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Visual and Aural Modal Interactions in Traditional Foot Reflexology Practice

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ABSTRACT

The application of multimodal interactivity in HCI and VR avails a host of advantages which includes enhancement of realism and the achievement of interactivity that is relatively close or identical to the conventional human to human interactions. Visual and aural interactions have been widely applied in various domains ranging from mobile industry to medical field. In Virtual reality stress therapy application, particularly in the proliferation development towards the virtualization of traditional foot reflexology therapy, little is understood on the visual and aural interactive nature of the therapy and to what extent they contribute in relaxation and stress relief. This paper presents a study that examines from both the patients' and practitioners' perspective, the visual and aural interactive nature in foot reflexology domain since the practices promote relaxation and stress relief. The study explored 2 traditional foot reflexology sessions; data were collected through audio recorded semi-structured interview, and was analysed using content analysis. Results were compared with the existing haptic exploratory procedures. The study findings presented the visual and aural interactive nature involved from the patients' and practitioners' perspective. Implications for future research are also discussed.

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INTRODUCTION

Visual and aural interaction in HCI focuses on the essence of interaction by which users can carry out tasks on an interactive system using visual and/or aural tools or elements, then this interactive system provides feedback to the users by representing the results of the tasks the users performed visually and/or aurally. Visual interaction in HCI is the most common and most important modality of interaction. Its significance cannot be over emphasized. For instance, operating Microsoft Windows calculator with a mouse, it is surely very user friendly and easy to use. Now try the same operation with your eyes closed, only then would you begin to comprehend how frustratingly difficult computational life can get without visual interaction, despite this task not being so different from dialling a touch tone phone which for most of us can be completed comfortably closing both eyes.

Haptics/touch is the most vital and dominant interaction involved in most complementary massage therapy that promotes relaxation and stress relief. Some of these complementary massage therapies include, acupuncture, lomi-lomi, reflexology and so on, are mostly haptic dominated. Several studies (Sherman, 2006;Okere *et al*., 2014), has highlighted the dominance and significance haptic interaction has on these therapies. But for the therapy in question "reflexology", is haptic interaction the only sensory interaction involved in this therapy that influence the therapeutic effects the users perceive? There has been little or no attention from literatures that attends to this. This paper hence looks to identify the visual and aural interactive nature involved in the therapy that influences the relaxation and stress relief the users perceive.

This paper presents its introduction in Section I, the literature review in Section II, containing relevant domains, significance, relevancy, and application. Section III presents the study, method, analysis and results. This is then followed by discussion, conclusion and future works.

Literature Review:

In Virtual Reality Stress Therapy (VReST), which are applications or technologies that allow users to enter computer-generated worlds or explore interactive interfaces or applications through visual, aural and/or haptic

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interactivity enabling them to combat stress (Okere *et al*., 2014). The application of VReST can be seen in the Nakajima *et al*'s VR Relax-Refresh system that applied VR technology in body massage (Nakajima, 1994). The VR Relax-Refresh system consists of a massage lounger that vibrates and massages the body (haptic stimulation), a head mounted-display (HMD) for visual stimulation, a standard VCR for aural stimulation, and an interface circuit that gears the massage chair and generates stereographic images. These three multimodalities were combined by the designers, exploiting the advantages offered by each modality to deliver body massage and sleep inducer via virtual space. By wearing the head mounted-display and sitting on the massage lounger, the user is put across 3 states by the system which are the sleep-encourage stage, the sleep stage and the refresh stage, inducing relaxation and relieving the user of stress as the system puts the user to sleep with a varying degree of interaction and refreshing the user after some duration of time.

The study of Dayang *et al*, (2011), presents another application of VReST in a web-based application that enables users to combat stress. This application is an image-based VR application built upon the concept of guided image therapy which is a kind of therapy where by users are guided by the therapist to imagine or visualize and environment and imagine mentally imagine the user being in the environment which may not be as effective or easy for everyone. But with this application, users are enabled to choose from a collection of virtual images, and virtually explore the location with their choice of selected sound tracks and voice therapists' talk interactions so as to mimic the traditional therapy session thereby inducing relaxation and stress relief to the user.

