

Design for Wellbeing: Generative Visual Music for Anxiety Reduction

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Abstract

In societies where productivity is prioritized over presence, anxiety abounds. The extensive and alarming effects of anxiety on the mental and physiological wellbeing of bachelor students inspired a cross-disciplinary team to tackle this problem. Using combined expertise in visual design, music technology, psychology, art therapy and mindfulness — a digital tool entitled “Modes” was born. The Modes digital tool is an atmospheric, introspective, and aesthetically sophisticated engagement of three senses: ophthamoception (sight), audioception (hearing), and tactioception (touch). Through immersive interaction, mesmerizing visual and sound landscapes are generated in order to reduce anxiety in bachelor students. The two measurable outcomes of Modes are 1) the reduction of self-reported anxiety in bachelor students, and 2) the reduction of bachelor student heart rates.

Interacting with the Modes digital tool is like playing in a sandbox of dynamic visuals and music. Users begin by selecting and entering one of three digital environments entitled *Refocus*, *Chill*, or *Energize*. Each environment (or *mode*) offers a unique set of visuals and music designed specifically for anxiety reduction. The design and functionality of Modes are rooted in tenets of mindfulness practice and Ayurveda — an ancient Indian healing system emphasizing inner balance as a method for maintaining health and wellness (Kiefer, 2016). The *Refocus*, *Chill*, and *Energize* modes aim to balance each of three governing principle of Ayurveda that regulate physiological activity. Ultimately, users may combat and control their anxiety in three targeted ways: by refocusing, chilling, or energizing.

Keywords: wellbeing, visualization, interaction, motion, sound, cross-disciplinary

In societies where productivity is prioritized over presence, anxiety abounds. The extensive and alarming effects of anxiety on the mental and physiological wellbeing of bachelor students inspired a cross-disciplinary team to tackle this problem. Using combined expertise in visual design, music technology, psychology, art therapy, and mindfulness — a digital tool entitled “Modes” was born. The “Modes” digital tool is an atmospheric, introspective, and aesthetically sophisticated engagement of three senses: ophthamoception (sight), audioception (hearing), and tactioception (touch). Through immersive interaction, mesmerizing visual and music landscapes are generated in order to reduce anxiety in bachelor students. The two measurable outcomes of “Modes” are 1) the reduction of self-reported anxiety in bachelor students, and 2) the reduction of bachelor student heart rates. The design and functionality of Modes are rooted in tenets of mindfulness practice and

Ayurveda — an ancient Indian healing system emphasizing inner balance as a method for maintaining health and wellness (Kiefer, 2016).

Literature Review

Mindfulness Practice Ameliorating Stress

A recent scientific study completed by individuals at the Bender Institute of Neuroimaging, Justus Liebig-University in Giessen, Germany, Massachusetts General Hospital, Harvard Medical School, and Brigham and Women's Hospital (Harvard Medical School) concluded that the “cultivation of mindfulness, the nonjudgmental awareness of experiences in the present moment, produces beneficial effects on well-being and ameliorates psychiatric and stress-related symptoms” (Hölzel, Lazar, Gard, Schuman-Olivier, Vago, & Ulrich, 2011). This research (entitled “How Does Mindfulness Meditation Work? Proposing Mechanisms of Action From a Conceptual and Neural Perspective”) presents evidence that mindfulness practice is associated with neuroplastic changes in several areas of the brain. This research reinforces the hypothesis that a *multisensory* interpretation of mindfulness practice via the digital tool will produce similar effects in Modes users.

