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**The Effectiveness of a CBT App vs. an ACT App  
in Changing Negative Self-Thought**

A thesis

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By

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### **Abstract**

Negative self-thought is associated with the deterioration of many mental health issues, such as depression, anxiety, self-esteem, and social isolation. Due to the impact negative thinking about oneself has on many individuals, there is a need for an accessible and cost-effective intervention. Cognitive Behavioural Therapy (CBT) focuses on insight and recognising the connection between thoughts, feelings, and behaviours surrounding an event. Acceptance and Commitment Therapy (ACT) focuses on being in the moment and accepting all thoughts that come up. In this study, I used a single-subject single-treatment design (A-B-A or A-C-A) to compare the effectiveness of two iHealth applications; iCBT™ and ACT Companion™ application in reducing negative thinking about oneself. Both approaches significantly reduced the mean daily negative thinking about oneself, however, the ACT Companion™ app was overall more effective. I found a significant increase in mean psychological flexibility, and the need for self-reflection and insight. Overall, both applications are promising forms of treatment for individuals struggling with some level of negative thinking about oneself. Overall, the ACT Companion™ application has shown to be an effective way of reducing negative thinking about oneself, in a relatively short period of time, and at the user's own discretion.

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## **Literature Review**

A private event, such as thinking, is a behaviour only known to the individual themselves (Baum, 2005). Skinner (1945) referred to thinking as a covert behaviour or private event and Moore (2000) further stated that a more rounded understanding of this topic would result in a better theoretical understanding of the human condition. This, in turn, would encourage better service in the psychological field.

Self-thought, as covert verbal behaviour, occurs when an individual thinks about themselves (Theodorakis, Weinberg, Natsis, Douma, & Kazakas, 2000). As thinking is not observable by anyone other than the individual doing the thinking, individuals engaging in negative thinking about themselves can be easily missed by society, and those around them.

Hackfort and Schwenkmezger (1993) state that self-thought is an internal dialogue in which the person gives themselves instructions and reinforcement. Furthermore, Baum expresses that thinking can, in fact, lead to behaviour. When thinking, the individual explores their feelings and perceptions, and regulates, evaluates, and changes their view.

According to Sutin and Terracciano (2015), private thoughts, are controlled by contingencies. These contingencies form the foundation of how a person thinks and interprets everything around them, and more importantly how the person sees themselves. What occurs in one's body (the stimuli for private events), needs to be met with self-observation (verbal contingencies), or public events; in order to build on the private events (Tourinho, 2006). The cognitive model outlines how an individual experiencing mental distress is more prone to focus on negative stimuli, thus experiencing greater levels of negative perception (Beck, 2008). An individual's private thinking will only become important to them when it becomes important to those around them. When private events are met with verbal contingencies, the individual will be encouraged to respond discriminately towards their thinking about themselves (Skinner, 1974). When an individual is aware of their thinking about themselves,

they are in better control over their behaviour. For example, an individual stuck in a spiral of negative self-thinking, may cause them to engage in anti-social behaviours such as avoidance or isolating themselves. The negative self-thinking may stop them from having contact with potential reinforcement, whilst trying to avoid potential punishers.

### **Negative thinking about oneself, an underlying issue**

*Negative* thoughts have been linked to various psychological disorders (Riley, Lee, & Safren, 2017) and poor mental health, associated with higher numbers of negative symptoms and decreased self-esteem (Hicdurmaz, Inci, & Karahan, 2017). While early behaviourists avoided studying private events due to them being hard to observe, they acknowledged thinking as a natural behaviour and, as such, it is open to explanation through complex social contingencies (Skinner, 1974). Humans are constantly thinking about events and scenarios. Understanding how an individual thinks can answer many questions surrounding their behaviour. We use the thoughts we have to interact with others (Baum, 2005). For example, an individual may not choose to tell a story in a certain social group, out of fear of being mocked as they think they do not know the people well enough. However, the same person may choose to tell the same story in a group of family, as they think they know the group and will not be mocked. In both scenarios, the individual's private events (thoughts) have influenced their choice of behaviour due to the reinforcement they think they will get.

Feeding negative messages to oneself, by oneself, is associated with numerous conditions such as low self-esteem, anxiety, depression, and social exclusion (Bunker, Williams and Zinsser, 1993).

