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**Evaluating Active and Potential Uses of
Audio Visual Media Art Applications
for Stress Management**

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Evaluating Active and Potential Uses of Audio Visual Media Art Applications for Stress Management

Abstract

This study aimed to explore university students' experiences using audio visual media art applications for stress management and relaxation; identify the suitable technology platforms; and combine the viewpoints of students, developers, and artists to determine key design features. A semi-structured interview was used to collect qualitative data on students' experience as well as the viewpoints of developers and artists regarding design features and technology platforms. Interview transcripts from six university students, three developers, and three artists were analysed using thematic analysis.

The study's findings highlighted design features for audio visual media art applications. Key design features include:

- *a simple layout,*
- *easy-to-navigate interfaces with less text on screen and more space for artwork,*
- *dynamic artwork, using abstract and geometric shapes,*
- *synchronization between visual and auditory elements,*
- *rhythmic visualization,*
- *smooth movement,*
- *short duration of artwork,*
- *slow, calm audio.*

Functional features include personalization through the ability to specify preferred visualisations.

Furthermore, the study found that larger screens, such as screen projectors, are a suitable technology platform for experiencing audio visual media arts applications. The main contributions are important design aspects for relaxation-based visual audio media art applications and understanding of the appropriate platform to display those creative applications.

Keywords: Human-centred computing, visual and audio media art, time based media art, stress management, breathing applications, abstract art

Introduction

One of the most prevalent issues among university students is psychological stress, as discussed in studies such as (Cohen, et al, 2021). There is interest in connecting with digital well-being services, and students are recommending mobile well-being apps as a good strategy for improving well-being and reducing their stress (Cohen, Graham, & Lattie, 2020). However, little attention has been paid to evaluating the benefits of using visual and audio media art applications for students' stress reduction or relaxation. Therefore, exploring university students' experiences, opinions, and preferences for accessing those art applications is vital. The results can be used to design more innovative audio visual media art applications for relaxation.

Relaxation and stress reduction are possible outcomes of viewing visual artwork and listening to sounds. Previous research has shown that stress relief is influenced by both the audio and visual arts (Wang, Liu, He, & Hu, 2022). In their scoping study (Law, Karulkar, & Broadbent, 2021) showed that digital artwork has the same potential as physical artwork to reduce stress. However, little focus was placed on finding an appropriate technological platform for students to view digital visual and audio media arts. There is also a lack of research on the design aspects of audio visual media art applications for stress reduction and relaxation.

As a result, the purpose of this study was to investigate university students' experiences with audio visual art applications for stress management, to identify the most appropriate technology platforms for those media art applications, and to combine the perspectives of students, developers, and artists in order to determine key design features. To achieve this purpose, the following research questions are formulated:

How do university students use and experience visual and audio media art applications to manage stress and relax?

What technological platforms are suitable for experiencing these applications? What are the key design features of audio visual media art applications?

This project contributes design features for relaxation-based visual and auditory applications from the perspective of a literature review, primary research data collected from developer and artistic responses and student experience. And evaluate the visual and audio media art applications based on student experiences with a specific app named “Syntropy” (Addadahine, Andrews, & Joy, 2021).

Related Work

Digital Arts and Stress Relief

Digital arts have the potential to reduce stress and aid relaxation. (Wang, et al, 2022) combined audio and visual arts to examine the potential stress-relieving effects of digital art as stimuli. This research showed that happy images and audio made people feel good and this type of feeling might successfully reduce stress. Similarly, (Law, et al, 2021) found that looking at art can help people to reduce stress. The results of the study also showed that digital and physical art can both have the same stress-relieving effects. Digitally projected artwork, slideshows of digital artwork, and digital reproductions of artworks were all included in that study. Fekete, Maidhof, Specker, Nater, & Leder (2022) investigated the possibility that a combination of visual art and music could

be a more efficient method of stress reduction than either one alone. In this study, visual artworks were displayed on an LCD screen, combined with a music piece with duration of three minutes. In another study, Trupp, Bignardi, Chana, Specker, & Pelowski (2022) looked at how online art content may affect feelings of anxiety and loneliness. The artistic stimulus came from Google Arts & Culture, a free online collection of virtual art galleries. According to this research, online art can lessen feelings of loneliness, stress, and low mood while enhancing positive mood and wellbeing, especially when it's beautiful and meaningful. One interesting finding from the study is that the amount of time needed to interact with art content is shorter than five minutes.

All the studies mentioned above show the potential application of digital audio and art for stress reduction. However, none of the research has explicitly explored the suitability of technological platforms for users to experience those digital visual and audio media arts.

Design Features of the Stress Relief and Relaxation Applications

When designing an application, it is critical to consider design elements that can impact application quality and user engagement. One approach for helping an individual reduce stress and enhance relaxation is the use of breathing exercises and visualization (Toussaint, Ngyen, Rotger, Dixon, Offenbacher, Kohls, Hirsch, & Sirois (2021). Chittaro & Sioni, (2014) analysed two visualization designs for breathing training apps and compared these with an audio-only approach. One of the visualizations was based on wave design, while the other was a circle-based visualization. Both used colours, shapes and movement to represent the breathing process. For example, in wave-based visualization, they used a green waveform, with a marker that follows the rising edge of the wave to guide inhalation and flowed the falling edge to guide exhalation. For circle-based visualization, they used green circles as a cue for inhalation and red circles as a cue for exhalation. The findings revealed that the wave-based visualization produced better outcomes than the voice-only design, and users reported a significantly higher preference for wave-based visualization. The study authors proposed further exploring the design space of visualizations for breathing- related applications.

Prpa., Cochrane, & Riecke (2016) described a prototype of an immersive computer- supported virtual system for teaching mindfulness meditation. The prototype was built around four design principles: thought distancing, abstract visual elements, immersive environments and rewarding system. The prototype used visual representations of breathing in the form of abstract elements, combined with pleasant sounds. The system used biofeedback input devices to score the quality of the meditative effect and used this to provide gentle feedback through colour changes. The findings showed that individuals felt more relaxed after using the tool. The study proposed that future studies should evaluate the effectiveness of visual elements for relaxation, as design principles will continue to evolve.

The above studies proposed abstract art visualization and pleasant sounds as the main features of applications to promote relaxation and also suggested further research on design aspects. In addition to those core features, Alqahtani & Orji (2020) identified usability, rich content, credibility, personalization, and security as important design features.

