Working with Imagery

Mediating Image Rescripting for Anxiety with Multimodal Digital Storytelling

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Abstract

An estimated 32% of adults in the United States experience an anxiety disorder at some point in their lives, according to the National Institute of Mental Health. Though a large segment of the population is affected by anxiety, many lack access to treatment and coping resources. Cognitive behavioral therapy is a type of psychotherapy aimed at helping individuals with anxiety challenge unhelpful patterns of thought and behavior. However, traditional treatments for anxiety can be costly and time-consuming. Beyond these logistical barriers lies an enduring stigma of mental illness that discourages individuals from seeking treatment. Mobile applications attempt to bring established mental health treatments to more people directly. Although efforts to expand therapy resources into a digital space have made them more accessible, many apps fail to take advantage of the affordances of mobile digital devices. Such devices make it easy to create and manipulate media and suggest opportunities beyond converting existing interventions to static device screens. This investigation explores how a digital therapy tool might be designed to challenge negative automatic thoughts related to planning and goal setting. Drawing from imagery-based interventions used in cognitive behavioral therapy, this investigation combines imagery change techniques with multimodal digital storytelling to develop visual strategies for eliciting, reframing, and transforming mental imagery.

Thank you

To Dr. Constance Williams Shepard. You are my angel.

To my family and friends for your encouraging love and support.

To my thesis crew for always being there.

To my committee (Matt, Denise, and Derek) for pushing me to do more.

To Beth O'Brien for encouraging me to give design a try.

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Introduction

The way people think, feel, and behave has important consequences for how they make sense of the world and navigate lived experiences. Thoughts, feelings, and behaviors influence how individuals manage stress, connect with other people, and make decisions. Mental health is a broad term used to describe a person's psychological, emotional, and social wellbeing (Medline Plus, 2020). Attitudes are shifting as more people are beginning to understand that mental health is just as important as physical health. Mental health is becoming a priority; however, more needs to be done to increase access to care.

According to the National Institute of Mental Health, an estimated 32% of adults in the United States experience an anxiety disorder at some point in their lives ("Prevalence of Any Anxiety Disorder," n.d.). Even though a large segment of the population is affected by anxiety, many people still lack access to treatment and coping resources. Traditional treatments for anxiety and other common disorders can be costly and time consuming. Beyond these logistical barriers lies an enduring stigma of mental illness that discourages people from seeking treatment (Moberg et al., 2019).

Mobile health and wellness applications like Sanvello (formerly Pacifica) and Head Space are bringing well established mental health practices and coping strategies to people directly. Although efforts to expand such resources into a digital space has technically made them available to more people, many of these apps have simply become channels for translating existing therapy techniques to static device screens. The affordances of mobile digital devices suggest opportunities to develop new strategies for delivering existing therapy techniques. Mobile digital technologies make it easy to record and display large amounts of data; they also have the potential for a greater range of input, including sound and image.

This investigation explores how a digital therapy tool can leverage the affordances of mobile digital technology to challenge negative automatic thoughts in a planning and goal-setting context.

Problem Statement

Feelings of anxiety are often uncomfortable, but worry can be beneficial in some situations. When faced with a threat or challenge, anxiety gives people the adrenaline they need to stay safe and perform. When worry becomes chronic rather than situational, though, it can have a negative impact on individual wellbeing (Weinberger, 2018). Generalized anxiety disorder (GAD) is characterized by "persistent and excessive worry that interferes with daily activities" ("What Are Anxiety Disorders?," n.d.). Individuals with generalized anxiety disorder worry about daily tasks and activities "such as job responsibilities or family health or minor matters such as chores, car repairs, or appointments" ("What Are Anxiety Disorders?" n.d.). For example, negative thoughts related to future events can hinder action toward goals leading to avoidant behaviors, which limit productivity and compound anxiety.

Procrastination, or putting off tasks and decisions until the last minute, is a common maladaptive response to anxiety. While procrastination remains relatively harmless for many, for some, the behavior contributes to a detrimental cycle of avoidance and stress (Rozental et al., 2018). One approach to understanding and addressing procrastination focuses on negative automatic thoughts and highlights the relationship between thoughts and delaying tendencies (Flett et al., 2012). In other words, directing attention to negative automatic thoughts provides the opportunity to reveal how cognitive distortions might be tied to maladaptive behaviors. For this reason, some researchers have explored using psychological treatments to help individuals overcome procrastination. One of these treatments, cognitive behavioral therapy (CBT), is believed to provide interventions that correspond to the variables associated with procrastination (Rozental et al., 2018). These variables are "the value of completing an intended course of action, the expectation to achieve that value, the timing of that value, and sensitivity to delay" (Rozental et al., 2018, p. 11). CBT involves helping clients identify their negative automatic thoughts, challenge them, and consider alternative thoughts based on evidence rather than feelings or moods. CBT is based on the idea that thoughts and behaviors are closely tied to the way people feel. Further, CBT aims to provide clients with the tools to alter their disruptive thoughts or behaviors with the goal of improving the way they feel (Beck, 1976).

An established technique employed in CBT is the Socratic method, also called guided discovery. This refers to prompts or questions asked by therapists to help

their clients realize information outside of their own awareness (Beck, 1976). The Socratic method is used by therapists to access clients' emotions through their thoughts (Neenan & Dryden, 2006).

This technique is manifested not only in traditional talk therapy but also in practice tools like thought records (TR) given to clients as homework. Individual assignments help clients prepare for self-management, an important goal of CBT (Neenan & Dryden, 2006). The TR is a tool for helping therapy clients challenge their negative automatic thoughts. TRs facilitate clients' explorations of anxiety inducing situations by asking them to identify their feelings and negative automatic thoughts, and observe evidence for and against those thoughts with the goal of reaching more balanced alternatives (Josefowitz, 2017). The TR is a widely accepted, well-documented intervention and is considered a fundamental component of a therapist's toolkit (Josefowitz, 2017).

Although TRs are typically assigned in a worksheet or workbook format, some efforts have attempted to bring the experience into a digital space, particularly in the form of web-based programs and mobile applications.

Research by Moberg et. al (2019), lead psychology and technology specialists for the mobile apps Sanvello (formerly Pacifica) and Youper, suggests that technology enabled interventions have the potential to reduce barriers to accessing mental health treatments such as cost and stigma. Mobile therapy applications can record, track, display, and highlight patterns for users in the absence of a therapist. Existing mobile therapy applications such as Sanvello offer effective and reliable therapy techniques outside of a traditional therapy program or environment. Sanvello touts its "peer-support community that is not moderated by professionals, but is rather a place where users can post their thoughts, challenges, and questions and receive support from others using the app" (Moberg et al., 2019, p. 5).

Moberg et. al (2019) also highlight the shortcomings of such interventions. For example, "digital tools that perform well in closely monitored, tightly controlled research settings do not always translate into widely utilized programs among consumers." They assert that "more real-world studies that demonstrate the effectiveness of mobile-delivered treatment programs are needed" (p. 2).

Further, many of the existing web-based and mobile therapy applications fail to realize the affordances of mobile digital technology. These apps place established tools like the TR into a digital space without considering how the technology might be used to increase their efficacy. Potential exists beyond straightforward translation through features that incorporate multiple modes of input and employ storytelling as a means to challenge negative automatic thoughts. These examples represent how mobile therapy tools might be designed to create experiences that enrich the processes involved in image rescripting for anxiety.

Assumptions & Limitations

For this investigation, I assume that undergraduate students experiencing general anxiety disorder want to engage in planning and goal setting, specifically to address procrastination. While there are several types of anxiety disorders, this investigation targets only general anxiety disorder. Further, the project scope does not address other psychological disorders that accompany anxiety, such as depression. Nevertheless, because thought records are also used in treatment of depression, this investigation may point to opportunities for addressing depressive behavior patterns as well. I assume that students represented in this investigation are willing to employ cognitive behavioral therapy techniques; however, this investigation does not aim to replace a relationship with a licensed therapist. Instead, the project investigates a supplemental resource for self-management. I also assume that students are willing to share sensitive personal information. While there is certainly an opportunity to design a system that spans a few mobile devices, I will design for mobile smartphones and assume students have access to this technology. I assume that students represented in this investigation are not expert visual communicators. Therefore, this investigation will explore ways to facilitate image representation.

Annotated Bibliography

Cognitive Behavioral Therapy

Cognitive Behavioral Therapy (CBT) is a psychological treatment based on the idea that thoughts and behaviors are so closely related that altering one can affect the other. In CBT, therapists provide their clients with resources to manage problems by altering disruptive thoughts and maladaptive behaviors (Beck 1976; Neenan & Dryden, 2006).

This deliberate reframing of thought is called cognitive restructuring ("Cognitive and Behavioral Therapies" n.d.). Mental health practitioners employ tools like the thought record (TR) to help their clients practice identifying and challenging negative automatic thoughts (Greenberger & Padesky, 2015). Negative automatic thoughts (NATs) are "thoughts that come rapidly, automatically and involuntarily when a person is in a negative frame of mind" (Neenan & Dryden, 2006).

The thought record engages clients in the process of observing evidence for and against their NATs with the goal of reaching alternative, more balanced ones (Josefowitz, 2017). TRs are often assigned to therapy clients as homework in worksheet formats requiring verbal expression through writing (Neenan & Dryden, 2006). TRs can be helpful in getting clients to balance their thoughts logically; however, some clients struggle to bridge the gap between what they know logically and what they experience and feel (Arntz, 2011). In other words, a client might be successful in reaching a more balanced alternative thought, but not actually believe the new thought. Imagery can be incorporated into TRs to better connect the logical and experiential by encouraging greater emotional engagement (Josefowitz, 2017).

Logical-Rational and Intuitive-Emotional Information Processing

Several authors (Epstein, 2003; Teasdale, 1993) have expressed the idea that people have two systems for processing information.One is rational and one is experiential. Although the two systems work together, they operate differently. The rational system "encodes reality in abstract symbols, words, and numbers," while the experiential system "encodes reality in concrete images, metaphors, and narratives" (Epstein, 2003, p. 177). Epstein outlines several approaches to prompting changes in the experiential system. One strategy uses the rational system to correct the experiential system; another involves "communicating

with the system in its own medium" (p. 177). An example of this approach in psychotherapy is imagery-based intervention (Epstein, 2003). Research suggests that the experiential system reacts to visualized or imagined events much like it does to actual events (Epstein & Pacini, 2001).

Cognition and Narrative

Bruner (1987) suggests that narrative is the primary method humans use to describe their lived experiences. Bruner asserts that humans construct both life and narrative consciously and deliberately, calling the act of telling others about our lives a cognitive achievement rather than a "recital of something univocally given" (Bruner, 1987, p.13). Drawing a similar relationship between narrative and the mind, Akimoto (2019) translates Genette's (1980) narrative discourse theory into a cognitive system, replacing fundamental aspects of narrative with representational and procedural cognitive elements. In the adapted system, Akimoto describes the story as "a mental representation containing information of structured events; discourse corresponds to an expressive structure of a narrative; and narrating corresponds to the action of producing stories and discourses." Herman (2013a) asks how narratives might be used as resources for interpreting others and scaffolding sensemaking. Herman (2013b) specifically identifies psychotherapy as a domain for further study, particularly the area of narrative therapy.

Computerized and Mobile Therapy Interventions

CBT has been established as an effective treatment for a range of psychological disorders, including anxiety (Beck, 2011). Despite the demonstrated efficacy of CBT, many people who could benefit from treatment simply do not have access. Moberg et al. (2019) suggest that technology-based therapy interventions have the potential to reduce barriers to access. Computerized and mobile therapy interventions are by no means a new phenomenon in mental health treatments; however, implementation has not kept pace with development (Moberg et al., 2019). More research is needed to explore how digital therapy tools can facilitate established mental health treatments. Bang et al. (2007), suggest using mobile digital technologies such as smartphones to deliver CBT treatment.

These devices allow users to record anxiety-provoking situations in addition to labelling and organizing thoughts and feelings (Bang et al., 2007).

Multimodal Digital Storytelling

There have been a number of studies (Balaman, 2018; Yang, 2012) exploring multimodal digital storytelling in learning contexts involving narrative writing. Digital stories written in multiple modes provide an opportunity to make meaning and communicate ideas (Balaman, 2018). Yang (2012) specifically suggests employing multimodal approaches used in design to build digital narratives.

More specifically, Yang builds on Kress' (2010) social semiotic approach which outlines two processes through which designers exercise agency: transformation and transduction. Transformation involves manipulating semiotic resources within a mode to create a new meaning. For instance, manipulating existing elements from one image to create a new one. Conversely, transduction involves shifting semiotic resources across different modes. For instance, translating speech to image (Kress, 2010).

Visual Representation

External stimuli are captured and coded as mental representations. Mental representations or mental images are "internal forms of information used in memory" (Sadoski and Paivio, 2001, p.42). Dual coding theory suggests that these representations are coded through two separate systems: a verbal and a nonverbal system (Sadoski & Paivio, 2001).