For stress relief and relaxation, massage therapies such as lomi-lomi, acupuncture, and reflexology and so on, are utilized; and for these therapies, haptics/touch is the most vital and dominant interaction involved in the entire therapy. The study of Sherman (2006) in their development of a taxonomy that presents the various styles and techniques practitioners utilize in the administration of various massage therapies highlights the dominance and significance haptic interaction has on these therapies. The study of Okere *et al*(2014), further buttressed this point by highlighting the haptic features involved in the traditional foot reflexology (TFR). But is haptic interaction the only sensory interaction involved in this therapy that influence the therapeutic effects the users perceive? There has been little or no attention from literatures that attends to this. This paper hence looks to identify the visual and aural interactive nature involved in the therapy that influences the relaxation and stress relief the users perceive.

Reflexology being the domain focus of this study, a form of massage which tries to apply pressure to target reflex points on a person's foot or hand corresponding to various parts of the body to improve health (Tiran &Chummun, 2005;Stephenson, Weinrich, &Tavakoli, 2000; Himmelstoss, 2007), on the basis that there are reflex points on the feet and hands that correspond to all of the glands, organs, and other parts of the body (Byers, 1983;Stephenson *et al*., 2000;Tiran &Chummun, 2005) The reflexologist systematically exerts firm pressure on the reflex points of the patient's feet. This pressure is gently and carefully exerted so as not to miss any point by making small caterpillar like creeping movements with a thumb, finger or reflexology stick along each foot, stimulating and sending nerve impulse along the energy pathways to every other part of the body to which they are connected.

The proliferating use of foot reflexology for numerous purposes such as stress reliefs, relaxation, distress, potential diagnostic tool, insomnia treatment, hypertensive patients, physiological Oedema treatment and as a complementary treatment tool which has been tested and proven effective in numerous studies (Stephenson *et al*., 2000; Stephenson, Dalton, & Carlson, 2003;Tiran, 1996). These benefits has fuelled attempts that try to simulate or mimic the haptic interactivity as can be seen in some devices of reflexology artifacts which anecdotally claim to be equally as effective. Knowing foot reflexology is a haptic dominated domain as was rightly pointed out by Okere *et al*, (2014) but is that the only modal interactivity involved in the therapy? This is a question this paper aims to address. This paper therefore examines the visual and aural interactive nature involved in TFR.

The Study:

Table I: Participant's demographic distribution.

	R1	R2	R3	R4	R5	R6	R7	R8	R9	TOTAL
Role	Pa	Pa	Pa	Pa	Pa	Pa	Pa	Pr	Pr	6 Patients 2 Practitioners
Age	30	27	22	22	24	22	31	55	53	na
Gender	1	1	0	1	1	0	1	1	0	6 Males, 2 Females
Occupation	s2	s2	s1	s1	s2	s1	s2	p1	p1	5 Student 2 Practitioners
Weight(kg)	88	90	54	63	78	60	67	na	na	na
Shoe size	44	45	38	41	45	37	40	na	na	na
M. Status	0	0	0	0	0	0	1	1	1	5 Single, 2 Married
Health	0	0	0	0	0	0	0	na	na	Healthy
Prior Exp.	0	0	1	0	0	0	0	na	na	1 Prior experience
Experience	na	na	na	na	na	na	na	15yrs	7yrs	na
Role (Patient = Pa, Practitioner = Pr); Gender (Male =1, Female = 0); Occupation (s1 = Undergraduate student, s2 = Postgraduate										

student, p1 = practitioner); Marital status (0 =Single, 1 =Married, 2 = Divorced); Prior Experience (0 = No, 1 =Yes); na (Not Applicable); R1 (Respondent No.1)

A. Objective:

The objective of this study is to identify the various visual and aural interactive natures involved in the TFR domain from both the patients and practitioners perspective.

B. Method:

An exploratory study was conducted with two (2) different certified traditional foot reflexology practitioner's centres with 4 and 3 patients at each reflexology centre making a total of 7 patients altogether participating in this study. Data was collected on their perceived visual and aural interactions or features of the entire therapy that positively or negatively influence their relaxation and stress relief. Semi-structured interview was used to collect data from the participants on the visual and aural interactions involved in the entire therapy process. The extracted interactive components were then shared with both certifiedexperts to give their expert opinions, justifications and significance of any identified visual or aural interaction that were identified. Sanders (2002) posited that, in capturing users' verbal expression about their experiences or opinion, it could be done through interview method and to capture users' non-verbal expressions could be done this time through observation methods. The participants were briefed on the objectives of the study before the session started. In collecting data on the visual interactive nature of the therapy, participants were asked to carefully observe the entire environment while the therapy was going on and freely point out any visual feature of the environment that influences their mental or physical relaxation positively or negatively as it was audio recorded. Likewise, in collecting data on the aural interactive nature of the therapy, during the therapy, participants were asked to shut their eyes, listen and freely point out any sound or aural interaction patients actively or passively interact with during the therapy that influences their mental or physical relaxation positively or negatively.

