Improving the Mental State of Patients in Clinical Settings Using a Non-pharmacological Method

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Abstract. Over the past two decades, a shift and rethinking has occurred by placing focus on patient-centered care. In 2001, the Institute of Medicine included patient-centered care as 1 of 6 specific aims at improving and bridging the quality, effectiveness, and efficiency of care required for patients. However, one area that patient-centered care has failed to clearly address is the psychological experience of patients waiting in clinics. In this paper, we address such psychological factors that impact patients and introduce a novel approach that has the potential for reducing stress and anxiety while waiting in clinical environments. Through this approach, we attempt at answering the following questions: Since patients might experience anxiety and stress while waiting, can a perceptual change in the environment help minimize such level of discomfort? And furthermore, can such a stress-reduction approach assist patients in communicating their symptoms more clearly to doctors?

Keywords: Mental wellbeing · Clinical environment · Affective care · Binaural audio

1 Introduction

Traditionally, many healthcare facilities have been designed from a utilitarian standpoint by providing efficient spaces for laboratories and increased number of rooms to accommodate beds for patients. However, such an approach has often led to facilities that function effectively but are psychologically "hard" on patients [1]. More importantly, these facilities indirectly create an atmosphere that is stressful and undermine the psychological needs of patients [2]. Adding to the existing pressure is the number of outpatient visits, which has risen to over 575 million just alone in the United States [3]. This high volume of outpatient visits has increased the wait times for patients to see doctors in clinics and hospitals. The average wait time to see a doctor in a clinic is 45 min [4] and upwards of 4 h in hospitals [5]. The result of having no control over how long the wait might be and the circumstances of the visit bring about anxiety, stress, uncertainty, and sometimes fear for patients [6–8]. Furthermore, studies have shown that high anxiety levels can cause a breakdown in communication between patients and doctors [9–11]. Although doctors and other healthcare providers are aware of this problem, implementing a system that is easy, affordable and non-disruptive to the

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pattern of healthcare can be very challenging [12]. In addition, designing a system that is user-friendly and provides affordance to patients who vary in age, medical symptoms and exposure to technology can be extremely challenging. To address this problem, we look towards improving the psychological experience of patients in clinics by immersing them in a virtual environment using an easy and non-invasive method.

1.1 Related Work

In a study conducted by Arneil and Devlin, they found that attention given to the design of outpatient waiting-room environments had a direct influence on patients' perceived quality of care [13]. They suggest "many aspects of the perceived quality of care that seem to be observable by the patient are not only positive interactions between the staff and patient, but between the patient and environment as well" [13, p. 346]. In a similar study, the modifications made to the waiting area had positive impact on the mood and morale of medical staff [14]. One of the goals for promoting wellness includes creating an environment that is "psychologically supportive" [15]. The effects of incorporating such supportive design may fast track the healing process. Unfortunately, many of the studies conducted on patient-centered care focus on inpatients rather than outpatient facilities and services. Furthermore, the scientific research on psychologically supportive health design remains limited and therefore we must look to other disciplines and theories that may help address this problem.

2 Methodology

As mentioned earlier, we must look towards new fields and use an interdisciplinary approach to address this growing problem. One field that might provide a solution is the research conducted in the domain of Acoustic Ecology, specifically, the theory of acoustic communication developed by Barry Truax. The central tenet of this communication model is the human act of listening. Unlike hearing, listening requires the active participation of an individual in order to experience the sonic environment around us. [16]. This receptive method of actively listening is part of a "dynamic system of information exchange". That is, usability of the information is driven by context and interactions, and it is through these that we are able to derive meaning from the sonic information. The context helps the listener understand the functionality of sound and helps bind the relationship between listener and the environment. Figure 1 depicts the mediating relationship of listener and environment created by sound. Although sound appears to be in the center of this figure, it does not reflect the lack of centrality of listening. Instead, it illustrates the listening process as relational and as a matter of information exchange within a specific context.

