An Immersive Interactive Installation as Positive Technology from an Artistic Practice Perspective

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Abstract. Interactive installation art in the context of art therapy can create positive emotions and encourage exploration of personal identity and relationships through immersive multisensory experiences for participants. Positive technology, a scientific approach to the use of technology to optimize individuals' quality of personal experience, provides a new dimension for the integration of art and technology. Researchers have explored positive technology from an academic perspective, but a new media artist specializing in immersive interactive installations takes a unique approach by analyzing how interactive installations enhance participants' emotions and engagement from a creative practitioner's perspective. *The Sonic Pharmacy* is an artwork that embodies the principles of positive technology by combining sound healing and iridology to transform biometric data into a personalized meditative journey. This paper also delves into the challenges and opportunities presented by this type of interdisciplinary artwork, examining the design concept, experimental process, and participant feedback. Personalized experiences can promote emotional quality and engagement in individuals, as emphasized by the existing framework of positive technology. This paper contributes to the growing body of research on positive technology by providing an empirical-based case study and analysis of *The Sonic Pharmacy* to provide innovative insights into the potential of interactive installations as a means of positive technology intervention.

Keywords: Positive technology, Interactive installation, Art therapy.

1 Introduction

It is well known that practices such as mindfulness, body-centered therapy, and creative arts, such as dance, music, art, and poetry, which involve entering into transcendent experiences, have positive effects on health and well-being (Vidyarthi et al., 2012; Middleton, 2017; Asgarabad et al., 2018; Keung,2021). There is a common understanding of how art can be used for therapeutic purposes by immersing individuals in creative expression. Seligman's PERMA theory provides a useful framework for understanding the interplay between positive psychology and art therapy (Seligman, 2011). Interactive art installation can serve as a practical approach to create positive emotions and encourage participants to explore their personal identity and relationships through immersive multi-sensory experiences.

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In today's fast-paced technological world, the development of technology is generally believed to optimize people's quality of life. Positive technology, a scientific approach to using technology to transform and optimize individuals' quality of personal experience, offers a new dimension for the integration of art and technology, providing broader meaning and possibilities for promoting positive functioning and well-being.

This article provides an empirically-based case study that explores the intersection of technology, art, and alternative therapy from the perspective of a creative practitioner and demonstrates how interactive installations can enhance participants' emotions and engagement.

2 Literature Review

In the late 1990s, Positive psychology originated with Seligman's PERMA theory and Csikszentmihalyi's (1990) Flow theory. PERMA-provided the most useful framework for updating the approach to investigate the interplay between the world of positive psychology and art therapy - included five pathways: Positive emotions, Engagement, Relationships, Meaning, and Achievement (Seligman, 2011). Flow is an activity with goals/progress, feedback, and balancing perceived challenge and skill (Kitson et al., 2018). Positive psychology, also known as the science of wellbeing, is the study of human potential and optimal functioning, and is characterized by trans-disciplinary, transpersonal approaches which include holistic mind-body integration, spirituality, and ecological sustainability (Wilkinson & Chilton, 2018). Combining the objectives of Positive psychology with enhancements of Information and Communication Technologies, scholars have proposed a new paradigm: Positive Technology - a scientific and applied approach for using technology to improve the quality of our personal experience through its structuring, augmentation, and/or replacement. Positive technologies have been classified according to these effects on three features of personal experience (Riva et al., 2012):

- Hedonic: technologies used to induce positive and pleasant experiences;
- Eudaimonic: technologies used to support individuals in reaching engaging and self-actualizing experiences;
- Social/Interpersonal: technologies used to support and improve social integration and/or connectedness between individuals, groups, and organizations.

For each of these levels, I will analyze them in detail with an example of an interactive installation.

Personal experience is an essential element of all the above disciplines and can be defined as direct observation or participation in events that shape our future intentions (Webster, 2010). Our personal experience is not homogeneous; instead, it varies depending on the degree of perceptual stimulation, attributed meanings and values, and emotions it elicits. In this context, cognitive psychology highlights the influence of

these factors in shaping our personal experiences. Numerous studies suggest that art therapy can be an effective way to reduce stress levels in individuals. Research indicates that both music and art interventions can have a positive impact on mental states and biomarkers (Chanda & Levitin, 2013; Stuckey & Nobel, 2010). Patients facing serious health issues often turn to art therapy to help alleviate stress and anxiety and express their emotions (Reynolds & Lim, 2007). Additionally, scholars have investigated how art therapy sessions can provide participants with a relaxing and enjoyable personal experience, allowing them to gain new insights into themselves and break free from constraints (Kaimal et al., 2016).