Procrastination

Procrastination can be described as the habit of avoiding or putting off tasks until the last minute. Individuals who procrastinate generally have automatic thoughts that occur with or after the behavior and in some cases the thoughts occur before engaging in a task (Stainton et al., 2000). While some interventions for procrastination are focused on motivation, studies suggest psychological treatments like CBT could also be helpful (Rozental et al., 2018

Table 4.1

Topic	Title	Citation
Cognitive Behavioral Therapy	Imagery Rescripting for Personality Disorders	Arntz, 2011
	Cognitive Therapy and the Emotional Disorders	Beck, 1976
	Cognitive Therapy in a Nutshell	Neenan & Dryden, 2006
	Incorporating Imagery Into Thought Records: Increasing Engagement in Balanced Thoughts	Josefowitz, 2017
	Imagery in Cognitive Therapy	Hackmann et al., 2011
	Mind over Mood	Greenberger & Padesky, 2015
Computerized & Mobile Interventions	Mobile Phone Computing for In-situ Cognitive Behavioral Therapy	Bang et al., 2007
	Guided Self-Help Works: Randomized Waitlist Controlled Trial of Pacifica, a Mobile App Integrating Cognitive Behavioral Therapy and Mindfulness for Stress, Anxiety, and Depression	Moberg et al., 2019

Topic	Title	Citation
Rational & Experiential Information Processing	Cognitive-experiential Self Theory of Personality	Epstein, 2003
	The Influence of Visualization on Intuitive and Analytical Information Processing	Epstein & Pacini, 2001
	Emotion and Two Kinds of Meaning: Cognitive Therapy and Applied Cognitive science	Teasdale, 1993
Cognition & Narrative	Narrative Structure in the Mind: Translating Genette's Narrative Discourse Theory into a Cognitive System	Akimoto, 2019
	Stories as Mental Representations of an Agent's Subjective World: A Structural Overview	Akimoto, 2018
	Cognitive Narratology	Herman, 2013a
	Storytelling and the Sciences of the Mind	Herman, 2013b
Visual Representation & Mental Imagery	A Dual Coding Theory of Reading and Writing	Sadoski & Paivio, 2001

Topic	Title	Citation
Multimidal Digital Storytelling	**Digital Storytelling: A Multimodal Narrative Writing Genre**	Balaman, 2018
	Multimodality: A Social Semiotic Approach to Contemporary Communication	Kress, 2010
	Multimodal Composing in Digital Storytelling	Yang, 2012
Procrastination	**Procrastination Automatic Thoughts as a Personality Construct: An Analysis of the Procrastinatory Cognitions Inventory**	Flett et al., 2012
	Targeting Procrastination Using Psychological Treatments: A Systematic Review and Meta-Analysis	Rozental et al., 2018
	Trait Procrastinators and Behavior/Trait-Specific Cognitions	Stainton et al., 2000

Conceptual Framework

Cognitive Model and Beck's Cognitive Theory

In Beck's (1976) cognitive model, situations trigger negative automatic thoughts and images which then elicit emotional, behavioral, and physiological reactions. In cognitive behavioral therapy, a type of psychotherapy based on the model, therapists use cognitive restructuring techniques such as image rescripting to help clients challenge disruptive thoughts and maladaptive behaviors (Beck, 1976; Neenan & Dryden, 2006).

Cognitive Experiential Self Theory

Cognitive experiential self theory suggests that people have two systems for processing information: a logical-rational system and an intuitive-experiential system. The rational system "encodes reality in abstract symbols, words, and numbers," while the experiential system "encodes reality in concrete images, metaphors, and narratives" (Epstein, 2003, p. 177).

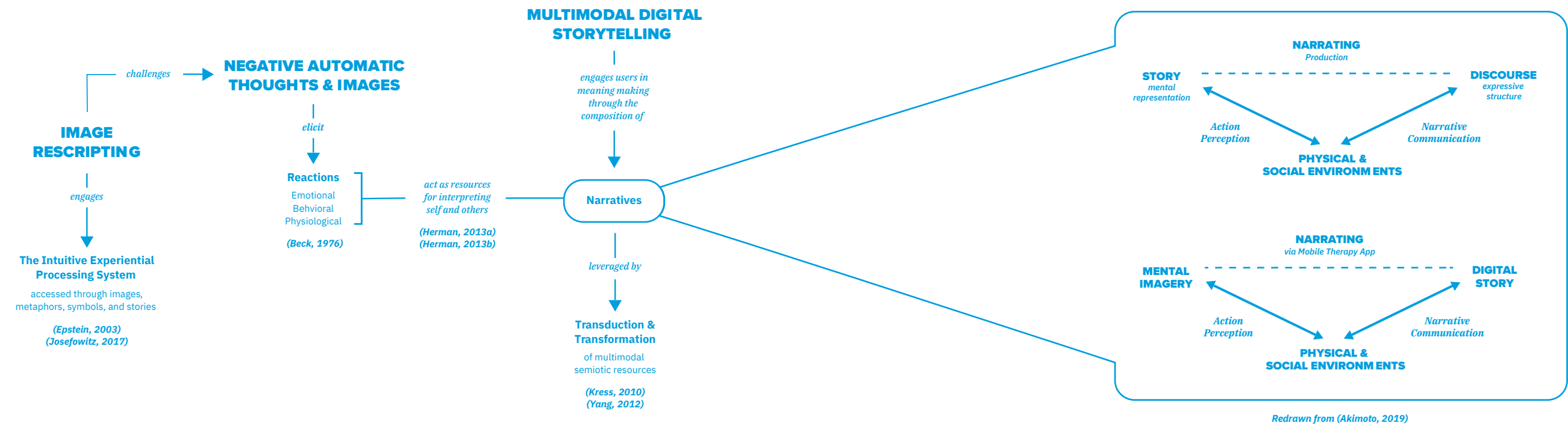### *Narrative Discourse Theory (Adapted for a Cognitive System)*

Akimoto (2019) translates Genette's (1980) narrative discourse theory into a cognitive system. In the adapted framework, story describes a mental representation, discourse describes the expressive structure of the narrative and narration describes the act of producing the story (Akimoto, 2018, 2019).

Transformation and Transduction

Building on a social semiotic approach for multimodality, Kress (2010) outlines two processes through which designers exercise agency: transformation and transduction. Transformation involves manipulating semiotic resources within a mode to create a new meaning. Transduction involves shifting semiotic resources across different modes.

Figure 5.1

Conceptual Framework

MULTIMODAL DIGITAL STORYTELLING

engages users in meaning making through the composition of

NEGATIVE AUTOMATIC THOUGHTS & IMAGES

challenges

IMAGE RESCRIPTING

elicit

engages

Reactions
Emotional
Behvioral
Physiological

(Beck, 1976)

act as resources for interpreting self and others

(Herman, 2013a)
(Herman, 2013b)

Narratives

The Intuitive Experiential Processing System

accessed through images, metaphors, symbols, and stories

(Epstein, 2003)
(Josefowitz, 2017)

leveraged by

Transduction & Transformation

of multimodal semiotic resources

(Kress, 2010)
(Yang, 2012)

NARRATING
Production

STORY
mental representation

DISCOURSE
expressive structure

Action Perception

Narrative Communication

PHYSICAL & SOCIAL ENVIRONMENTS

NARRATING
via Mobile Therapy App

MENTAL IMAGERY

DIGITAL STORY

Action Perception

Narrative Communication

PHYSICAL & SOCIAL ENVIRONMENTS

*Redrawn from (Akimoto, 2019)*

Synthesis

Therapists employ a range of interventions to help their clients challenge disruptive thoughts and maladaptive behaviors. Some interventions successfully tap into clients' logical-rational system, but not their intuitive-experiential system. Narrative, imagery and metaphor are associated with the experiential system and can be incorporated with traditional interventions such as the thought record to mediate the image rescripting process. Mobile digital technologies allow users to work with a wide range of media, making it possible to create and shift semiotic resources in and across modes (Figure 5.1).

RESEARCH QUESTIONS

How can a digital therapy tool challenge negative automatic thoughts for undergraduate students experiencing anxiety in order to achieve more balanced thinking in daily planning and goal setting?

Sub Questions

SQ 1: How can a multimodal image builder leverage unique personal visualizations and metaphor to help students new to metacognition represent their thoughts through imagery?

SQ 2: How can a multimodal image builder suggest alternative views or perspectives to help students identify and reframe negative automatic thoughts?

SQ 3: How can interactive visual prompts interrupt negative thinking patterns to help students practice using alternative thoughts and images to manage their goals in high and low-stress moments?

SQ 4: How can a multimodal image builder and interactive visual prompts cohere to facilitate the full cycle of experience, observation, reflection, and planning used in image rescripting?

Figure 5.2

Investigation Framework
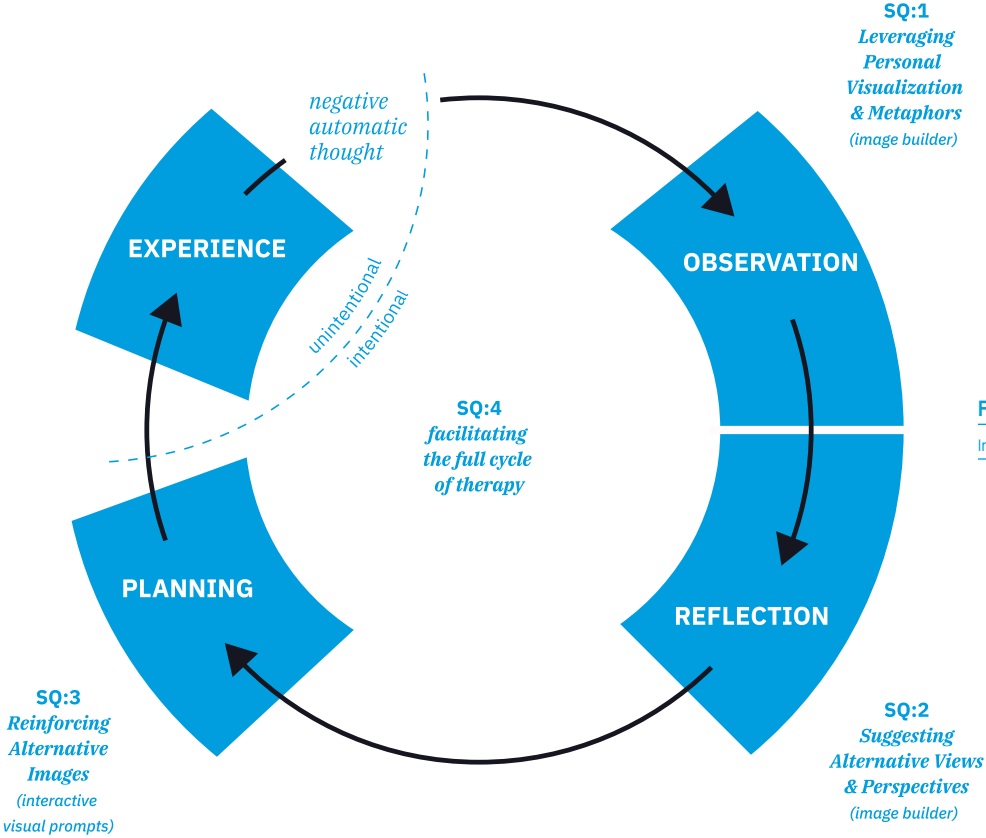
Methodology

Precedent Studies

I evaluated existing therapy interventions (both print and digital) and digital storytelling platforms to discover design opportunities. I also looked for qualities and features that I might build on to challenge negative automatic thoughts in a planning and goal setting context. Precedent studies are a secondary research method helpful for establishing the "groundwork to aid in the understanding of the design research and user territory under investigation" (Martin & Hanington, 2012, p. 154).

Case Vignettes

I consulted case vignettes to develop realistic personas and scenarios. The case vignettes also helped to provide contexts for better understanding image rescripting in practice. Case vignettes are patient-related cases and scenarios used to "illustrate key points about diagnosis, management, or therapeutic decision making" (UAB School of Medicine, n.d., para. 1).

Personas

I developed personas or hypothetical user profiles based on common cognitive distortions to focus the design. The personas were representative of behavior and characteristics associated with each cognitive distortion. Personas are helpful for focusing designs, creating empathy for users, and testing different scenarios (Martin & Hanington, 2012).

Scenarios

Developing personas lead to building detailed scenarios to explore design opportunities in realistic contexts. These scenarios helped to set the scene and ground ideas in the day-to-day while illustrating opportunities for potential user experience (Martin & Hanington, 2012).

Storyboards and Prototyping

Storyboards and Prototyping

I explored early concepts and ideas through storyboards and low fidelity prototypes. The final prototype was developed based on outcomes from visual studies and is representative of the designed interface at different moments in the users' experience (Martin & Hanington, 2012).

Thought Record (Worksheet)

Thought Record (Worksheet)

The thought record is a cognitive therapy tool with widespread clinical use, and is employed to treat a variety of mental health issues, most commonly anxiety and depression. Thought records involve a collection of prompts typically presented in a worksheet format and assigned as homework for clients in cognitive behavioral therapy. Prompts guide clients through the process of identifying and challenging negative automatic thoughts with the goal of reaching more balanced ones. They can also be used outside of a formal therapy program by individuals who are managing anxiety or depression on their own (Figure 7.1).

Worry Watch (Mobile App)

Worry Watch (Mobile App)

Worry Watch is an anxiety tracker that asks users to record anxious thoughts related to future events. The tracker is similar to a thought record as users are asked to document stressful scenarios and evidence for and against their thoughts. The app displays recorded information through data visualizations, specifically charts and graphs. Worry Watch uses a lot of clinical terminology, assuming users will understand. This could be a barrier for users who are self-managing and are unable to consult with a therapist. The prompts focus on anxiety related to future events, not past or recent events. And while data visualizations might be helpful for revealing patterns, in the absence of a therapist they may confuse or evoke negative feelings. Recorded information can be exported and shared, but the app does not offer tools or resources for changing negative patterns. The app is highly customizable, even down to design features like fonts, colors, and icons, which are not typically manipulated by users (Figure 7.2).

Sanvello (Mobile App)

Sanvello (Mobile App)

Sanvello is a mental health application that combines cognitive behavioral therapy, mindfulness meditation, health, and mood tracking. Sanvello includes features for daily mood tracking, guided meditation, coping tools, progress assessments, and community support. Unlike thought records that ask people to rate their own feelings and mood, the weekly check-in feature assigns anxiety, stress, and depression scores based on responses to prompts. Being scored on one's feelings

by an external entity might bring up negative feelings of judgment. The app offers tailored content and suggests activities based on user mood (Figure 7.3).

Mindshift (Mobile App)

Mindshift is a mental health application geared specifically for anxiety and depression. The app encourages users to identify specific steps toward their goals and offers prompts for users seeking to overcome specific challenges. Users can schedule goals, set reminders, and mark them complete. Users also have access to short activities and prompts for quick relief as well as resources for emergency help (Figure 7.4).

StoryJumper (Website)

StoryJumper is an online platform for creating both print and digital storybooks. The website, targeted to teachers and their students, allows users to write and illustrate their own stories. Users can search through a selection of pre-designed text, characters, and props to use or they can upload their own photos. Users also have the opportunity to record audio to accompany their writing and illustrations (Figure 7.5).

