Exploring Calming Activities for Intellectually & Developmentally Disabled Adults

A Major Qualifying Project

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Abstract

The purpose of this project was to analyze existing coping strategies and modify them for use by adults with Intellectual and Developmental Disabilities (I/DDs) to help cope with abuse related trauma. Limited research has been done to help adults with I/DDs respond to abuse, and many current tools created for response fail to incorporate the voices of those with I/DDs. Our research contains three studies addressing this research gap. Study 1 analyzed transcripts from interviews previously conducted with individuals to learn what existing calming activities are known to help adults with I/DDs cope with trauma. Study 2 analyzed previously conducted interviews where adults with I/DDs piloted an application prototype containing two calming activities, and suggested improvements to increase understanding of and engagement in calming activities. Study 3 involved a focus group with three consultants providing feedback on our application prototype focusing exclusively on calming activities. All studies highlighted that incorporating a) a diversity of interactive calming activities across four categories: creative, identity-based, social, and movement, b) a wide range of accessibility controls, c) vibrant colors, d) instruction visuals, and e) using plain language were essential to creating accessible and well-liked coping strategies for adults with I/DDs. Findings emphasize a need for more tools helping adults with I/DDs self-advocate. These findings are important for employers who are tasked with providing equitable workspaces and for those part of support communities for I/DD individuals.

Executive Summary

A study in 2012 with 7,000 participants with Intellectual or Developmental Disabilities (I/DDs) and families, found that 70% of participants experienced sexual, physical, or financial abuse (Baladerian et al., 2013). Previous research has found that calming activities are one way I/DD individuals cope with trauma and/or triggering. People with I/DD's needs are often neglected during the development of self-care apps for use by the general public. This gap between what is known to help adults with I/DDs and existing tools is why our team wanted to explore how to make calming activities accessible for people with varying disabilities.

We aimed to analyze existing calming activities and modify them for use by adults with Intellectual and Developmental Disabilities (I/DDs) to help cope with abuse related trauma. To do this, we conducted three studies. In Study 1, we learned what existing calming activities help adults with I/DDs through interview transcripts. In Study 2, adults with I/DDs tested an application and volunteered calming activity suggestions. Study 3 was our own design, where we conducted a focus group with the purpose of collecting feedback on our calming activity application prototype. We also analyzed the prototype's content and expanded on potential uses.

Overall, we found that having a wide range of calming activities that include vibrant colors, instructions that use plain language and visuals, and a wide range of accessibility controls was essential in successful self-care and calming activity usage. We believe these findings are important for employers who are tasked with providing equitable workspaces, clinics, doctors, and other groups who are part of medical and support communities for I/DD individuals. We believe our findings begin to highlight the need for developing calming activities for I/DD individuals that are centered around accessibility.

Exploring Calming Activities Best Fit for Use by the Adult I/DD Population

Within the United States, the rate at which individuals with intellectual and developmental disabilities (I/DDs) experience abuse is significantly higher than those who do not have I/DDs (Curtiss & Kammes, 2019; Baladerian et. al., 2013). Unfortunately, abuse can lead to negative and lasting effects that can influence functioning and well-being, known as trauma (US Substance Abuse and Mental Health Services Administration, 2014). Thus, those with I/DDs may be at a higher risk of being traumatized due to their greater risk of abuse. Given this, the focus of this project is to examine ways in which adults with I/DDs can respond and cope with trauma using calming activities. In particular, we will explore different calming activities that are meant to help soothe someone in need by helping normalize breathing, slowing heart rate, stabilizing one's mood, or bringing someone back to the present moment when triggered.

The I/DD Population

I/DD is an umbrella term grouping intellectual and developmental disabilities together. Developmental disabilities (DDs) are defined as a group of conditions caused by impairment in physical, learning, language, or behavior areas present before the age of 18. DDs may involve physical and/or intellectual difficulties and often fall under one of four categories: metabolism, regenerate, sensory system, and nervous system disorders (National Institutes of Health, 2021). Developmental disabilities are a broad category that intellectual disabilities (IDs) fall under. IDs are a type of DD that limit a person's ability to learn and function at an expected level. An ID needs to be present prior to the age of 18 and must impact social and life skills, as well as reasoning, learning, and/or problem-solving (National Institutes of Health, 2021). The five most common intellectual and developmental disabilities (I/DDs) affecting children (ages 3-17 years old) in the US are Attention Deficit Hyperactive Disorder (ADHD), Autism Spectrum Disorder

(ASD), cerebral palsy, hearing loss, and intellectual disability (CDC, 2021). I/DDs typically carry over into adulthood, often adding challenges and obstacles to overcome in daily life. These challenges can come in many forms with a wide range of effects for adults on an individual basis, one of which is abuse.

Abuse Within the I/DD Community

We are looking to analyze and modify calming activities to help adults with I/DDs cope with their previous negative experiences trauma, which is why we investigated abuse rates within the I/DD community. The Center for Disability Rights (2021) reported that intellectually disabled people are seven times more likely to be abused than a non-disabled person, while 90% of developmentally disabled people will be sexually abused at some point in their lives. This higher risk can be attributed to numerous factors, such as increased dependence on others, social isolation, and potentially being viewed as less valuable to society (Abuse and Exploitation of People with Developmental Disabilities, 2020). A person's disability may also play a role in their odds of being abused or mistreated. Due to the increased rates of abuse in adults with I/DDs, these individuals are at higher risk of developing trauma.

Trauma Within the I/DD Community

An event is deemed traumatic not only based on what happened but also on how someone experiences the event and lives through it. Trauma impacts individuals in different ways. Generally, trauma overwhelms an individual's ability to cope and elicits either a fight, flight, or freeze reaction when going through, or reliving, a traumatic event (US Substance Abuse and Mental Health Services Administration, 2014). It can also leave an individual feeling afraid, vulnerable, or helpless. Individuals with trauma can also get triggered, where they re-experience what they have gone through before (UT Health San Antonio, 2021, Module 2 Section 20).

Trauma affects neurotypical people and individuals with I/DDs in different capacities. It is important to understand trauma and help those with I/DDs learn to cope with trauma, as adults with intellectual and developmental disabilities are more vulnerable to trauma than neurotypical people. To be considered neurotypical, someone must be healthy in both a medical and psychological sense while showing a normative pattern of brain development (Perszyk, 2021).

As people with I/DDs process information differently than neurotypical people, coping with trauma is more difficult. Due to their varying abilities to process information, people with I/DDs may be more easily hurt by trauma. They also have lower levels of access to social support, making it more difficult to deal with traumatic events and lengthening the recovery process (UT Health San Antonio, 2021, Module 2 Section 13). Trauma can also lead to the person getting triggered by certain events that happen in everyday life, which may also make it more difficult to cope with traumatic events.

Response to Trauma and Triggers

Coping is a process used to come to terms with an event or series of circumstances that have caused trauma in someone's life (Olff et al., 2005). Everyone's coping style may differ, causing variation in which strategies they use. One study conducted on coping strategies in relation to Post-Traumatic Stress Disorder (PTSD) found that individuals use various coping strategies depending on the type of stress they undergo (Birmes et. al., 1999; Naatanen et. al., 2002, as cited by Olff et. al., 2005).

There are two major types of coping strategies used to manage trauma: passive and active (Olff et al., 2005). Passive strategies are viewed as maladaptive ways of confronting stress while active ways are viewed as positive ways to deal with stress (Olff et al., 2005). When the stress is not anticipated or controllable, the coping strategy used is typically passive. Some actions taken

when using this strategy are freezing in place or disconnection (Olff et al., 2005). Examples of passive coping strategies are isolating oneself from others, drug abuse, denying the event occurred, blaming the self for the event, extensive contemplation about the event, and avoiding stress (Olff et al., 2005). The effects of rumination have been found to increase negative thinking in PTSD (Birmes et. al., 1999; Naatanen et. al., 2002, as cited by Olff et. al., 2005). Escape-avoidance, denying anything happened, or distracting oneself not to think about the event have also been found to increase an individual's chances of developing PTSD (Charleton & Thompson et. al., 1996; Marmar et. al., 1996; Chang et.al., 2003, as cited by Olff et. al., 2015). The long-term effects of passive coping styles are an inability to process information and the continuation of being in a state of anxiety (Olff et al., 2005). Thus, these are not coping strategies we would recommend to individuals as they have a lot of long-term negative impacts.

When a stressful event is one that can be controlled or avoided, an active strategy is used. Active coping strategies involve confronting, fighting, or escaping it (Olff et al., 2005). Some active coping strategies are thinking positively or dealing with the stressor when it occurs. In the example of experiencing trauma from mass murder, analyzing the rationality of the stressor, reaching out for help, or dealing with the stressor head-on helped decrease the chances of developing mental disorders later (Olff et al., 2005). It was also found that using behaviorally centered active coping strategies helped decrease PTSD symptoms after experiencing sexual assault (Resnick, 1988 as cited by Olff et al., 2005).