As such, human-centered design is critical in creating immersive, interactive technologies that provide experiential accounts that support positive human functioning and well-being. Human-computer interaction scholars have suggested several characteristics of optimal experience in computer-mediated communication activities, such as exploiting curiosity, being conscious of time urgency, matching challenges to the user's skills, focusing attention on relevant content, avoiding distracting interface elements, and enhancing discovery with surprise (Riva et al., 2012). By integrating these suggestions, experience designers can create interactive systems that support people and foster enjoyable experiences. As Dewey says 'experience is the irreducible totality of people acting, sensing, thinking, feeling and meaning-making including their perception and sensation of the artefact in context' (McCarthy & Wright, 2004). Therefore, personal experience is an essential factor that should be taken into account in the design of interactive systems, with emphasis on positive human functioning and well-being.

The importance of personal experience design in the field of interactive art can be summarized by the identification of key elements that promote personal well-being. Positive Psychology has identified affective quality, engagement/actualization, and connectedness as critical features of personal experience that contribute to promoting well-being (Riva et al., 2012). Shedroff's book, "Experience Design," has identified three critical elements in personal experience design: adaptivity, immersion, and flow. Adaptivity refers to change and personalization, immersion refers to the feeling of being wholly involved in something, and flow refers to the sense of smooth movement (Shedroff, 2001). On the other hand, Saffer's six key elements of interaction design include motion, space, time, appearance, texture, and sound. Motion is a trigger for action, space refers to the combination of physical and digital space, time creates rhythm, appearance and texture refer to the physical qualities of the design, and sound adds to the overall sensory experience (Saffer, 2007). Ken Feingold also traces the history of interactive art and sees interactive art building on the biological basis, "to touch to acquire, to investigate, to examine the results of one's production . . . to affirm one's own existence in the world—the earliest and most durable forms of agency." (Feingold, 2002)

Overall, the design of personal experiences in interactive art is critical because it focuses on creating a positive and engaging user experience through careful consideration of these key design elements. As a digital art practitioner, I believe that the new

age artist should use technology as a common language and choose to work towards creating a part of these new technologies and fields of knowledge.

3 Research Questions and Method

This paper aims to address two research questions:

1. How does the artist embody the principles of positive technology and its potential for promoting emotional quality (hedonic) and engagement (eudaimonic) in individuals in the interactive artwork installation?
2. What data collection methods and measures can be used to assess the positive technology components of the artwork?

To answer these questions, this study will present an empirically-based case study, which will focus on an interactive installation artwork called The Sonic Pharmacy. Firstly, the experimental process behind the creation of the interactive installation will be explained from the artist's point of view, including the design concept, technical experiments of data collection and conversion, the level of participant interaction, and the design of the personalized experience. Furthermore, feedback from participants regarding their real experiences and thoughts about the interactive art installation will be obtained. Secondly, the design of the art installation will be analyzed to determine how it contributes to the positive impact on the health and well-being of the participants by incorporating the principles of positive technology.

4 Technology in '*The Sonic Pharmacy*' From the Artist's Perspective

4.1 *The Sonic Pharmacy* as an Interactive Installation

The interdependence of art, technology, and science has been well established throughout history. This relationship has driven artists to create inspiring artefacts through the exploration of new materials and biotechnologies. In this context, "The Sonic Pharmacy" project endeavours to contribute to the domain of image sonification and sound visualization by exploring different ways of dealing with biometric data in creative and unexpected manners. The aim of this project is to serve as a stepping stone for further exploration of the possibilities that lie at the intersection of art and science.

The Sonic Pharmacy project invites participants to embark on a meditative journey after their iris has been captured. Through interaction with this performance-based media artwork, the audience can play both the role of 'patient' and 'healer'.