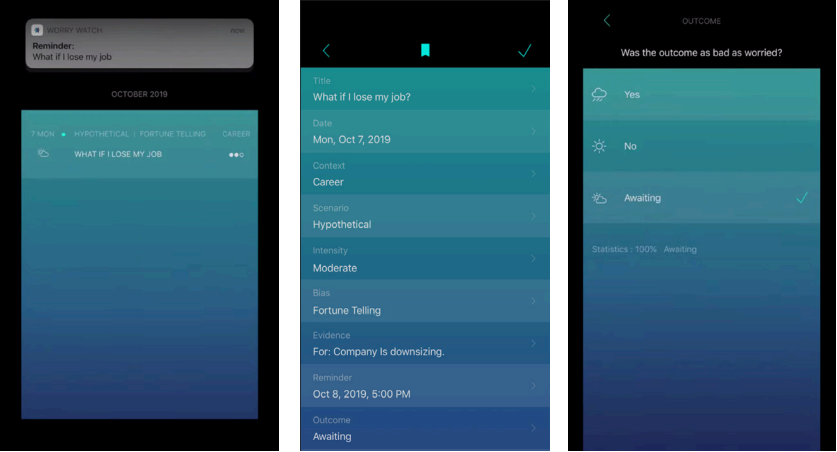
Figure 7.1
Typical thought record worksheet

Figure 7.2
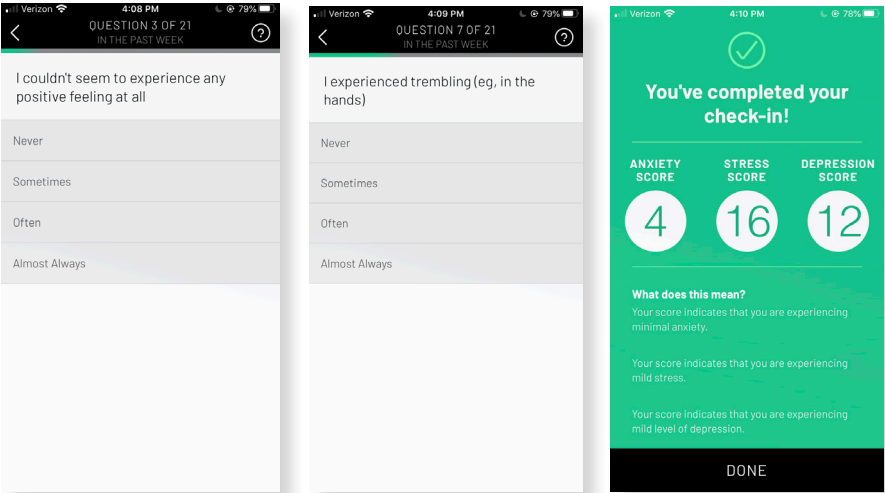Worry Watch User Interface

Figure 7.3

Sanvello User Inferface

Figure 7.5
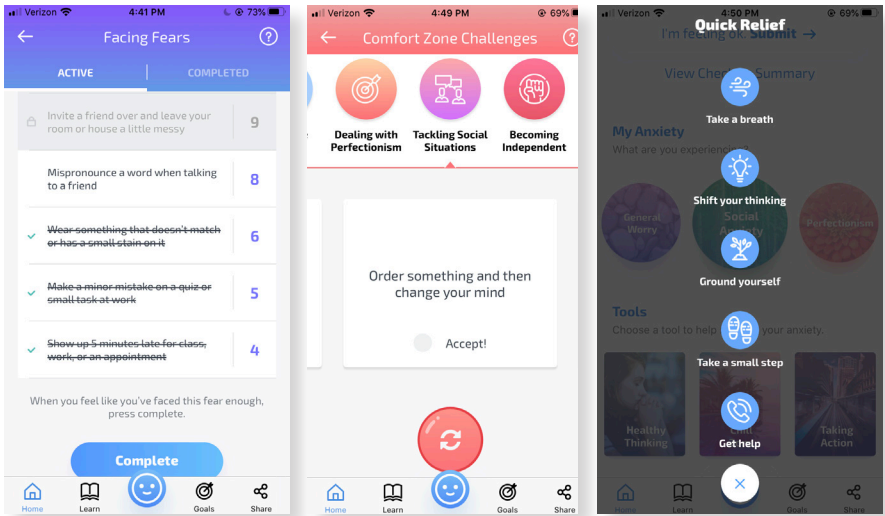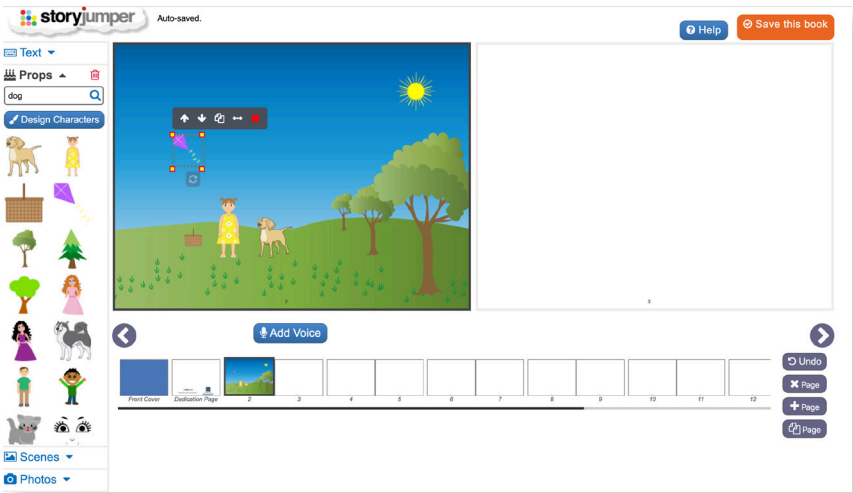
StoryJumper User Inferface

Figure 7.4

Mindshift User Inferface

Study One

Leveraging Personal Visualizations and Metaphor

To illustrate how a multimodal image builder might leverage unique personal visualization and metaphor, I created a series of visual studies exploring potential interactions and features. Each of these explorations relies on the clean language technique developed by psychotherapist David Grove to elicit and develop client metaphors. Grove and Panzer (1989) suggest that metaphors naturally embedded in client language can provide insight into how clients make sense of the world. By using set questions that reflect the client's exact words, therapists can limit the influence of their own "metaphors, assumptions, and presuppositions" (Lawley & Tompkins, n.d., para. 3).

For this study, I was also interested in how I might scaffold the image building experience for users with varying levels of image-making expertise. I started by defining three approaches for generating visual content: User generated, system generated, and user-system generated.

User Generated

The user generated approach relies on users to create their own visual elements. Users can then manipulate and arrange custom elements to build images. The first visual exploration employs prompts to help users develop mental imagery in a storyboard structure based on the clean language compass. (Figure 7.6)

Psychotherapists developed the compass to illustrate how clean language questions help clients navigate their own "metaphor landscape" (Lawley & Tompkins, n.d., para. 10). The arrows indicate how the questions guide clients toward accessing specific information needed to elaborate on their metaphors and form detailed symbolic representations. In this exploration, the user explores the metaphor of having a wall in front of them. The user is prompted to explore their metaphor by responding to the nine basic clean language questions. The user responds to questions by drawing on corresponding storyboards which are organized spatially, mirroring the compass model. The user navigates the storyboards by scrolling either up and down or left and right. Storyboards with questions for shifting the metaphor to symbol are stacked in front of those for defining attributes.

Scaffolding the image building process in this way creates a record of how the user's metaphor develops over time.

The next exploration engages users in short, timed visual exercises before they begin to develop and explore their metaphors through clean language questions. In this exploration, the user has one minute to create an image capturing how anxiety looks to them. After the initial exercise, the user can either start with a new storyboard or build on what they have already created. In this case, the user repurposes elements drawn in the initial exercise to illustrate their metaphor of having a wall in front of them. This approach might be appropriate for users who are not accustomed to making images. Starting with more general questions before moving on to clean language questions could be a way to ease users into the image building process. Timing the exercise encourages users to build images quickly; however, establishing a time limit might exacerbate anxiety (Figure 7.7).

Although asking users to generate image content allows for a wide range of expression, doing so might disadvantage users who are not accustomed to creating images. Both visual explorations raise the question of whether users should build images over time or in a single instance. The second study suggests an opportunity to scaffold the image-building process by pacing user interaction with shorter exercises.

System Generated

The system generated approach allows users to select and arrange fully designed pre-made elements without having to create their own. In this exploration the user is provided with a bank of icons they can use to compose their image. The user can place and rearrange the premade elements but cannot alter the elements beyond determining size and color. In this example, the user layers a small emoji behind a grid of rectangles to illustrate the metaphor of being stuck behind a brick wall (Figure 7.8).

This exploration suggests an opportunity to group elements based on categories or themes. For instance, the app might recommend specific elements based on how previous users represented common metaphors or emotions. For this study, I used icons in the style of emojis but asking users to choose from a selection of premade

elements raises questions about appropriate levels of representational abstraction. What would the elements need to look like to be most effective? Additionally, a media bank suggests that users might be able to use a range of media to build images including images, text, and sound. In this approach, users create meaning by positioning elements relative to one another. But users have limited control over the elements they choose as the icons are not editable. For this reason, pre-made elements would not account for the wide variety of personal mental imagery and would limit the range of expression.

User-System Generated

The user-system generated approach combines the previous two as it provides users with a starting point while allowing for greater customization. In this exploration, the app initiates the image building by drawing a line and prompting the user to complete the image. The user adds to the line to create a drawing of a wall (Figure 7.9). The next exploration provides users with a bank of shapes and lines that they can manipulate and combine. In this example, the user resizes and stacks rectangles to create an orange brick wall (Figure 7.10)

This approach could help address varying levels of image-making expertise. If the app initiates the image building process, it might seem less intimidating to users who are not yet accustomed to creating images. Providing users with resources to build their own elements gives them more agency to determine how their images look. Additionally, customized elements could be archived in a library and shared with others to establish a sense of community. These studies highlight the importance of striking a balance between guiding the user through the experience and influencing outcomes. As with earlier studies, these explorations also suggest a need for pacing user interaction. The amount of time used to build images would vary widely depending on the user. Spending too much time building images would prevent users from advancing to subsequent stages.

Form and Methods for Manipulation

Following initial studies, I was most interested in continuing the user-system approach for content generation. I continued to build on previous ideas through another series of visual explorations.

Face Builder and Generator

I began by exploring how an icon bank could allow for more customization. This exploration considers the potential of using either a face builder or generator to help users illustrate people in their images (Figure 7.11). The former allows users to build a face over time and see combinations as they go. The latter allows users to view and select facial features in isolation. Users only see the entire face after they have selected each feature. In this exploration, faces are simple icons, composed of only a set of eyes and a mouth. For this reason, the face builder seemed to be more appropriate. The face generator might be suitable for creating more detailed illustrations with many features.

Word Illustration

The next visual exploration adopts adjectives from user descriptions of metaphors to guide image building (Figure 7.12). The user ascribes characteristics to words by adding effects and animations. In the visual exploration, the user makes the statement "my life is a mess." The word "mess" becomes the starting point for image building. The user responds to clean language questions by manipulating the word to create an image. In this scenario, the more accurate word to animate would have been "life," however, the exploration illustrates how a user could build images from words to illustrate metaphors. Providing pre-made effects and animations allows new image makers to build images that are complex, detailed, and expressive.

Image Storyboarding

This exploration also relies on user descriptions to scaffold image-making. The app prompts users to create black and white illustrations and then ascribe characteristics to complete them (Figure 7.13). In this exploration, the user describes a dark, loud, heavy door slamming shut on them. The user draws the door in black and white before adding color to make the door appear dark. The user also has the option to animate their image or add audio. Applying different attributes to one element is simple, however, when users create multiple elements, they must also choose how to compose them. In the next example, the user describes a long, crowded, never-ending race. The user draws a long path, several

stick figures, and a spiral. The user strategically positions the path so that it extends in the direction of the spiral and places the stick figures along the path.

Collage

The next exploration again relies on user descriptions; however, the user is not prompted to draw their metaphor (Figure 7.14). Instead, the app suggests pre-selected photographs based on adjectives from the user. The user can then arrange and layer the photographs together in a collage. In this example, the user states that "everything is falling down all around [them]." They describe the "falling" as loud, crumbling, and crashing. The app then shows the user images that correspond with each adjective. The user selects images to represent the adjectives as they experience them and arrange the images to create a descriptive collage. The resultant image is an abstract depiction of the metaphor.

3D Model

Similar to the previous example, the next exploration asks the user to build an image that is more symbolic than a literal representation of the metaphor (Figure 7.15). Inspired by 3D Modeling software, the app prompts the user to illustrate their metaphor by manipulating a pre-designed geometric shape. The user can select a three-dimensional object and manipulate it by applying effects to represent their selected metaphor. In this exploration, the user states that "everything is falling down all around [them]." The user then selects a rectangular prism and distorts the shape to reflect the adjectives: loud, crumbling, and crashing. Although this exercise for building imagery might result in a compelling illustration, keeping track of the user's metaphor could become more difficult.

