

Maryland Institute College of Art



Anxiety in Air Travel

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INTRODUCTION AND OVERVIEW

The Backdrop

It's no secret that flying and traveling in general is viewed by many as a negative experience. Emotions experienced when flying can range from annoyance to anxiety to panic. "According to some estimates, as many as 25 percent of all Americans suffer some nervousness about flying but the National Institute of Mental Health says this fear, usually called aviophobia, affects just 6.5 percent of the population" (Seaney). It's easy to see why many view flying as a negative experience, considering passengers are required to remain confined and helpless with many other passengers for up to 18 hours at a time. While traveling at speeds above 500 miles per hour, miles above sea level, passengers must trust someone they've likely never met to fly them to their destination safely. During times of anxiety or stress, many people may turn to natural therapies such as exercise. However, in a confined, noisy plane cabin, these treatments are likely either difficult or impossible to accomplish. A solution to this problem could mean a reduction in anxiety for as many as 250 million passengers a year (United States Department of Transportation).

Advancements in VR Technology

Extended reality is simply an overarching category used to describe augmented, virtual, and mixed reality. Although there have been several waves of excitement around virtual and augmented reality in the past, we have only just recently begun to truly realize the full potential of this emerging technology. Today, experiencing a VR

headset such as the Oculus Quest has the effect of near true immersion. More recently, Oculus from Facebook and HoloLens from Microsoft have introduced hand tracking, thus removing even the need for controllers. As these technologies and hardware continue to improve, opportunities for applications outside of entertainment and enterprise begin to present themselves. This study sought to approach VR as a method of treatment for anxiety.

THESIS STATEMENT

Hypothesis - A Treatment for In-Flight Anxiety

As many as 25 percent of the 1 billion U.S. airline passengers each year experience some nervousness about flying (Seaney), an extended reality interface can alleviate or mitigate anxiety, claustrophobia, and fear passengers experience during travel.

REVIEW OF LITERATURE

Literature Review Overview

As mentioned in “The Backdrop” above, flight anxiety is a serious struggle for a considerable volume of travelers in the United States each year. The hypothesis of this study is that a fully immersive virtual reality interface will allow passengers to escape their in-flight anxiety or aviophobia. This literature review sought to better understand what studies have been previously conducted within the areas of anxiety treatments, flight anxiety treatments, and virtual reality as a tool for treating anxiety. Better

understanding previously conducted studies and academic literature in this topic shed light on areas that are currently well-studied as well as areas that may be unexplored. The literature did show that several significant studies have been performed in the area of virtual reality as a form of pre-flight exposure therapy. Other relevant topics included fear of flying, meditation for aviophobia, and additional varying anxiety treatment methods. This said, no studies could be found that attempted *in-flight* anxiety treatments using virtual reality. This literature review is included below for context and due to the significance of its later impact on the prototype design.

CBT (Cognitive Behavioral Therapy)

A combing of the literature discussing treatment methods for both aviophobia and flight anxiety showed that, of the the treatment methods used, cognitive behavioral therapy (CBT) is the most widely studied and tested. Cognitive behavioral therapy is a method of psychotherapy used to attempt to alter unwanted behavior patterns or remove unwanted thoughts. The literature on CBT showed that it was not only the most studied, but also the most prescribed and widely used method for treating fear of flying. Results of one study showed that, although virtual reality exposure therapy was effective, CBT was still much cheaper and easier to implement (Laboratory for Psychosomatic Disorders, Local Health Trust, Palermo, Italy. Faculty of Human and Social Sciences, University of Enna “Kore”, Enna, Italy. Italian Flight Safety Committee, Aeroporto di Fiumicino, Fiumicino (RM), Italy).