4.2 Concept Design

The project utilizes image sonification techniques to transfer unique patterns and structures of participants' irises into another meaningful sensory perception through abstraction in both auditory displays and visual space. Real-time visualization techniques are also employed to visualize the patterns of irises. The project can be regarded as a bioart piece, and its objective is to offer a new artistic representation of biometric data. *The Sonic Pharmacy* adopts the following operational procedures as shown in Fig.1:

1. Capture a clear iris image with a USB microscope.
2. Greyscale the image for scanning pixel data.
3. Send iris data from OF to Max/MSP via Open Sound Control (OSC).
4. Sonify the image and visualize sound in real-time.

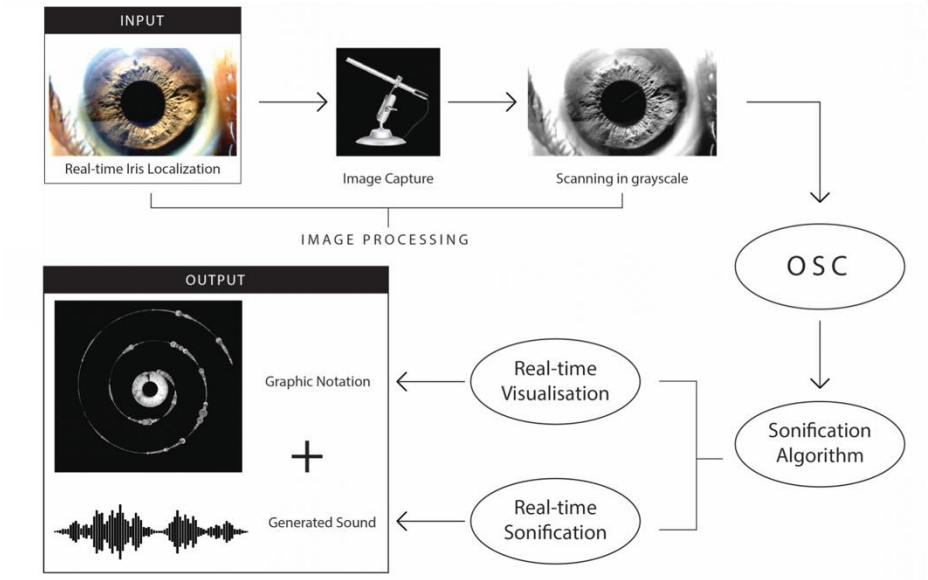

Fig. 1. Showcases the finalized system design using real-time visualization and sonification to transform iris patterns

Sound has been utilized as a powerful medium for healing for thousand years, with numerous examples found in various religious rituals (Stamou, 2002; Zentesia, 2023; Meymandi, 2009) .The human sense of hearing is also often used in approaches to health and well-being. Examples include relaxation music, nature sounds, or self-help audio guides. In the literature, the effects of music and therapeutic use of music have been well investigated (Wigram, 1996). Sound healing has been shown to aid in the recovery of individuals with serious medical conditions, as different frequencies can target various parts of the body. According to Randall McClellan, in "The Healing Forces of Music: History, Theory, and Practice", "each cell of the human body produces a frequency or resonating harmonic" (McClellan, 2000, p6, p38), and sound healing treats the body through resonance first and affects the emotions and mind second. Lyz Cooper, the founder of The British Academy of Sound Therapy, stated in her book that therapeutic sound sessions bring a sense of profound peace, appreciation for the wonder of existence, and our role in it (Cooper, 2016). The concept of sound therapy has attracted significant attention from artists, scholars, and practitioners and has been used to create enriching works in contemporary sound art.

Iridology is the study of the structural patterns and colours in the iris, which have the potential to reveal disharmonies in the body. Although iridology was first documented in 1670, its true birth began with Ignatz von Peczely, MD (1826-1911), a Hungarian physician (Jensen, 1982). The iris is connected to every organ and tissue in the body through the brain and nervous system (Jensen, 2011), and iridologists believe that any detail in the iris can disclose and indicate a person's health status. To identify where the different parts of the body are located, different schematic diagrams have been developed by doctors and scientists for centuries. The concentric zone version (Holl, 1999) is a simplified graphic which divided the iris into seven equal zones, and is utilized in this art project. The ring closest to the pupil represents the stomach, whereas the most external ring represents the skin (see Fig.2).

