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ARTIFICIAL INTELLIGENCE, MUSIC THERAPY, AND THE FIGHT AGAINST MENTAL ILLNESS:

EXPLORATION OF PRODUCT/SERVICE OPPORTUNITIES FOR DESIGNERS

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PAPER ABSTRACT: Society is struggling to maintain their mental health now more than ever, and with new advancements in Artificial Intelligence and up and coming medical practices (like Music Therapy), we can combat mental illnesses in unique and personalized ways. The purpose of this study is to understand the relationship between Music, A.I., and Mental Illness. This study focuses on the interactions people currently have with music(therapy) and ai, and how integrating them into the smart home system could improve the user's daily life. 130 participants completed a survey where they were asked questions about their relationship with music, ai, and mental illness/health. From their responses a set of interview questions were created, and two semi-structured interviews were conducted. All results were analyzed and sorted through for importance. The results of the survey and interview indicate that music is integrated into everyone's lives in different ways which prompts the need for a personalized smart home system. All participants found that a smart home assistant would be helpful and would positively impact their mental health. This smart home system/assistant would bring a personalized and adapting musical and compelling experience.

Keywords: artificial intelligence, music therapy, mental health, UX design, smart home system

1. INTRODUCTION

This study aimed to focus on the relationship between Artificial Intelligence (AI) technology, Music Therapy, User eXperience (UX) design, and their effects and possible impact on Mental health. Artificial Intelligence has been developing since the late 1950's. It helps us pick our music, personalize our experience on social media, and now it can even predict what type of person someone is based on mannerisms and characteristics (Broad, 2018). While AI is helping us predict what kind of people we are, music therapy can help us -better- the type of people we are. Music therapy has been found helpful when trying to modulate moods and certain emotions. However, without the precision of AI, music therapy alone only provides a short-term effect (Aalbers, 2017). Music therapy is a growing interest in the medical field. A previous study proved that music appreciation has a positive impact on individuals with anxiety and depression – showing that it can improve the mental health status of struggling individuals (Guo & Yu, 2020). Music effects the mood of the listener and can alter some one's mental health. However, what is not answered is; if music composed and personalized specifically for the user- could it have a more significant and immediate impact on the mental health of the listener? Answering

this question will help establish the need for AI personalized musical soundtracks in the home and further push the need for music therapy and good UX design. This study will be beneficial to designers who are interested in the healthcare field; particularly the battle against Mental Illnesses like depression and anxiety, as well as the AI and UX disciplines in showing how much more technology can be used to help the world and human race improve.

2. LITERATURE REVIEW

In effort to understand this research topic, AI and music therapy's effect on mental health, a search was conducted in the Kansas State University Library database as well as the Mintel database. Most of the literature reviewed was published between 2013-2020, with one article from 1995 that reviews were AI and Sound Designs relationship first started. Keywords used to find these articles include AI, UX, Mental Health, Music Therapy, Smart Homes, Sound Design, Anxiety/Depression, and Music Appreciation. These titles of all literature reviewed have been included and prepped for further review. As result, (12) articles, (3) book chapters, and (2) empirical studies of the topic related were reviewed for this study.

2.1 APPLICATION OF A.I. IN DAILY LIFE: SMART HOMES AND HUMAN INTERACTION

AI is used in homes around the world, amazon alexa, google home, as well as thousands of home security systems (Chutchian, 2018). This literature investigates the newest ways its being used and how it is constantly growing and learning. In the Smart Home industry, Bumblebee Spaces designed modules that are attached to the ceiling with a grid system and can move your bed, dresser, and other storage up and down for usage. The system learns from its user's routine and will lower the bed at night, clothes and shoes in the morning, and anything else you need during your daily routine (Corbett, 2020). AI can provide an intelligent exploratory aid, so that the computer can work cooperatively with the user by offering useful mechanisms for exploring the capabilities of the synthesis algorithm at hand (Miranda, 1995). The data from AI/Musical Therapy studies also proved that music could evoke different emotions. AI can analyze those emotions and compose music to pinpoint them. AI is already used to create soundtracks, produce and mix & master music, as well as create personalized Spotify playlists (Verma, 2020). With such a broad spectrum of possibilities with AI, the outcomes of its relationship with music therapy and mental health are endless and depend on the human brain to bring them to life.

