

Rochester Institute of Technology

## RIT Digital Institutional Repository

---

Theses

---

5-11-2021

### Design for Wearable Panic Aid Device

Allison Treacy  
adt8831@rit.edu

Follow this and additional works at: <https://repository.rit.edu/theses>

---

#### Recommended Citation

Treacy, Allison, "Design for Wearable Panic Aid Device" (2021). Thesis. Rochester Institute of Technology. Accessed from

This Thesis is brought to you for free and open access by the RIT Libraries. For more information, please contact [repository@rit.edu](mailto:repository@rit.edu).



## **Design for Wearable Panic Aid Device**

by

Allison Treacy

A Thesis submitted in partial fulfillment of the requirements  
for the Degree of Master of Fine arts in Industrial Design

Department of Industrial Design  
College of Art and Design

Rochester Institute of Technology

Rochester, NY

May 11th, 2021

**Committee Approval:**

---

Signature of Alex Lobos  
Graduate Director and Professor of Industrial Design

---

Date of Approval

---

Signature of Lorraine Justice  
Dean Emeritus and Professor of Industrial Design

---

Date of Approval

\*See signature page attached

# Design for Wearable Panic Aid Device

Thesis Advisors: Alex Lobos + Lorraine Justice

Allison Treacy

---

## Abstract:

Research shows that millions of people in the United States suffer from panic disorder and/or regular panic attacks each year. On average, women are twice as likely to suffer from panic attacks and anxiety than men are. Panic attacks can be frightening, intense, and uncontrollable, and the current solutions for panic attacks often involve extensive Cognitive Behavioral Therapy or long-term medication. The market lacks discreet and tangible products that help diminish the symptoms of a panic attack, once it has already begun. By using an external wearable device, the user can quickly access the help they need to regain control over their symptoms. The relationship between the user and the device fosters a safe and comfortable solution for someone suffering from panic attacks. This article will discuss the extensive process of research, design and prototyping done to create a product that helps women feel more confident about their panic on a daily basis. The main component of this design focuses on small vibration motors that are set into modular necklaces to help return breathing patterns back to a normal and calm state. This device provides a discreet and unique way to comfortably take control of panic, which is an important step in regulating the daily symptoms of anxiety, and can help the women who are suffering from panic attacks feel more prepared for when panic strikes.

**Keywords:** Panic Attacks, Vibration Therapy, Anxiety Attacks, Necklace for Anxiety

## **Introduction:**

Anxiety disorders are the most common mental illness in America and women are twice as likely to experience an anxiety disorder than men are.<sup>1</sup> In today's day and age there are countless things that can cause someone to develop an anxiety disorder, and to have panic attacks. This topic is important to me, because I have experienced panic attacks myself, and have not yet found a device that can help me to quickly and safely calm down after the panic attack has already begun. Through many interviews, I realized that most people also experiencing panic attacks feel similarly about the lack of products on the market today. With the onset of the COVID-19 pandemic, it has become even more relevant to study, research and design around anxiety and panic attacks because cases are increasing across the nation. Those who have never experienced something as intense as a panic attack, are faced for the first time with suffering through one, and not knowing how to help themselves.

The device I designed is specifically created for women to discreetly diminish a panic attack in any setting. There are many serious contributors to why a device for women with anxiety is so relevant today, and will be long into the future. Contributors like America's recent anti-feminist political climate, financial inequities between men and women, and the general societal hurdles that prevent women from easily accomplishing the same things as men.

My design process has been long and rigorous. I have gone through countless ideas, prototypes, and testing phases before finding a way to successfully accomplish my design goals. Throughout this article, I will discuss in detail my full design process through ideation, research, interviews, prototypes, and user testing. My final concept demonstrates a design that can make an impact on anxiety for the millions of women who experience it each year. This article will prove that the design process I took over the course of eight months is substantial, well thought-out, and positively contributes to bettering the lives of women who suffer through panic attacks and anxiety.

---

<sup>1</sup> Christiansen, Dorte M. "Examining Sex and Gender Differences in Anxiety Disorders." In Tech Open. Last modified September 9, 2015. Accessed April 19, 2021. <https://www.intechopen.com/books/a-fresh-look-at-anxiety-disorders/examining-sex-and-gender-differences-in-anxiety-disorders>.