Situation–Thought Organization

After exploring possibilities for visualizing images and metaphors, I became interested in how to organize multiple thoughts stemming from the same situation (Figure 7.16). For example, on TR worksheets thoughts related to a situation are listed either next to or under the situation description. The resultant exploration is a part-to-whole organization in the form of a cube made of blocks where each block represents a thought. The dimensional quality of the cube suggests

alternative ways of looking at or approaching a situation, and subtly prompts the user to reposition thoughts. The next iteration organizes thoughts by assigning them to symbolic forms known only to users with the same potential to reorganize. Lastly, the third exploration uses a file structure as the organizational principle, which suggests the potential to layer thoughts to illustrate their messiness and complexity. Users can see all thoughts associated with a situation at once. For these visual explorations, I organize users' thoughts by situation; however, it is also possible to organize thoughts by focusing on other categories. For instance, thoughts could be grouped based on associated feelings or emotions. Organizing thoughts suggests the potential for a tagging feature to make information searchable, especially for viewing over time.
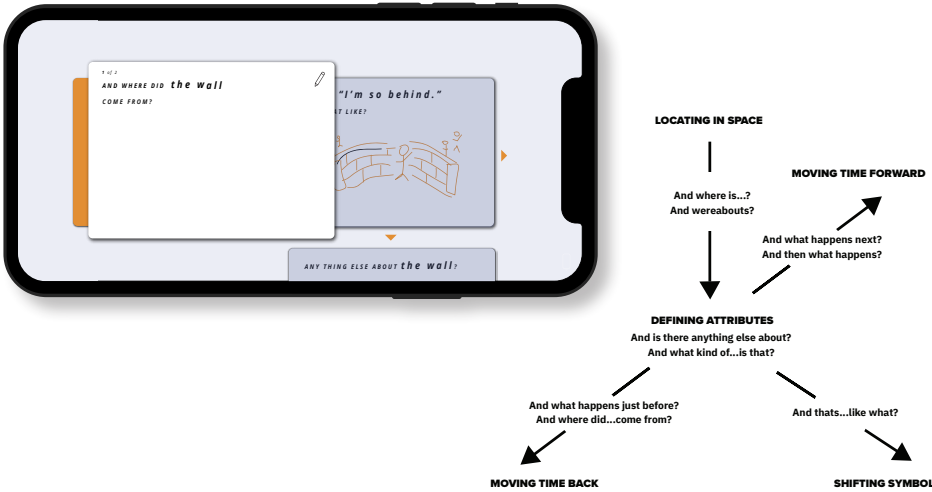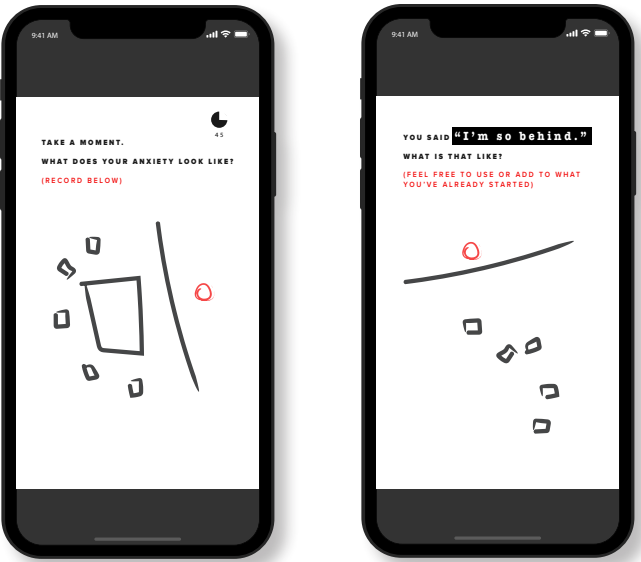
Figure 7.8

The user can select from a bank of fully designed icons to compose their images.
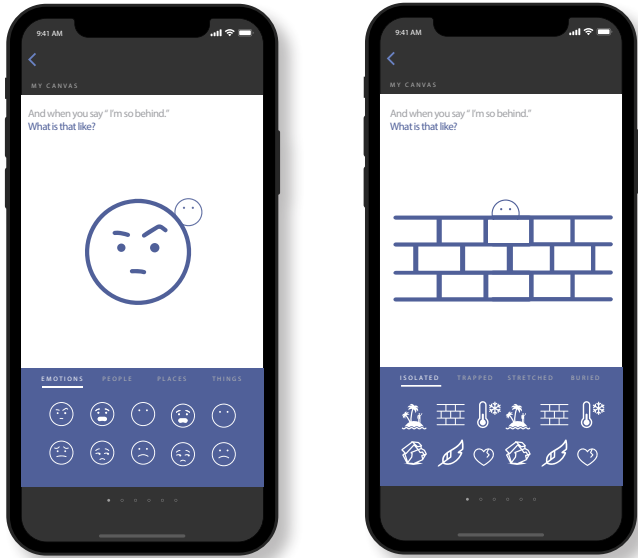
Figure 7.10

The user can manipulate and combine individual shapes to build an image.

Figure 7.9

The app initiates image building by drawing the first line. The user is then prompted to complete the image.
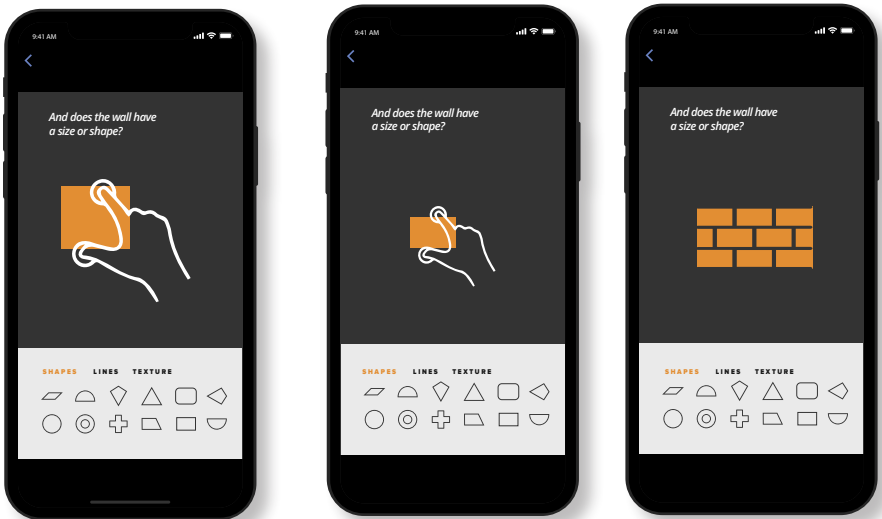
Figure 7.11a

A face builder allows the user to build a personalized icon over time and see combinations all at once.

FACE
Let's say this is you.

EYES
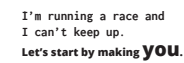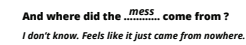*Which set of eyes most closely represents how feel right now?*

MOUTH
Which mouth most closely represents how feel right now?

YOU
Does this look like how you feel?

YES NO

FACE BUILDER
w/ Custom-drawn features

FACE
Start by drawing your head.

EYES
Next, draw your eyes as you feel right now.

MOUTH
Next, add your mouth as you feel right now.

YOU
Does this look like how you feel?

YES NO

Figure 7.11b

A face generator allows the user to view features in isolation and generate an icon based on selections.

FACE
Let's say this is you.

EYES
Which set of eyes most closely represents how you feel right now?

MOUTH
Which mouth most closely represents how feel right now?

GENERATING
Let's put it all together.

YOU
Does this look like how you feel?

YES NO

FACE GENERATOR
w/ Custom-drawn features

FACE
Let's say this is you.

EYES
Which set of eyes most closely represents how you feel right now?

MOUTH
Which mouth most closely represents how feel right now?

GENERATING
Let's put it all together.

YOU
Does this look like how you feel?

YES NO

My life is a mess.
And what kind of mess **... is that** mess **...?**
A big mess.

mess
pinch or drag to scale/warp

And is there anything else about that mess **?**
*It just keeps getting bigger and crazier.
I can't control it.*

And where is the mess **?**
Everywhere. I can't get rid of it.

And where did the mess **... come from ?**
I don't know. Feels like it just came from nowhere.

And then what happens?
I don't know. Feels like it's just going to surround me and swallow me up.

And what would you like to happen?
I just want to take control and fix everything.

You mentioned yourself again. *Would you like to update your image?*
YES NO

Figure 7.12

The user can illustrate their metaphor by adding effects and animations to text.

A door slamming shut on me.
Let's start by making the door.

Select a mode.

And what kind of door **is that?**
A dark, loud, heavy door.

dark   loud   heavy

Add color?   Add sound?   Add texture?
Add motion?

I'm running a race and I can't keep up.
Let's start by making you.

Select a mode.

And what kind of race **is that?**
A long, crowded, never ending race.

long   crowded   never ending

Figure 7.13

The user can ascribe characteristics to illustrations by selecting visual and audio effects.

Figure 7.14

The user can arrange and layer photographs to create a descriptive collage of their metaphor.

Everything is falling down around me.

And what kind of falling is that?

A loud, crumbling, crashing type falling.

LOUD

CRUMBLING

CRASHING

Figure 7.16

Studies of part-to-whole, shelf, and stacked organizational principles.

CUBE

SHELF/STORAGE

FILE/TAB

Figure 7.15

The user can manipulate 3D objects to represent their metaphor.

Everything is falling down around me.

And what kind of falling is that?

A loud, crumbling, crashing type falling.

SHAPES
Select one or more.

Bend   Pinch   Twirl   Twist

SUGGESTED EFFECTS
Drag and drop on shapes to apply.

falling

Study Two

Suggesting Alternative Views and Perspectives

After exploring techniques for generating images, I was interested in how a multimodal image builder might suggest alternative views or perspectives to help users identify and reframe their negative automatic thoughts. Pulling from established techniques used in cognitive restructuring, I created a series of visual studies exploring how verbal and visual prompts might encourage users to challenge unhelpful assumptions and beliefs.

I developed a matrix to structure and organize the studies (Figure 7.17). The matrix combines common cognitive distortions with three activities: building, manipulating, and reviewing. The term cognitive distortion describes the negative biases in thinking that lead individuals to inaccurately perceive reality (Beck, 1976; Neenan & Dryden, 2006). Building, manipulating, and reviewing loosely correspond to key stages in the imagery rescripting process. Building describes the process of developing and organizing image content. Manipulation describes the process of altering and augmenting established images. Lastly, reviewing describes the process of revisiting established images after manipulation. These activity descriptions represent initial efforts to adapt the image rescripting process for the mobile app I propose. The cognitive distortions included in the matrix were derived from thought patterns made evident in the scenarios I developed. I included these cognitive distortions to explore how this app might intervene to address specific negative thought patterns. I based visual explorations on established interventions used in CBT and related offshoots such as rational emotive behavioral therapy. In practice, therapists often use a variety of strategies and techniques to help their clients. There are voids in the matrix where I did not find specific strategies for targeting cognitive distortions related to the defined stages. I also incorporated general strategies used in CBT like guided questions and prompts.

Black and White Thinking

Black and white thinking describes a tendency to look at situations in absolute terms with no inbetween (Burns, 1999). It is important for people expressing this distortion to consider a range of possible outcomes. Sometimes situations involve either a best case or worst case scenario, but they are not always qualified as such.

Manipulation

In this visual exploration, the user is prompted to consider alternative images that could exist between their best case and worst case scenarios (Figure 7.18). The user begins by building images to represent each scenario. On the first storyboard, the user builds an image of a person drowning, on the second storyboard they build an image of a person swimming. The app automatically combines images to create a new storyboard between the two images, prompting the user to build an alternative. Automating the prompt creates an opportunity to populate the new artboard with content from initial images by pulling over recurring visual elements. Alternatively, elements might be collected in a library of recent assets. I also explored the possibility of using visual cues to indicate opportunities for forming alternative images (Figure 7.19).

Reviewing

Next, I explored possibilities for the user to revisit the images they have created. In this exploration, the user is prompted to build more alternative images by exhausting combinations of previous ones. As the user creates more alternatives, images morph from flat storyboards to a 3D cube, illustrating the potential to build complexity over time. The shape suggests that something might happen at the corners or edges of the cube to indicate relationships. For example, I assigned each image a different color and where images met the colors began to mix (Figure 7.20).

Several questions about pacing and structure emerged from these studies. For example, if the goal is to exhaust possibilities, when does exploration end? Additionally, is it helpful to have image elements contained in rectangles as "storyboards," or might it be beneficial to have users build images in a more open format? For example, it might be impactful to see images overlapping messily at various scales.

Catastrophizing

Catastrophizing involves the tendency to see situations as being worse than they actually are. The distortion can apply to both current situations and imagined future scenarios (Grohol, 2018).

Building

One technique to address catastrophizing is to imagine different points in time after the troubling event. This technique, called "time projection," was established by clinical psychologist Arnold A. Lazarus in 1968. The technique has since been adapted and used in cognitive behavioral therapy as well (Hackmann, Levy & Holmes, 2011).

This exploration illustrates how images might be built and organized along a timeline (Figure 7.21). Previous explorations ask users to consider alternatives during either the manipulation or reviewing stage. Conversely, this exploration encourages users to think of alternatives as they build initial images. Another visual exploration echoes the "blow up" technique for addressing catastrophizing. The method involves asking therapy clients to find humor in stressful or fear inducing situations by blowing them out of proportion (Froggatt, 2005). Following suit, the storyboard unfolds into an open space, setting the expectation for the image building to follow (Figure 7.22). If users are to be encouraged to exaggerate their images it might be helpful to provide the space to do such.

Manipulation

Continuing with the blow up technique, this visual exploration prompts the user to adjust the proportion of elements through demonstrative cues. Here the edges of the door, for instance are highlighted to encourage scaling (Figure 7.23).

Reviewing

Because the proposed app encourages users to work in the realm of metaphor, it raises the question of whether there would be an opportunity to reground images in the literal. For example, in this visual study users are able to view a timeline of images they created and explicitly note how the metaphor relates to their literal situation (Figure 7.24).

Mental Filtering

Mental filtering describes the tendency to dwell on specific details while ignoring others. People often focus too closely on the negative details of a situation and filtering out positive ones (Burns, 1999).

Manipulation

This visual exploration illustrates how a user might be encouraged to consider both positive and negative aspects of a situation. In this visual exploration, the user challenges the idea that their "life is a mess" by building an image to represent a more thorough evaluation of their circumstances (Figure 7.25). The user builds an image illustrating aspects of their life before labeling them as either negative or positive. The user then assigns a weight to each aspect and watches the elements automatically resize to match. Users may not be able to create an accurate image in the moment. This suggests that prompts should be designed to respond to the needs of the user.

Should Statements

Should statements are statements that people make about what they "should" or "ought" to be doing. The statements are typically related to some expectation that the person does not believe that they are currently meeting (Burns, 1999).

Building

To address this thinking, therapists often encourage clients to reframe their thoughts by changing the language they use.This study looks at verbal reframing during the initial image building process by highlighting key words and suggesting potential replacements (Figure 7.26). In this exploration the user builds an image of a race and with the statement, "I should be ahead by now." The user is prompted to reframe the statement as a preference.