VRET (Virtual Reality Exposure Therapy)

A second, much less studied treatment for flight anxiety and aviophobia was virtual reality exposure therapy (VRET). With VRET, patients are able to experience an immersion into a virtual simulation of whatever their fear may be. Through exposure to their fear, the patient is able to ideally become less fearful or sensitive to it. While exposure therapy is a common treatment for the curing of fears, a component it lacks is the ability to always truly and fully expose the patient to the fear in question. Virtual reality exposure therapy is elaborated further in the paper *Effectiveness of cognitive behavioral therapy integrated with systematic desensitization, cognitive behavioral therapy combined with eye movement desensitization and reprocessing therapy, and cognitive behavioral therapy combined with virtual reality exposure therapy methods in the treatment of flight anxiety: a randomized trial*:

Virtual reality exposure therapy (VRET) provides a controlled environment for people who are exposed to a computer-generated virtual world that simulates a real experience with the feared object or situation. Some experimental studies to examine the efficacy of VRET have found encouraging results in treating anxiety disorders and a wide range of specific phobias, including claustrophobia, acrophobia, agoraphobia, and flying phobia. (Laboratory for Psychosomatic Disorders, Local Health Trust, Palermo, Italy. Faculty of Human and Social Sciences, University of Enna “Kore”, Enna, Italy. Italian Flight Safety Committee, Aeroporto di Fiumicino, Fiumicino (RM), Italy)

Several studies reviewed did find that VRET proved to be a significant treatment method which, at times, beat out other well established methods of aviophobia

treatment. One such study, *Virtual reality exposure therapy in flight anxiety: A quantitative meta-analysis*, outlines the positive results of this treatment:

Results pointed out significant overall efficiency of VRET in-flight anxiety at post-test and follow-up. Analysis highlighted the superiority of VRET vs. control conditions at post-test and follow-up and the superiority of VRET vs. classical evidence-based interventions at post-test and follow-up...The present meta-analysis supports the efficiency of VRET in-flight anxiety and encourages the use of this type of exposure both in clinical practice and research field. (Cardoş et al.)

It is worth mentioning that in the topic of VRET, the aforementioned study calls for a further investigation of the benefits of VRET. The results from studies on VRET suggest that it was very effective in treating anxiety and phobias. However, no studies involving VR attempted to use the technology as a means of treating in-flight anxiety.

Mindfulness Meditation Therapy

The least commonly implemented of the three methods mentioned in this literature review is mindfulness meditation. Mindfulness meditation involves deep breathing and an intense, practice focus on one's surroundings. In *Neural correlates of mindfulness meditation-related anxiety relief*, the authors elaborate further on the subject:

Mindfulness meditation is premised on stabilizing attention, acknowledging discursive sensory events as 'momentary' and 'releasing' them without affective reaction. Training in mindfulness meditation has been found to significantly reduce anxiety in clinical and experimental settings. Mindfulness meditation is

hypothesized to regulate emotions by modifying cognitive and affective evaluations to sensory events by cognitive reappraisal processes...Twenty minutes of mindfulness meditation significantly reduced state anxiety in each session that meditation was practiced. (Zeidan 755)

In this specific study, the participants practiced mindfulness meditation for 20 minutes and saw an immediate reduction in anxiety. This method of anxiety treatment differs significantly from others in that it is an immediate action which leads to an immediate reduction in anxiety. This treatment, and tasks such as deep breathing, may be beneficial in treating sudden and unexpected occurrences of anxiety or fear. Due to the immediate reduction in anxiety caused by mindfulness meditation, it is worth noting that this is an ideal treatment for unanticipated bouts of in-flight anxiety.