Past Work on Existing Strategies to Help Cope with Trauma

There has been some past work done on ways to cope with trauma when an individual becomes triggered by an event via behavioral coping strategies. These coping and support mechanisms are part of trauma-informed care that is given by direct care and mental health

workers. A trauma-informed care approach is often used one on one with the person reliving trauma and a licensed professional. Trauma-informed care emphasizes the development of an organizational culture that prioritizes "safety, trustworthiness, choice, collaboration, and empowerment among service users" (Keesler, 2014, p. 37). Having knowledge of trauma-informed care that has been used by professionals is key to understanding what is currently successfully used to cope with trauma. There are multiple methods which are used to deescalate the response that a trauma trigger causes. When someone is triggered, the main goal is to get the person to calm down and bring them back to the present. A lot of this is done through conversation.

When using a trauma-informed care approach, professionals actively listen to what the person is saying and reassure them and create a safe environment. Through conversation, the professional leads the person away from the triggering event or environment and allows the person to verbally express what is happening rather than showing it through negative behaviors. They also aim to make the person feel validated and provide support (UT Health San Antonio, 2021, Module 2 Section 33). It is important to realize there are a lot of moving parts when using trauma-informed care approaches and they are not simple to apply. "Working with trauma is a delicate balancing act between the development of/or use of coping strategies and the need to process the traumatic experiences" (US Substance Abuse and Mental Health Services Administration, 2014, p.120). There is no one way to cope with trauma, thus many calming activities and techniques have been studied and used to help individuals cope with trauma. The US Substance Abuse and Mental Health Services Administration (SAMHSA) which aims to decrease impacts of substance abuse and mental illnesses on Communities in America, also

includes the most used calming activities for neurotypical individuals, which can be modified for use by the adult I/DD population to increase their effectiveness.

Coping Techniques for Neurotypical Individuals or Those with Mental Disorders

A large aspect of trauma-informed care is the use of calming activities immediately after someone experiences trauma due to a trigger. These activities are alternatives to what they are currently doing and may be stimulating such as breathing exercises, listening to music, or going to a sensory room (UT Health San Antonio, 2021, Module 2 Section 25). Meditation has also been found to be highly effective in both clinical and non-clinical contexts, as well as in-person and virtually via an application or the internet (Kellen & Saxena, 2020).

When using calming activities, professionals explain what the activities are and what to expect. One source by the US Department of Health and Human Services explains calming activities used by behavioral health services as a part of trauma-informed care. These calming exercises are specifically for those that have trauma, mental disorder, or co-occurring mental disorders. Someone with co-occurring mental disorders has more than one mental disorder at the same time (US Substance Abuse and Mental Health Services Administration, 2014). There are four main calming activities shown to be successful in addressing behavioral symptoms relating to mental disorders.

One of the calming activities is asking the affected person what they see. This calming activity focuses on bringing someone back to the present by making them aware of their surroundings. This involves reminding them that they are in a safe environment. Then, the person is asked to take slow deep breaths and give details about their environment before being asked what could be done to make them more comfortable (US Substance Abuse and Mental

Health Services Administration, 2014, p.98 Exhibit 1.4-1). This tells us that calling attention to environmental markers and stimuli can allow an individual to reconnect to the present.

The second calming activity focuses on decreasing how intense the effects of the trigger are. The technique for this calming activity is called the emotional dial. The affected person is asked to use their imagination to visualize turning the volume down on their emotions (US Substance Abuse and Mental Health Services Administration, 2014, p.98 Exhibit 1.4-1). The use of imagery, when accompanied by a guide, is helpful as it creates a safe space in the person's mind and can act as a distraction from the traumatizing event. (US Substance Abuse and Mental Health Services Administration, 2014, p.98 Exhibit 1.4-1). This activity tells us that utilizing imagery to cope with trauma can have a calming effect on an individual.

The third calming activity this source mentions is distracting the affected person from states of emotion that become unbearable (US Substance Abuse and Mental Health Services Administration, 2014, p.98 Exhibit 1.4-1). This can be done by using a few different methods that focus on the person bringing themselves back to the present by having them remember where they are and what is happening in the present. The first method is to focus on the environment they are in by giving the affected person a category and asking them to name things around the room that fit in that category. Another method is to ask the person to list what they have to do for the day or inquire about recent events. Adding to this, the affected person can be distracted through counting to focus on reality. The latter method employs somatosensory techniques. This includes moving their fingers or touching their own hair as this brings back to reality through body awareness (US Substance Abuse and Mental Health Services Administration, 2014, p.98 Exhibit 1.4-1). This explains that individuals may distract themselves

and come back to reality in various ways. They can do this through verbally speaking or by acknowledging where they are through touch.

The last calming technique mentioned in this source is breathing techniques. When triggered, the person is asked to breathe deeply at a slow pace, in through the nose and out through the mouth. They can also put their hands on their abdomen while doing so to watch their hands move as they breathe (US Substance Abuse and Mental Health Services Administration, 2014, p.98 Exhibit 1.4-1). Like the third technique, this provides grounding through body awareness. It is recommended that individuals are shown how to use these techniques so they can successfully utilize them independently (US Substance Abuse and Mental Health Services Administration, 2014).

It is important to note that these calming activities were created to help both neurotypical individuals and those with mental health disorders cope with trauma and/or triggering. These calming activities have undiscovered applications for use by the adult I/DD population. It is not fully known how existing calming techniques can be modified so they can be the most effective for people with I/DDs.

Filling the Gap in Research

Tools that are designed specifically for individuals with I/DDs are a subject of ongoing research. The needs of people with I/DDs are often neglected during the development of self-care apps for use by the general public. This creates a gap between what is known to help adults with I/DDs and existing tools. Our team wanted to know how we could make calming activities accessible to people with a range of disabilities for which we did three studies. In Study1, we analyzed interview transcripts to learn what existing calming activities help adults with I/DDs cope with trauma. This study incorporated the voices of professionals working with adult I/DD

abuse survivors. In Study 2, we watched recordings of previously conducted interviews in which adults with I/DDs tested an application and volunteered suggestions for calming activities. Study 3 was of our own design and involved a focus group with adults with I/DDs to provide feedback on our calming activity application prototype.

Study 1

In this study, we analyzed qualitative data from previously conducted interviews with professionals working with adult I/DD abuse survivors. These individuals answered questions about their roles and experience with the adult I/DD community. These questions were asked to better understand how individuals with I/DD can be empowered and practice self-care independently and will be used to help create a self-care app. The questions we focused on in these interviews centered around the types of trauma responses and calming activities adults with I/DD use, self-care they recommend individuals use in peer support meetings and at home, and advice they gave on facilitating self-care and how to improve an app on self-care for disabled people.

Method

Participants

Eight people were gathered through convenience sampling and interviewed about their work with adult I/DD abuse survivors and what they would like to see in a self-care app. For confidentiality reasons, the demographics of the participants were retracted from the data.

Design & Procedure of the Interviews

The purpose of these interviews was to learn about different support systems in place to help individuals with I/DD who have experienced abuse cope and engage in self-care. Since each person interviewed had different experiences, the interviewers use a semi-structured approach to ask similar questions across participants but to allow for additional and follow-up questions when something of interest was said (see Berg & Lune, 2012 for more information on semi-structured interviews). For the purposes of our work, we focused on the questions related to coping strategies and self-care.

More specifically, we analyzed the responses to a question investigating the extent to which individuals with I/DD practiced self-care on their own (e.g., "Do you know if others do self-care outside of support sessions?". The responses to this question provided information on how easily the calming activities taught in-session could be used independently. We also examined responses to questions directly asking about self-care activities (e.g., "What are the most useful activities?") because these responses provided more information on specific activities individuals engaged in for self-care. In addition, we were interested in what types of accessibility features might be important when engaging in different self-care activities whether in-person or in some other format like an app. Therefore, we analyzed the responses to a question examining what participants would like to see in an app on self-care (e.g., "What would you like to see in an app as a way to help survivors engage in self-care on their own?").

Interview Analysis Procedure

Each participant's transcript was read in full before the answers to the four key questions we identified were analyzed. Then one researcher read through the answers for the key questions looking for patterns, similar answers, and statements that agreed or conflicted with other

participants' answers. were noted. The same researcher then created the following categories into which the activities were sorted: social, creative, identity-based, or physical/movement-based. The creation of these general groupings was helpful in identifying broader types of calming activities which, in turn, can inspire the creation of more diverse calming activities to accommodate individual preferences. Additionally, these categories are intentionally broad to allow for individual interpretations.

The social category is defined by activities that require or are focused on interacting with one or more people. Activities that fell under this category included calling a friend, sharing in group sessions, and using social media. Some participants mentioned listening to music on YouTube or alternate social media sites, which were counted as creative calming activities rather than social ones. This is because, ultimately, the goal of listening to music, digitally or otherwise, is the art form itself rather than the social aspect of it. Unless the participant's response mentioned sharing or engaging in the art with another person, it was determined that the activity was more creative than social. Other examples of creative activities were journaling, coloring, or crafts, as the creative category was defined by any activity focused on art, be it the creation or enjoyment of said art.

Perhaps the most abstract category, identity-based calming activities, was defined by activities with the intent of exploring, confirming, or strengthening different aspects of a person. The category included activities that took a more holistic approach and were centered on each individual person. For example, messages of empowerment and inclusion with a focus on a person being more than the sum of their parts was mentioned. Identity-based calming activities may come in the form of social interactions but can also exist as solo activities. Things like

reciting personalized mantras, reading or listening to inspirational quotes, or looking at pictures that resonate with a person can all be considered identity-based calming activities.