C. Analysis and Result:

This study revealed the visual and aural interactive nature involved in the traditional foot reflexology from both the patients' and practitioners' perspectives.

The Table I present the participant's demographic distribution. Table II contains the contents analysis of the audio recordings of the therapy, which was categorized into 2 (visual and aural therapeutic features)

Visual Interaction:

From the analysis of Table II, the identified visual interactive nature of foot reflexology are of 3 main categories which includes *Informative* (reflexology chart on the wall, news from the television), *Entertaining* (comedydisplayed on a TV), *Relaxing* (the uniqueness of environment, the dull/deem lighting of the reflexology room and images/paintings on the wall)

The degree of pain bearable by a patient or the level of satisfaction or pleasure is measured by the practitioner from looking at the patient's facial expression or body movement towards the amount of pressure exerted, or the practitioner's ability to detect a problem or a potential problem with a patient's organ by observing acute or sharp response to a supposedly bearable pressure that corresponds to its relative organ before asking the patient some diagnostic questions for confirmation. These findings indicate the existence and role visual interactivity play in TFR.

Table II: Participants responses on Visual and Aural features of TFR

Resp. Id	Influential Visual features	Why?	Influential Aural features	Why?
R1	• *Beautiful Photo paintings on the wall* • *dull lighting in the room* • *animal documentary on the television*	• *Caries away my thoughts by trying to find the artists message* • *the dull light makes me wanna sleep* • *It also carries my thoughts away from my worries into the animal*	• *The sound of nature from the TV* • *Chinese orchestra music from the radio* • *Conversation with the therapist*	• *The music is very nice. It's unique and calming.*

Practioners' responses on Visual and Aural features of TFR

Q1 / ID	Question: *The amount of pressure applied on each patient, does it differ?*
R8	*The pressure applied depends on the texture of the patients' sole and how much pressure the patient can take before it gets too painful. I can tell by looking at the patient's facial expressions and body movements while I apply pressure. So when you see that, you reduce the pressure a little bit.*
R9	*It depends. With the right pressure, the patients would feel comfortable and relaxed, but if it's too painful, the patient would usually express their feeling - like they will be shocked and shake their body or feet. If something is wrong with a body part / organ, just a little pressure, they will say it's too painful. Then something is wrong or about to*

