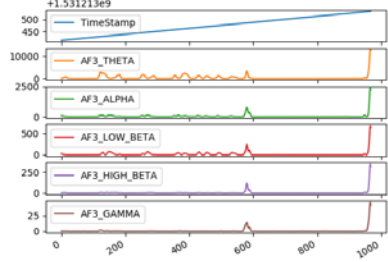
Table 30 Findings of the in-depth study

"Weightless"	"Raag Puriya Dhaneshree"	"Nelavili Gee"
This graph indicates that 62.5% (5/8) has lowered their heart rate.	Above graph indicates that 37.5% (3/8) has reduced their heart rate.	As the above graph, 87.5% (7/8) of the samples heart rate was reduced.

Therefore, comparing above results, it could confirm that the ability for is greater in *Nelavili Gee* than other pieces of music used in the study.

Table 31 Analysis of brainwaves and facial expressions

Analysis Brainwaves	Analysis of Facial Expressions
To analyses average bands of the brainwaves were calculated and plotted as a bar graph which could be easily understood by anyone. Therefore, a program was written to plot the brain waves.	Earlier it was planned to analyze the facial expressions manually with reference to the *bhava* and *Navanalu Rasa. W*ith the time constraints it was difficult to analyze it as planned. Therefore, an emotion recognition algorithm; Emotion API developed by Microsoft was used to analyse emotions of the facial expressions. (Microsoft, 2018)

4. Conclusion

By this study, it was determined that only the Heart Rate capturing through mobile camera has the capability of getting a reasonably accurate input. Signals detected by the Emotiv device (Industrially used EEG signal detection Brain-Computer Interfacing device) resulted in different results than the results obtained by the heart-rate analysis. It was understood that the noise of the detected brainwave signals was high; thus, accurate readings of the brainwaves is hardly achieved. Due to time constraints and technological limitations only one emotion recognition algorithm developed by Microsoft was used to analyze the facial expressions of the subjects. The results of facial expression analysis were contradictory with the textual and visual feedback given by the subjects. Thus, in this case, the accuracy of using image processing as an input mode for an interactive system to determine the emotion of the users was identified to be problematic since emotions detected by the computer did not match with the reflections of the sample. It was assumed that it might be due to the differences in facial expressions of humans from western and eastern contexts therefore further research to be done to identify the real cause behind this result.

With the findings of the in-depth experimental study it proved that 87.5% (7/8) of the sample's heart rate was reduced when listening to *Nelavili Gee*. Thus, *Nelavili Gee* has the ability to become an important asset in developing a context-based interaction design with traditional knowledge entwined.

Hence, it could be concluded that this research study disclosed the abilities to use Sinhala Traditional Music for stress relief via HCI which proved the hypothesis to be correct. Further research should be performed to validate whether the results of the study could be generalized.

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