In this research, we use this model as the underlying mechanism for creating distraction and immersion to help improve the psychological experience of patients waiting in clinical environments. Specifically, binaural audio recordings of environments are recorded and facilitated to outpatients. The goal is to create a perceptual change using these recordings in the environment that the patient is situated in while waiting to see the doctor.

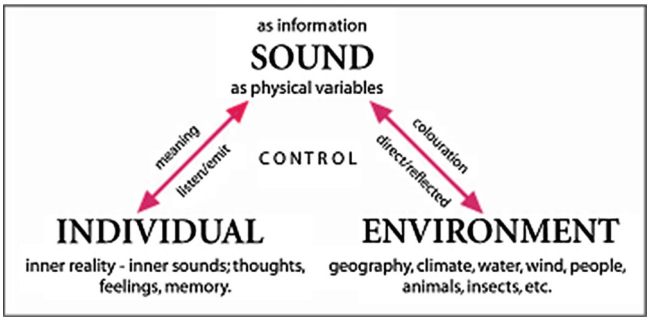

Fig. 1. Exchange of sound information between listener and environment (modified from Truax, 1984)

Our research team recorded 3 types of environment for this experiment, a park, an urban environment, and sounds of a care facility for the control group. Binaural microphones were used to capture a 3-dimensional recording of each environment. During the recording process, some challenges were encountered that we had to resolve. The first challenge was maintaining a walking speed that did not induce anxiety during playback. We also did not want the walking to sound, "rushed". In addition, head movement had to be kept to a minimum to reduce the feeling of nausea when listening back to the recordings. The goal was to focus on creating a sensorial journey that promoted relaxation.

Considering the aforementioned, there are a number of research questions that we will try to investigate in this regard, such as the following:

(1) Can a perceptual change in the environment help minimize the level of discomfort?
(2) Using the acoustic communication model as precedent, can such a mechanism provide positive distraction and create an immersive experience for patients that may help with stress and anxiety control?
(3) Can such a stress-reduction approach assist patients in communicating their symptoms more clearly to doctors?

The hypothesis here is that using such an approach will help reduce anxiety or stress experienced by patients in addition to the impediment of communication between patient and doctor.

3 Experiment

Typically the processing of outpatients includes 3 phases of waiting: pre-process, in-process, and post-process). Pre-process is the time it takes for patients to go from arrival to the examination area. In-process is the time between patients entering and completing their examination. And post-process involves completion of necessary paperwork and exiting the facility. Patients going through these phases have shown to experience annoyance, irritability and stress [17]. Our focus will be on using our novel

approach during the pre-processing phase. Ethics for this study was obtained and approved through Simon Fraser University's ethics board.

3.1 Participants

Participants are adults (over the age of 19 years) with some form of chronic. For this study, patients are recruited from 3 locations: An arthritis research clinic, a complex pain clinic, and finally a hospital. All three locations are in Vancouver, Canada. Currently, we have successfully recruited patients from our first location, the arthritis research clinic and we are continuing with our study at the other two locations starting in July 2014. Patients who volunteer to participate are compensated as an appreciation with a gift valued at $10.

3.2 Procedure

The experiment consists of three phases of testing: (1) a background anxiety screening questionnaire phase, (2) a testing phase, and (3) a feedback phase. In the first phase, anxiety is measured using the Hamilton Anxiety Rating Scale. This particular scale assesses the patient's level of anxiety based on a 14-item interviewer scale. The total score ranges from 0 to 56 points. In addition, questions are asked regarding their frequency of visits to the clinic and if they are currently taking prescribed medication for anxiety relief. For the testing phase, the recordings are randomly assigned to patients who volunteer to participate in the experiment. Since, our study is focused on patients in clinics, it was decided that each recording should be no longer than 5 min. This is sufficient enough for patients to participate in a complete listening experience using headphones without distraction and also avoid ear fatigue. It is important to note that the doctor is made unaware of the type of recording the patient is listening to and patients are asked not to discuss their experience with the doctor. The additional time would be spent on completing the post-questionnaire. During the feedback phase, patients are asked to rate their anxiety level using a 10-point anxiety scale. In addition, questions specific to their experience of listening to the recordings are asked to understand physiological and psychological changes that occur while listening to particular recordings. Furthermore, the doctors are also asked to rate their experience communicating with the patient in the post-listening phase.