		kingdom.					*be wrong with that region / organ. So I will usually confirm this observation by asking the patient some questions, advise them on how to better manage it. Sometimes I even ask them to go see a proper doctor. But with reflexology, it's like exercise for that part of the body.*
R 2	• *Gloomy environment* • *homely looking environment* • *Nature Movie*	• *the environment gives me this gloomy relaxing feeling.*	• *Cool Chinese music* • *Human conversation* • *sound from Television*	• *All the sound I hear are gentle and comforting*		Q 2	*We have observed that you engage your patients in conversation sometimes; does it have anything to do with the therapy? Does it affect their relaxation?*
R 3	• *Kind smiling man massaging my foot.* • *Comfortable environment*	• *His smile is welcoming and appeasing.* • *I would have loved to see some big wall papers of waterfalls or the jungle on the wall with a neater and organized setting.*	• *The Asian music is kinda ridiculous and irritating.*	• *It would have been nicer if it's a cool blues playing, I would have probably slept off by now.*		R 8	*Well it depends, it is not actually recommended because when a patient is talking during the therapy, he breaks the flow of the "Chi" as we call it in Chinese. But sometimes the patients wish to know about their health condition during the therapy, or wish to know more about the therapy which gets them happy after knowing that information. Sometimes their personal problems to get my opinion or advice which gets them relieved afterwards*
R 4 R 5	• *Comedy show from the TV* • *dark Blue light* • *poster Information about reflexology on the wall* • *Television*	• *I like the comedy, it's funny.* • *The light matches the massage because it is not too bright.* • *the posters on the wall are very informative, I like them, it tells me more about every reflex point on my feet.* • *the television is small and far I can barely see what its showing*	• *TV sound* • *Conversation and recommendation from the reflexologist*	• *The sound is amusing and it's very funny.* • *My conversation with the therapist is very interesting. He is very knowledgeable*		R 9	*Some patients love to chit chat during the therapy session, sharing their happiness, problems, or so and after that, they feel better. Some don't have nobody to talk to and prefer to come for reflexology and have a talk with me, some patients even break down in tears sometimes, I then try to encourage and strengthen them with kind words and after that, they will cheer up and become relieved. Some like the environment with the music, it helps them to relax more and they sleep off most of the time.*
						Q 3	*We have observed that most reflexology rooms, a lot of attention is given to the decoration of the environment like the light and so on; does the environment have any effect on the patient?*
R 6	• *It's a really nice place*	• *I like the way things are organised in here, everything is where it is supposed to be.*	• *It's a quiet, calm peaceful environment.* • *Sound from the television.*	• *It is not as noisy as the city centre or work.*		R 8	*Of course it does! The patient would feel more relaxed, more comfortable. If I put the chair outside under the sun and massage you there, how would you feel? You'll feel uncomfortable right? (Chuckling as he spoke)*
R 7	• *The colours and the decorations in the background.* • *The television show.*	• *They are Asian colours so I'm indifferent towards it but would feel more at home if it was African.* • *The massage is painful a times so TV comedy takes my mind off the therapy also.*	• *The instrumental music*	• *I like the music because I'm a musician so I love the music. It's soothing and entertaining.*		R 9	*Yeah it does affect their relaxation! The light for instance, if you have been to other reflexology centres, you would notice some centres make their rooms with a dim lighting with romantic settings to get patients very comfortable. Some places also put water pot to add to the comfort patients would feel, with the air-conditioner to really calm the patients.*

Aural:

From the analysis of Table II, we identified the existence of aural interactive nature involved in TFR. We observed that these aural interaction are either passive interactivity(the relaxing music from a sound system, TV or radio, or general people interactions happening in the background) or active interactivity (the dialogue between the practitioner and patient) which are usually in the form of confirmations, recommendations, information, advice, consoling or opinion sharing. R7made reference to the music playing an important role "in

making the patients feel relaxed". This was also concurred by the study of Mackereth *et al* (2009) reporting the "Patient-therapist interaction" during the TFR session. These findings indicate the existence and role of aural interaction in TFR.

Discussion:

This study has shown that despite the dominance of haptic interaction in the traditional foot reflexology, other modal interaction exists in the therapy that plays significant roles in the relaxation and stress relief the patient s perceive. From the analysed data, a visual and aural modal interaction model from both the patient's and practitioner's perspective was designed on the basis of the extracted information. There are currently no interaction model in this domain within the best knowledge of the researcher.