Heart Rate Impacted by Mindfulness Practice

Studies also show mindfulness impacts health and heart rate. The studies of Krygier (2013) conclude that the practice of mindfulness directly contributes to heart rate variability and a positive increase in health. A documented study from the article “Mindfulness Meditation, Well-being, and Heart Rate Variability” proved that “participants improved significantly on all positive psychometric measures of psychological health and well-being, including positive affect, satisfaction with life and mindfulness (Krygier, 2013, p.308).” The overall goal of this study explored the impact on mindfulness and the effects on participants' health while researching cardiovascular data. “The Effect of Mindfulness on Heart Rate Control,” was “an experiment conducted to test the hypothesis that mindful attention to change regarding heart rate (HR) would result in greater control over HR (Delizonna, 2009, p.64).” This study provided “supportive data for mindfulness as a working strategy for emotion regulation, mindfulness as a conduit for improved health, and mindfulness requiring a switch in general cognition to making novel distinctions (Delizonna, 2009, p.65).”

Ayurveda for Health and Wellness

Medical studies consistently link psychological disorders such as anxiety and depression with physical wellbeing (Remington, & Brownson, 2011). The balance of mind and body is of fundamental importance in maintaining “complete health” in Ayurveda. Further, understanding the tenets of this ancient Indian healing system gives clues into the early development of many illnesses (Hankey 2005). Morningstar (2008) states, “Ayurveda provides a guide to lifestyle and ways of healthy living appropriately individualized for each person. Thus, “that which tends to go out of balance easily can be returned to homeostasis through meditation, breathing exercises, yoga, diet, sleep, music, and/or nature.”

Research Methods

The two measurable outcomes of Modes are 1) the reduction of self-reported anxiety in bachelor students, and 2) the reduction of bachelor student heart rates. The research study design for Modes address both of these outcomes. First, participants will complete a consent form and a demographic questionnaire. They will then complete the self-report State-Trait Anxiety Inventory (at Time 1); these are physical papers that will be collected. The State-Trait Anxiety Inventory includes items such as “I am tense; I am worried” (Spielberger ,Gorsuch, Lushene, Vagg, & Jacobs, 1983). Each item is rated on a 4-point scale (Almost Always to Almost Never). In addition to the State-Trait Anxiety Inventory, participants’ baseline heart rates will be measured using HeartMath equipment (at Time 1); these will be digital data recorded within software. Once these two measurements are complete, the participants will interact with the Modes digital tool on distributed iPads for 5 minutes. Upon completion (at Time 2), participants will complete the State-Trait Anxiety Inventory again, and baseline heart rate will be measured again using HeartMath equipment. The two measurements are meant to support and compound each other’s results. For the data analysis, Statistical Product and Service Solutions (SPSS) will be used to enter and analyze data. T-tests will be conducted to compare whether Modes was effective in reducing the State Anxiety Inventory and heart rate variability measures. Paired sample T-tests should show decreased levels of anxiety from Time 1 to Time 2.

Discussion

Interacting with the Modes digital tool is like playing in a sandbox of dynamic visuals and music. Users begin by selecting and entering one of three digital environments entitled *Refocus*, *Chill*, or *Energize*. Each environment (or *mode*) offers a unique set of visuals and music designed specifically for anxiety reduction. The *Refocus*, *Chill*, and *Energize* modes aim to balance each of the three governing life principles of Ayurveda that regulate physiological activity. Ultimately, users may combat and control their anxiety in three targeted ways: by refocusing, chilling, or energizing.

The Three Life Principles (Doshas) of Ayurveda

According to Ayurveda, consciousness (listening to one’s body and making informed decisions) gives rise to human perception. There are five basic elements that comprise everything humans perceive through the senses: space, air, fire, water and earth. These five elements dynamically combine and organize themselves into three life principles, or *three doshas*. In Sanskrit, these terms are known as *Vata* (the air and movement principle), *Pitta* (the fire and metabolism principle), and *Kapha* (the earth and protection principle). All humans possess qualities of the three doshas, but everyone has an inherent tendency towards one. Some individuals are primarily lively and airy (*Vata*), others are primarily passionate and fiery (*Pitta*), and others are primarily grounded and earthy (*Kapha*). This primary dosha constitution is established at birth, but lifestyle choices can imbalance these doshas over time. If one’s primary dosha is *out of balance*, psychological and physiological anxiety is experienced. The following two sections describe how the visual design, interaction design, and sound design of *Modes* aid in rebalancing bachelor

students' doshas for anxiety reduction.