The final category is physicality and movement, which covers activities like yoga, taking walks, and tactile activities that a person finds soothing. This category was defined by activities with the explicit intent of moving to calm a person. Examples of tactile calming activities are body percussion, an activity involving striking the body rhythmically for musical, social, or therapeutic purposes (Romero Naranjo, 2013), or repetitive tasks like washing dishes. There is some overlap with creative calming activities as arts and crafts which can be considered a physical calming activity. The key difference between physical and creative calming activities lies in the perceived benefit of the activity. If a person is cutting up paper because they enjoy the action of doing so, then it is a physical activity. If cutting the paper allows them to meet a goal such as creating a mosaic, despite cutting the paper being pleasant, it would be considered a creative calming activity.

Results & Discussion

The category the most responses fell under was creative activities. Seven of the eight participants (87.5%) mentioned creative activities at least once in their interviews. Listening to music and coloring were the most mentioned creative outlets. This is likely because these activities are relatively accessible and widely understood. There is a plethora of free coloring pages of varying complexity online that can be downloaded and printed ahead of time. There are also many free coloring apps available for tablets and phones. However, coloring may only be soothing and entertaining to people with certain degrees of eyesight and color distinction. For others, a creative outlet such as music is likely their most accessible calming activity. There are many free music listening options such as YouTube, radio stations, and Spotify, to name a few.

Music can also be considered a social experience. People may enjoy sharing their favorite songs and artists with others, as well as discussing styles, emotions, and experiences tied to music.

Six participants (75%) agreed and mentioned identity-based calming activities at least once in their interviews. “Empowerment” was the most common word used to describe these activities and their importance. Three participants (37.5%) mentioned movement-based activities such as dancing, stretching, and taking walks. Five of the eight participants (62.5%) mentioned a social activity as a preferred calming activity at least once during their interview. One participant confirmed that this extended to topics beyond abuse and disabilities as group members enjoyed talking about movies and other pleasures during sessions. This indicates that an important factor in social calming activities is the sense of community in addition to the topic. Conversing with people who have similar experiences may take the pressure off a person to talk about emotionally taxing topics such as their disabilities and trauma because those characteristics are a commonality not isolating.

There were mixed reviews on the effectiveness of meditation as a calming activity. One participant (13%) said that meditation was the least useful activity they used in a group setting while another participant (13%) said they would like to see a guided meditation activity in a self-care app for adults with I/DDs, provided it did not over-explain what to do and was not condescending to users. The mixed reviews about guided meditation indicated that the activity itself may be effective and enjoyed by the adult I/DD community, but its current structure is not as well as it could be. This speaks to the necessity of customization for calming activities.

Recommendations

With this information in mind, we recommend that apps and programs aimed at encouraging self-care should include at least one calming activity from each of the four

categories: coloring/visual stimulation, music/auditory stimulation, movement/physical stimulation, and social interactions. Because each category contains a multitude of possible activities which can be tailored to suit each individual's needs and wants, instructions that include various examples would be more effective than a strict set of guidelines. For example, there is no "correct" way to complete a mandala but explaining that the pattern is meant to be colored may be necessary if a person is unfamiliar with the concept of a mandala. Similarly, music and pleasant sounds have different definitions depending on the person, so listing common genres and noise-making apps would be more ideal than telling a person to listen to "calming music."

As for meditation, therapists and instructors as well as adults with I/DDs should be consulted to create a successful guided meditation app or lesson. By asking the adult I/DD community and those directly familiar with some of its members, a more precise adaptation of the activity can be created.

Due to each person having varying abilities and preferences, engaging in self-care can feel more akin to a task than a pleasure, so we would recommend the calming activities be gamified, as preliminary research suggests it may be helpful (Johnson et al., 2016). An example of this would be a self-care bingo card. The card would consist of a three-by-three grid with the center space marked as a "free space" or indicated in some other way that there does not need to be an activity in that slot. It should be explained that this square will still count toward a person getting "bingo" despite no calming activity being completed. The other eight spaces can be customized with calming activities of each person's choosing. The person should be allowed to choose from an attached descriptive list or write in their own activity. The objective would be for a person to engage in various self-care activities until they have completed the activities in three

consecutive squares, whether vertically, horizontally, or diagonally across the grid. Any of these would be considered “bingo.”

Study 2

While interviews with professionals were helpful, they did not incorporate input directly from adults with I/DDs, leading to Study 2. This study focused on gauging attitudes toward existing calming activities. To do this, we analyzed predominantly qualitative data by looking at recordings of interviews conducted by a research team piloting an application containing two lessons on abuse as well as two calming activities. The piloted app was designed specifically for adults with I/DDs to recognize, respond, and report five different forms of abuse.

Method

The questions we analyzed focused on music and breathing calming activities’ engagement, ease of use, and reactions perceived by participants. We created our own set of questions that informed us on these two calming activities are useful, need modifications, or should not be used by the adult I/DD population. Analysis of these data played an essential role in providing accurate and relevant information directly from adults with I/DD, influencing the creation of our second study. The results of this study were used in study 3 to increase the effectiveness of currently existing music-making and breathing activities. The interviews were previously conducted over Zoom with 11 participants.

Participants

Interviews were conducted with 14 adult members (with ages ranging from 20-49 years) of the I/DD community gathered through convenience sampling, and they were compensated

with a $30 gift card for their participation. Three participants requested to stop their interviews early due to scheduling issues or feeling overwhelmed. Thus, the analyses are based on 11 participants (3 Male; 8 Female). All participants and any legal guardians gave informed consent prior to participating. All participants agreed to having the interviews recorded for purposes of data analysis and transcription.

Interview Design & Procedure

Semi-structured interviews were conducted with individuals with I/DD to understand how they interacted with an app that was being designed to help individuals with I/DD recognize, respond, and report abuse (see Berg & Lune, 2012 for more information on semi-structured interviews). During the interviews, participants interacted over Zoom with two lessons in the app: one on sexual abuse and one on financial abuse. The order in which participants saw these lessons was randomly assigned and counterbalanced. If participants were using a computer, then they were given control over the shared screen on Zoom and could use their own mouse and keyboard to control the app. If participants were using a tablet, then they verbally instructed one of the interviewers on what to press and when.

Participants first navigated through the first lesson they were randomly assigned to complete (financial or sexual abuse). As they navigated through the lesson, they were asked to share out loud their thoughts. Each lesson began with slides providing information about the types of abuse. Then participants were randomly assigned to one of two calming activities–either a breathing exercise or an activity where they could make music on a keyboard. After the calming activity, participants engaged in an activity to practice a skill related to the type of abuse. For sexual abuse, the participants clicked on all the no-touch zones depicted as an outline of both female and male bodies. For the financial abuse lesson, the participants made change for

a predetermined amount of money using $20.00, $10.00, $5.00, and $1.00 images, as well as depictions of quarters, nickels, dimes, and pennies. Participants also watched a few video clips depicting each type of abuse and answered some quiz questions after each video clip. After going through the lesson, the interviewers asked participants about their thoughts and experience with the lesson. Participants then engaged in the second lesson, and after completing that lesson answered questions about their thoughts and experiences with that lesson. After completing both lessons, the participants answered questions about their experiences using the app as a whole.

Observation Design & Procedure

We were most interested in how participants reacted to and felt about the two calming activities used in the app, a breathing exercise and music-making activity, in terms of engagement, ease of use, and reactions. Therefore, we watched each interview and coded the responses to the breathing exercise, the music-making activity, and reactions to the calming exercises overall in conjunction with the list of questions we created to answer when coding each section. To conduct this observation study, two independent observers watched each interview with a list of questions that needed to be answered for each activity and overall reactions (see Observation Materials for more details).

After the observations were completed, the two observers met and compared their results to check for inter-observer reliability. Past research has indicated that 60% agreement between observers is an acceptable level of interobserver reliability (SAGE, 2018). Therefore, if there were discrepancies in observations, the two observers discussed the variable in question, came to a consensus on how to analyze that variable, and watched the interview again. Our initial inter-observer reliability was 81% for the music-making activity and 86% for the breathing exercise. We discovered that one area of misunderstanding between observers was indicating when a

calming activity began and when it ended. To account for this, we agreed that the start of the activity would be when the participant clicked the close button to exit the instructions window. The end of the calming activity would be determined by when the participant clicked the next button exiting out of the calming activity window to continue with the lesson. We then rewatched all interviews and revised our timestamps for the music activity and breathing exercises. Our final inter-observer reliability was 87% for the music-making activity and 89% for the breathing exercise. The interobserver reliability for the overall reactions to the calming activities was 87.50%.