### **Social isolation**

Negative thinking about oneself can lead to social isolation. This isolation can be thought of as a defense mechanism, in order to reduce negative thoughts and feelings (which rely on forming associative links with other thoughts and feelings) (Liu, Lewis, & Evans,

2013). If no interaction is made, associations cannot be formed. For example, being in the company of others can expose a person to the potential of criticism. Furthermore, self-abasement can follow, as the individual is likely to focus more on negative aspects and thoughts. Self-abasement is “voluntary self-punishment or humiliation in order to atone for some real or imagined wrongdoing” (Liu et al., 2013). When an individual does not engage with others, the individual does not put themselves in the position to receive reinforcement, thus leading to social isolation.

### **Depression**

Negative self-thinking has been implicated in the development of depression (Beck, Rush, Shaw, and Emery, 1979). For example, individuals presenting with depressive symptoms tended to choose more negative adjectives than positive ones about themselves (Bradley & Mathews, 1983). Furthermore, the individuals were found to show a negative bias towards themselves, but only in conditions that referred to themselves (Bradley & Mathews, 1983). Heightened negative self-focused thought is a main characteristic in major depression (Philippi et al., 2018). Consequently, depression has been associated with a reduction in the focus on positive information (Ji, Grafton, & MacLeod, 2017).

### **Anxiety**

Individuals experiencing anxiety have been found to be 8 times more likely to develop depression (Costello, Egger, & Angold, 2004). When self-thought is treated, however, a substantial reduction in anxiety symptoms has been found. Furthermore, Sze and Wood (2007) found that increasing positive self-thought reduced anxiety and improved the individual's social and adaptive functioning.

### **Self-esteem**

A link between negative thinking about oneself, lower self-esteem, lower self-satisfaction, and higher levels of psychological trauma has been found (Goodhart, 1985).

Goodhart (1985) found that negative thinking about oneself hinders the ability to choose behaviours that are going to lead to positive outcomes. Consequently, continuing to think negatively about oneself can affect the way an individual interacts with others. Liu, Lewis, and Evans (2013) found that negative thinking about oneself leads to a higher risk of verbal and physically aggressive behaviours towards others. Negative self-thinking is implicated in relationship problems, performance issues, increased risk of depression, high levels of stress, loneliness, anxiety, and high risks of using alcohol and drugs (Germer, 2009). From these effects, other issues such as high blood pressure and the feeling of helplessness can begin to develop.

Self-thought is an important component of many treatments (Hanton & Jones, 1999). Teaching individuals to engage in more constructive self-thought will support an individual to choose behaviour that leads to positive outcomes in that situation.

### **Mental health cost**

“Narrating to ourselves what has happened or could happen is such a central part of the human experience” (Spasojevic & Alloy, 2001, p. 31), neuroscientists have called this the brain's default mode. In behavioural terms, an individual interpretation of thoughts will cause them to choose to act certain ways, resulting in certain consequences. If an individual narrates a situation to themselves, they may engage in a behaviour that is criticised, however, the individual may take this outcome and learn from it the next time.

### **Population**

In New Zealand, an estimated that four of five adults experience some form of mental distress personally, or know someone who does (Kvalsvig, 2018). Individuals aged between 15-24 years, particularly, express high levels of mental distress and isolation (Kvalsvig, 2018). Mental distress becomes a bigger issue when an individual is not aware of that distress and engage in behaviours that prolong or worsen that distress.

### **The need for intervention**

The issue with negative thinking about oneself is that an individual will think about their problems in various areas, yet they will make no effort in actively trying to solve problems in those areas (Rudiger & Winstead, 2013). Whilst these self-thoughts can be automatic and reflect the way in which a person views themselves; an individual can indirectly control them by shifting the contingencies that lead to that thinking (Baumeister, 2014). These automatic thoughts need to be challenged as they can be the underlying cause of many mental health issues (Hicdurmaz et al., 2017). An individual may not see that they need to challenge thoughts or may not know how to do so; this is why there is a need for intervention when dealing with self-thought.