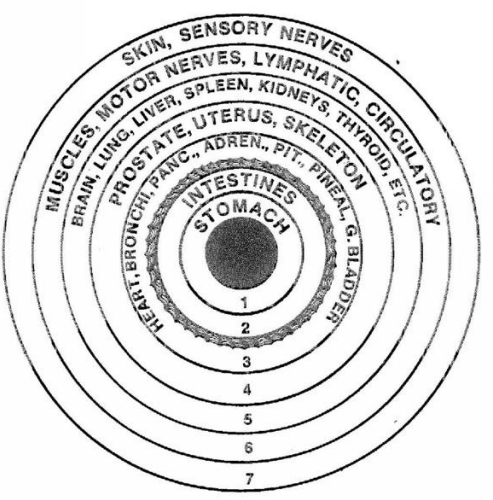

Fig. 2. A schematic diagram employing concentric rings to delineate zones of the iris, illustrating its holistic connectivity to organs

In this context, a person's iris pattern is a rich source of data that can be used to gain insights into their health status. To encode this data in an artistic and meaningful way, the concept of 'Sonic Vitamins' (SVs) data sonification and visualization is proposed. I have developed a new sonification algorithm that integrates therapeutic intervals and links them with the seven zones of the iris. The term 'Sonic Vitamins' (SVs) is used to describe these notes as each person has different vitamin requirements, and these special vitamins are sonic nutrients the body needs in small amounts to function properly and stay healthy. The mapping model is shown in Fig. 3 below:

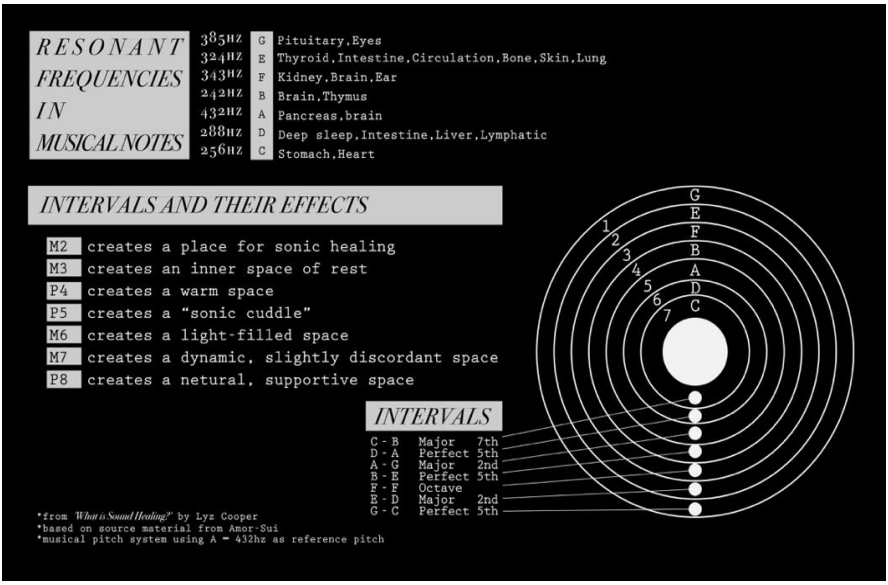

Fig. 3. SVs sonification model integrates therapeutic intervals with iris zones

4.3 Experimental Process

The initial prototype of the installation, *COSMOS*, was displayed in 2018 (Song, 2018). During the four-day exhibition, approximately 200 participants engaged with the interactive installation, acting as 'patients.' As an ophthalmologist for the first time, I was surprised to find that I was comfortable with the role-playing. Some participants immediately felt that they were undergoing an eye examination with an ophthalmologist, especially when I wore a white coat during the exhibition, indicating the importance of attention to detail in performance practice. To create an 'ophthalmic diagnosis' context that would allow participants to engage with my artwork, I paid close attention to the entire setting area in addition to my costume.