## Initial Research and Insights:

My research process focused mostly on why women experience anxiety twice as much as men, and the symptoms and solutions for panic attacks. The rate at which panic disorder afflicts younger women is twice the amount as it is for men the same age. As women and men get older, the presence of panic between both genders tends to drop overall. However the gap between men and women grows larger, with women experiencing almost three times as much anxiety as men.<sup>2</sup> Women are also more likely to experience a more debilitating and/or frequent onset of panic attacks than men are.<sup>3</sup> While women have many different stressors contributing to different levels of anxiety, hormones also play a substantial role in the differentiation of anxiety between the genders. Below is a chart that demonstrates how hormones contribute to anxiety for women throughout their lives, beginning at childhood until menopause.

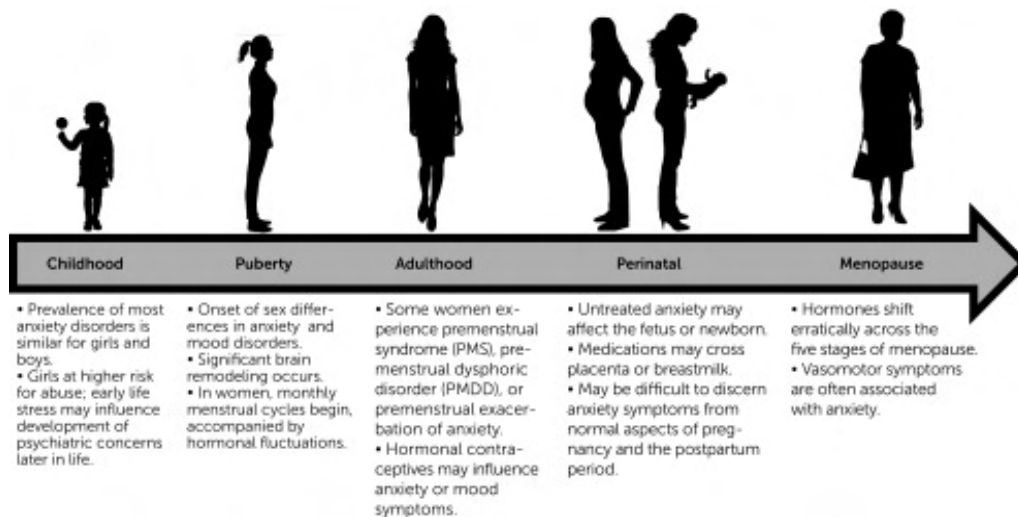


Figure 1 - Chart of hormonal stages that influence anxiety throughout a woman's life<sup>4</sup>

Research findings like this only solidified the relevance of designing for women to help combat panic attacks. Not only are women subject to "social" gender bias' and stressors, but also hormones add to the uncontrollable contributors to panic and anxiety.

<sup>2</sup> Leskin, Gregory A., Javaid I. Sheikh, and Donald F. Klein. "Gender Differences in Panic Disorder: Findings from the National Comorbidity Survey." *Psychiatry Online*. Last modified January 2002. Accessed April 19, 2021. <https://ajp.psychiatryonline.org/doi/pdf/10.1176/appi.ajp.159.1.55>.

<sup>3</sup> Leskin, Gregory A., and Javaid I. Sheikh. "Gender Differences in Panic Disorder." *Psychiatric Times*. Last modified January 1, 2004. Accessed April 19, 2021. <https://www.psychiatrictimes.com/view/gender-differences-panic-disorder>.  
Volume 21, Issue 1

<sup>4</sup> Hantsoo, Liisa, and C. Neill Epperson. "Anxiety Disorders among Women: A Female Lifespan Approach." *The National Center for Biotechnology Information*. Last modified April 6, 2017. Accessed April 19, 2021. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5613977/>.

As I continued my research, I wanted to understand what the main symptoms experienced during panic attacks included. I found that the list of symptoms remained relatively consistent no matter where I looked. Things like a racing heart, sweating or chills, trembling, weakness, muscle tension, dizziness, breathing problems, chest pain, stomach pain and nausea are all common panic attack symptoms. Another symptom that stood out to me was fear of when the next panic attack would happen.<sup>5</sup> That was something I was determined to help allay. I wanted my device to help someone to feel like no matter what, they would be able to take on the panic attacks, and feel less anxiety about when the next attack might occur.

As I moved forward from research to interviews I was able to start narrowing down which symptoms my device would tackle. I spoke to a handful of different women all who suffer from some level of anxiety, and have before, and/or consistently suffer from panic attacks. The most common thread between the symptoms was difficulty breathing, and it became clear to me very early on that the device would primarily target the regulation of deep breathing. The science behind this is very simple, deep breathing compared to shallow breathing helps every aspect of your body reach a calmer state. This can be seen in the comparison diagram below.