Manipulation

The previous exploration illustrated how users can be asked to consider whether their expectations tied to their images are realistic as they build them. Users have the opportunity to alter their expectations before continuing to build images. This visual exploration illustrates how insights might be gained by rearranging and overlapping images to compare them (Figure 7.27).

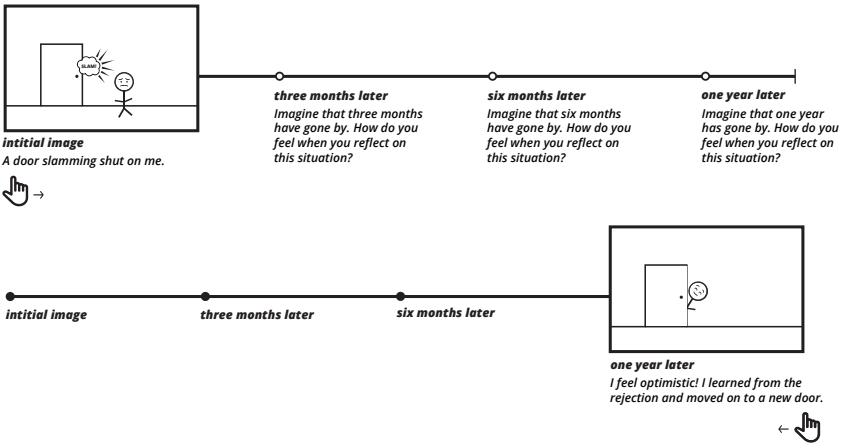|	black and white	catastrophizing	mental filtering	should statements
BUILDING		**Responsive Canvas:** system adapts based on exercise aims. **Storyboard Timeline Open Canvas**		**Verbal Reframing:** system offers suggestions for reframing language.
MANIPULATING	**Image Merge:** system encourages user to explore areas of overlap by blending images to create new ones.	**Manipulation Demo:** system encourages manipulation through demonstrative cues.	**Highlighting & Prioritization:** system encourages user to highlight elements of their images and prioritize them visually.	**Image Comparison:** system allows user to explore relationships between multiple images.
REVIEWING		**Reflective Mapping:** system allows user reflect on insights gained from engaging with metaphorical imagery.		**Filling Gaps:** system encouragee users to create images to explore missed opportunities.

Figure 7.18

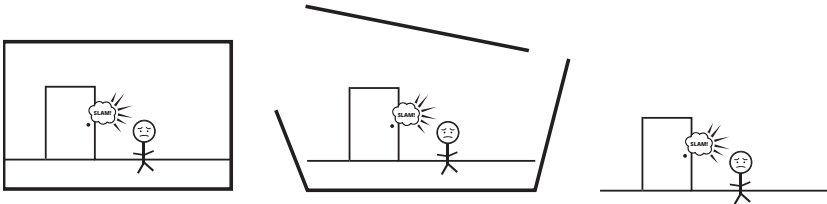Image Merge Prompt challenges the user to consider alternatives by seeing storyboards come together.
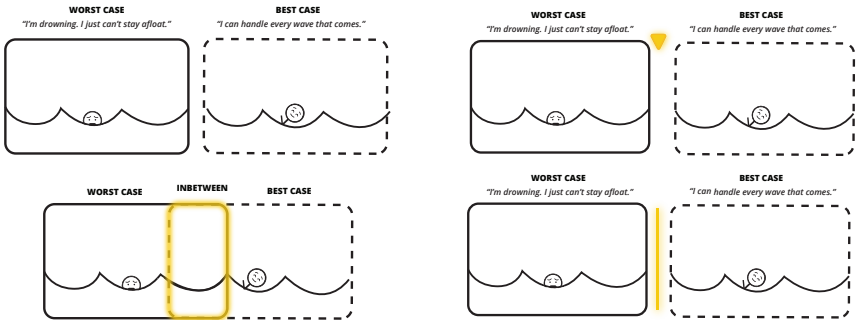
Figure 7.19

Small visual cues indicate areas where an alternative image might be added.
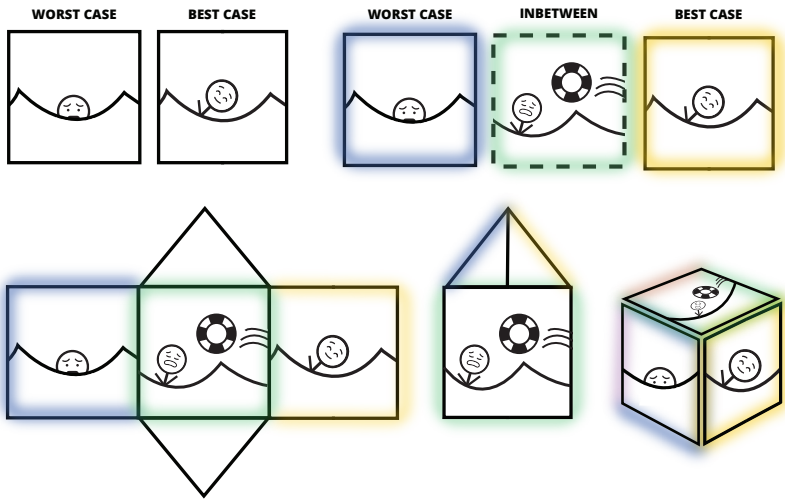
Figure 7.20

Images building up to a cube, illustrating the potential to build complexity over time; morphing from flat artboards to a 3D shape
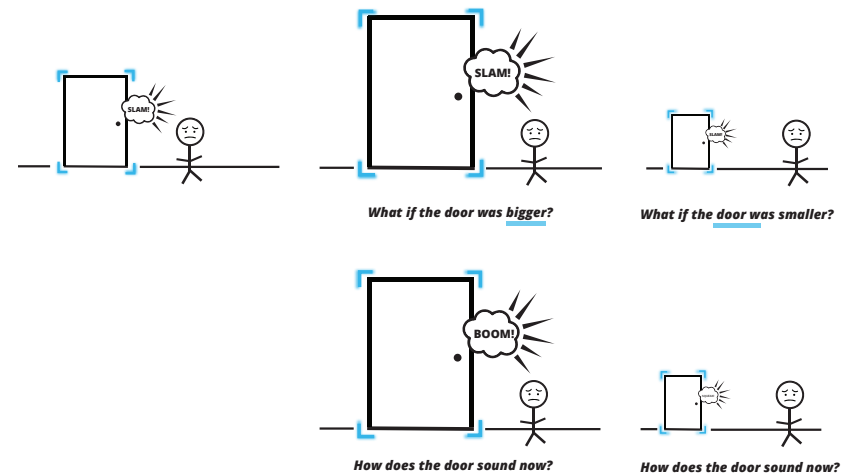

WORST CASE
"I'm drowning. I just can't stay afloat."

BEST CASE
"I can handle every wave that comes."

WORST CASE
"I'm drowning. I just can't stay afloat."

BEST CASE
"I can handle every wave that comes."

WORST CASE   INBETWEEN   BEST CASE

WORST CASE
"I'm drowning. I just can't stay afloat."

BEST CASE
"I can handle every wave that comes."

WORST CASE   BEST CASE   WORST CASE   INBETWEEN   BEST CASE

Figure 7.21

The user is prompted to build their images into a timeline.

initial image
A door slamming shut on me.

three months later
Imagine that three months have gone by. How do you feel when you reflect on this situation?

six months later
Imagine that six months have gone by. How do you feel when you reflect on this situation?

one year later
Imagine that one year has gone by. How do you feel when you reflect on this situation?

initial image   three months later   six months later

one year later
I feel optimistic! I learned from the rejection and moved on to a new door.

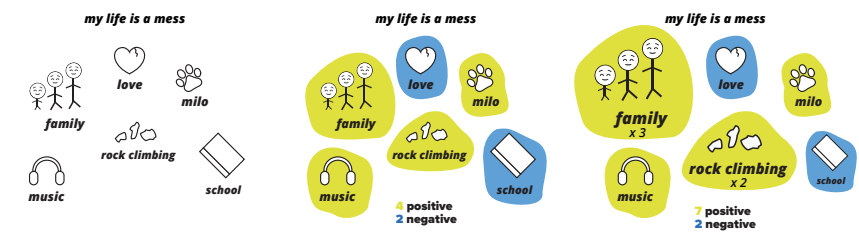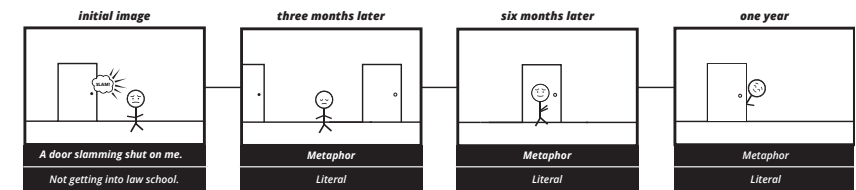## Figure 7.22

Physical boundaries of the storyboard open to set the expectation for the imagery work to follow.

Figure 7.23
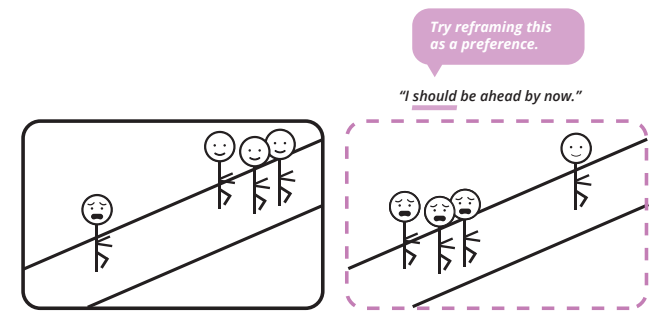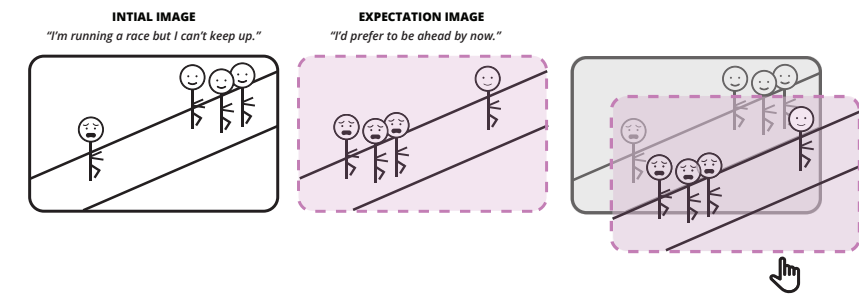Demonstrative visual cues prompt the user to adjust the proportion of elements.

What if the door was bigger?   What if the door was smaller?

How does the door sound now?   How does the door sound now?

Figure 7.25
The user can map the metaphorical imagery back onto the literal situation.

initial image	three months later	six months later	one year
A door slamming shut on me.	Metaphor	Metaphor	Metaphor
Not getting into law school.	Literal	Literal	Literal

Figure 7.25
The user can augment images by highlighting and visually prioritizing specific elements.

my life is a mess   my life is a mess   my life is a mess

love   milo   love   milo   love   milo
family   family   family x 3
rock climbing   rock climbing   rock climbing x 2
music   school   music   school   music   school

4 positive 2 negative   7 positive 2 negative

Try reframing this as a preference.

"I should be ahead by now."

Figure 7.26
The user is challenged to reframe negative automatic thoughts by using choosing allternative language.

INTIAL IMAGE
"I'm running a race but I can't keep up."

EXPECTATION IMAGE
"I'd prefer to be ahead by now."

Figure 7.27
The user can rearrange and overlap images to compare them to gain new insight.

Study Three

Reinforcing Alternative Images with Interactive Visual Prompts

Once the user builds and manipulates their images, the next step in the process is reviewing them. This study imagines interactions that facilitate continued engagement with established images.

A number of approaches help therapy clients establish what therapists call "new ways of being," which describes, the "new positive orientation that clients, who have previously had strong persistent negative beliefs, are encouraged to develop towards themselves" (Hackmann et al., 2011, p. 181).

Competitive memory training (COMET) uses imagery practice "to help clients believe at an emotional level what they may only know about themselves at an intellectual level." (Hackmann, Levy & Holmes, 2011, p. 182). In COMET, clients are expected to engage with imagery on a daily basis through exercises intended to help build and reinforce positive images. COMET is based on Brewin's (2006) retrieval competition theory which suggests that CBT does remove negative mental representations altogether. Instead, the therapy "alters the relative accessibility of memory representations containing positive and negative information…"(p. 773). Therapists help clients establish "competitor representations" so that when faced with challenging situations, positive representations are retrieved in place of negative ones.

For this reason, I developed visual explorations that illustrate a range of strategies for facilitating imagery practice through interactive visual prompts. This study raised important questions about what would be most helpful and appropriate in high-stress moments versus low-stress moments, including which factors should be considered in designing interactive visual prompts for varying anxiety levels. How much effort is required of users? How might these interactive visual prompts be designed so that users are motivated to complete them? And what would be the content of the prompts? For example, if the user is experiencing a high level of stress at the moment, a short prompt could provide quick relief. Conversely, if the user is experiencing a lower level of stress a longer prompt requiring continued engagement might be appropriate. It might be beneficial for the user experiencing

a high level of anxiety to spend more time engaging with positive alternative imagery. The user experiencing a lower level of anxiety might be more prepared to engage with positive and negative imagery more equally. These assumptions would need to be tested, but are important factors to consider when designing interactive visual prompts.

In the first few visual explorations, I created prompts that encourage the user to work with positive alternative images rather than the initial negative ones.

Matching Prompt

I was inspired by card matching games that show players an image and ask them to recreate or describe it without looking. In this exploration, the user is asked to recreate positive alternative images from memory (Figure 7.28). The user can flip back and forth between a blank storyboard and storyboard featuring the image they need to recreate. Responding to this prompt could be simple or challenging, depending on the complexity of the alternative image. This visual exploration suggests that it might be necessary to establish the level of difficulty or ease expected of the interactive games. While the prompts should be challenging enough to be engaging, they should be designed to not cause further anxiety or distress. Additionally, I wondered if this prompt would be appropriate for a first attempt at imagery practice or for an advanced stage.