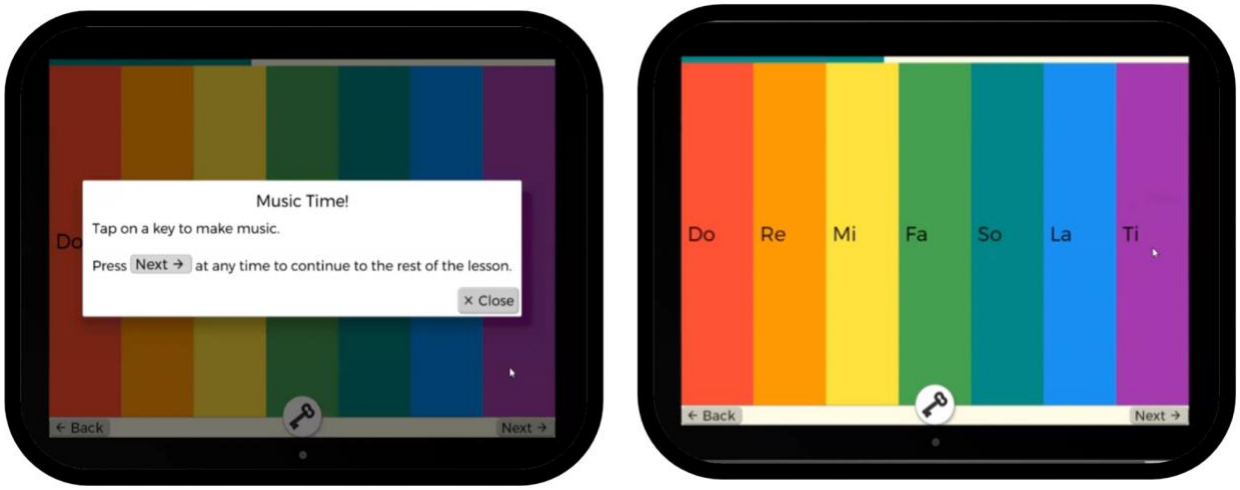
Observation Materials

Music-Making Activity

For the music-making activity, participants saw a rainbow-colored keyboard with musical notes that were labeled do, re, mi, fa, so, la, and ti on the screen. When participants pressed one of the "keys", the respective note played (See Figure 1). Participants could play random notes, scales, or musical pieces they pleased. Participants could stay on this activity for as long as they liked and had to press the "next" button to continue with the lesson. For our observation, we wanted to understand how easy the activity was to use, how engaging the activity was, and how participants felt about the activity. Therefore, we watched the interactions with the music activity with a particular focus on these key variables (see Appendix A for all items).

Figure 1

Music Activity Visual



Music-Making Measures

To measure ease of use with the music-making activity, we looked to see: a) if the participants needed more instruction on how to use the activity (yes, no); b) what specifically was confusing (summary of what clarifying information was needed); c) number of misclicks that were made using the activity; and d) number of misclicks made trying to exit the activity.

To measure engagement with the music-making activity, we noted: a) if they skipped the activity (yes or no); b) how long they spent on the activity (start and finish timestamps); and c) total number of times they click on keys to make music.

To measure reactions to the activity, we summarized what participants: a) liked about the activity, b) disliked about the activity, and c) any suggested changes to the activity. We also noted how useful and helpful the participants found the activity to be (a lot, a little, not at all).

Breathing Exercise

For the breathing exercise, participants saw a ring on the screen. If participants started the exercise, then the word "inhale" would appear above the ring and the ring would begin to fill in with the color yellow to show participants how long they should inhale. Then, the color would change to blue, and the word exhale would appear above the ring. And the ring would fill with blue to show participants how long they should exhale. Participants could stay on this activity for as long as they liked. They could click a reset button if they wanted to start the breathing cycle over from the beginning (e.g., inhale) (See Figure 2). Participants had to press the "next" button to continue with the lesson. For our observation, we wanted to understand how easy the activity was to use, how engaging the activity was, and how participants felt about the activity. Therefore, we watched the interactions with the breathing exercise with a particular focus on these key variables (see Appendix B for all items).

Figure 2

Breathing Activity Visual

Breathing Exercise Measures

To measure ease of use with the breathing activity, we looked to see: a) if the participants needed more instruction on how to use the activity (yes, no); b) how confused the participant appeared (not at all, a little, very); c) what specifically was confusing (summary of what clarifying information was needed); d) total number of misclicks that were made using the activity; e) number of times start button was clicked erroneously; and f) number of times reset button was clicked erroneously).

To measure engagement with the breathing exercise we noted: a) if they skipped the activity (yes or no); b) how long they spent on the activity (start and finish timestamps); c) total number of breathing cycles they engaged in before moving on; d) number of full inhales completed; an e) number of full exhales completed.

To measure reactions to the activity, we summarized what participants: a) liked about the activity, b) disliked about the activity, and c) any suggested changes to the activity. We also noted how useful and helpful the participants found the activity to be (a lot, a little, not at all).

Overall Reactions

We were also interested in how participants felt about the calming activities after they had worked through both lessons. Therefore, we observed the reactions participants gave to the questions they were asked about the calming activities after they had finished working through the app (see Appendix C for items).

Overall Reaction Measures

We wanted to measure overall reactions to each activity. To do this, we measured how much participants: a) liked the music-making activity after completing the app (not at all, a little, a lot); b) thought that others would find the music-making activity helpful (not at all, a little, a

lot), c) liked the breathing exercise after completing the app (not at all, a little, a lot); d) thought that others would find the breathing exercise helpful (not at all, a little, a lot); and e) how frequently the calming activities should be available in the app.

We also wanted to understand what possible accessibility features might be needed for different calming activities. Therefore, we summarized what features participants suggested should be available to increase accessibility (e.g., text to speech, voice commands, bolded font, enlarged font, etc.). While the current app relied on two calming activities, there are other calming activities that might be helpful for individuals with I/DD. Therefore, we noted any other calming activities that participants suggested could be used in the app (see Appendix C for all items).

Results & Discussion

To analyze the observational data collected, we focused on three key themes for each activity: how easy the activity was to use, how engaging the activity was, and how participants felt about the activity.

Music-Making Activity

Ease of Use

To determine how easy the music-making activity was, we analyzed a) if the participants needed more instruction on how to use the activity (yes or no); b) what specifically was confusing (summary of what clarifying information was needed); c) number of misclicks that were made using the activity; and d) the number of licks made trying to exit the activity. Overall, 5 out of 11 participants (45.5%) needed additional instructions when engaging with the activity. The most common areas of confusion were how to exit the instructions and how to begin the

activity (e.g., needing to be told to press a key to begin), and some participants did not understand what the word "key" meant in the instructions. For example, one participant thought they needed to press the key icon at the bottom of the screen, but that key icon redirects users to a menu of options in the app. The amount of confusion resulting in misclicks ranged from no confusion (no misclicks) to some confusion (four misclicks). Seven (63%) of the 11 participants engaged in the activity with no misclicks. The four participants made one to four misclicks. From these analyses, it appears that the music making activity needs additional clarity on how to begin and use the activity, but once participants figured that out, they understood how to use the activity.

Engagement

To measure engagement with the music-making activity, we analyzed: a) if they skipped the activity (yes or no); b) how long they spent on the activity (start and finish timestamps); and c) total number of times they click on keys to make music. One (9.1%) of 11 participants skipped the music-making activity. Of those who engaged in the music-making activity, most participants (N = 7) spent between 15-45 seconds making music. More specifically, two participants (18.2%) spent 0-15 seconds engaging with the activity, four (36.4%) spent 15-30 seconds, three (27.3%) spent 30-45 seconds, one (9.1%) spent 45-60 seconds, and two (18.2%) spent more than 60 seconds. The longest someone spent on the activity was two minutes. As for the number of keys each participant pressed while engaging in the activity, most participants pressed between 1-7 keys. Five participants (45.5%) clicked 1-3 keys, five (45.5%) clicked seven keys, and one (9.1%) clicked 10 keys. Overall, most participants engaged with the activity; however, that engagement tended to be on the shorter side.

Reactions

To measure reactions to the activity, we examined how useful and helpful the participants found the activity to be. We also analyzed what participants: a) liked about the activity, b) disliked about the activity, and c) any suggested changes to the activity. Overall, most participants (N = 7) believed the music-making activity would be helpful to others. More specifically, two participants (18.2%) believe the music-making activity was not helpful at all, three (27.3%) said it was a little helpful, four (36.4%) said it was very helpful, and two (18.2%) did not answer. For things they liked about the activity, one participant noted that they liked being able to make music because it was fun, and another participant liked the vibrant colors of the keyboard. For things that were disliked, one participant did not find the activity relaxing, and one participant found the piano-esque screen confusing. More specifically, the participant indicated that there should be some white space around the keyboard, so it looks less like a block of striped colors and more like a keyboard. As for suggested changes, the words on the keyboard should be white rather than black and use a bigger text size because they were hard to see. In addition, one participant did not understand what the colors meant, and one possible remedy to this would be that the words being the keyboard (e.g., do, re, mi, etc.) could be the names of the colors instead, and the instructions could tell them to press the “color” rather than the “key”. Participants also suggested being able to use their own computer/tablet keyboard rather than the mouse to make the music. Another participant suggested being able to upload their own music that they could play instead of making their own music. Overall, most participants liked the music-making activity and believed others would find it at least somewhat helpful.