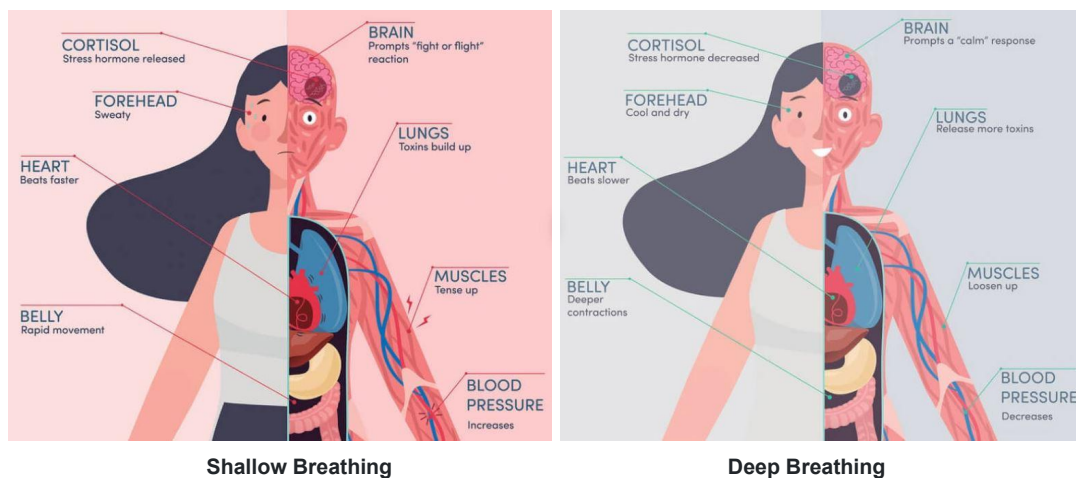


Figure 2 - Diagram of a body when practicing shallow and deep breathing techniques<sup>6</sup>

Studies have shown that deep breathing practices are an effective way to achieve emotional enhancement such as stress and anxiety relief, without the use of pharmacological involvement.

<sup>5</sup> US Department of Health and Human Services. "Panic Disorder: When Fear Overwhelms." National Institute of Mental Health. Last modified 2016. Accessed April 19, 2021. <https://www.nimh.nih.gov/health/publications/panic-disorder-when-fear-overwhelms/index.shtml#pub5>.

<sup>6</sup> Komuso. Accessed April 19, 2021. <https://www.komusodesign.com/pages/how-it-works>.

Diaphragmatic breathing or deep breathing helps maximize the body's natural blood and oxygen flow.<sup>7</sup> In other words, shallow breathing can restrict the oxygen from reaching the brain, prompting intense negative bodily reactions. During the intense moments of a panic attack, it can be difficult to remember how to regulate breathing when the mind is racing and all senses are firing. From my extensive research, I was determined to design a wearable haptic device that physically reminds the user how to practice and maintain healthy diaphragmatic breathing during a panic attack.

### **User Needs:**

Stereotypical gender roles are a large contributor to daily stress for women. While the presence of feminism is rising, dismantling preconceived notions of traditional gender roles can complicate the ease by which women are able to accomplish the same things as men. The expectation to start families, the desire to work, and most prominently the general expectation to uphold appearances in society all cause daily stress and panic. I took a lot of insight from the pressure on women to uphold appearances. This can be related directly to anxiety, because oftentimes women are categorized as “too emotional” and giving off the impression that they have an anxiety disorder could cause them to be viewed differently, therefore perpetuating the cycle of panic. This made me realize that one of the most important needs for my device was discretion. From my discoveries throughout the research process, I decided that a wearable device would be most discrete. A wearable device could be available at all times, and there would be less opportunity for the user to forget it, or draw attention to themselves when pulling it out of a pocket or a bag.

---

<sup>7</sup> Ma, Xiao, Zi-Qi Yue, Zhu-Qing Gong, Hong Zhang, Nai-Yue Duan, Yu-Tong Shi, Gao-Xia Wei, and You-Fa Li. "The Effect of Diaphragmatic Breathing on Attention, Negative Affect and Stress in Healthy Adults." National Institute of Mental Health. Last modified June 6, 2017. Accessed April 19, 2021. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5455070/>.



## Competitive Products:



Figure 3 - The Shift Necklace by Komuso Design<sup>8</sup> Figure 4 - Natural Wood and Water Anti-Anxiety Necklace<sup>9</sup>

Product designers and medical professionals alike have certainly taken notice of the increased importance in regulating anxiety and panic attacks. While medical professionals are more likely to offer a medication or recommend therapeutic treatments, designers are using the science behind stress reduction techniques to design external devices that offer a different kind of treatment. Above are two products closely related to the outcome I reached with my final prototype.