4 Results

Based on the data collected from the first clinic, 30 patients participated in the study, predominately female (25) and 5 male subjects. The mean age was 55.72 years (SD 12.66). The results, as indicated in Table 1, were analyzed using a 2-way between – subjects ANOVA for each of the measures. Gender was used as a secondary factor for the analysis. In the pre-listening phase, there were no significant differences between the three groups from the Hamilton Anxiety Rating Scale, $p = 0.990$. Post-listening phase, there were also no significant differences between the three groups from the 10-point anxiety scale,

Table 1. Comparison of anxiety experience by patients during pre and post-listening phase.

Pre-listening Phase	F(2, 27) = 0.010	p = 0.990
Post-listening Phase	F(2, 27) = 0.153	p = 0.859

p = 0.859. The questionnaire administered to the doctor is consistent with our analysis, in which only 3 of the patients (two from the control group and one from the recording of the urban environment) felt less relaxed and uneasy. According to the doctor, all the patients were able to clearly communicate their symptoms despite the groupings.

Although there was no significant change in anxiety level, the qualitative responses provide further insight into the affective qualities experienced by the patients, which may suggest a potential for using such recordings as a mechanism for distraction. Interestingly, 85 % of the patients experienced moments that brought particular images to mind. The patients also experienced particular emotions (43 %) and physical sensations (30 %). In their comments, patients mentioned feeling as if "they where walking by the beach" and "feeling relaxed being in nature". In the case of listening to the urban recordings and clinical environment, patients felt "agitated" and experienced "discomfort and nervousness". Some felt "relaxation of muscles" while others felt "sleepy" listening to the recordings of the park. While patients that listened to the urban environment and clinic felt "their heart beating faster" and felt "increasingly tense".

5 Discussion

There are several factors that might have contributed to the outcome of our results from this particular study. The biggest issue might be the group size in which ideally we would have liked ~15–20 participants per group. The larger group size will also help balance out the female to male ratio, which was significantly skewed in this case. Our low recruitment was due to the availability of the doctor during our first phase of the study. Although 23 % of all the patients reported taking medication for anxiety, their responses led to a low baseline anxiety level, which might have produced a floor effect. Furthermore, due to time constraints with the patients, we were not able to administer the Hamilton Anxiety Scale post-listening phase. Additionally, the choice of clinic needs to be also reconsidered since this particular location did not handle patients that had painful or anxiety provoking procedure.

6 Conclusion

Several challenges were faced during our initial phase of our study as our results indicate. However, we are able to significantly learn from this particular phase, which will allow us to improve our experimental set up for future studies at the other locations. The results from the qualitative responses have allowed us to refine our recording procedure for creating better immersive soundwalk compositions. We plan to create more stimulating environments that fully take advantage of the binaural processing of the sounds. Integration of such sounds is based on patient feedback. For example,

patients reported that the natural (park) environmental sounds like water, birds, and open space had the most calming effect. While the city sounds and clinics confused or in some cases irritated patients and as one patient succinctly stated, felt "agitated". The initial cause of anxiety also needs to be determined since it was unclear if patients experienced anxiety because of the clinical environment or past events prior to their arrival that might contribute to their psychological state. Obtaining further information from doctors is challenging since they are focused on their consultation with patients and do not have enough time to provide more detail reporting of their experience. However, we do believe that proper integration of technology in conjunction with an understanding of user-centered design may help improve the psychological experience of patients in clinical environments.

Our goal is to refine our experimental design and continue to collect data from our other locations and compare the outcome to see if there are significant differences in anxiety level pre and post listening.

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