Significant Findings in Literature

The three methods of anxiety and fear reduction chosen to be discussed for the purposes of this literature review were a very small sampling of the articles and studies that were reviewed. Of these three methods, CBT (cognitive behavioral therapy) is the most commonly prescribed by professionals and seems to show significant positive results as it relates to the treatment of flight anxiety and aviophobia. CBT is also the cheapest and most easy to implement method. VRET (virtual reality exposure therapy) also proves to be very effective in treating flight anxiety and aviophobia. VRET provides the added benefit of allowing the patient to be fully immersed in the environment they fear, providing effective “exposure.” Studies reviewed using VR have not yet approached methods other than exposure to treat anxiety or fear. Mindfulness

meditation seems to be especially effective in treating the effects of unanticipated, on-the-spot anxiety. Mindfulness meditation is very useful due to its immediate effect on the patient. The most important insight that came out of this literature review is that, although many treatments have been studied for flight anxiety and aviophobia, no treatments have yet been studied that seek to remedy flight anxiety or aviophobia *in-flight* rather than prior to the flight.

The findings of this literature review presented the opportunity to create a VR interface that seeks to alleviate anxiety in-flight using mindfulness meditation along with methods of distraction through immersion. The data gathered in this literature review was crucial in defining the ultimate interface.

METHODOLOGY & WORK PLAN

Research Design

Research design steps were as follows: discovery research, surveys, interviews, and usability testing. The first step in research involved gathering initial quantitative data covering the central topic of flight anxiety and covering peripheral topics of general anxiety, fear, and travel. The goal at this phase in the research was to begin to better understand the problem and passenger pain points at a high level. The insights and data gained at this early stage helped to inform additional steps throughout the research, design, and testing processes. The second step was to conduct interviews with passengers who experience anxiety and airline workers who have experience

comforting passengers with anxiety. Interviews sought to gain qualitative data on the topic. Last, after prototype design, initial usability testing was conducted to evaluate the efficacy of the chosen features and overall UI. The target outcome of this research would be first and foremost to determine the most effective way to use VR in order to reduce general anxiety experienced by airline passengers in-flight.

Surveys

Surveys served as the first step in understanding users and demographic information. Surveys were sent out containing general questions pertaining to anxiety, travel, and demographics. These initial surveys served to achieve multiple goals. First, screener questions helped to filter in interview participants who suffered from the most anxiety of those surveyed. Second, the results of these surveys provided quantitative data to be compiled during the analysis phase. Questions contained within the surveys covered general topics such as when participants had traveled and participants' preferred methods of travel. Questions also asked participants more specific questions such as what aspects of travel caused them the most anxiety, what methods they'd tried to treat their own anxiety, and other feelings they may experience during flight. Participants who experienced the most negative feelings pertaining to air travel were invited to participate in more in depth interviews.

Interviews

Participants filtered in from user surveys and gathered via alternative means were interviewed at this stage in the research process. The participants chosen to be

interviewed were ones which had reported to experience the most anxiety involved with air travel. Questions at this stage dove deeper to hear open ended answers from passengers who were experiencing anxiety during air travel. Examples of some open ended interview questions for participants were “What’s your favorite way to pass the time or distract yourself in-flight?” and “Can you walk me through any methods you’ve tried to mitigate your anxiety?” Users were invited to speak more and expand on their experiences. The data gathered from this stage in the research was majority qualitative, as it was seeking to understand the passengers’ thoughts, fears, desires, and motivations.

At this stage, additional participants relating to the care of the target audience were also interviewed. Participants relating to the care of the target audience include flight attendants and airline workers. These participants were crucial in understanding the current methods for care of passengers experiencing in-flight anxiety. These airline workers’ insights were used to build a more robust, 360° narrative relating to the experience of passengers suffering from in-flight anxiety.

Usability Testing

After results from literature review, surveys, and interviews were conducted and analyzed. An interface was defined and refined into a usable prototype mockup created with the intention of ultimately being deployed for use on the Oculus Quest. 3D assets were created in Cinema 4D and ultimately brought into Unity in preparation for deployment to the Oculus. The features in this prototype included a natural

environment, relaxing spacial audio, mindfulness meditation, and UI elements leading to entertainment options. Users were asked to complete simple tasks to determine overall usability. This early stage of usability testing sought to simply determine whether users understood the product and the functions of its UI. Future usability testing will determine the prototype's effectiveness in reducing anxiety.