The Shift necklace seen in *figure 3* functions by being brought to the mouth to regulate breathing.<sup>10</sup> While they have designed a fashionable device to combat stress and panic, it becomes noticeable as the user pulls it up to their mouth to breathe through it. Oftentimes, during a panic attack, drawing attention to your distress can perpetuate it further. I took this into consideration in my design process that my product needed to provide a more subtle haptic reaction to help regulate breathing. This propelled my ideation into creating a fashionable piece that still relies on external haptics as the primary source of relief.

The product in *figure 4* caught my attention with its unique and beautiful appearance. This necklace, marketed as an anti-anxiety device, is made from wood and “water” (resin). It relies on its

---

<sup>8</sup> Komuso. Accessed April 19, 2021. <https://www.komusodesign.com/pages/how-it-works>.

<sup>9</sup> "Natural Wood and Water Anti-Anxiety Necklace." Fortune Houses. Accessed April 19, 2021. <https://www.fortunehouses.com/products/natural-wood-and-water-anti-anxiety-necklace>.

<sup>10</sup> Komuso. Accessed April 19, 2021. <https://www.komusodesign.com/pages/how-it-works>.

calming aura to combat anxiety, claiming to mimic the peace we feel when staring at the ocean or walking in the woods.<sup>11</sup> While I was drawn to the attractiveness of the necklace, as I read more, I quickly realized that there is no science behind its function. Through my research, I had come to understand that most people suffering from a panic disorder cannot only rely on a spiritual mindset or a calming aura to help them through a panic attack. After gaining insights into the current products offered for panic attacks, I sought a way to challenge them and create something with both physical elements supported by research and science to diminish panic, and unique beauty that masks the true function behind the device. This was a gap in the market I was determined to fill.

**Early Concepts:**



Figure 5 - 3D printed form studies



Figure 6 - Wearable chest-piece that holds vibrations from a cell phone up to the chest

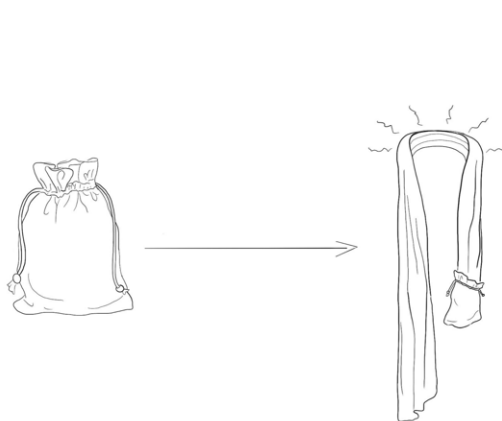


Figure 7 - Design for a portable scarf with calming vibrations

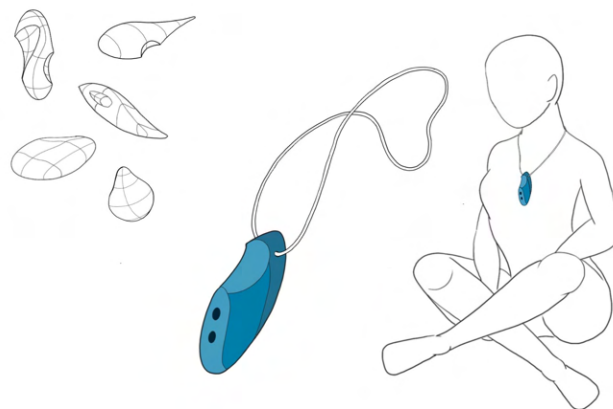


Figure 8 - First concept for a vibration necklace to help regulate diaphragmatic breathing

<sup>11</sup> "Natural Wood and Water Anti-Anxiety Necklace." Fortune Houses. Accessed April 19, 2021. <https://www.fortunehouses.com/products/natural-wood-and-water-anti-anxiety-necklace>.

