Introduction

• Chronic anxiety is a growing psychological challenge worldwide and at pre-clinical levels can be disabling [1].

• Some research suggests music may reduce anxiety symptoms as effectively as anti-anxiety drugs without the adverse side-effects [2].

• Auditory beat stimulation (ABS) is an auditory illusion that can be perceived when two or more pure-tone sine waves of similar but different frequencies are presented through stereo headphones [3].

• For example, a two-tone exposure of 400 and 405 Hz presented in each ear separately will be perceived as a single tone with a frequency of 5 Hz [3].

• ABS (4-7 Hz) may also reduce anxiety [4].

• Here, the anxiety-reducing potential of calm music curated by an affect-based AI agent with theta ABS was examined.

Methods

Participants

• Participants (n=268) taking anti-anxiety medication were recruited using the online participant pool Prolific and randomly assigned to one of four separate experimental sessions: music & ABS, music, ABS, and pink noise.

• There were 68 males, 200 females.

• Mean age of participants was 31.08 years.

• All participants completed the following measures prior to their assigned intervention:
  • Short Test of Musical Preferences (STOMP)
  • Short form of the Eysenck Personality Inventory
  • STICSA somatic and cognitive trait anxiety

• All participants completed the following measures pre- and post-intervention:
  • STICSA somatic and cognitive state anxiety

 Experimental Procedure

• After consenting to the study, participants then downloaded the LUCID Research Application on their iOS device.

• Participants then completed the pre-intervention survey prior to completing their assigned intervention.

• Participants listened to their assigned intervention for 24 minutes.

• Participants then completed the post-intervention survey.

Results

Multiple Linear Regression

• Multiple linear regression showed that the relationship between STICSA state anxiety reduction and STICSA trait anxiety was significant (p < 0.05).

• Participants were separated into moderate and high trait anxiety groups prior to analysis.

• Prior work establishes the following thresholds for STICSA trait [5]:
  • Moderate anxiety
    • STICSA trait somatic score between 16.9 and 22.4
    • STICSA trait cognitive score between 17.1 and 26.6
  • High anxiety
    • STICSA trait somatic score of 22.4 and above
    • STICSA trait cognitive core of 26.6 and above

Moderate Trait Anxiety Participants

A) Somatic State Anxiety Reduction

B) Cognitive State Anxiety Reduction

Figure 1: Anxiety reduction in moderate trait anxiety participants for A) Somatic state anxiety reduction and B) Cognitive state anxiety reduction (* denotes p < 0.05 by Fisher Randomization Test (5000 iterations))

• In moderate trait anxiety participants, the music & ABS and music groups have significantly higher somatic state anxiety reduction than the pink noise and ABS groups (Figure 1A).

• There were no significant differences in cognitive state anxiety reduction between any of the treatment groups for moderate trait anxiety participants (Figure 1B).

Discussion & Conclusion

• Moderate trait anxiety participants had more significant reductions in somatic anxiety in the music treatment groups compared to those with high trait anxiety.

• High anxiety participants may require a longer and more frequent music interventions to achieve a reduction in anxiety.

• Moderate trait anxiety participants in music treatment groups had significant decreases in somatic state anxiety but not cognitive state anxiety.

• Music reduces heart rate, respiration rate, sweat production, body temperature, muscle tension which are the same physiological activities associated with reducing somatic anxiety [6].

• Somatic anxiety predicts responses to acute stressors (panic), cognitive anxiety predicts responses to chronic stressors (worry).

• Reduction in cognitive anxiety may require more frequent and consistent interventions over time.

• A longitudinal study with music interventions is being planned to further explore these questions.

References