2.2 STUDIES ON MUSIC THERAPY

Previous studies emphasized the importance of music as a positive and impactful combat against mental illness (Wei, 2020). Music is often used as a medium for processing and addressing emotions, trauma, and grief. It can also be used as a stabilizing agent for anxiety (Lane, 2020). This idea is further explored with music therapy. Music Therapy has already been tested in the medical world, but are there more opportunities for it? Depression is a highly prevalent mood disorder, and if Music therapy sessions are implemented it may help modulate moods and emotions. Music therapy alone only provides short term beneficial effects, but when added to regular treatment, music therapy has a more noticeable impact (Aalbers et al., 2017). There is a proven increase of functional connectivity as well as a more random

network structure when certain music is played. This supports the effects of music on the human brain's function network with a trend toward a more efficient but less economical architecture (Wu, 2013). Studies also show that people who get less sleep and take on more stress usually have a shorter and less healthy life. AI improves sleep by utilizing music therapy to enhance the sleep duration and levels. It analyzes a person's sleeping schedule, habits, and disorders (Pandian, 2019). Today's people are faced with increasingly fierce competition and subjected to enormous mental pressure. Music appreciation can be used to combat this because it can significantly alleviate anxiety and depression (Wei Guo, & Wenxiu Yu, 2020).

2.3 USING A.I. TO CREATE A PERSONALIZED MUSICAL EXPERIENCE AND IMPROVE MUSIC APPRECIATION

In the past few years AI has been implemented into houses and everyday products. It has also been used to almost perfect UX and Sound design. After studying how music affects mental health, and how AI technology can analyze the human brain and tendencies – this literature review looks deeper into how these components can work together to create an adapting environment created by and for the user. Meditation allows the user to relax and be center focused, but everything in the world is designed for a general population, so we as humans are constantly adapting to new products/services which causes stress and strain on the brain. A study shows that linking music with emotions is a promising way to enhance relaxation, especially in the therapy industry (Williams et al, 2020). Relaxation in the home environment is a big part of winning the battle against depression and anxiety. There is a focus of transitioning from a world where connected tasks are performed by a user to one in which those tasks are performed for the individuals in a way that is personalized, intuitive and effortless (Chutchian,2018). This personalized transition is the key to improving mental health and needs to be brought to the home front.

2.4 DISCUSSION

AI technology is implemented in homes, the music industry, and in the medical community. In smart homes, it is used for speakers and in recent designs it has been used to save storage space. In the music industry, it is used to help producers create hits and is also capable of composing new and unique music in real time. In the medical industry it is used to find causes to illnesses as well as study the effect of music on mental illness. The gap at hand shows Itself in the under development of UX design and related products/services in the AI and Music Therapy field. The gap implies an opportunity to combine AI technology and Music Therapy into a system that provides a smooth user experience and can be implemented into smart homes. The system's focus would be to help to compose or compile a personalized musical soundtrack that created a healthy and adapting environment for individuals at home. The user would interact with the system through an app on their phone or through voice command and through this interaction the AI would store data and learn more and more about the person it is creating soundtracks for. The music would follow the mood the user is in and work to

combat any anxiety or depression and encourage productivity. This would be a new way to actively fight against mental illness as well as instill a new appreciation for music in society.

3. SURVEY AND INTERVIEW

Again, this study is essential to the healthcare field, particularly the battle against Mental Illnesses such as depression and anxiety, as well as the AI and UX disciplines in showing how much more technology can be used to help the world and human race improve. With this ever-advancing technology and the studies on music therapy, we can implement a system in smart homes that creates an adapting musical environment that improves the user's mental health and motivation. Based on the literature review, the consideration of UX and related product/service design in the AI/ Music Therapy field has been addressed as a gap, which implies the opportunity of an adapting musical environment that uses AI to analyze and cater to its user's needs. The main purpose of survey and interview is to investigate the relationship people have with music, music therapy, and artificial intelligence, as well as pinpointing the reasoning behind the publics fear of A.I., and finding ways to educate them about Music Therapy and the positives of Artificial Intelligence. The author would like to 1) compare how music lives in everyone's daily routine 2) the common knowledge of AI and its products 3) how music affects everyone mentally.

3.1 SURVEY METHODOLOGY

A set of survey questions were used to collect data from a sizable sample of individuals. The survey method enabled effective data collection from participants in the U.S. Textual analysis was used to find the emergent themes from the participants' comments and feedback regarding their experience related to music therapy, artificial intelligence, and mental health/wellness.