Tracing Prompt

In this visual exploration, the user is asked to trace their alternative image at a zoomed level, focusing on details that might otherwise go unnoticed (Figure 7.29). The potential to draw attention to smaller details could be lost when engaging with the full image. By visually breaking down the image into smaller portions, the user is offered a different perspective. The user might also be compelled to slow down, suggesting a more calming, less taxing interaction. At first glance this prompt seemed like it might lend itself to earlier image practice. Conversely, this prompt might also be helpful for refreshing the user in more detailed aspects of an image even after they have engaged with it for a while.

The next series of visual explorations came from an interest in exploring how prompts might illustrate transformation, engaging the user in practice with both initial negative images to positive alternatives. Asking users to deal with negative thoughts and imagery as a means to reach more positive alternatives could be helpful in reinforcing that imagery work is a process.

Wipe Away Prompt

This visual exploration was inspired by scratch off cards. The user is prompted to wipe away the negative image, the slammed door, to reveal an alternative image beneath, in this case the stick figure entering the door (Figure 7.30). The act of breaking down or destroying the negative image suggests a level of agency. Users can initiate an immediate change through direct action. In this particular exploration, the metaphor of wiping away suggests a potential for other visual themes that reveal a previously hidden or obscured image. For example, digging, excavating, scratching, or chipping, each of which implies that some effort is needed to reveal a "thing".

Recomposition Prompt

The next visual exploration also asks the user to engage with the negative image to reveal the positive alternative. The user is prompted to rebuild an alternative positive from the negative image using the same or similar elements (Figure 7.31). While the user can physically borrow elements from the negative image to build the alternative image, they also have the opportunity to discard some elements and introduce new ones. This particular prompt has the potential to draw attention to specific elements in an image. The user can express agency by literally getting rid of some elements and introducing new ones. Agency exercised in this context might inspire similar agency in literal situations.

Puzzle Prompt

In this visual exploration, the user is prompted to deconstruct the negative automatic image "puzzle" and build the alternative image with the same puzzle pieces (Figure 7.32). The transformation is triggered when users drag the puzzle piece away from the original image and across the dashed line. The whole image

doesn't transform all at once, but rather piece by piece creating a sense that users are working with the same pieces. Having users build new images from what is already there versus starting with a new storyboard implies transformation and again reinforces user agency.

Press & Hold Prompt

After working with several static visual explorations, I became interested in exploring animated images (Figure 7.33). In this visual exploration, the user is prompted to press down and hold a button to trigger a timed animation of the negative image transforming to the positive alternative image. While this prompt requires minimal user effort from the user, it also creates a situation where users can pay less attention to recreating images, and focus instead on the transformation itself. In this exploration, the user is no longer working with two distinct static images. Instead, the user is also asked to observe and consider what might happen between negative and positive images. This transition is lost in static visual explorations but can be captured through animation.

Voice Activated Prompt

Encouraged by the previous exploration, I became interested in exploring how users could express even more agency while engaging with animated interactive prompts. In this visual exploration, the user is prompted to trigger a change by speaking the alternative thought out loud (Figure 7.34). As the user speaks the thought associated with the positive alternative image, they see an animated change. This exploration provided an opportunity to consider both visual and verbal ways to reinforce alternative thoughts and images. It raised the question of whether this imagery work could be strengthened by working deliberately in multiple modes at once. Throughout this investigation, I considered whether it would be helpful to keep thoughts visually linked to associated images throughout the process or only at the start. In this exploration, including thoughts with the images became a more intentional decision.

In subsequent practice, the user might be able to watch the animation and hear themselves narrating the transformation. This exploration led me to consider

how the interactive visual prompts could build on each other, providing multiple opportunities to engage with one an alternative image.
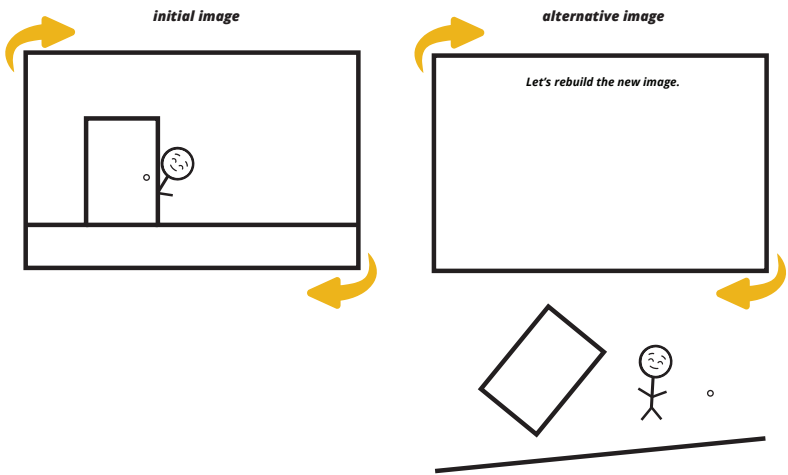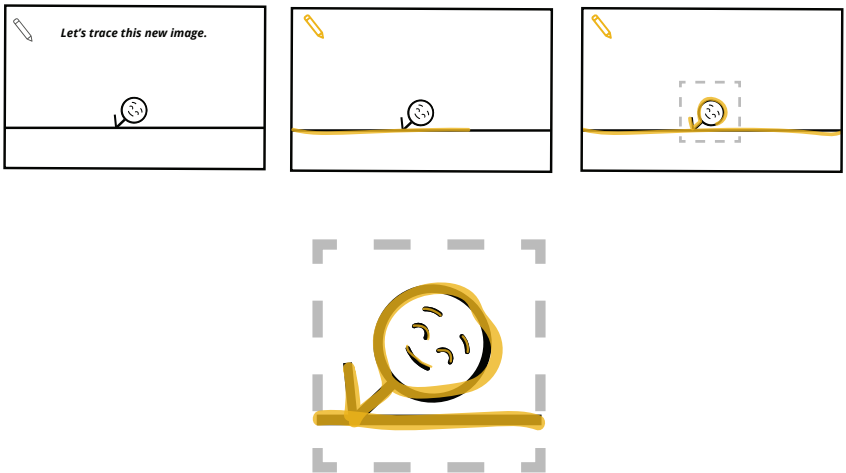
Figure 7.30

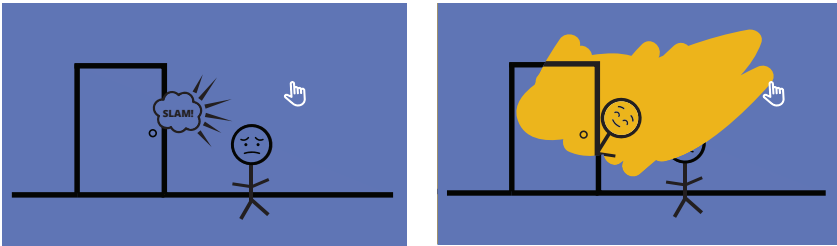The user is prompted to wipe away negative image to reveal the alternative image below.

Figure 7.31

The user is prompted to deconstruct the negative image and build the alternative image using the same or similar elements.

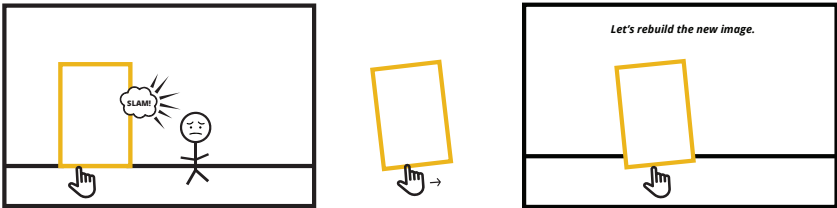Let's rebuild the new image.

Figure 7.31

The user is prompted to deconstruct the negative automatic image "puzzle" and build the alternative image with the same puzzle pieces.
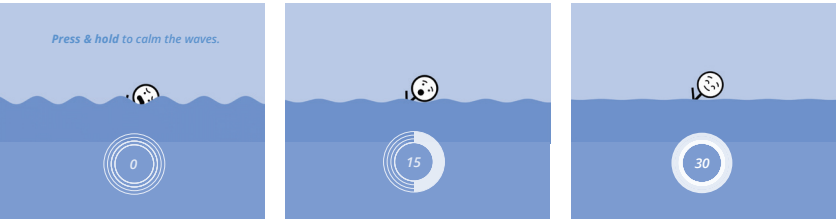

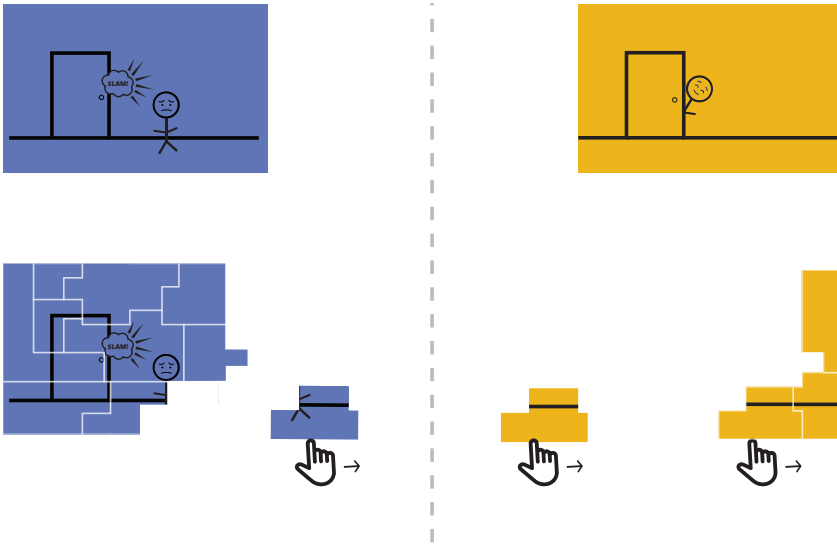Press & hold to calm the waves.

0

15

30

Figure 7.33

The user is prompted to press and hold a button to trigger a timed animation of the negative image transforming to the alternative image..

Try using your new thought to calm the waves.

I CAN HANDLE WAVES THAT COME MY WAY.

I CAN HANDLE WAVES THAT COME MY WAY.

I CAN HANDLE WAVES THAT COME MY WAY.

I CAN HANDLE WAVES THAT COME MY WAY.

I CAN HANDLE WAVES THAT COME MY WAY.

Figure 7.34

The user is prompted to speak the alternative thought out loud to trigger an animation of the negative image transforming to the alternative image.

Study Four

Facilitating the Full Cycle of Therapy

This study investigates how a multimodal image builder and interactive visual prompts might combine to facilitate the full cycle of experience, observation, reflection, and planning used in image rescripting. I began by incorporating insights gleaned from previous studies to develop screens for a mobile app. The goal of this study was to discover how features explored in previous studies might work together as a system.

Capturing Thoughts and Eliciting Metaphor

The first visual exploration incorporates prompts from traditional thought record worksheets with clean language questions to capture thoughts and elicit metaphorical images (Figure 7.35). In initial visual explorations from study one, the process for capturing thoughts and eliciting metaphor was combined with the process for building images. The user was asked to respond to clean language questions through image making.

In this visual exploration, the user responds to clean language questions before building images. Separating the stages creates a more gradual, paced process that allows users to focus on expressing their thoughts and feelings without having to build images simultaneously. A thought record feature tags keywords and phrases for continued exploration, before the user is asked to build any images. Users are encouraged to respond to prompts verbally, as the app records and converts responses to text. The thought record mirrors the user's words to ask follow up questions. The thought record looks out for specific words and phrases typically linked with cognitive distortions and metaphorical phrases. Once a metaphorical phrase is identified, the user is prompted to move on to the next step. The user can choose whether to move on or keep working in the thought record. If a cognitive distortion is also identified, the app offers an appropriate prompt for exploring the metaphor. Pacing the interaction in this way scaffolds the process by moving the user along, whereas many other mobile interventions leave pacing to the user.

Although a verbal exchange between the user and the app promotes a more natural flow to the dialogue, it also brings up the issue of privacy. One of the benefits of mobile digital technology is that users have access to the intervention anywhere at

any time. Some users may not feel comfortable speaking their thoughts out loud; a typed text input might be another appropriate option. In order to address this, the user should have access to more than one method for input.

Multimodal Image Builder

Another visual exploration builds on work done in study two to develop visual strategies for scaffolding the image building process based on specific cognitive distortions. The exploration illustrates how the image building process might be set up to address black and white thinking, where users have the tendency to view situations in absolute terms. In this case the goal of the prompt would be to engage the user in considering more than two possible outcomes.

The user begins with two storyboards instead of one, setting the expectation for building two separate images. While the user can see that they will be asked to build two images, only the first prompt is revealed initially (Figure 7.36). The second prompt, to the right of the first one, remains locked until the user builds the first image. Locking and revealing prompts could be a helpful strategy for pacing image building, by encouraging the user to focus on one image at a time. Requiring the user to complete an activity before unlocking another one also offers an incentive to engage.

The next exploration follows up on visual explorations from study one to illustrate how users might be provided with resources and content for building images (Figure 7.37). The user interface includes a floating toolbar with a selection of pre designed shapes and lines. While this exploration shows a simple arrangement of shapes, the app could easily allow these shapes to be edited and manipulated to build more complex images.

After users build their initial images, they need to be prompted to explore alternatives. This visual exploration focused on how a multimodal image builder might suggest an alternative way to view images. The prompts are intended to help users challenge specific cognitive distortions and to see their images from a more balanced perspective, by creating opportunities for discovery. In this example, the app automatically creates a new storyboard between the two images to encourage the user to consider an in-between scenario (Figure 7.38 & 7.39).