In this artwork, image processing is completed using OF, and sonification is implemented in Max/MSP. Initially, a greyscale image is captured from a live camera (digital

microscope), and the image is then saved into the data file. A black dot, which represents the pupil, is added to better position the eyeball for scanning. A scanning line then rotates 360 degrees and extracts seven pixel-color values (r, g, and b) which are then sent via OSC message to Max/MSP every 30 frames, thereby creating a rhythm.

The audience or 'patient' underwent iris scanning under my instruction, viewed their iris on a mini projection on a box and listened to it for one minute. The interactive installation received enthusiastic feedback from participants, with some stating that it was an unusual yet memorable experience for them. The experience's duration was just right for them to concentrate and 'feel.' However, the sonification method made it difficult to distinguish between different irises. On the one hand, the method is relatively direct, making it difficult to differentiate between the identified sounds. On the other hand, the sinusoidal and digitized sound within one minute needs improvement since there are numerous sound attributes like timbre, timing, and pitch to play with. The output sound appeared to be identical and simple at the time. Later, I modified the sonification model in the hope of achieving better results.

This project utilizes iris images with a scanning line projected on a surface to provide real-time sonification. From this, certain iris images and sound were selected, with permission from participants, and the sound file was visualized in other formats such as spectrograms, which displayed frequency distribution information over time. To notate the audio in a linear format, two different shapes were adopted: the rectangle and the circle. The shapes were drawn using two parameters from audio analysis, namely the spectral centroid and the peak frequency of the signal, with the brightness of the sound measured by the spectral centroid using Fourier transform's frequency and magnitude information.

To test the effectiveness of the graphic score, three individuals with a musical background were invited to perform the scores within ten seconds without assigned pitches or tempo using any instrument they chose. A sample of this music can be streamed at https://soundcloud.com/user-189306979/tracks. Feedback was solicited from the participants, who interpreted the scores with their intuition. Participant 1, who played the score on a kalimba in the C diatonic scale, stated, "I naturally interpret it with a left-to-right direction. I also play with a stronger rebound when I see a bigger dot. For the noise shaking lines, I try to think about water drips on instruments, so I imitate that by using my fingertips to make that effect." Participant 2, a double bass player, said, "I just use my intuition to improvise with the score. I chose to play it with a bow when I see the rectangular shape." Both participants read the score from left to right and tended to associate the brightness of the shapes with pitch.

These observations suggest that people have an inertial habit when viewing scores and tend to connect dark visuals with lower pitch and solid projection. While there are infinite possibilities to experiment with visual dimensions like direction, shape, size, and color, the simplest linear form for notation and grayscale color mode is relatively

easy to interpret. In terms of sound visualization, this approach offers a straightforward way to avoid confusion among viewers.

In June 2019, I held a two-day work-in-progress popup exhibition, during which I refined my sonification and visualization methods. By integrating the resonant frequencies and interval relationships with the iridology theory, I was able to modify the iris sonification process. To ensure that certain elements of the sound were more recognizable, I manipulated the acoustics to create auditory changes for the audience. Additionally, I calculated the average value of the pixels from seven zones to obtain the fundamental frequency of a sinusoidal amplitude modulation. This allowed the frequency to change over time, resulting in a richer soundscape based on the iris data. These new methods received a great deal of positive feedback during the popup exhibition. The timbre of the sound was quite pleasing, and the short sustained effect provided listeners with a sense of calm and relaxation.

After multiple rounds of revision and adjustments, the final presentation of this work was successfully held at an exhibition. A total of 79 participants took part in this immersive interactive installation experience, and ultimately, all the 'diagnosis results' - audio and images generated from their irises – were uploaded to a website: https://songxiaranfda6.myportfolio.com. Participants could find their own and other participants' 'diagnosis results' according to the assigned number. Those who were unable to participate could also browse the website to view and listen to the 'diagnosis results' of the participants.

4.4 Positive Technology in Interdisciplinary Artwork

The Sonic Pharmacy is an artefact that explores the intersection of technology, art, and alternative therapy. This interdisciplinary art practice requires the artist to be connected to both the art world and the technological world, for example, by using biological data as an input to the creation of art, in this case. These practices require artists to be open to abandoning traditional media and technologies when necessary, and to develop new strategies, theories, methods of presentation, and forms of public contact. By doing so, artists can create works that transcend known boundaries of information and demonstrate new applications that technology can offer. This investigation of new technologies can also yield poetic results.