University Students and Use of Mobile Apps

A previous study (Hakima, Maryem, Ikrame, Imane, Chadya, & Mohamed, 2020) was aimed at verifying the "relaxation program," an anti-stress tool that incorporated into the "stress-free" smartphone app, which aimed to assist Moroccan university students in better managing their psychological stress. Another study (Schulte-Frankenfeld & Trautwein, 2021) examined the benefits of a mobile mindfulness-based intervention on perceived stress, self-regulation abilities, and life satisfaction in a part-time working student population. The study's findings indicated that mobile applications were beneficial for reducing perceived stress and improving self-regulation. Similarly Huberty, Green, Glissmann, Larkey, Puzia, & Lee (2019) investigated the initial efficacy and long-term effects of an eight-week mindfulness meditation mobile app on college students with high stress levels. For this study, they used the 'Calm' mobile app. The study's findings showed that the Calm app can lower stress while also improving mindfulness and self-compassion in short-term conditions for stressed college students. As a result, all of these researchers have found that the student population is experiencing significant levels of stress, and that using a mobile relaxation app can significantly reduce stress.

A qualitative study and thematic analysis are useful approaches for studying university students' experiences and opinions regarding stress. A previous study (Fleischmann, 2018) investigated the experiences of students who participated in an Internet- and app-based stress management intervention. They conducted a qualitative study and evaluated interviews using thematic analysis. Another study to use a qualitative approach is (Sifat, et al, 2022), which investigated the acceptance of mindfulness among Bangladeshi university students. They performed twelve in-depth interviews to investigate students' reactions to linguistically (Bangla) and culturally appropriate mindfulness exercises. The thematic analysis produced three themes: previous experience with mindfulness, positive responses to mindfulness, and improvements to mindfulness exercises. This evidence supports the importance of doing qualitative research with university students to explore their experience of using applications for stress reduction and relaxation.

As a conclusion, prior studies have shown that digital visual and auditory media art can reduce stress and relax people. However, there have been fewer studies about the most suitable technology platform for users to experience those applications. Prior research has also identified abstract images, abstract art visualization, and pleasant sounds as good design elements for relaxing applications. As they recommended, more research is needed to address the design elements of visual and auditory media art applications for relaxation. Previous research has also shown that university students are under pressure and stressed, and they prefer to use mobile apps for their well-being and relaxation. However, there has been no significant research about the visual and audio media art applications for relaxation among university students, as well as an investigation of their experiences and preferences.

Methodology

Data Collection

A qualitative research method was selected for this study because it is an effective way to explore student participants' experiences, opinions, and preferences (Fleischmann, Harrer, Zarski, Baumeister, Lehr, & Eber, (2018) (Sifat, Tasnim, Stoebenau, & Green, 2022). It is also

appropriate to explore developer and artist perspectives on design features and technology platforms for visual and audio media art applications.

A semi-structured interview method was used to collect detailed information through in-depth, casual conversations. Each interview was conducted online, using Microsoft Teams. Interviews with each participant lasted 30 to 60 minutes. During the interview, Microsoft Teams automatic transcription was used. Ethical research processes were followed including informed consent and peer approval.

Semi-structured interview questions were created independently for students, developers, and artists. These questions were developed based on the literature review and author's own reflections to provide responses to research questions. As a result, those questions were divided into different categories, including design features, user experiences, and technology platform preferences. The interview questions were reviewed by a third party to check for clarity and reshaped to ensure that they achieved the research purpose.

The study included six Northumbria University students (two males and four females) ranging in age from 19 to 30 years. All students were postgraduate students, and they have used the Syntropy app (Adadahine, et al., 2021). The research involved three developers and three artists. One developer is actively involved in the Syntropy app design, while the other two are independent developers with experience in developing games and media applications. One artist is directly involved in the art design of the Syntropy app, while the other two artists work independently.

The study's goal, as presented to the student participants, was to evaluate audio visual media art applications for stress reduction and relaxation. It also aimed to better understand student experiences, opinions, and preferences for audio visual art applications. Therefore, it was requested that students use the Syntropy app at least for a week. The Syntropy mobile app was chosen as the major data gathering case due to its focus on stress reduction and relaxation through visual and audio stimuli.

An event was organized at the university to better understand students' feelings and experiences of viewing visual and audio art on a larger screen. A projector displayed two "coherent breath pacer" videos and two relaxing videos onto a screen. A coherence breath pacer video guides the user in breathing steadily at the recommended rate of 5.5 breaths per minute. After seeing the videos, students were given the opportunity to describe their feelings, experiences, and preferences for using this platform. They used paper forms to write their feelings and experiences, and these forms were gathered anonymously.

Data Analysis

Thematic analysis was used to analyse interview responses and transcripts (Braun & Clarke, 2021). This approach helps to identify, analyse and highlight themes and patterns within data.

While it is challenging to extract meaningful and relevant information from interview responses using thematic analysis, this was addressed by reading the data multiple times. The first step in data analysis was familiarization with the data from interview transcripts by reading them many times. Following this, areas of the text were highlighted, usually phrases or sentences, and then codes generated. Analysis of the codes results in generation of themes and subthemes. The themes were then reviewed to ensure that they are helpful and accurate representations of the data. This

review also ensures that it is possible to address the research questions by using these codes. Interview responses were selected for each theme and presented on a digital board. This process resulted in the development of three main themes: (1) user experience; (2) design features; and (3) technology platform. The next section will present each developed theme and its sub-themes.

Findings

Theme 1: User Experience

University students described their experience using visual and media art applications for stress management and relaxation. Subthemes were developed based on the responses. These subthemes include user engagement, usefulness, satisfaction, negative experiences, and app features evaluation.

User Engagement

Students described application usage frequency, engagement time, and the situations in which they interact with the application. When evaluating the active and potential uses of visual and media art applications, it is important to see how users engage with the application.

All students used the app more than once a day (Student1, Student2, Student3, Student4, and Student5). Student6 said *“I used the reminder function and set two times a day to watch video.”* Two students (Student1, Student5) watched the artworks for a maximum of two minutes. Student4 took two to three minutes to watch, while Student3 and Student6 took three to five minutes. Student3 expressed that *“But in the mobile app, I think the time duration is fine to three to five minutes”*. Student4: *“I guess two and three minutes are fine. Because more than that will be then get a bit annoying.”* Student5: *“I think the two minutes video is more ideal as compared to the any longer video”*.

Four students commented that they watch the video in the evening or before sleeping (student3, student4, student5, student6). Two students mentioned they watch while traveling (student1, student4), and one student mentioned she listens to the audio of the app while studying (student2). Only student1 mentioned he uses the app when he gets short breaks from work or university time.