Interactive Visual Prompts

After building a new alternative image, the user can save the new images for later practice. This visual exploration builds on study three which focused on reinforcing alternative images. The user can collect positive alternative images created during previous image building sessions into "stories" labeled with the alternative thought, targeted cognitive distortion, and date (Figure 7.40). The user can review alternative images by engaging with interactive visual prompts. The prompts ask users to engage in timed activities to practice working more balanced alternative images. Prompts can be customized to based on the users' level of anxiety. For instance, more anxious users can choose a "quick review" option to receive prompts that are shorter and require relatively lower effort. Conversely, less anxious users can select prompts that require more time and effort. A short, low effort prompt could ask users to press and hold on the screen to quickly see their initial image morph into an alternative image (Figure 7.41). A more involved prompt might ask users to state alternative thoughts out loud in order to trigger an animation of their initial image morphing into an alternative (Figure 7.42).

This exploration raised the issue of continued engagement. Imagery work is a process that requires effort over time, not just in isolated sessions. The app could be designed to use notifications that gently nudge users to revisit alternative images. Reminders might not be appropriate in all cases. Especially those where a user could potentially become even more anxious.
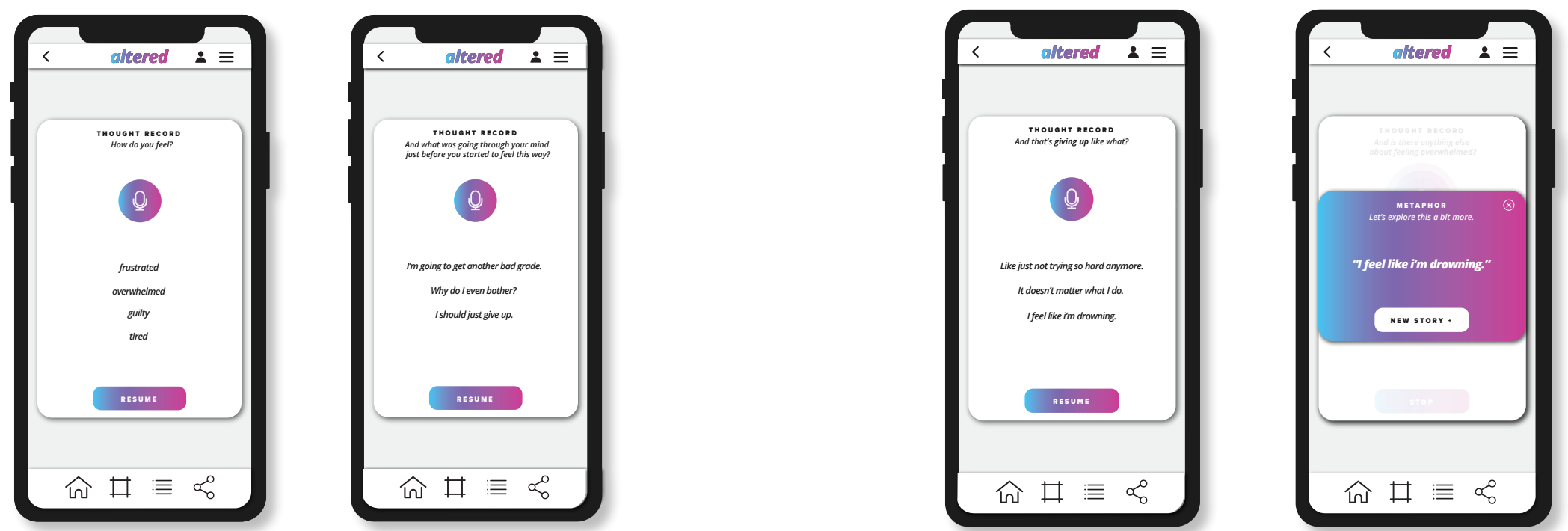
Figure 7.35

Thought Record Feature
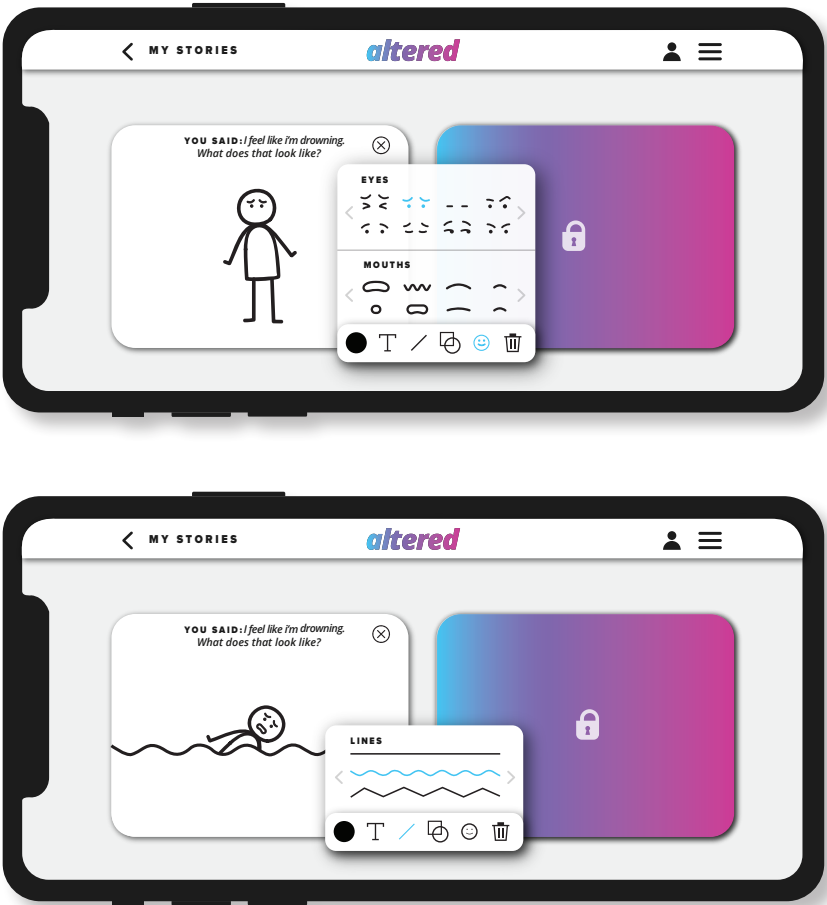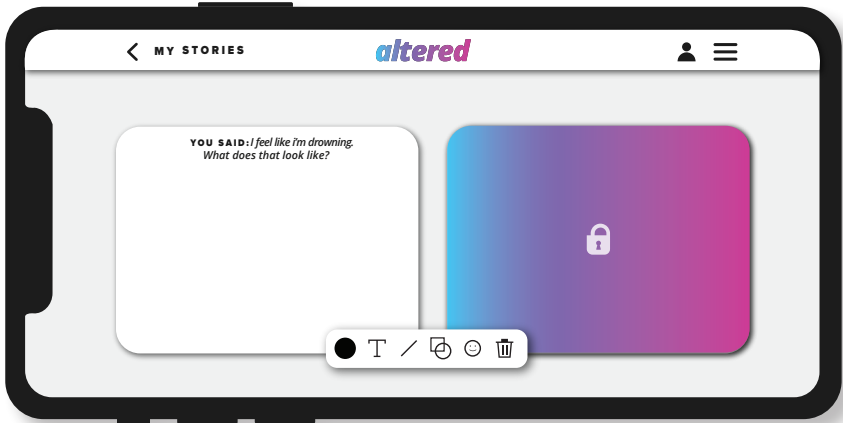
Figure 7.36

Paced prompts inside multimodal image builder

Figure 7.37

Floating toolbar allowing users to select and manipulate predesigned elements

Figure 7.38
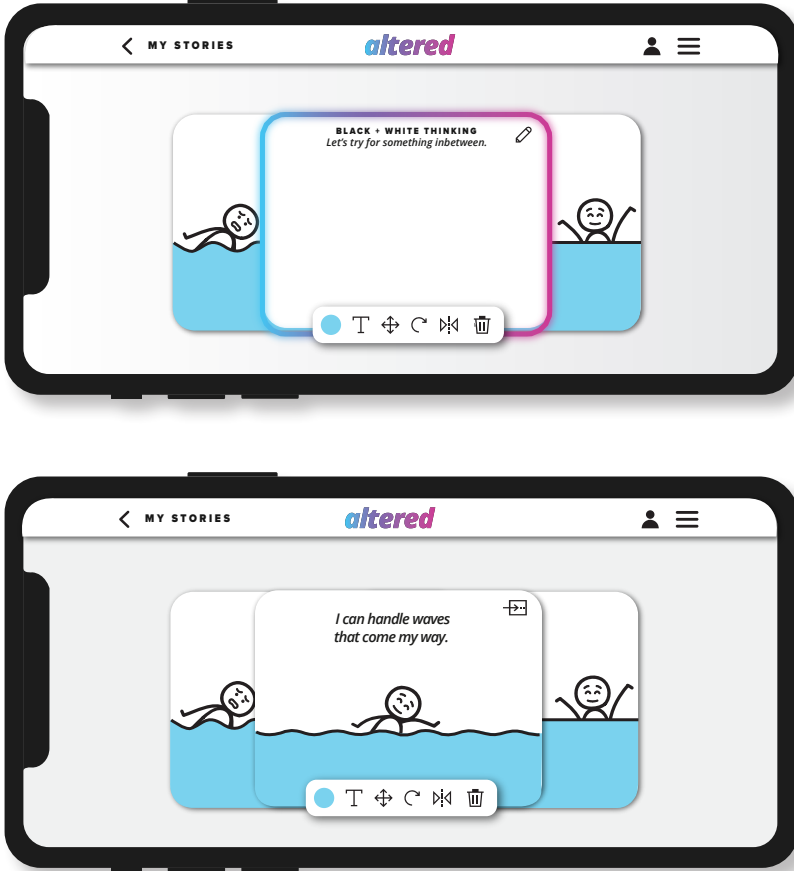
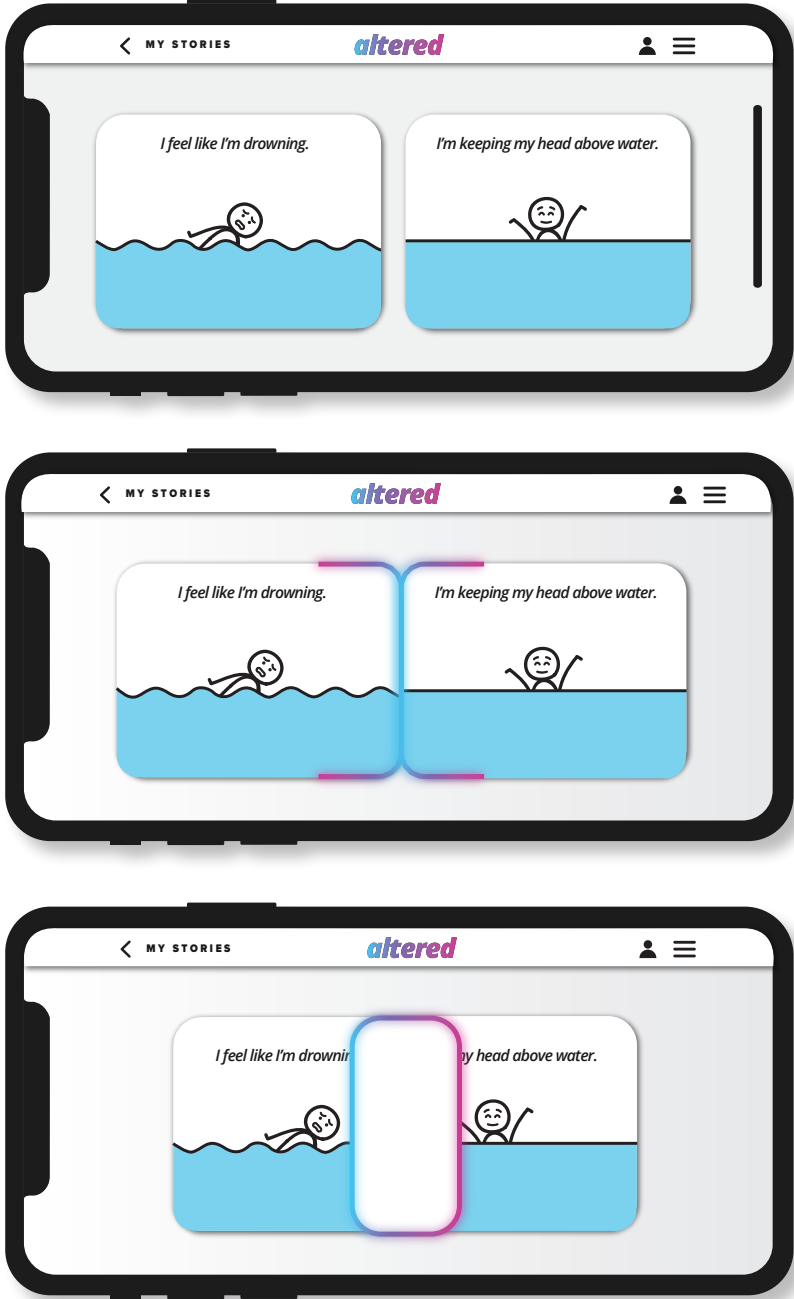Automated visual prompt for merging images.

Figure 7.39

New storyboard generated between images

Figure 7.41

Press and hold prompt

Figure 7.38

Automated visual prompt for merging images.