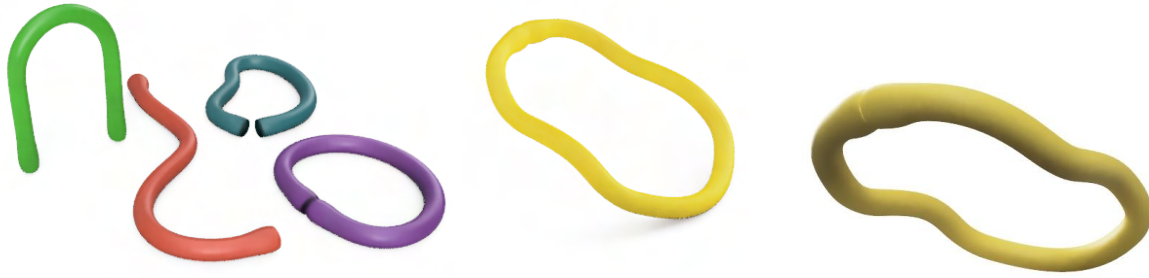


Figure 9 - Fusion360 renderings of a full silicone necklace with calming vibrations

There was significant ideation prior to determining that a vibrating element would be used in the final device. In the beginning of this design process, I focused a lot on the different shapes and forms that my device could take (*figure 5*), and then started to speculate on which haptics would be most effective. Throughout my many interviews, I decided to move forward with vibrations as opposed to light, sound or smell. I spent a lot of time thinking about what type of appearance would be tactile, discreet, and calming. While I had not yet narrowed down whether I wanted it to be made with soft or hard materials, I knew I wanted it to lay on the chest. This would support the research and testing that determined the comfortable places on the body that people would enjoy having a light vibration setting. It also made sense for the vibration to lay along the path of the breath, because that is what the vibration motors are designed to assist with: regulated breathing.

Initial ideas seen in *figures 6 and 7* demonstrate how the vibration motors could be incorporated into a soft wearable device like a scarf or chest piece. I ran into complications with testing however, because it was difficult to keep the vibration motors in place using fabric, because it's natural soft and flowing characteristics move very easily. As I went back to the drawing board, I began researching women's sex toys that vibrate which are often made from molded silicone. Silicone is a great material that can be both soft and malleable, as well as structured. After deciding I wanted to use vibration motors encased in silicone, *figure 8* was my first idea. However, after feedback from continued interviews, I needed to ideate on concepts that did not resemble a female sex toy at all. I took a dramatic shift from *figure 8* and started some form studies which led me to *figure 9*.

## User Testing:

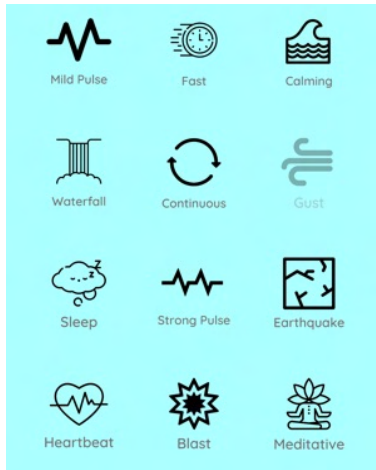


Figure 10 - Vibration patterns on iVibrate | Figure 11 - Silicone necklace prototype | Figure 12 - Silicone necklace prototype

For my user testing, I moved forward with the concept seen in *figure 9*. The design was simple and fairly easy to implement. I wanted to create a silicone “ring” to be worn as a necklace. I 3Dprinted a mold, poured the silicone, and embedded five vibration motors throughout. Using cell batteries, I was able to manually turn the vibration motors on and take notes on how the use of vibration was influencing the anxiety of the wearer. User testing was an incredible turning point for my design, because the feedback was not at all what I had expected it to be.

In early user testing to determine if vibration could help diminish the symptoms of a panic attack, I used an app called *iVibrate* (*Figure 10*). It helped me to research which types of vibration patterns were effective in calming the user. After the user testing with my prototype seen in *figures 11 and 12*, I moved away from the necessity to create a functioning vibration pattern, and realized that the implementation of the vibration could be conceptual, and that the appearance of the device was the most important element to focus on. My feedback from using the *iVibrate* app showed that most people were calmed by at least one vibration pattern held to their chest. The feedback from testing my prototype was that a continual vibration with no pattern was distracting and intense for most people. The testing prototype was too focused on the actual vibration, which had already been proven to work when the vibrations moved in different programmed patterns via *iVibrate*. I shifted my attention to the visual beauty, comfort and wearability of the device.