3.2 SURVEY DATA COLLECTION

Online surveys were conducted with people of the public. A series of questions about Music, Mental Health, and Artificial intelligence were asked. To recruit participants, the researcher used the emails he already has - as well as sending the survey out on all social media platforms (Instagram, Facebook, etc.) for followers and mutual to view and participate. In the first stage of the survey, the purpose of the study was shown to the participants, they were asked a few questions describing their demographics. In the next stage they were asked about their music taste and reliance on music in their daily lives. They were asked about their relationship and knowledge of artificial intelligence. The study plan was reviewed and approved by the Institutional Review Board (IRB) at [UNIVERSITY NAME REDACTED] (IRB protocol number: 11093). To recruit participants, the student researcher used his accumulated email list and established social media platforms to reach out to the public. An online survey was conducted using Qualtrics, the people who received the email or clicked the link on social media, and were interested in participating in the study, followed the link to be enrolled in the study (the link directed them to the online survey).

3.3 SURVEY PARTICIPANTS

For people of the public, the survey participants needed to be 1) an adult that enjoyed/listened to music and 2) was fluent in English. The researcher was looking for people (18 & up), that have an appreciation for music and mental health. For the survey sample, thousands of individuals were recruited, 130 began the study with 118 completing (85% of) the survey. A wide variety of people participated, ranging in age, sex, race, and occupation. Note: There will be further research on individuals that don't listen to music and are not interested in smart home systems.

3.4 SURVEY DATA ANALYSIS

Quantitative survey responses using tables, graphs, and bars were sorted through and given importance through majority vote and quantity of interaction.

Textual analysis was used to synthesize the data from the surveys for thematic analysis including: 1) reading the notes and written survey responses; 2) labeling relevant pieces, either important or not important; 3) deciding which questions were most important; 4) creating categories by bringing several responses together; 5) labeling categories; and 6) determining which were most relevant and how they were connected.

3.5 SURVEY RESULTS AND FINDINGS

From the surveys, 3 themes and multiple categories under each theme were developed from the collecting data. Including: 1) Relationship with Music, 2) Music and Mental Health, and 3) Artificial Intelligence.

Relationship with music: Results showed that 52% of participants listened to music about 1-3 hours a day, and 23% listened for about 4-8 hours. The graph in figure 1 shows the participants responses to being asked when or where they listened to music the most. The most popular location to listen to music was in the car, and the most popular time to listen to music is when the participants are decompressing.

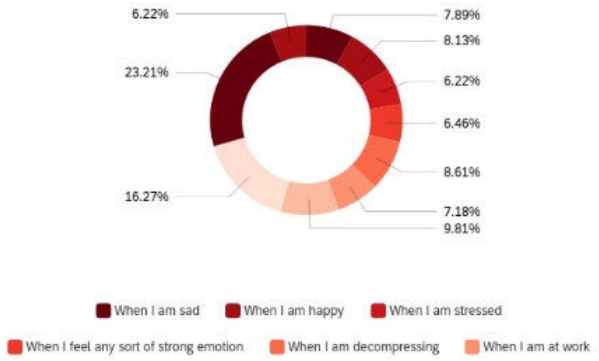

Figure 1. Relationship with music.

Music and mental health: The survey results showed that the most common thing participants struggle with is Stress (43%), with 36% also struggling with Anxiety, and 20% struggling with Depression. Every participant picked at least one of the options, showing that much of the public are struggling with

something, at some point. Results also showed that when dealing with these issues and mental illnesses, 77% of the participants used music as an emotional support system. It helped them cope, think, decompress, relax, create, perform, and analyze situations. This data shows that people are already using music as a type of therapy without even knowing it.

Artificial intelligence: Results showed that Facebook and Instagram were the most popular platforms among the participants. Tik Tok was also very popular among the younger spectrum of participants. Each one of these platforms uses A.I. technology to cater to its users. Participants also felt that the AI coding on their social media platforms accurately curated content for them. Nearly ¾ of the participants say that the AI minds they have interacted with are very accurate.