### **Behavioral interventions**

Behavioral interventions can be a means to change an individual's actions, in order to improve their health outcomes (Cutler, 2004). Behaviourists recognise an individual's behavior as most important, with the goal to change it (Cutler, 2004). Behaviourists base their interventions on a theory, which can be implemented on an individual, community, and national level (Cutler, 2004). Two methods I have chosen to explore is Cognitive Behavioural Therapy (CBT) and Acceptance and Commitment Therapy (ACT). These therapy styles have shown to help prevent and treat many mental health issues, both with their own unique approach (Plaza, Demarzo, Herrera-Mercadal, & Garcia-Campayo, 2013). CBT explores thought disputing; and links the influence of thoughts on feelings, feelings on behaviours, and behaviours on thoughts (Plaza et al., 2013). ACT explores being present, accepting all thoughts, and committing toward behaviours that align with the individual's goals (Plaza et al., 2013).

### **Cognitive Behavioural Therapy (CBT).**

CBT is a therapy in which psychological distress is viewed as a result of faulty cognitive processing (Longmore & Worrell, 2007). The therapy is used to attempt to modify thinking associated with these faulty cognitive processes (Longmore & Worrell, 2007). An individual's capacity to use effective self-reflection and insight will influence CBT (Hatcher, Hatcher, Berlin, Okla, & Richards, 1990). Furthermore, "insight is related to increased psychological well-being and cognitive flexibility, while self-reflection is associated with higher anxiety but lower depression" (Sutton, Williams, & Allinson, 2015, p. 621). CBT is a talking-based therapy in which a person is taught to manage problems, through challenging the way they think about that situation (Arch et al., 2012). CBT therapists view thoughts, feelings, physical constructs, and behaviours as interconnected and negative thinking can have an overall negative impact on the individual (Tolin, 2010). CBT therapists have the goal to break down situations into manageable pieces and change negative thoughts regarding that situation; thus, improving the way you feel and act (Tolin, 2010). Furthermore, CBT therapists focus on current situations, rather than focussing on past situations (Tolin, 2010). Beck originally created CBT, in an attempt to directly address the internal and external thoughts that an individual may have (Beck, 1979). CBT therapists recognise that changing patterns of thinking can directly change an individual's experience (due to the strong link between thoughts and feelings; Martin, 2016). CBT therapists aim to address cognitive distortions, which are seen as faulty patterns of thought (Martin, 2016). Cully and Teten (2008) describe essential techniques used in CBT which include outlining the situation through highlighting thoughts and moods in response to the situation. Firstly, when an individual engages in functional analysis, they can learn about what causes certain behaviours. Secondly, becoming aware of cognitive distortions (unrealistic or unhelpful feelings regarding the situation) is helpful when trying to reduce negative behaviours



reinforced by negative thinking about oneself. Thirdly, exposing oneself to situations and emotions that cause negative feelings can create awareness, and encourage the individual to change the way they interact or think about those situations. Finally, the individual is encouraged to engage in cognitive restructuring, in which these negative thoughts are challenged and replaced with positive thoughts. Overall, CBT therapists aim to empower an individual to become aware of their thoughts and emotions, to identify situations that evoke unwanted emotions, and improve their feelings by changing dysfunctional thoughts and behaviours (Cully & Teten, 2008).

CBT has been shown to be effective in treating panic disorders, generalised anxiety disorders, social anxiety, obsessive-compulsive disorder, phobias, and PTSD (Hofmann & Smits, 2008). Furthermore, CBT is a relatively easy intervention to implement (Arch et al., 2012). CBT has become a “dominant empirically validated treatment for anxiety disorders” (Arch et al., 2012, p. 2). Moreover, CBT has been shown to reduce relapse in people recovering from depression, at a significant rate that is at least as effective as antidepressants (Piet & Hougaard, 2011).

### **Strengths and Limitations of CBT**

CBT can be used in addition to other interventions such as medication (Piet & Hougaard, 2011). When used effectively, CBT can be completed over a relatively short period. CBT is highly structured and can be completed through many different mediums, i.e., self-help books, with a therapist, or through a mobile phone application (Arch et al., 2012). Through the strategies taught, the therapy can be used in everyday life, even when the individual is not directly engaged in a therapy session (Arch et al., 2012).