Student1: *“So I used to watch these videos during my busy schedules during the one minute 2 minute break I get from my work or my university work or while I'm travelling.”*

Student4: *“I usually use it like before sleeping. Sometime like once I have used it travelling.”*

Student6: *“So during sleep time I watched some relax videos.”*

One student suggested it would be useful to raise awareness about this kind of app since the student was unaware that this kind of media art app is available for relaxation and stress reduction. Student2 explained *“a lot of awareness apps have to be done because I don't think other than us who are doing the research, not many know about the app.”*

Usefulness

Visual and audio media art applications are evaluated based on their usefulness to students. Whether students truly experience stress reduction and relaxation, whether they can breathe with the visuals, and whether this application helps them to improve their mood are all reviewed.

All students mentioned that they can relax by watching the visuals. As student1 mentioned *“I think the main thing is it makes me calm. That's the most useful thing I I've experienced from the app. especially the music, they are so light music. Their nature is like very calm, so it helps me to get relaxed.”* And Student4: *“sometime I used to like the music. It was very calming. I think if I'm using it for relaxing.”* Student2 expressed the same *“the relaxed segment in that videos or the music was really good and it was really soothing actually”*.

Geometric shapes arts and movements help students relax. As student3 expressed *“The patterns are help me do feel actually relax. There are few categories, but for me the round circle and the triangle. So when I look at the visual and so it gives very relaxed and feel very calm”*. Art visualization takes their focus and stays them calm. As Student5 mentioned *“I can see some of the videos they have patterns. So I'm able to concentrate on that. It gives me calmness. I'm able to my mind focuses on their movement and their sounds, so I'm able to be calm. I'm able to stay relaxed and focus on that for the time”*. The students who were tired with their work could relax and get better sleep by watching those media arts. As Student6 mentioned *“I worked part time so at night I felt so tired. So during sleep time I watched some relax videos. So it makes me very calm and I could able to get better sleep as well.”*

According to the students' feedback, they were able to forget the busy environment around them while watching the visual arts. As student1 mentioned *“it helped me to disconnect from my busy world. Release my stress it took some time to achieve it, but I think I got disconnected from my stress from watching that. I feel like I can forget all the stress or the busy environment around me for few minutes.”*

Both student5 and student6 mentioned that they could take away their busy feelings or thoughts. Student5 said *“When it's a bit busy, I can open the app and to distract me from my thoughts, so be able to hear the sounds and the imagery. It's good. It provides a good distraction”*. Student6 said that *“I'm bit stressed with my assignments. So before start my assignments I watched breathe related videos and try to reduce my stress. Actually I would say it worked, while try with breath pacer it forget me everything and I could take out my busy feelings”*.

But Student2 mentioned they couldn't completely disconnect from the stress, but it “fluctuated” the stress level. *“I believe that sound system kind of thing where it is trying to fluctuate our stress levels by giving us a rhythm of music. it is really soothing for my mind, but I won't say that it was completely helpful in being stress free.”* And both student3 and student4 mentioned they didn't completely disconnect from the stress.

Students tried different breathing pacers within the visual and audio art application, and geometric shapes and sounds helped them to be relaxed. Student3 mentioned: *“We don't practice the proper breathing technique. So this app is actually good because it shows that. So we can hold breathe and the patterns. I have tried 2/3 times in same pattern with once I feel comfortable. So the triangle and the round patterns those are very good “and Student5 added “I was able to be calm. I was able to be in the thoughts stay in a logical order. At that moment, my head was thinking about the music, the patterns, and the geometrical patterns that are on the video. It gave me a*

sense of peace in some of the videos". In other cases, students mentioned they forget to breathe with the visuals since their focus goes to music and movements (student1). Only student2 and student4 mentioned that they did not get much benefit from the breath with the visuals, and another student mentioned that her breath pacer pattern did not match her rhythm. All students expressed that they were elevating the mood by using visual and audio media art applications, and they enjoyed watching the videos.

After the projection event, all of the students said they felt calm and relaxed while experiencing visual and aural arts on a larger screen. Some of them stated that they had an excellent experience (student2), that their minds were cleaned for a short period of time (student4), and that they felt deeply connected to themselves (student5).

"It felt like it was trying to utilize me. It reminded me of movies about hallucinations and immersive art galleries" (student6).

Negative Experience

All students stated that they were bored after watching the visuals for more than four minutes, and three students exited the app (student2, student4, student5), while the other three switched to another video to watch (student1, student3, student6). As student2 expressed: "*I did feel bored. I have to agree. It was like a long duration, 6 minutes videos or 5 minutes videos. So if I'm bored, I would like to play it and do some work*" and Student6 mentioned: "*It is not board to listen the audio or the music. But watching the visuals more than 4 minutes make me board sometimes. Then I try with different video*".

Satisfaction

All students were asked to rate the application out of 10. Three students rated the application as 8 (student1, student3, student6). Student1 stated, "*It's a good application. It helped me to relax during my busy times, and I think it's good.*" Student2 rated the application as 7 saying, "*I really appreciate the efforts of people for coming up with an application with this kind of idea; this app would be very beneficial.*" Student5 was rated as 6.5. Only student4 rated the application as 3 and said that she didn't use the application much. Three students stated they would recommend the application to family and friends, highlighting its importance for relaxation (student1, student3, student6).

App Features Evaluation

The visual and audio media art elements were evaluated based on usability, art content, and performance. Students commented on the user interface features and functions. The application looks simple and attractive (student1, student3 student6). It's easy to use and navigate (student1, student2, student4, student5, student6). The application includes no interruption features or navigation (student1). It gives an organized professional appearance (student5). There is not too much text on the screen (student6), provide a clear and good explanation (student3). It is attractive and eye-catching (student5). Support various functions, including light mode and dark mode, to play the videos and also shuffle the clips (student6).

Student5: *“In terms of the appearance the user experience, it's easy. It's easy to accessible. I can be able to navigate the app well because it's detailed. It's good in terms of the colours; I'd say they are attractive. They are eye-catching. The description and how the placement of the texts, I think they are more professional.”*

Art content in visual and audio applications are valuable because these are the features users interact with in order to relax. Students expressed their thoughts about the content of the application. Most students mentioned that the geometric shapes and art movements capture their focus and help disconnect from their busy surroundings.