**Concept Evolution:**



Figure 13 - Classic Chakra stones

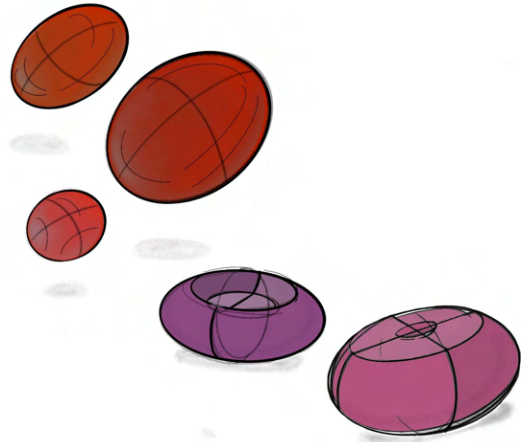


Figure 14 - Drawing of my interpretation of Chakra stones to be made from silicone

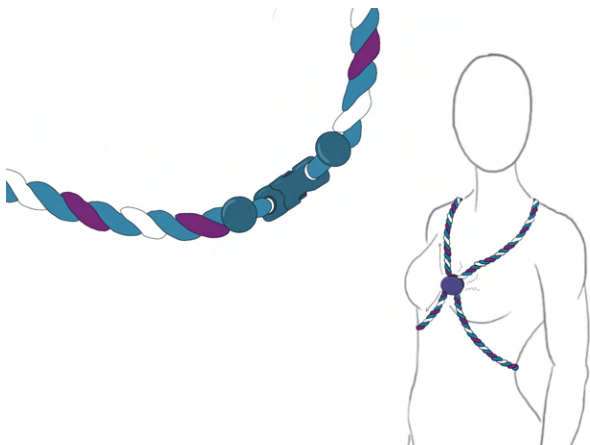


Figure 15 - "Sporty" vibration necklace

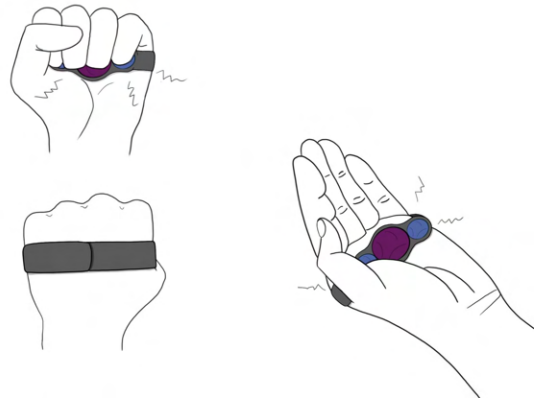


Figure 16 - Handheld vibration device

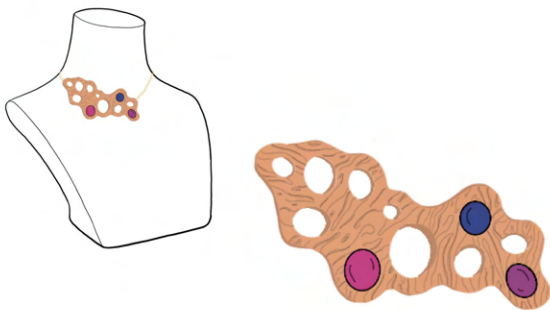


Figure 17 - Wooden necklace with vibration stones

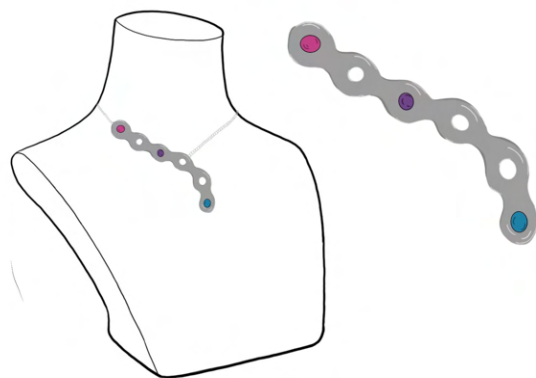


Figure 18 - Metal necklace with vibration stones

After accepting that my model could be a “looks-like” and less of a “works-like” model, I was able to let my creativity take over, and think of the most effective way to discreetly help women with panic attacks on a daily basis. No longer defined by the functionality of the vibration elements, I started to look at my project as jewelry design. I was drawn back to the necklace seen in *figure 4* and thought about how people use spiritual “vibrations” to change their mood. While I did not want to discard the use of actual vibration motors, I went into ideating on how they could be disguised as spiritual “vibrations.” I drew inspiration from a traditional set of chakra stones (*figure 13*) used for spiritual healing. *Figure 14* represents my interpretation of what a chakra “stone” might look like cast in silicone, encasing the programmable vibration motors. At this stage in the process, my design was really starting to come together, and I began figuring out how to incorporate my silicone “stones” into the jewelry pieces.