Whilst CBT has been shown to be effective in many studies, there are a large number of individuals who do not respond to CBT, will relapse following effective treatment, will be vulnerable to developing disorders throughout life, or need more treatment (Barlow, Gorman,

Shear, & Woods, 2000). The therapy needs to be repeatedly engaged with in order to learn and effectively apply the strategies in the long term (Tolin, 2010). Having to repeatedly engage with the therapy (even when not being directly involved in a therapy session) can be time-consuming. Individuals with learning disorders or more severe mental health issues can find have difficulty with CBT, due to its structured pattern (Tolin, 2010). The therapy requires an individual to engage with their emotions surrounding a situation, which can be confronting (Tolin, 2010). The therapy is focused on how the individual thinks and does not recognise the impact of other people (Arch et al., 2012). Finally, the therapy style focuses on current issues, and may not address the underlying cause of those issues (Arch et al., 2012).

### **Acceptance and Commitment Therapy (ACT).**

ACT therapy is a relatively recent approach and has become a popular option to treat psychological disorders (Hayes, Stroschal, & Wilson, 1999). ACT incorporates mindfulness, acceptance, and cognitive-diffusion processes (Hayes et al., 1999). The aim of this therapy style is to increase psychological flexibility, in turn, increasing the positive behavioral change in line with the individual's values (Hayes et al., 1999). ACT therapists aim to enhance the individual's "capacity to make contact with experience in the present moment, and based on what is possible at that moment, persisting in or changing behavior in the pursuit of goals and values" (Arch et al., 2012, p. 3). Furthermore, ACT therapists focus on changing the way a person feels about the situation, not the actual circumstance itself (Bass, Nevel & Swart, 2014).

The foundation of ACT is Relational Frame Theory (RFT), a behavioural account of how humans learn language (Hayes, 2004). Language is thought to be acquired through interaction with the environment (Hayes, 2004). Language is used both privately (thoughts) and publicly (talking), and relationships are made between various contexts. The mutual relationship between things and events are defined as the relational frames (Hayes, 2004). For

example, a child may become excited when he hears his parent say “let’s go for a walk”, this is due to the child knowing that they will walk to the park and play on the playground.

Additionally, relational responding can be defined as making connections between stimuli that do not relate to one another (Hayes, 2004). For example, a child who gets excited when a parent says let’s go play in the garden, but then gets a bee sting will make connections between being asked to go play in the garden and pain. RFT through experiential analysis of behavior is exploring how words become associated with each other through relational framing (Fletcher & Hayes, 2005). ACT therapists aim to change or eliminate the thinking that contributes to an individual’s unnecessary suffering (Hayes, 2015). RFT is useful when explaining distress and the event in which the distress was evoked. ACT encourages an individual to accept this distress, be present, and focus on the goals and values that an individual holds, rather than the event itself (Hayes, 2004). This, in turn, will encourage psychological flexibility, and commitment towards leading a meaningful life for the individual (Hayes, 2004). Psychological flexibility is when an individual does not engage in behavior due to how they think and feel, but rather they act in a way that aligns with their values (Fletcher & Hayes, 2005). Furthermore, an individual can be seen to display psychological flexibility when they are being present and aware of their thoughts, whilst accepting the experience that has fostered these thoughts, and committing to acting in a way that aligns with the individual's values (Fletcher & Hayes, 2005).

Furthermore, psychological flexibility is another key concept to explore within my study. Psychological flexibility can be defined as being able to behave in a manner that aligns with the individuals own values, despite distressing situations going on internally or in the environment (Bond & Flaxman, 2006). Studies have found that psychological flexibility negatively correlates with mental health issues such as depression, anxiety, and psychological distress (Hayes, Luoma, Bond, Masuda & Lillis, 2006). Moreover, increases in psychological

flexibility have been found to increase functional outcomes, which in turn, often leads to a decrease in psychological distress (Hayes, Strosahl, & Wilson, 2012). Psychological flexibility is a key component in ACT. Psychological flexibility has been found to contribute to the relationship between isolation and psychological distress (Leleux-Labarge, Hatton, Goodnight & Masuda, 2015).

ACT is considered a “third-wave” therapy in which focus is placed on the way people react to their thoughts and feelings (Hayes, 2004; Churchill, 2013). As a result, experiential avoidance is reduced, and unwanted feelings, sensations, thought or other secretive events can be dealt with (Bach & Moran, 2008). Avoiding unwanted feelings (experiential avoidance) can bring about temporary relief, however, when this avoidance is reinforced by short-term relief, individuals are more likely to engage in avoidant behaviours, for example, avoiding certain situations, not speaking, rumination (Hayes et al., 1999). Engaging in avoidance leads to more severe issues (Bach & Moran, 2008). When an individual changes the way they approach and deal with these unwanted thoughts and feelings, their quality of life will improve (Harris, 2009).