Student1: *“Some of the arts with geometrics. They are good because the movements of these arts make me focus on that and make me disconnect from my discipline. I can forget everything else.”*

Both student2 and student3 strongly referred to the animations' ability to capture attention. Student2 commented on the *“I really like that animation or graphics. It felt like they're trying to position our mind because it keeps on moving the object. I feel it was kind of different experience.”* Student3 added *“The same feeling by listening those audio, but the visuals are very powerful than the audio. For me, I always like colours and shapes”*. The application contains some unique art elements, such as geometric shapes and patterns, compared to other relaxation applications that have natural objects like waterfalls and rain (student6).

But student5 mentioned that sometimes it may be overwhelming to have too many patterns with the sound, as stated. *“There are too many patterns that are happening and on top of that the music can be a bit loud or be a bit different with the different instruments.”*

The performance of visual and audio media art applications is a crucial element to consider since if the user experiences poor performance, the entire application may fail. All students stated that the app's performance is excellent (student5, student6), and they had no lagging (student2, student4), or crashes (student3, student4) with the media art application.

Students' Suggestions for prototype design

Students provided suggestions for further improvement of the application. Those features included and presented as a Syntropy app prototype. As presented in Figure 1 below, two students suggested that the video be played in landscape mode on the full screen with the first click. Because visuals play on a larger screen, they may provide a wonderful experience for the user.

Student1: *“I would like to suggest a feature that plays the videos in fully screened landscape from a single touch.”*

Student4: *“I think the size of those videos should be better if they fit the whole screen. I guess that will be more immersive than just the slim portion of the screen”*.

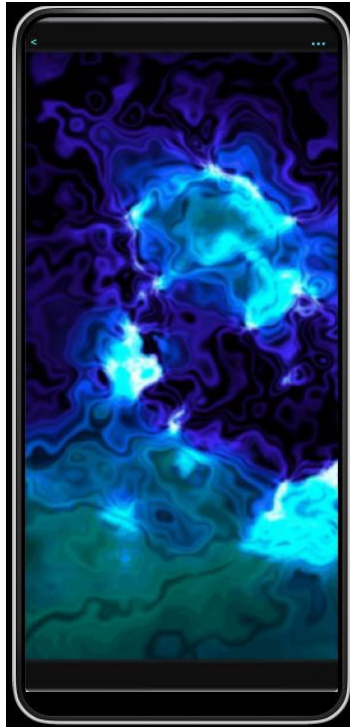


Figure 1: Full screen mode

Students suggested that they prefer to have an option to select artworks and keeping a list of favorites (Student5, Student6). For example, Student6 expressed that *“I would like to suggest option like add to favorite selection. Then the user can pick the favorite artwork to his selection and play”*. As presented in Figure 2 below, following these suggestions, an “Add to selection” menu option was added (left image) and when user navigates to first screen of the app it shows “My Selection” category (right image).

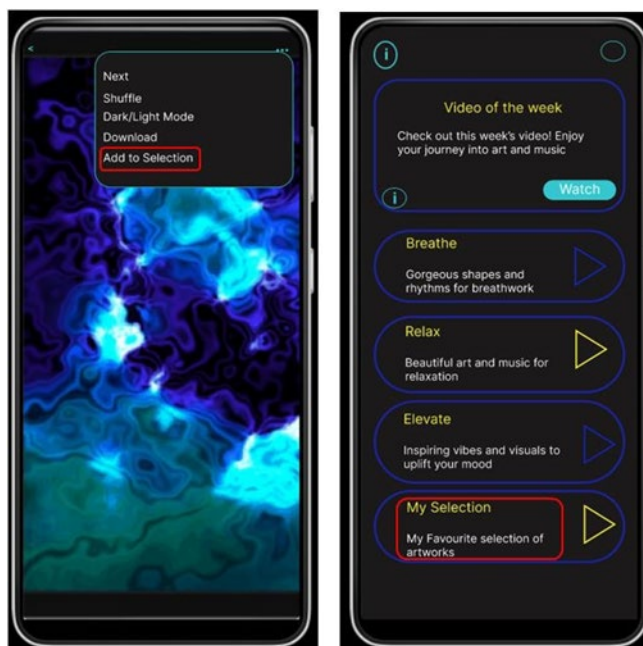


Figure 2: “Add to selection” menu option added (left image). When user navigates to the first screen of the app it shows “My Selection” category (right image).

One student proposed enabling the app to respond to a personal survey regarding stress and mood. Based on the responses the app could recommend a suitable visualisation for the user.

Student2 suggested, “it could ask me for my details like a personalized questionnaire. How often do you feel stressed in a week or some kind of behavioural questions then this is incorporated it would be much more useful because now I know that it is customized based on my preference”.

As presented in Figure 3 below, following this feedback, a “Personal Survey” option was added to menu (left image), then app displays survey (middle image). Once a user submits survey responses, the app will recommend suitable animations (right image).

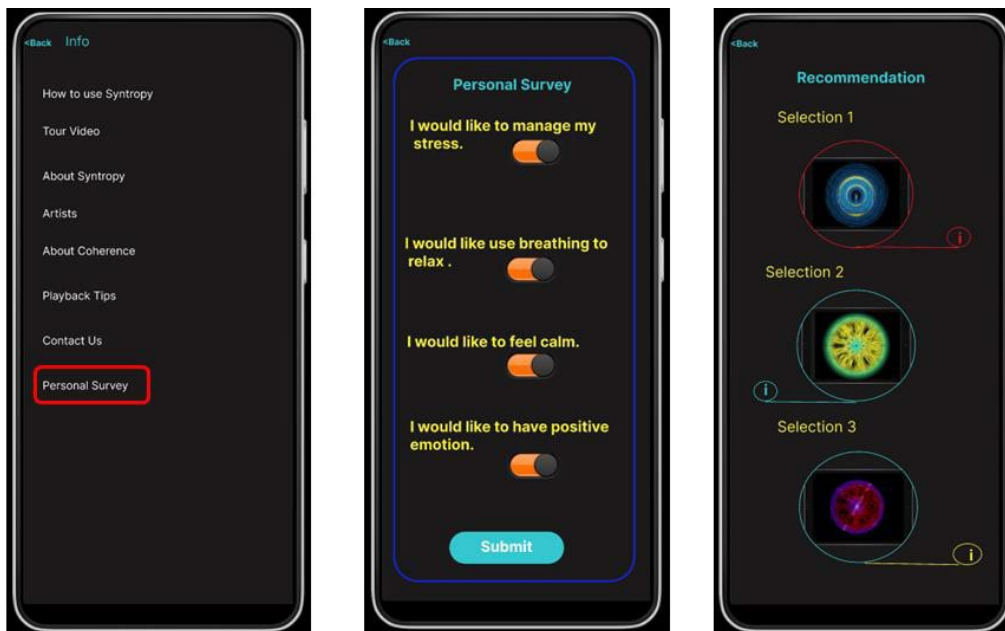


Figure 3: “Personal Survey” option added to menu (left image), App display survey (middle image), when user submit survey based on that app recommend suitable art videos (right image).