NEW STORY +

I can handle waves that come my way.
BLACK + WHITE THINKING
Sunday, April 5, 2020

I can put things back together again.
CATASTROPHIZING
Friday, March 27, 2020

I can move the mark.
BLACK + WHITE THINKING
Thursday, March 12, 2020

The clouds aren't always around.
MENTAL FILTERING
Saturday, February 14, 2020

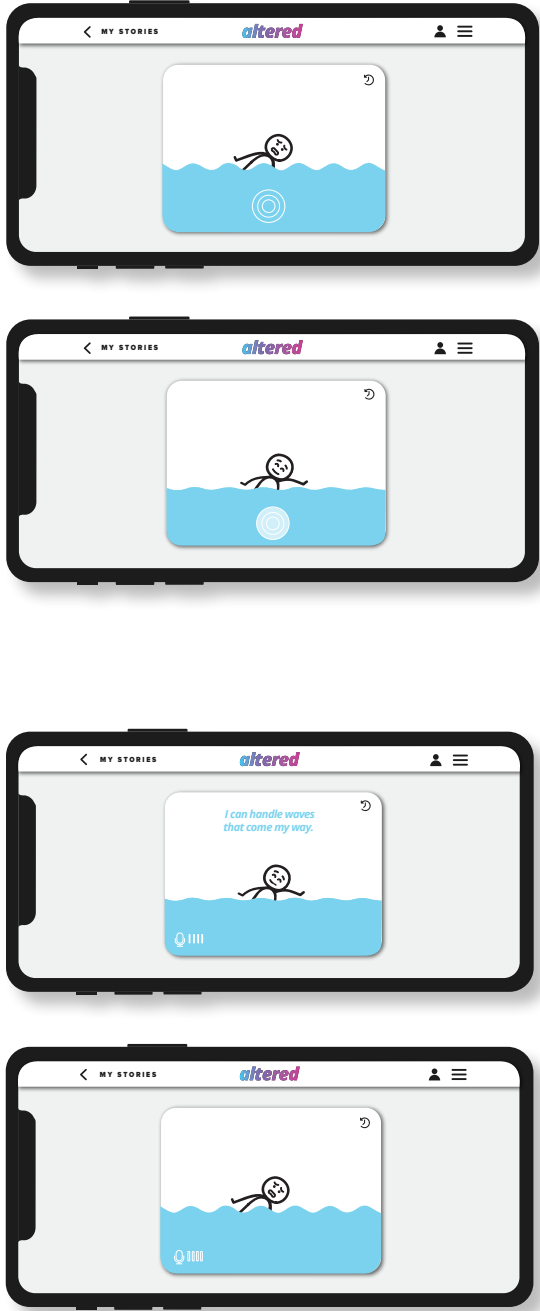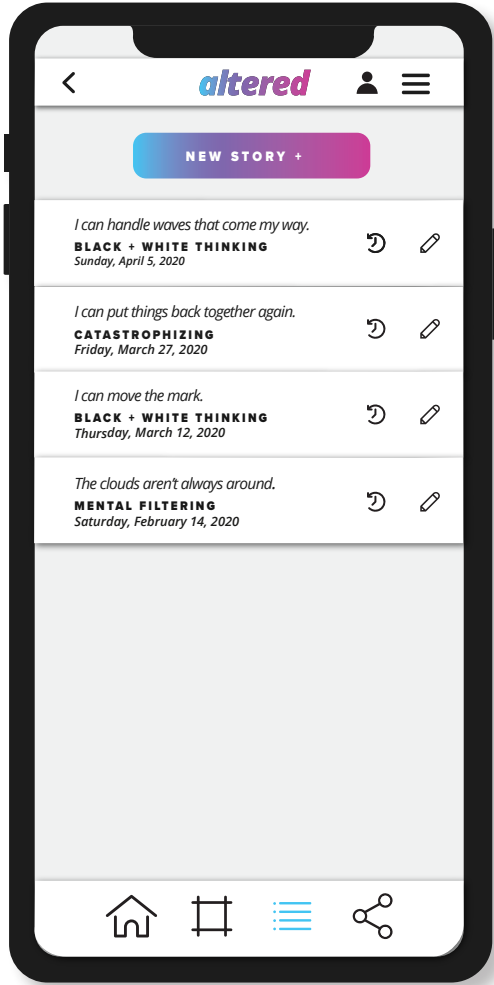**Figure 7.42**

Voice activated visual prompt

Discussion

1. Imagery Work as a Process

Interventions should (as closely as possible) reflect the full cycle of therapy rather than isolated moments.

Like most CBT techniques, imagery rescripting is a process that requires continued engagement. The thought record can be helpful for getting clients started with challenging their thoughts and images; however, they only address one aspect in the process of reaching belief change. Sustained engagement can be especially challenging with interventions intended for self management. For this reason, it is important to set user expectations by making sure designed interventions reflect the full cycle of therapy. This investigation explored visual strategies for explicitly addressing three key stages in the image rescripting process: observation, reflection, and planning. Experience was not explored in a distinct subquestion, but is indirectly addressed through the other subquestions. While it may not always be possible to design a mobile app that addresses the full cycle, users should be aware of how an intervention fits into a larger context. Providing a full picture of the process is an important part of providing the resources needed to self-manage.

2. Scaffolding the Process

Users need the structure and support to develop and explore imagery. There are multiple ways to provide it.

When interventions are intended to be used for self management, it is important to provide structure to guide users through the process. In a traditional therapy setting, a therapist is available to support their clients by setting expectations, providing prompts, and tailoring treatment. This investigation explored strategies for helping users develop and work with their images over time. Scaffolding makes it possible to pace and customize content as well as to prioritize image work, giving users what they need when they most need it. This should help keep users from becoming overwhelmed or discouraged from engaging in the process. If these digital therapy tools can be designed to scaffold the image rescripting process, it is reasonable to assume that this scaffolding could be customized or adapted to address specific needs.

3. Allowing for Adaptability

One-size-fits-all approaches are not appropriate, even for self-management.

When adapting Interventions for self-management, it may be tempting to design them for the broadest use cases. However, psychological disorders manifest differently in everyone. Anxiety can stem from a variety of cognitive distortions or biases. For this reason, one-size-fits-all approaches are not appropriate. Identifying a users' cognitive distortion could point to which approaches or activities would be most helpful. More research needs to be done to explore the identification of an issue without the expertise of a therapist. For instance, identification could be based on self-reported categories through a questionnaire; asking users to identify what they need help with. This might be more helpful for users who have already been working with a therapist. Another option is identifying key words in language used to develop images. Certain keywords are associated with cognitive distortions, If the app can identify those then it can engage appropriate resources. Tailoring content for varied stress levels might also prove helpful, as users may have different needs or capacities to engage with information. These concepts reinforce the need to keep users engaged; if the resources are not relevant to what a user actually needs, there is no incentive to keep working with it, and complete disengagement might result.

4. Building Complexity

Start simple and build complexity.

Because mental imagery includes mental representations that include a wide range of sensory qualities, resources for building images in this context should allow users to work in a variety of modes. While resources for representing mental imagery should allow for modality, they need not permit all modes at once. For this investigation, my goal was to facilitate each stage of the image rescripting process. Limiting user choice when working with images in earlier stages and allowing for more choice in later stages is helpful for prioritizing image work and scaffolding the process. If users can create images in a more uniform way to begin, they can work more easily with the images in later stages.

5. Trade-Offs

Developing visual strategies for mediating established interventions with mobile digital technology requires negotiation of factors.

For Feasibility

A major concern in designing a mobile app to facilitate the full cycle of therapy was feasibility. Because mental imagery can vary so widely between individuals, there is no way to anticipate what users might create — the app cannot reasonably account for every possible outcome. For this reason, it is helpful to limit modes for building images in the beginning by providing a selection of pre-designed elements. While greater customization might allow for a wider range of visual representation, using the pre-designed figures saves time and places emphasis on exploration in other stages.

For Access

In traditional therapy settings, therapists are available to guide clients through imagery interventions. Therapists can adjust technique and respond to clients in real time; this kind of exchange can be lost when developing digital therapy interventions. Such interventions are beneficial in their own right as they empower users to become proactive in addressing their own problems, a key goal in CBT treatments. This investigation illustrates how imagery interventions might be designed to retain scaffolding during the image rescripting process while giving the user agency in the process.

Future Work

Representational Abstraction

More research needs to be done to determine the appropriate level of representational abstraction for instigating belief change. For this investigation, I decided to use stick figures and storyboards because they allow for quick image building and have the potential for easy manipulation and animation. Stick figures are frequently used to represent actual people in sketches, storyboards and comics. McCloud (1993) suggests that individuals respond to simplified illustrations of people the same way they do realistic ones. Additionally, keeping illustrations simple early in the process can save time and allow users to move quickly to challenging their disruptive images. Furthermore, users do not need to be expert visual communicators to benefit from the intervention. More work should be done to explore the efficacy of other strategies for representation, including those using equal levels of abstraction. Here I only explored stick figures but I suspect that bubble figures might be an equivalent visual strategy.

Anxiety and Cognition

In this investigation, I highlight factors to consider when designing for users who experience anxiety such as effort and time involved. These factors stem from questions that arose through visual exploration. More work should be done to test how users actually respond to these strategies under varying levels of stress.

Mobile Digital Devices

I designed for smartphone screens with the assumption that this intervention could be scaled for other mobile digital devices. Further work should be done to explore which mobile devices are most appropriate for this kind of imagery work. Tablets, laptops, and smartphones offer limited screen space and require user interaction through touch gestures. Designers should consider screen space and input methods when designing similar image-based therapy tools.

Implications for Practice

In traditional therapy settings, assigned homework is an opportunity for clients to practice new skills on their own. Clients do not always get a chance to discuss their homework with their therapists. This investigation was focused on providing a tool for self-management; however, the intervention could be adapted to facilitate image rescripting together with a therapist. What if users could share their imagery work with their therapists and have them respond so that it becomes a dialogue? And how can a real person (therapist or counselor) get involved when necessary? Additionally, recording thoughts and images in a mobile application permits the information to be viewed in aggregate over time. Traditional thought records are often completed and discarded. This investigation specifically deals with what therapists call intrusive day-time images (Hackmann et al., 2011). More work should be done to explore how a mobile app could help with rescripting imagery tied to dreams or upsetting memories.

Conclusion

Mobile technologies can help reduce barriers to accessing therapy treatment; however, designers and mental health technology experts should consider how the affordances of mobile technology might be used to increase the efficacy of established therapy techniques and resources.

I explored how a digital therapy tool could be designed to mediate image rescripting for anxiety with multimodal digital storytelling. The studies were developed to explore visual strategies for addressing each stage in the image rescripting process by leveraging personal visualization and metaphor, suggesting alternative views or perspectives, and reinforcing alternative imagery. The visual studies culminate in snapshots of a mobile phone application illustrating how a multimodal image builder and interactive visual prompts might come together to facilitate the full cycle of therapy.

I do not suggest that mobile apps can be used to replace therapists or traditional interventions. Instead, I offer visual strategies for mediating image rescripting based on established tools and techniques. Therapists are specially trained to guide clients through the image rescripting process. For this reason, managing influence will be key for similar interventions intended for self-management. Without a therapist, there is a missed opportunity to respond to imagery work and ensure that it is productive. While mobile applications should not be used to replace therapists, this does not mean that interventions cannot be designed to help guide users in engaging with established tools and resources, especially those intended for self-management.

I explored image rescripting for anxiety in the context of planning and goal setting with the idea that this app could be scaled for working with a variety of thought content. Moving forward, designers and mental health technology experts should consider and build on the observations and principles outlined here. It is my hope that this investigation becomes part of a larger effort to improve the efficacy

of established therapy tools and techniques through design. As an established psychotherapy approach for addressing a range of psychological disorders, cognitive behavioral therapy is a rich area for further investigation.

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Appendices

Definition of Terms

Balanced Thinking: thinking that considers evidence, objective information, and is not outweighed by cognitive distortions.

Cognitive Behavioral Therapy (CBT): a type of psychotherapy aimed at helping clients solve problems and improve their mental health by changing their thinking patterns.

Generalized Anxiety Disorder (GAD): a psychological disorder characterized by persistent and excessive worry about daily activities.

Image Rescripting: a technique used in psychotherapy to address problems by altering mental images.

Mental Imagery: mental representations in the form of visuals, sounds, smells, tastes, or physical sensations.

Metacognition: awareness of one's own thinking or thought process.

Mobile Therapy Application: a therapy intervention accessed through mobile devices, such as phones, laptops, or tablets.

Multimodal Digital Storytelling: aomposition of stories on a digital platform using multimodal semiotic resources.

Narrative: a story made up of related events and experiences.

Thought Record: a tool used in cognitive behavioral therapy to help people identify and challenge negative automatic thoughts.

Transduction: shifting semiotic resources across modes to deliver intended meaning. Example: Recording a thought as written language.

Transformation: reorganizing and arranging semiotic resources within the same mode to deliver new meaning. Example: Rewriting a nonfiction story as an rhetorical essay.

Personas and Scenarios

Malik Williams
Age: 18
Hometown: Charlotte, North Carolina
Major: Undecided
Stress Level: High

Malik is an 18-year-old first-year student at NC State. His parents want him to study business but he's trying to keep his options open. Outside of school, Malik enjoys watching movies and going on outdoor adventures with his friends. In high school, he started a rock-climbing club and was very involved with student government. Malik wants to stay involved in college but worries that he'll be unable to balance a heavier workload.

Malik's Scenario:

Malik has a calculus exam and a 5-page paper on World War II due tomorrow. He planned to spend the whole day working but hasn't been as productive as he'd hoped. It's 8:30 pm and Malik is only halfway done with his paper and hasn't even looked at his study guide for calculus. He got a D on the first exam and knows he should probably prioritize studying but feels like finishing the paper will be easier.

Tania Bradley-Cabello
Age: 21
Hometown: Newark, New Jersey
Major: Criminology (minoring in music)
Stress Level: Medium

Tania is a 21-year-old senior majoring in criminology at NC State. Outside of school, she loves writing songs and playing her acoustic guitar. As an out-of-state student, Tania has found a community in the local music scene. Tania is also passionate about helping children and hopes to become a juvenile attorney. She's currently preparing to apply to NC Central School of Law but worries that her application won't stand out.

Tania has been working on her law school application for several weeks. The application deadline is just five days away and she only has two of the three recommendation letters she needs. Tania thinks it might look good to get a letter from the department head, Dr. Shepard, but has been too nervous to ask since hearing rumors that she rarely write letters for students.

Joie Greene
Age: 20
Hometown: Winston-Salem, North Carolina
Major: Art & Design
Stress Level: Low

Joie is a 20-year-old junior majoring in art and design at NC State. She's quiet and mostly keeps to herself but feels at home in the College of Design. Outside of school, Joie loves bullet journalling and recently started an Etsy sticker shop with her best friend. Like many students, she has a habit of comparing herself to her classmates and worries about building a good body of work.

Joie's Scenario:

The College of Design is hosting several portfolio review sessions for undergraduate students. Joie thinks attending would be a great opportunity to get feedback on her work from professional designers. She keeps telling herself that she'll sign up but hasn't gotten around to it. Joie is proud of her work but doesn't feel like her portfolio is "ready" to share.