The Visual and Interaction Design of *Modes*

The visual design within each of the three *Modes* environments is very specific in how it assists in balancing each of the three doshas (Vata, Pitta, and Kapha) to reduce anxiety. The visual design methodology of *Modes* may be considered in two parts: *color* and *the circle*. *Color* plays a strong role in guiding a user towards anxiety reduction. Three functional attributes of color are considered within each digital environment. These three elements include *hue*, “a property of color that represents the generic names of family groups within the visible spectrum (Puhalla, 2011, p. 62),” *saturation*, “brightness, or color intensity” (Albers, 1963, p.16), and *value*, a color's lightness or darkness (Puhalla, 2011, p. 62). Since each dosha requires different properties for achieving balance, the hue, saturation and value are designed specifically for these properties. The *Refocus* environment within *Modes* is designed for Vata (Air) imbalance. When there is an overabundance of Vata within the body, the goal is to add elements of the Kapha (Earth) dosha to counter the imbalance. The color manifestations of Kapha are warm earth tones (hue), mid-to-high saturation, and dark, heavy values. The *Chill* environment within *Modes* is designed for Pitta (Fire) imbalance. When there is an overabundance Pitta within the body, the color counterbalance is characterized by cool colors like blues and greens (hue), medium saturation, and medium values. The *Energize* environment within *Modes* is designed for Kapha (Earth) imbalance. When there is an overabundance of Kapha within the body, the goal is to counter with elements of the Vata (Air) dosha. This includes hues that include reds and oranges, extremely bright, bold saturation, and mid-to-dark values. The dynamic color variable behaviors in each environment are the guide for keeping users engaged in the experience. The carefully considered elements of hue, saturation and value combine as the vehicle that drives bachelor student users through the *Modes* visual journey.

The second consideration of the *Modes* visual design methodology is *the circle*. The shapes within the *Modes* experience are decisively constrained to circles only. “Geometrically, a circle is the result of just one structural condition. It is the locus of all points that are equally distant from one center (Arnheim, 1966, p. 60).” This fact renders the circle the perfect vessel to assist with the reduction of anxiety — there is no beginning and no end in a circle; it is a neutral shape. “The circle is the first, perfect shape... The space speaks of potential — the tension between what is achieved and what could be achieved. From the circle, we derive ideals and focus, both the halo of saints and the cross-haired target in gun sights. (Gestalten, 2008, p. 11).” The circles within the *Modes* digital tool multiply and employ different behaviors based on user interaction, or gestures. Gestures include tap, long press, swipe, draw, and pinch. The combination of the variable design elements (color and the circle) activated by user interaction — outputs a plethora of new and exciting media content each time a user engages with the *Modes* digital tool.

The Sound Design of *Modes*

The sound design within each of the three *Modes* environments is very specific in how it assists in balancing each of the three doshas (Vata, Pitta, and Kapha) to reduce anxiety. The sound design methodology of the *Modes* digital tool consists of two parts: *music composition*

and *interactive frequency*. The *music composition* is the foundation that guides a user's quest for achieving balance and reducing anxiety. Within the music composition of Modes, three sound elements are dominant within each digital environment. These three elements include: *timbre*, "the quality given to a sound by its overtones, distinctive of a particular singing voice or musical instrument (Webster, 1996)," *melody*, "a sweet or agreeable succession or arrangement of sounds (Webster, 1996)," and *rhythm*, "the pattern of regular or irregular pulses caused in music by the occurrence of strong and weak melodic and harmonic beats (Kariger, 1995)." Since each dosha requires different properties for achieving balance, the timbre, melody and rhythm are written specifically for these properties. The composition in each environment becomes the glue or the guiding track for keeping bachelor student users engaged in the experience. The carefully considered elements of timbre, melody and rhythm combine as the vehicle that drives users through the Modes sound journey.