Students suggested including “video of the week” information in the same area. As presented on Figure 4 below information icon is added to that area. When User clicks on icon it will show information in a tooltip.

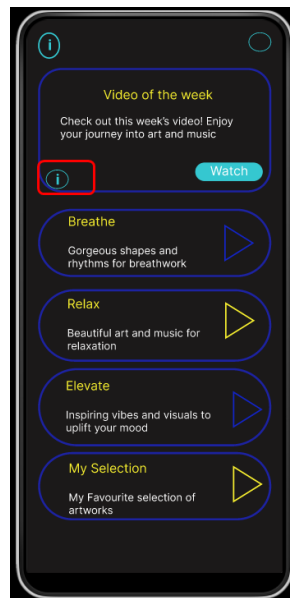


Figure 4: Information icon added to the “Video of the week” section

Theme 2: Design Features

The subthemes of design features include interface design features, science and art design features, functional design features, and performance features.

Interface Design Features

When developing digital apps, developers follow design rules or guidelines in order to provide the best user experience. Based on their development experience and review of other application designs, they identified the simple layout of the application interface, ease of navigation (developer1), usability, accessibility, and visual presentation frame rates (developer2) as key design features for the visual and audio media art applications.

Another significant design feature they highlighted was less information on the screen and more space for creative representation (developer2). Users may become overwhelmed if a user interface presents them with too much information and too many options (artist1). As a result, it is critical from the perspectives of development and artists to have less written information on the screen by providing more spaces for art representation. As developer2 expressed “*you want to be minimal in the interface so that you've got as much space or as much time as possible in the artistic representation. In practice you might have to choose options and things like that, but you want to keep that time as short as possible and for them to be completely non-existent while the artistic and audiovisual application is running so that you're just seeing a screen with nothing on it*”.

Artist1: “*So when I went on the bigger meditation apps like headspace and calm. There was so much information. Their libraries are vast, they're huge and there was just information everywhere and it was like choose something. And it was I felt overwhelmed. It was actually doing the opposite of even though it was lovely; calming colours and sounds, the information was an overload.*”

Science and Art Features

An audiovisual media art application that promotes relaxation has some unique design features. Most of them emerged from a scientific and artistic perspective. One of the main design features is the use of abstract art (developer1, artist1) or psychedelic art (developer1) and simple geometric shapes like circle, triangle and square (artist1). These participants offered physiological explanations for their preference for abstract shapes.

Artist1: *“Shape needs to be abstract ... we found out that if ... people think of a beach, think of a cloud and you associate objects in your mind and that's engaging the pre frontal cortex, which is the same part of the brain that's involved with anxiety, and so you're engaging, you're trying to calm down that part of the brain that's ... overstimulated by trying to soothe it. Whereas what abstract art does is it communicates with a whole different part of the brain.”*

Developer 1: *“Getting people into different states of consciousness or different states of coherence or relaxation. So that's particularly why we decided to go down the route of abstract and psychedelic art. The science behind that is that it helps to bypass the conscious mind so quickly can get you into different states basically.”*

Another design feature is rhythmic shape visualization. The application includes a breath pacer to help users relax or calm down. This can be achieved by expanding and decreasing geometric shapes or abstract art (developer1, artist1). Technically, it should be possible to expand and contract artworks that reach eight, ten, and twelve-second breathing cycles (developer1, artist1). Users can breathe along with the visualization of the artwork. As both the developer and artist described, this is a design requirement of the visual and audio applications that support relaxation via breathing practice. It could be achieved via geometric shapes art properly, and according to both the developer and the artist, it's also the reason why breathing-related artworks don't include real objects like waterfalls and trees.

Developer1: *“The breath work sort of balanced breathing instead of different types of breathing where you might have a longer inhalation or exhalation, for example, or box breathing or whatever. So that's really just as far as the science underpins the design of the artwork is that it's expanding and contracting in a balanced way.”*

Artist1: *“So for the breath work, as in technical requirements, you've got the eight second, ten second and 12 second speed modes. And so that would be the art of music moving for four seconds. So that's an inhale. And then moving backwards for four seconds, that's an exhale. And so it's really important that's timed all the way through the video. So the viewer can breathe along and kind of trust that the artwork will tell it what to tell the viewer what to do. And so that's one of the criteria is that the artwork cannot look like an object. It can't look like a tree ...”*

The visual and audio media art application should provide dynamic artworks with smooth movements (developer1, developer2). Natural rhythms and smooth movements are crucial for stress reduction and relaxation (developer2). Repetitive movements help the user step back from their thoughts (developer3). Bright colors that fluctuate with movement make individuals feel calmer (artist2). It provides psychological benefits to active individuals (developer1). The scientific reason for this is that it helps with thought distance, which reduces stress and allows people to relax. Based on the rhythmic movement, it can perform various functions such as stress

reduction, relaxation, or enhancing the individual's mode (developer1).

Developer1: *“You know that the artwork must be a bit more dynamic and activate people's psychological state so that that's how we're making sure that we get artworks that are appropriate to each of those different functions.”*

Developer2: *“To promote stress free relaxation and so looking for harmonics, looking for natural rhythms, it is critical actually. Similarly, you wouldn't want an object that if I had an object here that was moving side to side. I don't want it to move suddenly. I want it to move to slow down. Then come back again and slow down. So it's a natural swaying motion rather than the sudden movement like this. So trying to smooth movements is also quite useful.”*

Visual and audio media art applications should offer both light and dark mood videos as people watch them during the day or at night (artist1). Another design aspect for visual and audio media art applications is the ability to create short-term art visualizations. As Artist1 expressed *“The reason why we wanted to keep the videos short, so 5 minutes is for not only ... is it appealing to do things you know quickly, [but] because it's very hard to get people to sit down for 20 minutes”*. Further she added, *“You'll feel good in that moment in those five minutes. But honestly, it's the building up of the nervous system and breathing and regular relaxation and meditation that will make the difference where you can feel outside of the app”*.