Interdisciplinary artwork presents numerous opportunities for innovation and creativity, pushing the boundaries of what art and technology can achieve when combined in novel ways. *The Sonic Pharmacy* contributes to the media arts representation of human irises and offers the audience an active and positive participatory experience. It is a personalized interactive experience, and each person's experience is slightly different because the images and sounds generated based on their biometric data (iris pattern) are unique. This allows the audience to truly participate in the design process, greatly enhancing the participants' sense of real experience. In this interactive experience design, the input source is a participant's iris photo taken by a microscope, and the final

output is a 2-minute-long data-generated music and real-time dynamic moving image in color.

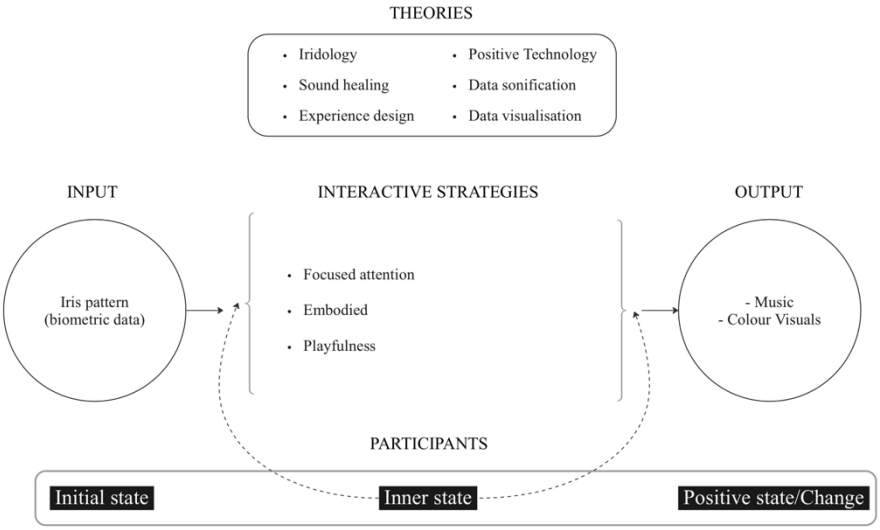

Fig. 4. An interactive experience design guides participants through a transformative journey, fostering deep engagement and personalized interactions in interactive experience

Therefore, the entire strategy of the interactive experience design is to intentionally invite participants to bring in an identity (as a 'patient'), enter a unique experience (the process of diagnosis and treatment) through setting a scene (an ophthalmology clinic). Throughout the process, using the participant's curiosity, setting a goal and rules, letting them feel deeply connected to the artwork. This creates the best experience of presence, playfulness, and high involvement. So that each participant can gradually undergo an internal change from the initial state, through communication with the artist and listening to their personalized 'Sonic Prescription,' until the end of the entire journey shown in Fig. 4. Clinical psychology has clearly shown that personal changes occur through strong attention to a specific experience (Riva et al., 2012). Therefore, the purpose of *The Sonic Pharmacy* is to provide each participant with the most unique and unforgettable multi-sensory experience, introducing them to an alternative way to explore themselves.

Technology has significantly revolutionized the way we interact with the world, allowing us to have immersive experiences that are not limited to a single sense. With advancements in virtual and augmented reality, haptic feedback systems, and high-quality audiovisual displays, technology has provided the conditions necessary for creating multi-sensory experiences that can transport us to different places and enhance our perceptions of reality.

In the design process, it is important to consider what people want to do, rather than what technology can do. With careful consideration and design, it is undoubtedly possible to create an interactive system that supports people and promotes enjoyable experiences. The use of technology in this process is to serve this overall goal: to optimize the quality of personal experience, strive for the integration of body and mind, and it also aligns with the concept of positive technology.

The Sonic Pharmacy can be seen as an embodiment of positive technology principles in several ways, particularly in terms of its potential for promoting emotional quality and engagement with the three features of personal experience in Hedonic, Eudaimonic, and Social/Interpersonal levels (see Fig.5).