Limitations

The majority of the limitations for this chosen study lie within two primary categories: time and lack of resources. First, the study was limited in time to 8 weeks due to the nature of the M.P.S. program. This limited time required that all phases in the research, prototyping, and testing process be optimized and thoroughly planned ahead. This shortened time also meant that extensive usability testing could not yet be performed. Limitations due to the lack of resources also limited the scope of this study. Ideally, with a larger team, a more robust study could be conducted with duties being divided based on expertise. Finally, this study was conducted during an unforeseen global pandemic due to the Corona Virus. During this time, the majority of businesses were closed and persons in the U.S. were advised to stay in their homes. For this reason, all interviews were conducted virtually. Lack of the ability to meet in person also severely limited the ability to usability test this prototype due to it being a VR interface and requiring the user to wear an Oculus Question headset.

RESULTS

Survey Results - Quantitative Data

Surveys (10 questions) covering general questions involving travel, in-flight experience, and anxiety were released and remained public for approximately 7 days. Over the 7 days, 56 persons responded. Significant quantitative findings from these surveys are as follows: 82.1% of respondents reported they had traveled by air in the past year. 50% of respondents reported that, of 4 potential methods of travel, air travel caused them the most anxiety. The majority of participants, 58.9%, reported that takeoff and landing were times when they experienced the most anxiety in-flight. Top 4 activities reported in response to the question “What do you typically do to pass the time during a flight?” were “Watch TV or a Movie”, “Work”, “Sleep”, and “Read.” Top 4 activities reported in response to the question “Have you tried any of these anxiety remedies?” were “Deep Breathing”, “Meditation”, “Mindfulness”, and “Prayer.” 28.6% of respondents reported that they experienced anxiety or anxious thoughts during flights. 10.7% of respondents reported that they experience fear during flight. 37.5% of respondents reported feeling claustrophobia while flying.

Interview Results - Passengers

Survey results were used to screen participants who experienced the most significant in-flight anxiety of respondents. These select respondents (11) were then contacted and invited to share more about their experience with in-flight anxiety by answering 8 open-ended questions. 5 Participants in the passenger group agreed to be interviewed.

Results from passenger interviews are as follows: Participants reported that a major source of anxiety came from their experience prior to flight. Participants reported that if they had been behind schedule or pressed for time, they would be more prone to in-flight anxiety. Additional reported contributors to heightened anxiety included takeoff, landing, and turbulence. Most participants reported their main means for mitigating their own anxiety was through distractions such as reading, sleeping, or watching movies. Other notable methods included deep breathing and ASMR (autonomous sensory meridian response).

Interview Results - Airline Workers

After passenger interviews were conducted, airline workers were contacted to be interviewed for their perspectives. A total of 5 flight attendants were interviewed. Some insights from this group of participants are as follows: A feeling of lack of control is a large perceived contributor to in-flight anxiety. Turbulence is the stage of the flight during which the majority of passengers experience anxiety. Phones and devices are a helpful distraction from anxiety. Engaging the brain in an activity that involves tasks or problem solving can be a very useful method of distraction. One such suggested method mentioned as a means of engaging the mind was meditation.

Initial Usability Test Results

2 participants were invited to test the baseline usability of this interface. The tasks users were asked to complete served the function of determining whether simple way finding and navigation could be completed with ease. Some examples of tasks users

were invited to complete were as follows: “Navigate to the tables”, “Turn 180°”, and “Attempt to grab an object.” Additional questions were asked to gather qualitative data such as “What is your overall impression of the environment.” Users of the interface reported that it was easy to navigate and “fun.” Users were able to navigate the environment with relative ease. Users required some initial instruction to understand the controls of the VR interface. Users reported to appreciate calming visuals of the scene. Further usability testing will attempt to bring in more complex tasks and test additional features that will be added to the prototype.