Better visual and audio synchronization (artist1, artist2, developer2) is another design aspect of the application that promotes relaxation. Designing art with slow and rhythmic music has an emotional influence on people (developer1).

Developer1: *“The science around art ... is, I would say, fairly strong as well. We know that art impacts emotions. You know that art also has the potential to impact physiology in terms of things like relaxation or actually the opposite activation as well depending on the nature of the art. And indeed the music, it can be either kind of like broadly, you know, relaxing or activating.”*

Artist2: *“Perry Hoberman says an interactive art there should be a one-to-one connection between user action and response in the system ... In the case of the synaesthesia maps, for example, ... if you're looking at a tonal melody, I would use one colour, let's say red, and then its total opposite which is the as far away tonally as you could get. So if we're thinking of red as one colour, its opposite might be, well, probably blue.”*

Functional Features

The audio and visual media art application's functional aspects that may be more advantageous from the user's standpoint have been highlighted by the developers. Ability to download and play offline videos (developer1), pick favourite art videos (developer1), view arts in dark mode and light mode (artist1) are some functional features of the visual and audio media art application. People may have different preferences, and they may view them at different times of the day. So having application support to play the artwork in dark mode or light mode is an interesting function, and it may increase user engagement as well.

Developer1: *“Things like being able to select favourites. At the moment the closest we get to that*

is you can download videos to play offline, because one of the problems with the app is if you're not connected to the internet, you can't watch the videos like same with a lot of apps that stream.”

Performance Features

When dealing with media files, there are a few performance features that should be taken into account. As all developers highlighted, videos can be streamed, or alternatively, they can be loaded into memory beforehand and played later. Developer2 expressed, “... *you're going to have problems with loading if your program has a delay while loading a file, then that's going to cause some sort of stutter or some sort of disjoint in the experience. So you want to give two options. One is to pre-load. Is to try to as much as possible get the data loaded into memory before you need it, but sometimes it may be too big for that, in which case you need to get it streaming.*”

Theme 3: Technological Platforms

Students, developers and artists commented about technology platforms suitable for viewing audio and visual media art applications.

Delivery through mobile apps is one possibility. Mobile phones are ubiquitous and easily portable. Four students indicated that they like to access media art using a mobile app since it is convenient and accessible at any time and from any location (student1, student2, student5, student6). While they were at home they preferred to view media art on a larger screen, such as a television (student3, student4). Student3 expressed, “*LCD screens or TV, if we can operate this app, it will be nice 'cause some people have a separate room for the personal activities like yoga, meditation. If it will be in a TV screen it will be very helpful*”.

There was also some interest in the idea of viewing the app through a Virtual Reality platform. As Student5 expressed, “*They will be interesting to see in terms of virtual reality 'cause their patterns would be interesting*”.

Virtual reality was also discussed by developers and artists (developer1, developer3, artists1, artist2). A similar technology used 360 mobile headsets that use a mobile phone for rendering (artist1). As Artist1 noted, there is a lot of research exploring the well-being of virtual reality environments. As she expressed “*Creating and working within virtual reality spaces and that is something that we are like pursuing and are interested in. There's a couple of meditation apps that I've done that have taken stuff into a virtual reality space, and a lot of research around well-being of virtual reality because it's so immersive*”. Developer1 commented, “... *takes virtual reality headsets into hospices and they take people on virtual tours of locations around the world through drone footage in the VR headsets. We could create breath pacers like, imagine some translucent breath pacers sitting on top of the drone footage*”.

As used for the projection event, it is possible to deliver the content by projecting the media onto a large wall or other surface. Five students said that they would prefer to use the projection platform for personal, individual use and watch visual and audio media art while relaxing at home. Only one student raised the possibility of using projection for meditation and yoga sessions in groups. Students put forward suggestions regarding the environment. The setting should be quiet,

and it is preferable to have comfortable seating arrangement (student6), comfortable seats (student4, student5), a darker environment (student3, student6), and better sound control (student2). Developers and artists made further suggestions about using a multimedia application through wall projection for well-being in an immersive setting (developer1, artist1). It could be used in yoga studios, resorts, and wellbeing rooms. Developer 1 reported that they are conducting a test project working together with a yoga studio. As he expressed, *“Spas and wellness resorts are looking to create environments for people to experience those types of things. We've done a pilot project with a yoga studio who been projecting the images onto a wall ... while people were then going through a yoga class, which was a really interesting way of using the content.”*

Another technology platform that can be used to view applications for audio and visual media art is a Sealed Pod, where the user is completely enclosed a small chamber, which reduces distraction from outside noise or movement. These are not extensively used but could be implemented in large organizations or specialist situations. As Developer1 expressed *“It's like a sealed pod that you get into, with very comfortable seat speakers. A screen. Ambient lighting. Temperature controlled. So it's like an environment that you get into for well-being and they're interested in ... being part of that. And I think you know that's again the type of application that we could be thinking about.”*

As well as considering platforms for experiencing the audio visual applications, developers and artists commented on the suitability of technology platforms for creating and distributing the content. Both the use of a website and the delivery through a smart TV were mentioned. A website or larger screens make it more convenient to enjoy the artwork (developer1). YouTube as a suitable channel for distributing the artwork to a large potential audience (artist1). Smart TV is another platform with the same advantage (developer1).

Developer1: *“Smart TV's ... getting it on there, or part of somebody else's channel on a smart TV. There are more and more of these well-being channels popping up. You can subscribe to or ... access through TV ... immersive environments or artistic environments.”*

The artworks can be designed and developed using Mad Mapper, Unity, and Touch Designer (artist2), as well as 3D Studio Max (developer2). The below Table1 summarizing the viewpoints of all three communities regarding the technology platform.

Table 1: Suitable technology platform to view Visual and audio media art applications

Technology platform	Participant
Mobile app	student1, student2, student5, student6
Website	Student3, developer1
Projector	student1, student2, student3, student4, student5, developer1, artist1
Smart TV	student3, student4, developer1
VR	Student5, developer1, developer3, artists1, artist2
Sealed pod	developer1
360 mobile headset	Artist1

Discussion

This study set out with the aim of exploring university students' experience of using visual and media art applications for stress management and relaxation based on the Syntropy. The results of this study show that after using the application two to three times per day for a maximum of two to three minutes, all students benefit from visual and audio art and discovered that they can relax and be calm while using it. Another key discovery is that students become bored if they spend more than four minutes viewing the artworks. This finding supports the viewpoint of the artist, who stated that very short-term art visualization should be designed to promote user engagement. Prior research also found that to remedy loneliness, stress and low moods, it requires less than five minutes of interaction with art content (Trupp, et al, 2022). Therefore, this study recommends developing short term art clips for the application.