The second element of the Modes sound design methodology is the *interactive frequencies* triggered by user gestures. This sound application is based on *binaural beats*. Physicist Heinrich Wilhelm Dove originally discovered binaural beats in 1839.

He discovered when signals of two different frequencies are presented separately (one to each ear) the brain detects the phase variation between the frequencies and tries to reconcile that difference. In doing so, as the two frequencies mesh in and out of phase, the brain creates its own third signal, called a binaural beat, which is equal to the difference between those two frequencies. This technique can be used to quickly and easily guide your mind into any state (IMMRAMA Institute, 2001).

The interactive tones within the Modes digital tool not only harmonize with the music melody, but mesh cohesively with the existing musical frequencies to produce a third signal. Different tone samples are layered into the overall music composition. Since each musical composition is written in a defined scale with a specific tempo, each tone (or interactive frequency) follows the same key and pacing of the composition. While interacting with Modes, users are able to hear distinct third tones within different areas of the stereo mix as the brain interprets the frequency. This interpretation creates an experience that propels users to more balanced states, therefore reducing anxiety.

The effectiveness of balancing the mind and body through sound is a result of masterfully combining *music composition* with *interactive frequencies* specific to each digital environment within *Modes*. Effectiveness is also determined by the overall sound and musical properties that have been specifically written and recorded to counter each of the dosha imbalances. Each sound environment elicits a different "feel" unique to the dosha's characteristics — and, in combination with the visual and interaction design elements, allows bachelor student users to *Refocus*, *Chill*, or *Energize*.

Conclusion

Ayurveda teaches that understanding how the basic elements of nature are expressed in our individual constitution enables us to make better choices to maximize health and wellness. The visual and sound design of the three environments within the Modes digital tool answer the optical and aural demands needed to reduce anxiety in bachelor students. The Modes digital tool accomplishes this through attention to color theory (hue, saturation and value), the

repeated and decisive use of the circle, interaction design, music composition (including timbre, melody and rhythm), and interactive frequencies. The attention to visual, interaction and sound design *harmony* within the Modes digital tool ultimately correlates to the inner harmony experienced within the user when anxiety is reduced.

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Author Bios

Emily Verba Fischer is an Ohio native who returned to the Midwest after receiving her master's degree from the Basel School of Design. Prior to her studies in Switzerland, she lived and practiced design for a variety of corporate and cultural clients in New York City, San Francisco, Seattle, and the French Alps. Through these international experiences, she developed a teaching approach that emphasizes the concept of global citizenry in addition to design acuity. She believes that maximizing understanding of other cultures through interpersonal connection and the shared language of design can create a more empathic world for all. Emily's academic research concerns information visualization — the creation and study of visual representations of data for ease of understanding by the masses. In our age of information overload, she is interested in the potential to marry ultra clear communication with aesthetic sophistication.

Emily is currently an Assistant Professor at the Myron E. Ullman, Jr. School of Design in the University of Cincinnati's College of Design, Architecture, Art, and Planning (DAAP). She frequently travels abroad to share her research and pedagogical activities. Her work has been featured in exhibitions and publications nationally and internationally.

John Hebbeler is a musician exploring areas of digital media, fusing elements of sound, video and web production with computer technology. As an Assistant Professor in Electronic Media at the University of Cincinnati's College-Conservatory of Music (CCM), he teaches a range of courses that include advanced studio production, digital audio production, integrated media production, and special topics courses. Professor Hebbeler has created interactive trans-media compositions that integrate iPhone and Wii remote technology into live audio and visual performances. His work includes the development of computer-based applications for iOS

mobile devices that use programming and accelerometer technology to integrate aspects of composition, production, and performance. His original compositions have been distributed by Spotify, iTunes (US, Japan), Amazon, Rhapsody, eMusic, Zune, Tradebit and Last.fm. Over the past decade, Professor Hebbler has worked extensively in music technology for clients including The World Association of Symphonic Bands, The International Tuba and Euphonium Association, The United States Jazz Ambassadors, The BBC, The Cincinnati Opera, and more.