DISCUSSION

Discussion Overview

The general high-level research questions set out at the beginning of the study helped to prioritize and align goals throughout the process and are as follows:

1. Of the negative emotions passengers experience while flying, which are the most prevalent and/or impactful?
2. What are the current professional methods or treatments used to combat flight anxiety?
3. Have any studies or companies attempted a solution to this issue previously? If so, what have they tried?

Of the negative emotions passengers experience while flying, the most prevalent are anxiety, fear, and claustrophobia. Although these and several other emotions were reported by participants, the most prevalent was general anxiety. Studies have been performed to understand and treat flight anxiety using cognitive behavioral therapy, VR exposure therapy, mindfulness meditation, and several others.

What can be understood from the existing literature is that a gap exists currently in the treatment of unexpected in-flight anxiety that may arise in the moment. While previous studies and treatments approached treating anxiety and fear prior to flight through exposure or CBT, none sought to provide treatments or mitigation methods that could be utilized in-flight. Further, the majority of airlines do not seem to currently have a clear method for assisting in the treatment of passengers experiencing in-flight anxiety. One exception seems to be Virgin Australia, which recently performed a “meditation flight” and has recently incorporated a meditation app into their in-flight entertainment system. (Branson) Understanding this gap in in-flight treatment of anxiety, the prototype sought to fill this gap and give passengers a tool to treat their spur-of-the-moment anxiety, claustrophobia, or fear.

The perspectives from airline workers such as flight attendants helped to fill in the full picture of qualitative data concerning the experience of passengers with flight anxiety. Having this alternative perspective is important due to the considerable experience flight attendants have with treating passengers in the moment they are experiencing in-flight anxiety. After hearing flight anxiety’s causes and treatments from

both the passengers' and the flight attendants' perspective, it was much easier to draw out common factors that would help inform a more educated solution. The key insight drawn from this cross-section of perspectives was that distraction through engagement of the mind was a useful means of anxiety treatment. This insight ultimately guided the decision to include mindfulness meditation and environment exploration as core features of the VR interface.

Potential Stakeholders

It can be determined that there will be two major groups of future stakeholders, should a product be created based on the VR prototype developed in this study. One of these stakeholders will be viewed as the target enterprise customer. Target enterprise customers would be major US airlines that currently provide in-flight entertainment services as they would be the most likely to embrace technological enhancements to in-flight experience. As mentioned, Virgin Australia incorporated a meditation app into their in-flight entertainment and therefore Virgin may be an ideal candidate for the piloting of a VR in-flight anxiety reduction product. The second possible group of stakeholders would be manufacturing partners. Depending on the eventual chosen approach, this could include streaming services, VR headset manufacturers, smart TV manufacturers, or others. It should be mentioned that more stakeholders may present themselves as the product develops. Ideally, several Oculus headsets could be kept in the airplane cabin in case of occurrences of in-flight anxiety. Should a passenger report to a flight attendant that they are experiencing unexpected anxiety mid-flight, the flight attendant would then offer the VR headset as a means of treatment.

Risks

Due to the siloed and antiquated systems that the airline industry currently operates under, a proposed solution would face many potential hurdles. Furthermore, constraints would also be faced in working with manufacturers to negotiate bulk enterprise orders. However, if an argument can be made for cost savings and improved passenger experience, this hurdle can certainly be overcome. Additionally, some risks could include safety risks involved with the addition of technology in airplanes. As we saw with the Boeing 737 Max tragedies, the addition of new technology can sometimes lead to unexpected bugs and complications. While bugs and complications are standard, in a setting such as an aircraft they can lead to dangerous and even deadly situations.

CONCLUSIONS & RECOMMENDATIONS

As mentioned in the introduction to this study, as many as 25% of US passengers experience some sort of nervousness about flying (Seaney). Considering the 1 billion US passengers in 2018, a solution to this in-flight anxiety problem could mean a reduction in anxiety for as many as 250 million passengers a year (United States Department of Transportation).