The second question in this research is to find suitable technological platforms for experiencing this kind of visual and audio media arts applications. After conducting a projection event and based on the students interview responses, it was discovered that larger screens were a suitable platform. This outcome is supported by both the developers' and the artists' viewpoints. As a result, current research suggests that larger screens like projectors are suitable technology platform for experiencing audio and visual media arts applications. Therefore, it is recommended to use the projectors platform for yoga studios and meditation programs that incorporate visual arts.

The third question in this research is to identify key design aspects of a visual and auditory media art application created for relaxation from the perspectives of students, developers, artists, and literature. The following Figure 5 presents the key design features for audio visual art applications intended for wellbeing, based on responses from all three communities. When the results were critically analysed, it was discovered that all three communities expressed that the application should have a simple layout with less text on screen. Both developers and students favoured easy-to-navigate interfaces and artists felt that more space for art presentations was useful. These are important design features for media art application interfaces. Functional features like personalisation options and selecting favourite arts were highlighted by students. As mentioned in the literature review, usability and personalized features (Alqahtani & Orji, 2020) are important features for apps.

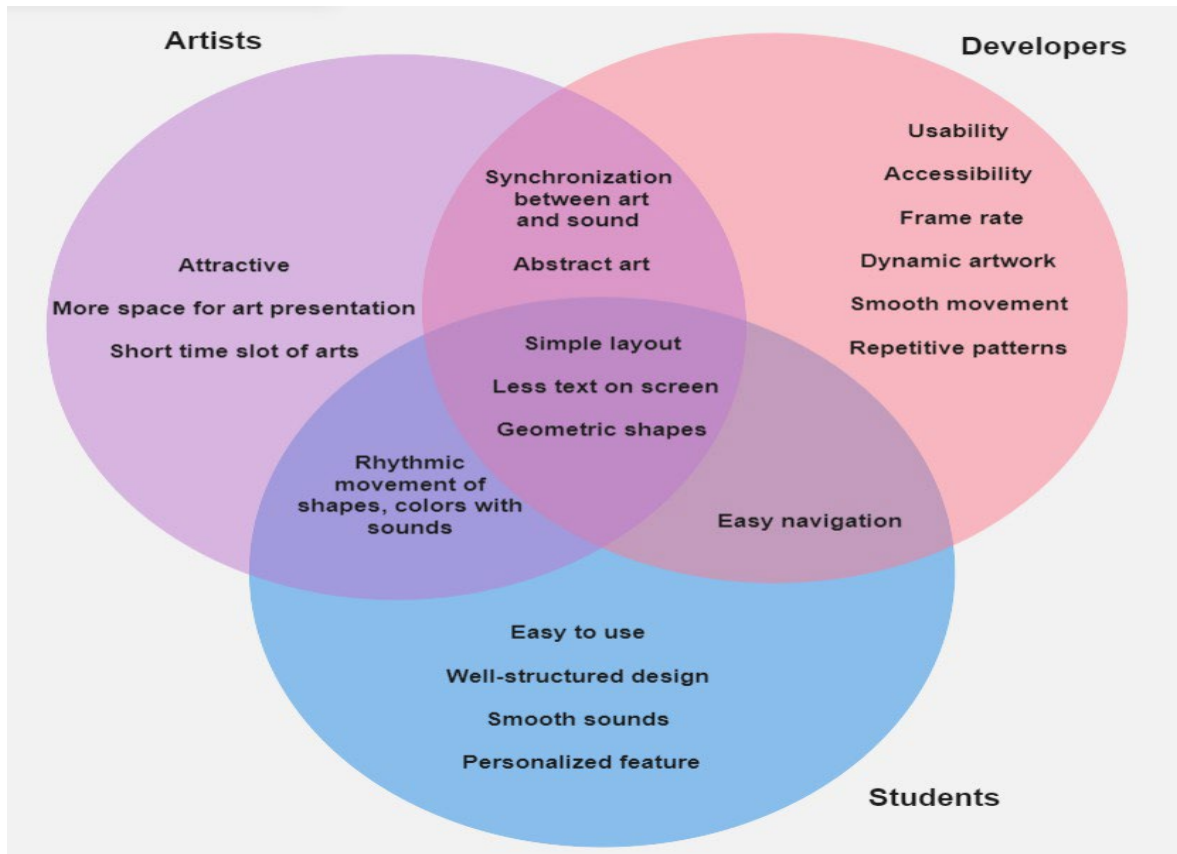


Figure 5: Key design features of visual and audio media art applications

The most obvious finding to emerge from the analysis is that visual and audio media art applications designed to promote calmness and relaxation should include geometric shapes. Both developers and artists viewed abstract art, synchronization between art and sound as key design features. Furthermore, research identified rhythmic visualization of art, dynamic artwork, smooth movement, repeated patterns, short time slots of arts, and inspiring aspects as key design features. As mentioned in the literature review, visual representation to encourage cognitive separation, abstract visual elements, pleasant sounds, colour changes, and geometric forms are considered as important design features for relaxing applications (Chittaro & Sioni, 2014; Prpa., Cochrane, & Riecke, 2016). Therefore, these results are in line with those of previous studies.

Prior research has identified cognitive distancing as a design principle in their prototype (Chittaro & Sioni, 2014). Consistent with the literature, this study indicated that student participants can forget about their surroundings, clear their minds by viewing rhythmic movements of geometric shapes, colours and sounds. Therefore, this study recommends design features mentioned in Figure 5 as key features to consider when developing relaxation-based visual and audio applications.

There was an opportunity to present the research findings and prototype to the Syntropy developer and artist via an online meeting. Researcher received positive feedback indicating that the research findings are useful. They accepted the findings and expressed an interest in

applying them in the future. Furthermore, they suggested increasing the number of personalized questions about colour, shape, and sound choices in the survey option.

Limitations and Future work

This study is a small-scale investigation, with a focus on a sample of six students who use visual and media art applications. The findings may be biased and not applicable to the large student population. As a result, it is also necessary to examine the larger student population in order to determine the best approach to engaging with the visual and audio media art applications for relaxation.

The current study does not investigate how students' cultural backgrounds influence the selection of visual and auditory artworks in relaxation apps. Furthermore, this study does not address how the artist's cultural background affects artwork design for visual and aural media art applications. In future work, it can address these aspects and conduct studies.