3.6 INTERVIEW METHODOLOGY

A set of interview questions were used to collect data from a small sample of individuals. The interview method enabled effective data collection from two participants in the U.S. Textual analysis was used to find the emergent themes from the participants' comments and feedback regarding their experience related to music therapy, artificial intelligence, and mental health/wellness.

3.7 INTERVIEW DATA COLLECTION

Semi-Structured in person interviews were conducted with two individuals, a user of music apps and another with expertise in Music Therapy. A series of questions about Music, Mental Health, Artificial Intelligence, and their experience with existing music apps were asked. To recruit participants, the researcher reached out to people he knew that had informed backgrounds and educated insight. The study plan was reviewed and approved by the Institutional Review Board (IRB) at [UNIVERSITY NAME REDACTED] (IRB protocol number: 11093) (Note: For further research a larger group of people will be interviewed for more accurate and less bias information)

3.8 INTERVIEW DATA ANALYSIS

Qualitative interview responses, using thematic analysis, were sorted through, and given importance through coding and different themes.

3.9 INTERVIEW RESULTS AND FINDINGS

From the two interviews conducted, the following themes were emerged: 1) Choice of Music, 2) Opinion of Smart Home System, 3) Use of Current Products (music apps), 4) Current A.I. Algorithms, and 5) Therapy and Medication.

Choice of Music: Overall, participants mentioned that music that is more upbeat and sentimental have an extremely positive impact on their mood. To be more specific, a participant commented that she listens to music that her parents showed her or music from her childhood that have positive connotations. This response implies that if an algorithm can create and document the positive memories of its user to certain songs or types of music, then it will be able to improve or amplify the user's mood with a song or playlist.

Opinion of home system: Overall, participants mentioned that a Smart Home Assistant could be very helpful and even fun. To be more specific, a participant commented that a lot of the time we may not even know what we want to listen to, so having an algorithm to play something catered to my needs and preferences could be interesting and have a powerful and positive impact on one's mental health. This response implies that there is an opportunity for future research on the need for the personalized experience that this Smart Home System can provide. People want to be catered to, they want personalized products, and they want to be happy – which would help increase their quality of life.
Use of current products (music Apps): Overall, participants mentioned that they have used the generated playlists that most music apps offer, but not often. To be more specific, a participant commented that she only uses the generated playlists when she has overplayed a new song, album, or even her own playlists. She mentioned that Spotify has a few playlists based of your mood and that they are quite accurate and helpful to her. The results implies that although the current generated playlist is not given much attention, they do have the ability to be accurate. With more information implemented into the algorithm, the product/or playlist could be even more personalized and accurate.
Current A.i. algorithms: Overall, participants mentioned that the social media algorithms are insanely accurate. To be more specific, a participant commented that it seems like his TikTok is predicting what he likes with very little to no information. He said that it was scary how it seems the app knows what he likes more than he does. The results implies that algorithms can analyse a user and cater to its needs or interests. With this information, the Smart Home Assistant has the potential to become very accurate and good at pinpointing the user's mood or tone and creating a plan on how to better it or amplify it.
Therapy and medication: Overall, participants mentioned that they would prefer Music Therapy over medications if its effects were permanent or long lasting. To be more specific, a participant commented that she believes wholistic medicine is the best and most healthy way to combat illnesses of the body or mind. While it depends on the person and should be decided on a case-by-case basis – music therapy is a healthy subsite for medication. These responses imply that the Smart Home System can push and provide a healthier style of living and dealing with illnesses by implementing music therapy into the home.

4. CONCLUSION

The results from the literature review, survey, and interview provided insight into a gap in the smart home market and sparked some interesting product design opportunities. This study showed that music/music therapy, when used in the right way and in a controlled environment, has the potential to be a daily substitute for anxiety and depression medication in certain situations. It also showed that AI technology can continuously adapt to changing data and learn about its users, as well as the ability to compose and generate music personalized to a someone's specific needs or taste. Combining the practices and knowledge from these two findings creates the opportunity and need for an adapting smart home system/assistant, that can generate and compose music that is tailored to its users' needs depending on their mood, tone, and body language- helping to combat negative thoughts, anxiety, and depression. The system/assistant would not only interact and learn from the user through speakers

placed around the house, but also through an App on their smartphone, tablet, or smart watch that would allow them to elaborate on their emotions, update their mental status, and provide information for the system to be more accurate with its curation. This would be a new take on holistic medicine, music therapy, and AI technology in the home.

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