This new concept brought me back to my user needs as I once again thought about the things women suffering from panic attacks need throughout their day. First came my concept for a “sporty” wearable piece, seen in *figure 15*, that would allow the wearer to have maximum mobility while still being able to depend on the device to stay in place and provide the services intended. Some people gave me feedback about exploring a handheld version, and my ideation for that can be seen in *figure 16*. While both a handheld and sporty version of my design did not make it to prototyping, I hope to circle back to them for future experimentation.

*Figures 17 and 18* most closely resemble my final concept while it was still in the prototyping phase. This was where the most important elements came to the surface. I thought about beauty, modularity, functionality, and uniqueness. The most important contributor to these factors were the different materials the necklaces would be made out of; wood, metal, plastic, full silicone, etc. Then I thought, why not all of them? What better to contribute to the uniqueness and modularity than to offer an anxiety necklace in many different materials, shapes, and sizes. This stage of ideation ultimately led me to a final concept that best supported my user needs.

**Final Concept:**



*Figure 19 - Final prototypes for three anti-anxiety necklaces with silicone vibration "stones"*



*Figure 20 - Wooden anti-anxiety necklace prototype*



*Figure 21 - Metal anti-anxiety necklace prototype*

My final design concept is unique, beautiful and functional. Each anxiety necklace provides a discreet way to diminish the symptoms of a panic attack while allowing women to go about their daily tasks, and to look great while doing it! The main component of this design focuses on small vibration motors that are set into the main necklace frame to help return breathing patterns back to a normal state. The vibration motors are the multicolored circular pieces seen in *figures 19, 20, and 21*. They are inserted into the various holes of necklace pieces. The motors are encased in silicone to protect them, to properly absorb and disperse the vibrations, and to conceal them in a way that allows for design modularity and custom modifications. Once each silicone “stone” is placed into the necklace they automatically sync to one another, allowing the user to turn them on and off together, and allowing the vibration patterns to move simultaneously. They are turned on manually when a panic attack is beginning. I did some research into the potential for bio haptic feedback sensors that would automatically turn them on for the user when their heart rate increased. However the feedback I received resulted in a resounding desire for it to be turned on and off manually, because of the possibility for an uncontrolled vibration to cause more anxiety for the wearer.

The main necklace frame allowed me to do some fun experimentation with shapes, orientation and materials. I ended with three different frame designs; one in plastic, printed on the 3D printer, one in wood, cut with the laser cutter, and one copper plated piece formed in an electroplating bath. The possibilities don't end there, I am confident that there is a material and orientation for every wearer, that can be tailored to their specific needs and style. Everything is customizable, the necklace frame, the stone color and the placement of the stones can all change each day! In the next few sections I discuss in further detail the interactions between the product and the wearer, and the technology behind how it all comes together.



## Wearer's Interaction:



*Figure 22 - Example of a user scenario of picking out a vibration stone from the box and placing it in the necklace frame*

My anxiety necklaces involve a lot of interaction by the wearer. The customizability makes this product incredibly intimate. Seen above in *figure 22* is an example of “creating” the necklace that the user needs on any given day. The wearer would choose from their box of six stones, and decide how many they need, the placement of the stones, and the colors they feel like wearing that day. The user would only need to have one necklace frame, and a selection of stones in any colors they choose, and they can create a new necklace each day from the one “kit.”

## Function Overview:



Figure 23 - Exploded view of the silicone vibration stone and internal components

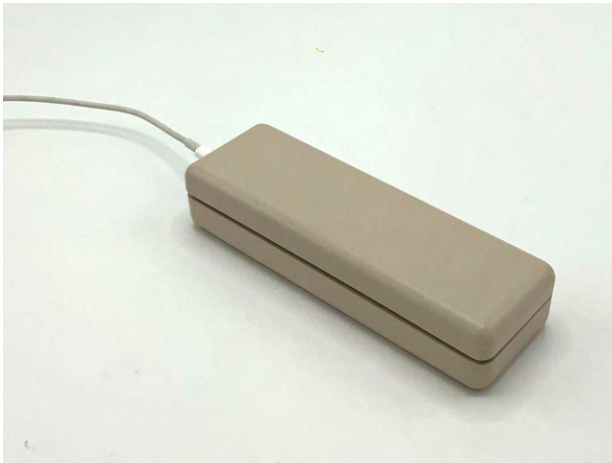


Figure 24 - Closed box that holds silicone stones



Figure 25 - Open box that holds silicone stones

The internal elements of the silicone stones can be seen in *figure 23*. Each stone contains a vibration motor, a power source and a programming panel so that they can sync up to one another, and can move in the different predetermined patterns (calming patterns from *iVibrate* based on feedback from the user testing phase). They would be molded into the silicone all in one piece so that there is no opportunity for the stones to fall apart, or for pieces to go missing. As mentioned previously, when you place each stone into the necklace form, they will sync to one another so that the vibration pattern designed to help with regulating your diaphragmatic breathing will work in unison. The box that the silicone stones are kept in doubles as the charging station for the batteries within the stones (*figures 24*

*and 25*). I wanted to design this case to look like a traditional jewelry box that also has additional functionality. It allows the user to carry it with them if they need to change the stone arrangement and/or quantity throughout the day based on their symptoms of panic.