A further limitation is that this study was conducted utilizing only one visual and audio media art application. As a result, students only experience one application and base their design preferences on it. Further research might look into other visual and auditory media art applications and how users experience them, as well as evaluate their design aspects.

Conclusion

The aim of the present research was to evaluate student experience of using audiovisual media art applications for relaxation, to determine key design features of those application and explore suitable technology platforms to experience those applications.

One of the more significant findings to emerge from this study is that geometric shapes, abstract art, synchronization between visual and audio, rhythmic visualization, smooth movement, short time slots of arts, slow calm audio, personalized are the key design aspects for audio visual media art application used for relaxation. These design aspects assist students relax, calm down, forget about their surroundings and clear their minds. The second major finding was that a large-screen TV or projector is suitable technology platform for viewing these media art applications.

This study's findings make a number of contributions. First, it recommends key design elements for relaxation-based visual and audio media art applications. These features can be used to develop novel applications or refine existing ones. Second, the study helps to understand the best platforms to experience these creative applications. Furthermore, the results of this study indicate that short art experiences (of up to five minutes), pleasant sounds, and a larger screen platform boost user engagement. Although the current study is based on a small sample of students, the results demonstrated that they can relax using these applications. Future research should be conducted with a bigger student sample to investigate how cultural background influences to view or create those art applications.

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References

- Addadahine, S. Andrews, G., & Joy, A. (2021, November 21). Syntropy. The Syntropy Partnership. Retrieved from <https://www.syntropystates.com>.
- Alqahtani, F. & Orji, R. (2020). Insights from user reviews to improve mental health apps. *Health Informatics Journal*, 26(3), 2042–2066. doi:10.1177/1460458219896492
- Braun, V. & Clarke., V. (2021). *Thematic Analysis: A Practical Guide*. Thousand Oaks, CA: Sage Publishing.
- Chittaro, L. & Sioni, R. (2014). Evaluating mobile apps for breathing training: The effectiveness of visualization. *Computers in Human Behavior*, 40, 56-63. doi:10.1016/j.chb.2014.07.049
- Cohen, K.A., Stiles-Shields, C., Winqvist, N. & Latie, E.G. (2021). Traditional and Nontraditional mental healthcare services: Usage and preferences among adolescents and younger adults. *The Journal of Behavioral Health Services*, 537–553. 10.1007/s11414-020-09746-w
- Cohen, K., Graham, A. & and Lattie, E. (2020). Aligning students and counseling centers on student mental health needs and treatment resources. *Journal of American College Health*, 724–732. doi:10.1080/07448481.2020.1762611
- Fekete, A., Maidhof, R.M., Specker, E., Nater, U.M. & Leder, H. (2022). Does art reduce pain and stress? A registered report protocol of investigating autonomic and endocrine markers of music, visual art, and multimodal aesthetic experience. *PLOS ONE*. doi:10.1371/journal.pone.0266545
- Fleischmann, R.J., Harrer, M., Zarski, A-C., Baumeister, H., Lehr, D., Ebert, D.D. (2018). Patients’ experiences in a guided internet- and app-based stress intervention for college students: A qualitative study. *Internet Interventions*, 12, 130–140. doi:10.1016/j.invent.2017.12.001
- Hakima, E. M., Maryem, B., Ikrame, Y., Imane, T., Chadya, A. and Mohamed, B. (2020). “Stress-free” mobile app for Moroccan University Students: “Relaxation program” validation. *International Conference on Intelligent Systems and Computer Vision (ISCV)* (p. [Preprint]). Fex, Morocco: IEEE. doi:10.1109/iscv49265.2020.9204232
- Huberty, J., Green, J., Glissmann, C., Larkey, L., Puzia, M. & Lee, C. (2019). Efficacy of the mindfulness meditation mobile app “calm” to reduce stress among college students: Randomized Controlled Trial. *JMIR mHealth and uHealth*, 7(6). doi:10.2196/14273

- Law, M., Karulkar, N. & Broadbent, E. (2021). Evidence for the effects of viewing visual artworks on stress outcomes: a scoping review. *BMJ Open* 11, 6. doi:10.1136/bmjopen-2020-043549
- Prpa., M., Cochrane, K. & Riecke, B.E. (2016). Hacking alternatives in 21st century: Designing a bio-responsive virtual environment for stress reduction. *Communications in Computer and Information Science*, 34-39. doi:10.1007/978-3-319-32270-4_4.
- Schulte-Frankenfeld, P. & Trautwein, F. (2021). App-based mindfulness meditation reduces perceived stress and improves self-regulation in Working University Students: A Randomised Controlled Trial. *Applied Psychology: Health and Well-Being*, 1151– 1171. doi:10.1111/aphw.12328
- Sifat, M., Tasnim, N., Stoebenau, K., & Green, K.M. (2022). A qualitative exploration of university student perspectives on mindfulness-based stress reduction exercises via smartphone app in Bangladesh. *International Journal of Qualitative Studies on Health and Well-being*, 17(1). doi:10.1080/17482631.2022.2113015
- Toussaint, L., Ngyen, Q.A., Rotger, C., Dixon, K., Offenbacher, M., Kohls, N., Hirsch, J. & Sirois, F. (2021). Effectiveness of progressive muscle relaxation, deep breathing, and guided imagery in promoting psychological and physiological states of relaxation. *Evidence-Based Complementary and Alternative Medicine*, 1-8. doi:10.1155/2021/5924040
- Trupp, M. D., Bignardi, G., Chana, K., Specker, E. & Pelowski, M. (2022). Can a Brief Interaction with Online, Digital Art Improve Wellbeing? A Comparative Study of the Impact of Online Art and Culture Presentations on Mood, State-Anxiety, Subjective Wellbeing, and Loneliness. *Frontiers in Psychology* 13. doi:doi.org/10.3389/fpsyg.2022.782033
- Van der Merwe, S. E., Biggs, R., Preiser, R., Cunningham, C., Snowden, D. J., O'Brien, K., ... & Goh, Z. (2019). Making sense of complexity: using SenseMaker as a research tool. *Systems*, 7(2), 25. . <https://doi.org/10.3390/systems7020025>.
- Wang, Q., Liu, Z., He, C. & Hu, J. (2022). Effects of Dynamic Digital Art with Audio-visual Emotional Congruence on Relieving Stress. *Tenth International Symposium of Chinese CHI*. Guangzhou. doi:10.1145/3565698.3565788.

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