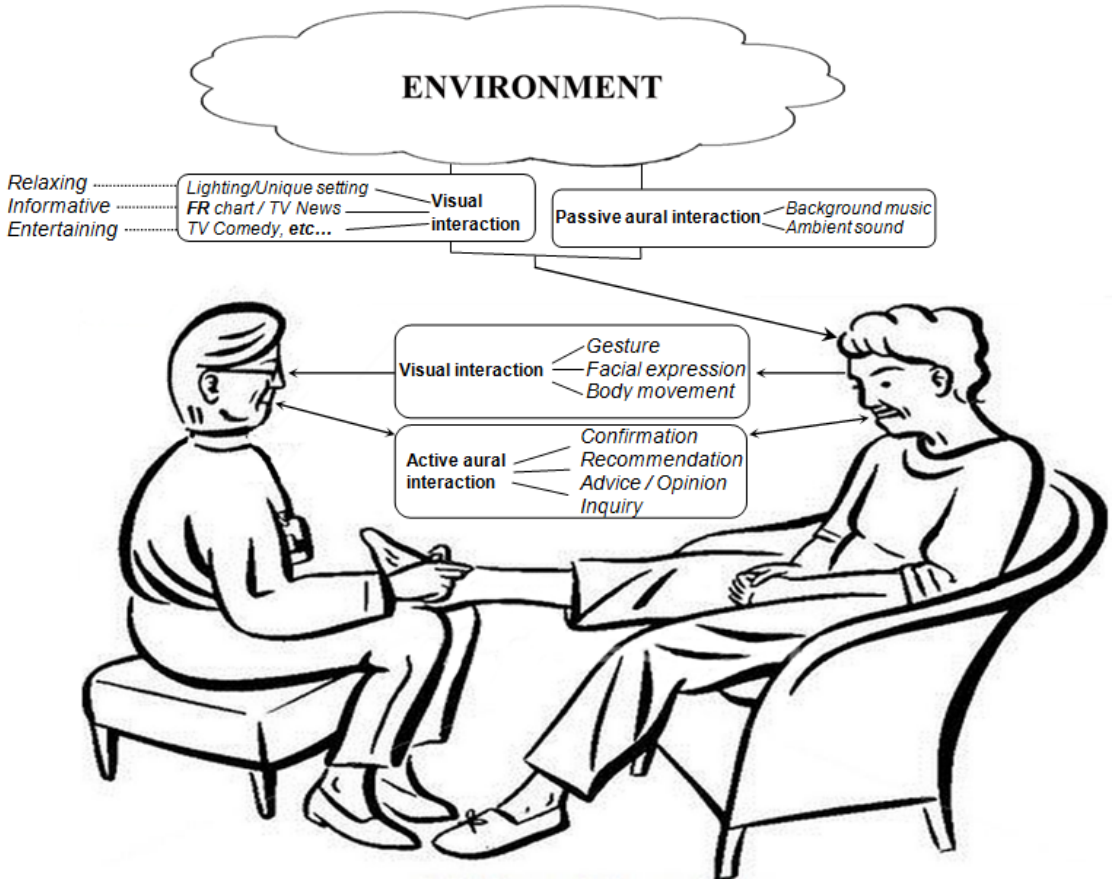

Fig. 1: Visual and Aural modal interaction model of TFR.

*** The visual interactions identified are of two perspectives which includes the patients' and the practitioners' perspectives.

Patients' perspective – The visual interaction involved in TFR from this perspective encompasses the visual interactivity between the patient and the environment which comprises of the unique setting of the environment, the dull dim lighting of the reflexology room, graphic images / painting / reflexology charts on the wall, Television displaying comedy or news, as was verified by the experts(R7 and R8) in their response to the questions "Q3*"*. These visual features are perceived by the users as either being relaxing, informative or entertaining.

Practitioners' perspective – The visual interaction involved in TFR from this perspectiveencompasses the visual interactivity between the practitioner and the patient which comprises of visual cues the practitioner collect or utilize during the cause of the therapy. The practitioner utilizes location tracking to identify / locate the exact reflex point to work upon. Gesture, facial expression and body movement are all visual cues the practitioner uses to gauge the amount of pain bearable by the patient, or identify defect parts / organs / region for further enquiries from the patient as was described by R7 and R8 in their response to the questions "Q1*"*.

*** The aural interactions identified from the observations are of two dimensions which includes the active aural interaction and the passive aural interaction.

Active aural interaction –From this viewpoint, the interaction encompasses the direct active aural interaction (conversation) between the patient and the practitioner. From the observations, it often exist in the

form of inquiry, advice/opinion, recommendation, confirmation or regular conversation from either the patient or the practitioner as was likewise verified by the experts (R8 and R9) in their response to the question "Q2"

Passive aural interaction – This interaction involved in TFR from this viewpoint encompasses the indirect passive aural interaction between the user and the environment. From the observations, it often exist in the form of a cool soothing gentle background music that contributes in calming the patients, or the ambient background sounds of other activities going on in the background which can be regular conversations of other people or voices from the television and so on. This can be perceived as relaxing / entertaining for some patients or disturbing to other patients.

These multimodal interactions in this therapy would be very instrumental in enriching the user and system requirements for future designers/developers in the simulation or virtualization of this therapy or related domain.

Conclusion and Future Works:

From this study, the visual and aural interactive nature involved in TFR these indentified features would be pivotal in coming up with design guidelines which would have a direct impact to next generation system development. By understanding the multimodal interactive nature, future designers would have an enriched requirement specification for the design of a more effective haptic, visual and aural interactive system especially in TFR domain. Future works can be done in the development of and simulation of multimodal visual, aural and haptic interactions.

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