Breathing Activity

Ease of Use

To determine how easy the breathing activity was, we analyzed a) if the participants needed more instruction on how to use the activity (yes, no); b) what specifically was confusing (summary of what clarifying information was needed); c) number of misclicks that were made using the activity; and d) number of misclicks made trying to exit the activity. Overall, 5 out of 11 participants (45.5%) needed additional instructions when engaging with the activity. The most common areas of confusion were how to exit the instructions and begin the activity and not knowing how to begin the activity (e.g., needing to be told to press a key to begin). The amount of confusion resulting in misclicks ranged from no confusion (no misclicks) to some confusion (4 total misclicks). Two-thirds (or 67%) of the participants engaged in the activity with no misclicks. The remaining one-third of participants made one to four misclicks. From these analyses, it appears that the breathing activity needs additional clarity on what the function and purpose of the start and reset buttons are.

Engagement

To measure engagement with the music-making activity, we analyzed: a) if they skipped the activity (yes or not); b) how long they spent on the activity (start and finish timestamps); and c) how many full breathing cycles the participant completed (one breathing cycle consists of one inhale and one exhale without pausing or restarting the activity). One (9.1%) of 11 participants skipped the breathing activity. Of those who engaged with the music-making activity, most participants (N = 8) spent between 30- and 60-seconds breathing. More specifically, one participant (9.1%) spent 0-15 seconds engaging with the activity, zero (0%) spent 15-30 seconds, six (54.5%) spent 30-45 seconds, two (18.2%) spent 45-60 seconds, and two (18.2%) spent more

than 60 seconds. The longest someone spent on the activity was 1 minute and 20 seconds. As for the number of breathing cycles each participant completed while engaging with the breathing activity, most participants completed 2-3 breathing cycles. Two participants (18.2%) completed 0 breathing cycles, one (9.1%) completed one cycle, six (54.5%) completed two cycles, and two (18.2%) completed 3 breathing cycles. Overall, most participants engaged with the activity; however, the engagement time was often used to watch the color ring fill up or ask questions on how the activity works.

Reactions

To measure reactions to the activity, we examined how useful and helpful the participants found the activity to be. We also analyzed what participants: a) liked about the activity, b) disliked about the activity, and c) any suggested changes to the activity. Overall, most participants (N = 10) believed the breathing activity was either a little or a lot helpful while one participant (9.1%) believed the breathing activity was not helpful at all. No participants said there was anything they particularly liked about the activity. For things that were disliked, two participants (18.2%) had specific dislikes for the breathing activity. One participant disliked the engagement of the activity, asking if that's all it does while the other participant found the exhale period to be too long. As for suggested changes, 3 participants (27.3%) offered suggestions for the breathing activity. One participant suggested adding a character that says, "Let's breathe together" and a set timer that gives the option of continuing the activity. Another participant suggested adding audio prompts for the visually impaired, having a pause button, and not using a circle for the activity. The third participant that gave suggestions said the breathing activity should be made like the ones in the app store and the exhale period should be shorter. Overall,

most participants liked the breathing activity but thought that the visual aspect of it could be improved. Most also believed this activity was at least somewhat helpful.

App as a Whole

The data were analyzed based on two questions participants were asked: if they would have liked any additional accessibility controls not offered in the app, and if they have any suggestions for calming activities other than the music and breathing one in the pilot app.

Accessibility Controls

The first question asked was if the participants would have liked to see additional accessibility controls for which three participants (27.3%) said yes. Out of those that identified wanting more accessibility controls, one participant mentioned adding pictures to make it clear that you need to exit the popup instructions and that the popup window is different from the lesson, quiz, or activity. Another participant said to add bold font, plain language, voice commands, and text to speech. Meanwhile, another individual suggested making the mouse pointer larger. A fourth participant said narration should be subtitled, the volume of the music activity should be altered, and another said there should be options to personalize font size and color.

Calming Activity Suggestions

The second question analyzed in this section asked participants if they have any suggestions for other calming activities. Six participants (54.5%) said they did, while one participant (9.1%) did not answer the question and four participants (36.4%) had no additional calming activity suggestions which can be seen in the table below.

One participant recommended guided meditation videos and a simple coloring activity so they can be happy about what they accomplished. Another participant suggested walking around,

stretching, pressing letters on the keyboard, uploading calming music, guided meditation, button clicking, and a maze activity. A third participant recommended meditation, yoga, audiobooks, something to listen to other than music (that is soothing like the "Calm" app) and writing down thoughts in a journal or on a piece of paper. A fourth participant suggested a smiley face rating system asking, "How do you feel". Meanwhile, another participant mentioned taking a walk or thinking about a different topic until they are ready to continue the activity. The last participant with suggestions said playing games, watching funny videos, doing a word search, or painting.

Table 1

Suggested Calming Activities Separated Into Five Categories

Physical	Tactile	Creative	Auditory	Identity-based
Meditation (3)	Pressing keyboard letters	Coloring	Calming music	Writing down thoughts
Walking (2)	Press buttons	Painting	Audiobooks	Smiley face emotion rating
Stretching		Maze activity	Non-music sounds	Thinking about other things
Yoga			Apps like "calm"	

Note: Number of times suggested is once unless otherwise identified.

Table 1 shows the five categories of calming activities: physical, tactile, creative, auditory, and identity-based. Physical activities consisted of those that required strategic movement of the body. Tactile activities are designed with the goal to provide stimulation through touch. Creative activities had the goal of drawing or coloring in various ways. Auditory activities involved activities with the goal of listening to sounds to calm down. Lastly, the

identity-based category consisted of either managing existing thoughts or the avoidance of certain emotions.

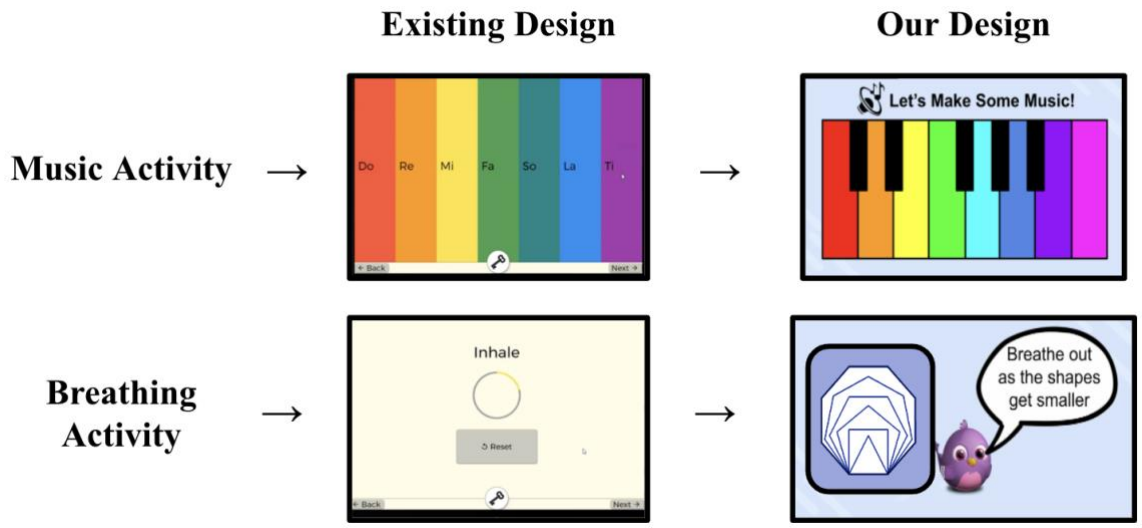
Recommendations

Overall, participants liked the music-making activity and breathing exercise and thought each activity would be at least somewhat helpful for others. For ease of use and understanding, the biggest area of confusion for participants for both activities was how to get started and what buttons to press to move onto the lesson. For instance, some participants found the instruction screen confusing as they believed the instructions were telling them to click the “next” button to exit the instruction screen and start the activity, but participants had to first click “close” to exit the instructions and then click “next” to begin the activity. To remedy this, the instruction screen could be its own screen rather than a pop-up window that needs to be closed, or the instructions on the pop-up window should just say how to close the instruction screen (e.g., to click “close” at the bottom right of the box).

For the music activity, participants specifically struggled with starting the activity. To remedy this, the instructions should say to press on the different colors to make music rather than keys, as some participants were unsure what the word keys was referencing. Some participants also indicated that they would prefer to listen to their own music rather than make music. Therefore, one possible modification for the future is to allow participants the option of making music or listening to music. As for the breathing activity, one participant suggested adding a character that says “let's breathe together” which we suggest implementing as the character can act like a guide for the user and show them how to do the activity and when to breathe while decreasing the exhale period as one participant found it to be too long. Figure 3 shows the original designs alongside our suggested modifications.

Figure 3

Comparison of Original and Modified Music Making and Breathing Calming Activities



As for the app as a whole, for accessibility controls, font size should be either made bigger or the participant should be given font and cursor size options as some may have visual impairments. Adding to this, narration or text-to-speech should also be made available as some participants may have visual impairments that prevent them from being able to see the screen clearly. Voice commands should also be added as an option as some participants may not be able to easily click buttons on the screen.