As stated in the findings above, many studies have been performed to understand treatment of flight anxiety prior to travel. However, no studies could be located that sought to understand treatment for unexpected in-flight anxiety. Further,

no studies sought to treat in-flight anxiety using VR. Insights gained from flight anxiety sufferers and airline workers suggest that a VR interface would likely provide an enormous benefit to passengers experiencing unexpected in-flight anxiety. Due to the limited scope of this study, it can be recommended that much more extensive research and usability testing be performed to better understand what core features would best serve to reduce passengers' in-flight anxiety. Based on the results from research, it can be recommended that core features of an anxiety-reduction VR interface include mindfulness meditation, calming visuals, therapeutic audio, and entertainment options. Lastly, it can be recommended that, in future studies, usability tests be performed in real-world settings to understand the efficacy and limitations of an anxiety-reduction based VR interface.

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APPENDICES

8 Week Timeline		
Week	Task	Description
Week 1:	Discovery Research.	Gather initial secondary data. Get a feel for some of the needs within the category. Perform general competitive analysis to find out what others are doing within this topic.

8 Week Timeline		
Week	Task	Description
Week 2:	Research Plan.	Formulate a plan to begin researching users and stakeholders. This may involve writing research questions, formulating surveys, and determining user demographics to target.
Week 3:	Continue Research Plan.	Write surveys and user interviews and begin the research process. This will start with sending out surveys to screen and gather quantitative data and move into interviews to gather qualitative data.
Week 4:	Begin User Research and Literature Review.	Begin sending out user surveys and recruiter user interview participants. Determine user compensation. Review literature on the topic of anxiety in air travel and peripheral topics.
Week 5:	Continue User Research. Finish Literature Review.	Continue user interviews and interviews with airline workers. Begin data analysis. Writeup findings from literature review.

8 Week Timeline		
Week	Task	Description
Week 6:	Wrap up user research. Begin Analysis.	Wrap up interviews with passengers and airline workers. Begin to draw out findings from notes and answers.
Week 7:	Finish Analysis. Begin Prototyping.	Finish drawing out results from research. Sketch and storyboard to define potential features and begin designing in 3D.
Week 8:	Continue Prototyping. Begin Usability Testing.	Continue prototyping interfaces in Unity and begin testing Oculus interfaces on target users. Refine based on testing.

Survey Questions

Quantitative Data

1. Have you traveled by air in the past year?
2. When was your most recent flight?
3. Of these methods of travel, which would you say causes you the most stress and/or anxiety?
4. Of the stages involved in air travel, which would you say is the greatest cause of anxiety?
5. What do you typically do to pass the time during a flight? (Select all that apply)

6. Do you experience any sort of anxiety or anxious thoughts during flights?
7. Are there any steps you've taken to treat or remedy anxiety?
8. Have you tried any of these anxiety remedies? (Select all that apply)
9. Would you say you suffer from any sort of fear involved with flying?
10. Have you ever experienced a feeling of claustrophobia while flying?

Interview Questions

Qualitative Data

Passenger Anxiety Questions

1. Can you walk me through a flight where you experienced anxiety?
2. What do you think contributes most to your flight anxiety?
3. What's your favorite way to pass the time or distract yourself in-flight?
4. Can you walk me through any methods you've tried to mitigate your anxiety?
5. Have you ever tried meditation of any kind?
6. (If yes) What was the effect of this meditation, if any?
7. If you had a magic wand, what would you change about the in-flight experience?
8. Is there anything else you'd like me to know?

Flight Attendant Questions

1. Was there ever a time you comforted a passenger with anxiety?
2. (If yes) Can you walk me through how you dealt with the situation?
3. In your view, what contributes most to flight anxiety?
4. When during a flight do passengers typically experience the greatest anxiety?

5. In your view, what would you say is the best way to mitigate or treat flight anxiety?
6. If you had a magic wand, what would you change about the in-flight experience?
7. Is there anything else you'd like me to know?