The main principles of ACT include acceptance, defusion, contact with the present moment, committed action, self-as-context, and values (Harris, 2009). The acceptance aspect describes the situation in which an individual is ready to experience their thoughts and feelings, without trying to avoid them (Harris, 2009). With reference to negative thinking about oneself, the individual would be encouraged to not suppress the negative thoughts, but rather experience them, even if it is difficult.

The concept of defusion explains when an individual detaches themselves from thoughts and memories that could bring them discomfort (Harris, 2009). Defusion is usually unpleasant or negative thoughts and memories that are avoided. These negative and unpleasant thoughts allow the individual to decrease the effects of unhelpful thoughts and

memories. In doing so, the individual is given space to see that they do not need to be controlled by those thoughts and feelings. These thoughts are not who you are, but rather how you think (Harris, 2009). Defusion is a key step for someone experiencing negative thinking about oneself, as it allows them to see that they are not what they feel. Diffusion allows the individual to act in accordance with their values, and their environment (Bach & Moran, 2008).

Being present results in the individual experiencing what is occurring at that moment, rather than what has happened in the past (Harris, 2009). Being present means the individual takes note of what is happening in their direct surroundings and their own body at that moment (Bach & Moran, 2008). Mindfulness-based therapies can help an individual focus on being conscious and aware of what is going on at that moment (Harris, 2009).

Committed action describes the situation where an individual behaves in accordance with their values. By engaging in overt responses that are important to them, the individual will experience greater levels of satisfaction, and the feeling of control over their lives (Bach & Moran, 2008).

The self-as-context means an individual is aware of the observing self, and the thinking self (Harris, 2009). The individual is encouraged to make themselves the context, thus being aware of their own thoughts, feelings, and emotions (Harris, 2009). This is particularly important when identifying patterns of negative thinking about oneself that the individual is experiencing.

Lastly, values are the areas in life that are important to the individual, and that gives them something to aspire to. By creating a list of values to work towards, an individual is less focused on what society is telling them to do and more focused on becoming the best version of themselves (Bach & Moran, 2008). Freeing yourself of feeling that the negative thinking

about yourself has full control over oneself, can help an individual move forward and work toward achievable goals.

Numerous studies have provided evidence to support ACT as an effective treatment for anxiety, OCD, social anxiety, panic disorders, and PTSD (Twohig et al., 2010; Wetherell et al., 2011). When negative thoughts enviably arise, the individual can manage them, instead of avoiding them which could lead to more severe issues (Gaudiano & Herbert, 2005). Mindfulness-based activities have produced significant improvements in immune and autonomic nervous systems, positive thinking, life satisfaction, vitality, and emotional regulation (Plaza, et al., 2013). Furthermore, mindfulness-based therapies have been linked to reduced negative outcomes and psychopathological indicators (Plaza, et al., 2013).

### **Strengths and Limitations of ACT**

When practiced effectively, ACT has shown to hold long-term benefits (Forman et al., 2007). Furthermore, ACT therapy can be practiced in a relatively short time frame, and is effective for many conditions.

A disadvantage of ACT is that it encourages an individual to face many situations that they may have been suppressed in the past. An individual needs to accept and make peace with their feelings and thoughts, instead of avoiding them; which for some people can be traumatic and confronting (Harris, 2009). Furthermore, individuals are forced to confront situations that trigger negative thoughts, which can be distressing.

### **Is self-thought able to change?**

Self-thought is a growing field of research, in which mindfulness, as well as cognitive restructuring, are important areas. Studies have shown that practicing mindfulness can improve stress, anxiety, depression, pain, and overall quality of life (Forman et al., 2007). Mindfulness is the awareness and acceptance of the present moment (thoughts, feelings, events). Being mindful has been found to be an “antidote against common forms of

psychological distress- rumination, anxiety, fear, anger, and so on-” (Keng et al., 2011, p. 1041). Mindfulness was adapted from Buddhist practices, and incorporated into Western psychology during the 1970s (Kabat-Zinn, 1982). Mindfulness is a mode or state in which the individual is being aware and non-judgemental (Kabat-Zinn, 1982).