The calming activities suggested by participants should be further researched in terms of how they work and their effectiveness and activities that fall under each of the five categories physical, tactile, creative, auditory, and thoughts/feelings based should be offered. Due to the vast amount of suggested calming activities, the app should contain more than the two activities it offered at the time of these interviews. The most mentioned activities should be looked into first which included: guided meditation, walking, coloring, and listening to some sort of sound/music.

Study 3

The purpose of this focus group was to help answer the main question of what is required to create accessible, easy-to-use calming activities within an application for adults with I/DDs to cope with trauma in their daily lives. The findings of our two previous studies highlighted the need and desire for such an application for individuals with I/DDs to gain a sense of independence when coping with trauma. To gain specific insight and provide a researched and usable solution, we created an application prototype containing a variety of calming activities and collected data from members of the target population. The data we collected summarized reactions and suggested modifications to make the calming activities within our initial prototype easy to use and understand while further developing and refining the design (look, feel and navigation) and available app functions (calming activities).

Method

Participants

A focus group was conducted with three adults with I/DDs who served as consultants on our project. They were given a summary of our findings as compensation for participating in the study from our research group. Each consultant gave informed consent prior to participating including having the contents of the focus group transcribed for data analysis. Demographics of the consultants were not recorded for confidentiality reasons.

Design & Procedure

After a preliminary conversation was had with our three project consultants gauging what types of calming activities they found to be beneficial, a semi-structured focus group was conducted with the same consultants to gain insight on how to refine and modify our application

prototype to be more accessible and easier-to-use. We were specifically interested in identifying features that we executed well and areas of improvement as the calming activities we implemented into the prototype were identified in the preliminary conversation with our consultants. These areas of potential improvement included: the eight calming activities and their look, feel, and engagement along with the suggested accessibility controls. We did this by seeking to understand specific elements of the prototype that were received positively or negatively as well as recognizing the potential benefits of using this application by gauging perceived ease-of-use and accessibility.

Throughout the focus group, consultants were walked through each calming activity as well as the functions of the application prototype by a researcher using screen sharing abilities over Zoom. A total of eight calming activities were presented and consultants were asked to express their reactions and volunteer suggested modifications for each one. See Appendix D for a complete list of focus group questions. To measure the engagement and understanding of each calming activity we summarized what consultants: a) liked about the activity; b) disliked about the activity; and c) what modifications were suggested to the activity. We also noted how easy-to-use the consultants found the activity for which they provided responses on the following scale: very easy, a little easy, neutral, a little difficult, very difficult.

The prototype was designed with two main functions that provide users with the ability to utilize specific calming activities in two ways. The first allows users to access a library of calming activities where they have the freedom to choose the order and quantity of calming activities they would like to use. The second provides users a rewarding gamified way of using calming activities through ‘self-care bingo’ as described in Study 1. To measure the benefits of the prototype we looked to see: a) how likely the consultants would be to use the application if it

was made available; b) specifically, how likely the consultants would be to use the application in response to trauma and triggering; c) how often the consultants would use the application; and d) if there were any calming activities that should be removed or added. Due to this calming activity application prototype being the first prototype iteration, we also chose to use a SWOT analysis to further evaluate its contents and future direction of development.

Materials

Based on the recommendations of Studies 1 and 2, we made accessibility our top priority. We used plain language in a large, bold font to describe in detail how to navigate through each calming activity.

Music-Making Activity

Figure 4 shows this activity's vibrant graphic that simulates a keyboard octave beneath the phrase, "Let's make some music!" Users are prompted to click on any of the colorful "keys" and will hear the respective piano note. The details of this activity's visuals incorporated the results and recommendations of Study 2, including: a) removing the words seen on each "key"; b) adding the sharps and flats "keys"; c) using vibrant colors in rainbow order; and d) adding a full octave.

Figure 4

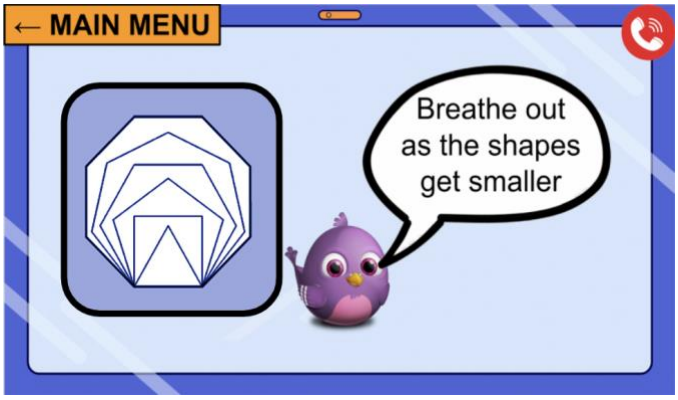
Modified Music-Making Activity Visual

Let's Breathe Activity

Following the title screen prompting users to take some deep breaths, two versions of this activity were shown to the consultants to gauge their preferences on different designs, both of which were inspired by the results and recommendations of Study 2. Figure 5 shows the first version of the activity, containing an animated bird that prompts users to follow along with the animated image, breathing in as the shapes expand and breathing out as the shapes deflate. The second version links to a YouTube video that depicts an animated ant character that verbally guides users through continuous breathing cycles for two minutes.

Figure 5

Modified Breathing Activity Visual



Maze Arcade Activities

This activity offers the user two options, "marble run" (Figure 6) and "new maze" (Figure 7). The first maze activity option redirects users to a YouTube video depicting marbles rolling through a plastic obstacle course. The second maze activity option has two versions shown: a) choose a color; and b) choose an image. Version A prompted users to choose a color and then move their cursor through the maze. The path they took would be highlighted in the color they chose. Version B prompted users to choose an image followed by moving their cursor

through the maze. The image chosen would then replace the cursor icon and the user would be moving that image through the maze.

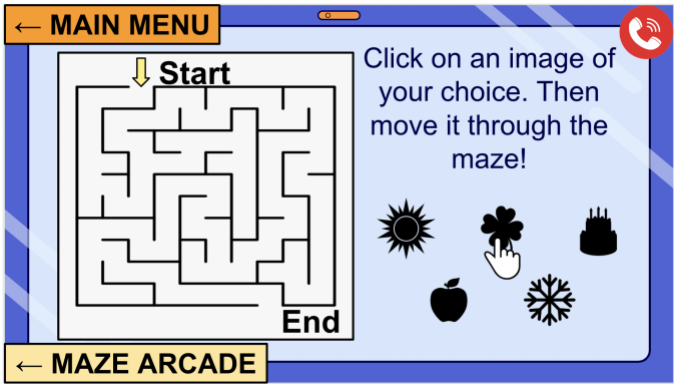
Figure 6

Marble Run Visual

Note: Marble ASMR Healing, 2021, (https://youtu.be/KOPShuigfoQ)

Figure 7

Maze Activity Version B Visual

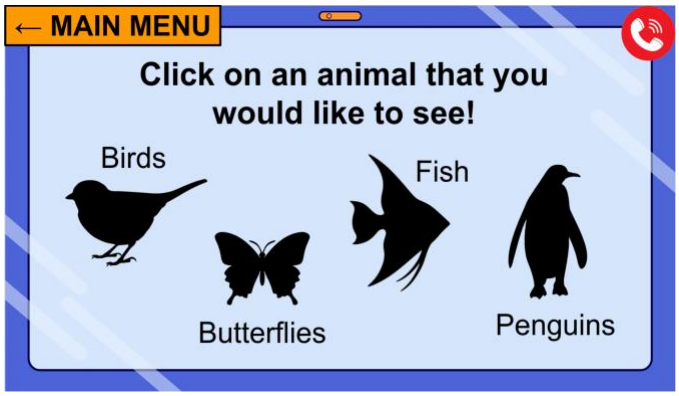


Animal Watch Activity

The content of this activity prompts users to click on one of the four animals (birds, butterflies, fish, and penguins) which directs them to a video observing that animal in its natural habitat, as seen below in Figure 8. Users can return to that screen at any time to choose another animal to observe.

Figure 8

Animal Watch Activity Menu Visual

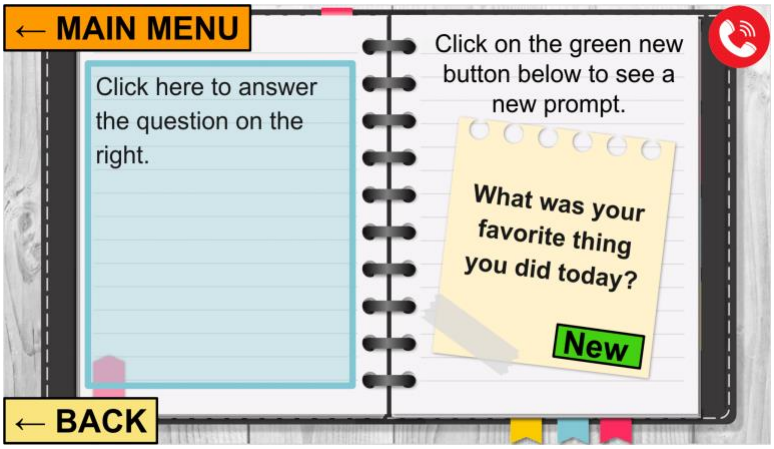


Daily Journal Activity

This activity allows users to choose between "answering a prompt" and "free write." Figure 9 displays the former. By clicking on the "answer prompt" button they are directed to a virtual journal with a sticky note on the right side of the screen illustrating a question such as "What was your favorite thing you did today?" Users can generate a new question prompt by clicking the "new" button on the bottom of the sticky note and are instructed to type or speak the answer to the question into the blue box on the left side of their screen. If users click on the "free write" button in the first screen they are directed to a virtual journal where they are instructed to type or speak their thoughts, feelings, or anything else they would like such as a poem or music lyrics into the blue box on the right side of the screen.