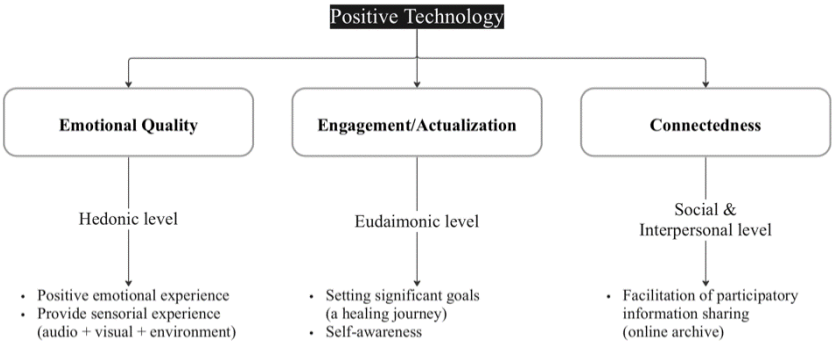

Fig. 5. *The Sonic Pharmacy* in Positive Technology domain

At the Hedonic level, *The Sonic Pharmacy* provides a unique and immersive multisensory experience that induces positive and pleasant emotions through sound, light, and visual stimuli. The use of sound, visual and environment creates a relaxing and calming atmosphere that allows participants to disconnect from the stress of their daily lives and engage in a meditative state. This aspect of the experience aligns with the hedonic classification of positive technology, as it seeks to induce positive emotional states.

At the Eudaimonic level, *The Sonic Pharmacy* supports individuals in reaching engaging and self-actualizing experiences through its emphasis on self-awareness and healing. The use of iris capture and personalized meditation journeys encourages participants to reflect on their own inner states and emotions. This introspection, in turn, can lead to greater self-awareness, personal growth, and fulfillment. The Sonic Pharmacy's focus on personal development aligns with the eudaimonic classification of positive technology.

At the social/interpersonal level, *The Sonic Pharmacy* enables participants to not only engage in a personal journey, but also create and share their own sonic prescriptions. This user-generated content - images and sound files - will be shared through an

online website, allowing individuals to connect with others and potentially find inspiration in the creations of others. Additionally, the facilitation of participatory information sharing through this platform promotes a sense of community and interconnectedness, as participants can view each other's creations, fostering a sense of belonging and shared experience.

In summary, *The Sonic Pharmacy* embodies the principles of Positive Technology by prioritizing personal experiences and well-being. The artwork offers an immersive and unique multi-sensory experience, inducing positive emotions through sound, light, and visuals. It creates a calming atmosphere for participants to disconnect from daily stress and enter a meditative state. The emphasis on self-awareness and healing supports personal growth and fulfillment, while the facilitation of user-generated content and online sharing fosters social engagement and a sense of community. These aspects correspond to the three classifications of positive technology. *The Sonic Pharmacy* demonstrates the potential of positive technology to enhance emotional experiences and meaningful engagement.

5 Conclusion

This paper presented an empirical case study of *The Sonic Pharmacy* as an exemplary interactive installation with significant potential for positive technology intervention. The study explored the design philosophy, technical experiments in data collection and transformation, participant interaction, and personalized experience design from the artist's perspective. Analyzing the installation against the principles of positive technology, it aimed to understand its contribution to the health and well-being of participants.

As an interdisciplinary art practice, these endeavors require artists to transcend traditional media and techniques, developing new strategies, theories, representation methods, and public engagement forms. By integrating technology, artists and designers can create interactive installations that facilitate enjoyable experiences, promote engagement and self-fulfillment, and enhance social integration and connections among individuals, groups, and organizations.

In this case, the artist collected participants' iris patterns and transformed the biological data into personalized visual and auditory experiences using a developed data mapping system. Through iterative experiments and participant feedback, the artist continuously refined the installation and data mapping system, delivering a unique and positive experience to participants.

While other interactive arts may employ wearable devices for real-time monitoring of participants' bio-information and immediate evaluation of physiological responses, this case did not involve collecting audience biological data during the experience. Therefore, it could not provide additional data on individual participant experiences.

Nonetheless, the innovative use of emerging technologies in art creation will undoubtedly expand our capacity to explore novel ideas and experiences.

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