### **Explanation of Future Experimentation and Concluding Remarks:**

As stated above when referring to *figures 15 and 16*, there are a lot of ways I'd like to expand on my panic aid device even further. I would like to design different units that can contain the standard silicone vibration "stones" that are adaptable to any activity the wearer may be participating in. Whether it is exercising, working, driving, or anything else, I want there to be a wearable unit available for whenever and wherever panic attacks may occur. Something that I have really enjoyed about showing people my final concept is the reaction of excitement for the possibilities it holds. People immediately understand that it is customizable and can be adapted to anyone's individual needs, tastes, and preferences. That has given me a lot of ideas and inspiration for future development. I am also interested in creating a version that is more genderless. While women experience anxiety twice as much as men, I have still received interest from people for a more masculine or a unisex design that could accomplish the same type of discreet panic aid. I intend to further my development with this concept, and look forward to future outcomes and opportunities.

In closing, this project has taught me a lot. To intensively study, research and design for a topic like panic attacks has helped me become a more human centered designer. Through research, prototyping, and testing, I have come to a viable solution to the problem at hand. By helping to discreetly regulate diaphragmatic breathing, my anxiety necklaces with silicone vibration motors are an effective way to safely reduce the symptoms of panic attacks for women. The impact that this product will have on women who suffer from panic attacks is substantial. The current market does not offer something like this, and therefore I felt it was my obligation as a woman, a panic attack survivor, and an industrial designer to fill this gap in the market.

## References

- ADAA. "Symptoms: Panic Disorder." Anxiety and Depression Association of America. Accessed April 19, 2021. <https://adaa.org/understanding-anxiety/panic-disorder-agoraphobia/symptoms>.
- Bourne, Edmund J. *The Anxiety and Phobia Workbook*. Oakland, CA: New Harbinger Publications, 2020.
- Christiansen, Dorte M. "Examining Sex and Gender Differences in Anxiety Disorders." In Tech Open. Last modified September 9, 2015. Accessed April 19, 2021. <https://www.intechopen.com/books/a-fresh-look-at-anxiety-disorders/examining-sex-and-gender-differences-in-anxiety-disorders>.
- Hantsoo, Liisa, and C. Neill Epperson. "Anxiety Disorders among Women: A Female Lifespan Approach." The National Center for Biotechnology Information. Last modified April 6, 2017. Accessed April 19, 2021. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5613977/>.
- Leskin, Gregory A., and Javaid I. Sheikh. "Gender Differences in Panic Disorder." *Psychiatric Times*. Last modified January 1, 2004. Accessed April 19, 2021. <https://www.psychiatristimes.com/view/gender-differences-panic-disorder>.  
Volume 21, Issue 1
- Leskin, Gregory A., Javaid I. Sheikh, and Donald F. Klein. "Gender Differences in Panic Disorder: Findings from the National Comorbidity Survey." *Psychiatry Online*. Last modified January 2002. Accessed April 19, 2021. <https://ajp.psychiatryonline.org/doi/pdf/10.1176/appi.ajp.159.1.55>.
- Ma, Xiao, Zi-Qi Yue, Zhu-Qing Gong, Hong Zhang, Nai-Yue Duan, Yu-Tong Shi, Gao-Xia Wei, and You-Fa Li. "The Effect of Diaphragmatic Breathing on Attention, Negative Affect and Stress in Healthy Adults." National Institute of Mental Health. Last modified June 6, 2017. Accessed April 19, 2021. <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5455070/>.
- Nardi, Antonio Egidio, and Rafael Christophe R Freire. *Panic Disorder: Neurobiological and Treatment Aspects*. Cham: Springer International Publishing, 2016. Digital file.
- US Department of Health and Human Services. "Panic Disorder: When Fear Overwhelms." National Institute of Mental Health. Last modified 2016. Accessed April 19, 2021. <https://www.nimh.nih.gov/health/publications/panic-disorder-when-fear-overwhelms/index.shtml#pub5>.