Figure 9

Daily Journal Activity With Prompt Visual

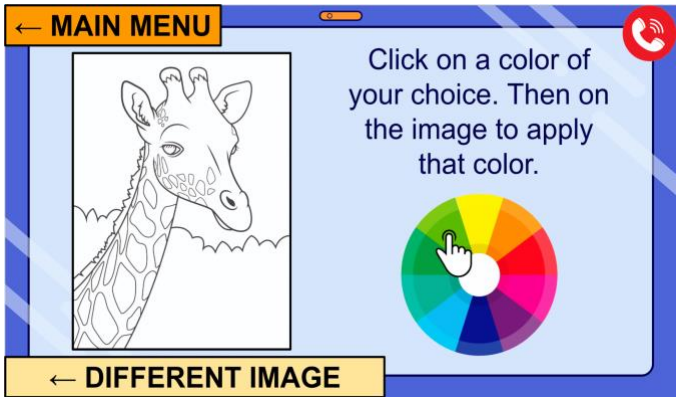


Coloring Activity

During initial conversations with the consultants, we learned that coloring applications currently available such as Happy Color are well-liked and perceived as easy-to-use by select individuals. Taking this information into account, this coloring activity was created to imitate the feel of those existing applications in a way that was more accessible to adults with I/DDs. Our solution for this activity was to follow a "click and fill" design, as seen below in Figure 10. Users can choose from five categories (flowers, cars, animals, dinosaurs, and landscapes) and are presented with three images within that category. They can click on which image they would like to color. The image expands and a color wheel appears. The user is prompted to click on the color they would like to use followed by clicking on the area of the image they would like to add or remove that color.

Figure 10

Coloring Activity Visual



Sound Exploring Activity

During initial conversations with the consultants, it was made known to us that listening to common household noises such as a garbage disposal were able to calm an individual in a time of need. Inspired by this finding, this activity provides users with three categories to explore sounds (household items and nature sounds, as well as planes, trains, and cars) as seen in Figure 11 below. The user is prompted to click on the category they would like to try and is redirected to a screen with five images depicting objects a person could find relating to that category. Users are instructed to click on an object to hear the sound it makes.

Figure 11

Sound Exploring Activity Menu Visual

Mindfulness Activity

As reported in Study 1, it was recommended that licensed therapists, trained instructors, and adults with I/DDs should collaborate to create a guided meditation video or program that could be added to the calming activity in this application as current meditation videos do not accommodate for varying needs of individuals with I/DDs. Because of this, our mindfulness activity was not interactive but rather visuals included "Let's practice mindfulness!" with written instructions underneath prompting users to try meditation or yoga by clicking on the respective buttons.

Figure 12

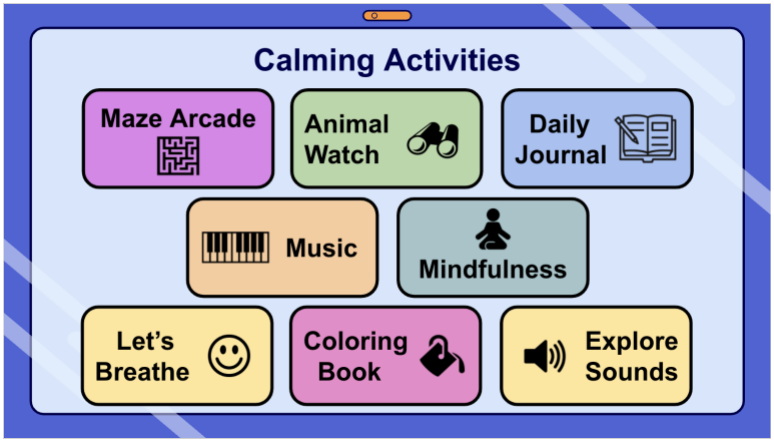
Mindfulness Activity Menu Visual

Calming Activity Library

Our prototype was designed to offer the eight calming activities described above through two main functions. Figure 13 shows the calming activity library where users have the freedom to choose the order and quantity of calming activities, they would like to use just by clicking on them. We included our eight initial calming activity designs which can be classified into social, movement, creative, identity-based, tactile, and auditory categories as recommended in Studies 1 and 2.

Figure 13

Calming Activity Library Visual



Self-Care Bingo

The second main function of our prototype was "self-care bingo," a gamified way to utilize calming activities, seen below in Figure 14. As described and recommended in Study 1, this function provides the user with a rewarding experience as they try to achieve "bingo" by completing three calming activities in a row, including the free space. This aligns with previous research suggesting the objectives of enjoyment and engagement that games have are excellent motivators as they play on the basic needs of completion and satisfaction (Johnson et. al., 2016).

Figure 14

Self-care Bingo Visual

Results & Discussion

The consultants found seven out of eight calming activities easy to use. The new maze activity presented challenges for users with higher physical needs to successfully drag their cursor through the barriers. This highlighted a need to incorporate varying levels of difficulty within the design of each maze to accommodate for differences in users' abilities. All other designs were perceived as "very easy" to use by each consultant. Despite the challenges identified in the design of the new maze activity, each consultant enjoyed the look and feel of all eight initial designs. Minor modifications were suggested to increase engagement, such as the ability to mute videos as one consultant had an adverse reaction to a sound in a video of a calming activity. While the implementation of accessibility was successful, further research should be conducted allowing participants to interact with the prototype as our focus group design was limited to gathering information on initial reactions.

Due to this calming activity application prototype being the first prototype iteration, we used a SWOT analysis to further evaluate its contents and future direction of development. This SWOT analysis allows us to gain a better understanding on what further research must be done to take this app prototype and make it a fully functional app that fulfills its purpose of providing calming activity fit for use by the adult I/DD population. One strength lies in the variety of calming activities we included, as we included calming activities fitting under the 4 categories highlighted in Study 1. This variety allows for the app prototype to be used by individuals with a wide range of interests and preferences. Providing options that fit under individual preferences increase the likelihood that they will use the app and be a returning user. Another strength was the implementation of accessibility controls within the app prototype. These accessibility controls allow adults with a wide range of disabilities to have the ability to use all the calming

activities. The last strength we would like to mention is the positive initial reactions we had from the consults, as they are adults with I/DDs which may be potential users of the app.

With every strength comes weaknesses. Our weaknesses included the limitations presented in preliminary work in this topic as not much research has been done on adults with I/DDs and modifying calming activities for their use. Thus, further research on the first prototype iteration must be conducted to test the effectiveness of each activity. Although we based our calming activity library on the opinions of those with I/DDs and those working with the I/DD population, the versions we created have not been used or tested, making the effectiveness assumed. Testing the calming activities is important as it ensures that all user needs are satisfied and that modifications to the app and its content can be made for it to be as beneficial and easy to use as possible.

This prototype creates opportunities for use within clinical offices as it is the first research-based self-care app for adults with I/DDs. Doctors, therapists, and other clinicians may suggest these calming activities for adults with I/DDs to use in order to cope with trauma or increase the amount of self-care they practice. This may make the app an important tool for the mental health of adults with I/DDs. This app may also increase communication and understanding between the doctor and patient while increasing the support and resources that an adult with I/DDs has access to. Current threats to this prototype are general self-care apps as some have been widely used by others and may have become their top choice for use. Another threat is the lack of widespread topic awareness surrounding I/DDs as to use these calming activities, adults with I/DDs and their support networks need to be made aware that the application exists as well as the potential benefits it holds.

General Discussion

Our project explored existing calming activities and ways in which they can be modified for use by adults with a wide range of disabilities. In Study 1 and 2, we looked at what calming activities are currently used by the adult I/DD population and what makes them effective. In Study 3, we applied that knowledge while engaging with a focus group to put together an app prototype of calming activities that are easy to use and understand by the adult I/DD population while listening to their needs and preferences.

In our research, we found that the general self-care apps that exist today have a few gaps that we have addressed through our three studies. First, these apps lack the necessary accessibility controls needed for adults with disabilities to be able to use them with ease and understanding. These accessibility controls include, but are not limited to, instructions with simplified language in plain bold 30-point font or bigger, visuals to supplement instructions, audio prompts, and text-to-speech commands. There is also a lack of variety in the calming activities used by adults with I/DDs as they are often too complex or hard to follow and lack the necessary accessibility controls to be easy to use and understand. Although this work gave a lot of insight and new knowledge on creating an app for adults with I/DDs to use to cope with trauma, there is more research to be done before it is complete as identified by the SWOT analysis.

Implications in the Workspace

There is a significant number of individuals who have I/DDs worldwide, which makes our research of more value to others (i.e. Residential Information Systems Project, 2020). We have become more conscious of the needs of others and advocating for those that struggle to advocate for themselves both in and out of the workspace.

For areas outside the workplace, we believe there should be further research done on the use of calming activities for adults with I/DDs within school settings. This could be beneficial to students as school is often a stressful environment for which calming activities may be beneficial. Additionally, increased access to calming activities for an individual that is struggling to cope with the effects of trauma could have the potential to increase their academic successes beyond allowing them to navigate the stressful environment. This could be beneficial to students as school

In terms of within the workspace, this project can impact companies around the world, as it can enlighten them on how to create more equitable workspaces and increase the options those with I/DDs have when it comes to the environment, they work in. The findings from this research are useful for the Office of Disability Employment Policy (ODEP) as it would help them better integrate adults with I/DDs into the workspace. Using this research ODEP can find ways to allow adults with I/DDs personalize their workspace to make it more comfortable to work in.

This research could add an additional awareness training in human resource departments to use during the new employee onboarding process and orientations to inform workers on the needs of people with I/DDs who they work with. Although these trainings would be a small, easily implementable addition to the onboarding process, they could make a huge difference. The increased awareness these trainings would provide could decrease negative reactions towards adults with I/DDs, making the experiences they have at work more positive.

This would also be useful for the Occupational Safety and Health Administration (OSHA) as it would help them create a safe and healthy working environment for those with I/DDs as some aspects of currently implemented work environments may negatively impact an

adult with I/DDs mental health and ability to work effectively. These changes may increase the chance someone with an I/DD will speak up if something is wrong, increasing everyone's quality of life. Although our work provides a lot of valuable information on calming activities for the adult I/DD population and can have beneficial applications for adults with I/DDs within the workspace, there are some limitations of this research to highlight as well.

Limitations

Throughout the studies, we had a few limitations. First, we used convenience sampling as we accessed the data through our advisors. Using previously acquired data, we were not present during collection and could not get additional questions answered. Our sample sizes were also small. Lastly, our research is preliminary as there has been limited exploration on this topic. For our app prototype to be effective and become a full-fledged app used by adults who have I/DDs, additional research and prototype development should be done.

Future Research

As our three studies were preliminary work, future research should be conducted for project scalability, as it would verify our research and expand upon it. With additional prototype development, the further iterations could be ready to test with a larger sample of the I/DD population. Additional findings from this larger scale research would make the future application generalizable to the adult I/DD population. There should also be further evaluation of all the calming activities in the calming activity library to test their effectiveness, ease of use, and understanding. In terms of user experience, there needs to be more research done on user interface and experience for users that are specifically adults with I/DDs. Foundational research pointed us towards app development for the use of calming activities. However, various implementation methods expanding beyond a virtual application for calming activities should be

at the center of future research to accommodate different needs, abilities and preferences present within the I/DD population.

Conclusion

We created a calming activity prototype with features unlike those of any current self-care application for the adult I/DD population. We were able to do this by gathering data from three studies, the first two of which were previously conducted and shared with us. In Study 1, we identified four calming activity categories. In Study 2, we found what makes these activities effective. Study 3 then took this information and made an application prototype with a variety of accessibility controls and visual aids. Finally, we analyzed our preliminary research and explained its implications for a variety of organizations. However, we have only laid down foundational findings. This project requires larger scale additional research to validate the conclusions of our preliminary work. This would include doing more research on user experience and further evaluating all calming activities to create an effective platform that would help adults with I/DDs self-advocate.

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Appendix

Appendix A

Pilot App Interview Questions Analyzed on the Music Calming Activity

1. What was the timestamp marking the start of this calming activity? (time stamp - numerical value)
2. What was the timestamp marking the end of this calming activity? (time stamp - numerical value)
3. Did the participant skip the calming activity? (Yes or No)
    a. Did the participant require more instruction on how to use this calming activity? If so, what was it? (Yes or No; summary or quote of what further instructions the participant was given)
    b. What was the total number of times the musical notes were clicked on to play music? (numerical value)
    c. What was the total number of misclicks that were made while using the calming activity? (numerical value). A misclick can be defined as clicking on anything that is not a part of the calming activity itself.
    d. What was the total number of misclicks that were made when trying to exit the calming activity? (numerical value based on verbal instruction or cursor location). A misclick can be defined as clicking on anything that is not a part of the calming activity itself.
4. Did the participant make any remarks on the look and feel of the calming activity? (summary or quote of what was the participant said)

   a. Did they say that they liked anything in particular? (summary or quote of what was the participant said)
   b. Did they say that they disliked anything in particular? (summary or quote of what was the participant said)

5. Did the participant return back to the calming activity through the key after pressing the next button? (Yes or No)
6. Did the participant say that they had any suggestions for future changes to the music activity? If so, what were they? (summary or quote of what was the participant said)
7. Did the participant find the calming activity useful or helpful? (a lot, a little, not at all)

Appendix B

Pilot App Interview Questions Analyzed on the Breathing Calming Activity

1. What was the timestamp marking the start of this calming activity? (time stamp - numerical value)
2. What was the timestamp marking the end of this calming activity? (time stamp - numerical value)
    a. What was the total number of breathing cycles that the participant ran through before moving on? (numerical value)
    b. Was the calming activity skipped entirely? (Yes or No)
    c. What was the total number of times that the participant selected something other than [x Close] to exit out of instructions for calming activity? (numerical value based on verbal instruction or cursor location)
        i. Did the participant require more instruction on how to use this calming activity? If so, what was it? (Yes or No; summary or quote of what further instructions the participant was given)
        ii. On a scale of 1-3, how confused was the participant following the initial instruction? (1 = not at all, had no problems and didn't need further instruction; 2 = a little bit, they struggled at first but figured it out independently; 3 = very, needed additional instruction to get through the activity).
    d. What was the total number of misclicks that the participant made when interacting with this calming activity? (numerical value based on verbal instruction or cursor location)

i. How many times was the start button clicked? (numerical value)

ii. How many times was the reset button clicked? (numerical value)

iii. How many full rounds of inhales were completed? (numerical value)

iv. How many complete rounds of exhale were completed? (numerical value)

3. Did the participant make any remarks on the look and feel of the calming activity? (Yes or no)
    a. Did the participant like anything in particular? (summary or quote of what was the participant said)
    b. Did the participant dislike anything in particular? (summary or quote of what was the participant said)
4. Did the participant return back to the calming activity through the key after pressing the next button? (Yes or No)
5. Did the participant have any suggestions for future changes? If so, what were they? (summary or quote of the participant's suggestions)
6. Did the participant find the calming activity useful or helpful? (a lot, a little, not at all)

Appendix C

Pilot App Interview Questions Analyzed on the App as a Whole

1. Have they participated in previous trainings? (Yes or No)
2. Did the participant ask for any accessibility controls to be available in the app (e.g. text to speech, voice commands, bolded or enlarged font, etc.)? (summary or quote of the participant's suggestions)
3. Were there verbal warnings given to the participant before the lessons by the interviewer (e.g. viewer discretion advised, the people in these videos are actors, no one was harmed in the making of these videos, etc.) ? (Yes or No)
4. "How much did the participant like the music-making activity?" (summary or quote of what was the participant said; code as loved it, liked it, neutral, disliked it, hated it)
5. "Do you think it will be helpful for other people when using the app?" (summary or quote of what was the participant said; code as very helpful, helpful, neutral, unhelpful, very unhelpful)
6. "You also got to work through some breathing exercises in the app. How much did you like the breathing exercises?" (summary or quote of what was the participant said; code as loved it, liked it, neutral, disliked it, hated it)
7. Did the participant suggest any other calming activities that should be implemented into the app? (summary or quote of what was the participant said)
    a. How frequently should they be available/offered (e.g. after every video clip, only at the end of each section of the lessons, etc.) (*if applicable*, summary or quote of what was the participant said)

Appendix D

Questions for Consultant Focus Group

1. Please rate this calming activity on its overall effectiveness in providing a calming feeling. The highest rating you can give is 5 stars. Why?

   Star Rating Question

2. Please rate this calming activity on its ease of use to you. The highest rating you can give is 5 stars. Why?

   Star Rating Question

3. Please rate this calming activity on how much you like the look of it. The highest rating you can give is 5 stars. Why?

   Star Rating Question

4. How likely are you to use this self-care app?
   a. Extremely likely
   b. Somewhat likely
   c. Neutral
   d. Not very likely
   e. Not at all

5. How likely are you to use this self-care app in response to triggering?
   a. Extremely likely
   b. Somewhat likely
   c. Neutral
   d. Not very likely
   e. Not at all

6. How likely are you to use this self-care app in response to trauma?
    a. Extremely likely
    b. Somewhat likely
    c. Neutral
    d. Not very likely
    e. Not at all
7. How likely are you to use this self-care app when you are feeling overwhelmed?
    a. Extremely likely
    b. Somewhat likely
    c. Neutral
    d. Not very likely
    e. Not at all
8. How often would you use this self-care app?
    a. Very often
    b. Pretty often
    c. Somewhat often
    d. Not very often or rarely
    e. Never
9. Are there any activities you would like to see added or removed from the app?