Changes in self-thought during interventions has been analysed across 207 studies through a meta-analysis; in which, interventions were associated with self-thought changes over an average of 24 weeks of intervention (Roberts et. al., 2017). Furthermore, engaging in pro-social behaviours that resulted in positive outcomes became more frequent as a result of the interventions (Roberts et. al., 2017). Speaking up and engaging in social interactions also increased. As these two behaviours are closely linked with self-thought (self-regulation, and isolation), there is evidence that, through intervention, negative thinking about oneself can change. Intriguingly, the type of intervention or therapy style was not strongly associated with the amount of self-thought change (Roberts et. al., 2017).

Typically, the view has been that self-thought can change, but the change occurs over a long period (Roberts, 2006). However, other researchers have found that the greatest change occurs in the first month of the intervention or therapy (Luborsky et al., 2002). Furthermore, people who experienced mental distress showed the greatest change in self-thought (Roberts et. al., 2017). These studies support the view that a person’s self-thought can change, and this can be done in a relatively short period if they are willing; regardless of the intervention or therapy style.

### **Behavioral interventions summary**

In summary, evidence-based interventions are important when trying to reduce negative thinking about oneself (Hardy, Roberts, & Hardy, 2009). In a study comparing the effectiveness of ACT vs CBT (with a therapist), 128 individuals showed similar improvements in pre- and post-treatment measures (Arch, Eifert, Davies, Vilardaga, Rose, &

Craske, 2012). The study included a 12-month follow-up, in which ACT participants showed greater improvement than CBT participants (Arch et al., 2012). On the other hand, results show that undiagnosed anxious and depressed patients responded equally as effectively to the two treatments (ACT & CBT) (Forman, Herbert, Moutra, Yeomans, & Geller, 2007).

Overall, both interventions (ACT and CBT) have been researched and shown significant positive effect across many studies in reducing negative behaviours (Hofmann & Smits, 2008; Twohig et al., 2010).

Meta-analyses have found a moderate-to-large effect size for ACT interventions, compared to other established interventions (Powers, Zum Vorde Sive Vording, & Emmelkamp, 2009). In previous studies comparing the effectiveness of CBT and ACT, both therapies were shown to improve mental distress in a similar manner (Forman et al., 2007). I compared the effectiveness of a CBT vs an ACT approach in reducing negative thinking about oneself; as both these approaches aim to achieve the same outcome through different methods.

### **Smartphone application inventions**

Mobile phone applications have become a popular means of health promotion and self-management (Plaza, et al., 2013). Using smartphone applications can reach a large group of people in a non-obtrusive way. Mobile phone applications can use various therapy styles and include activities such as daily meditation, mindfulness training, assessments, attention focus, and mixed objectives. Furthermore, the applications generally use reminders, alarms or notifications, statistic tools, audio tracks, educational information, and overview reports (Plazo et al., 2013). The use of mobile phones and their applications are increasing rapidly, with smartphone application use growing by 46% since 2010 (Plaza, et al., 2013). The medical/healthcare application category is the third-fastest growing for both iPhone and Android users (Healthx Team, 2012). A well-programmed application has the ability to



educate and enhance self-management for individuals (Miller, 2012). In 2013, Google Android applications surpassed Apple iOS in the number of applications (Gartner, 2013). Furthermore, Google Android applications are generally cheaper than Apple iOS applications (Gartner, 2013). More affordable applications are more popular than those with higher costs (Gartner, 2013).

Therapy in the form of a mobile application has been found to have some benefits over traditional face-to-face interventions, although there are limited studies involving solely their use (Andersson & Cuijpers, 2009). These benefits include, but are not limited to, high commitment, easier accessibility, convenience, and cost-effectiveness for individuals (Andersson & Cuijpers, 2009). Furthermore, certain fears associated with the disorders can be avoided through self-directed therapy.

### **iCBT™.**

iCBT™ is an application developed by Bonfire Development Advisors, which is available only on iOS systems. The application is available on both smartphones and iPads. According to the information on the website, the application can be used to manage stress and anxiety and is a “tool for Cognitive Behavioural Therapy that is always with you when you need it” (Bonfire Development Advisors, 2016).

The application does not require previous knowledge of CBT techniques and explains that prior brief reading of the therapy style may be helpful. The application does not require any connection to a cellular network. The application provides a 3-step process to address negative thinking about oneself. These steps are guided and explained through the application. These steps include; the event (describing in words what happened, outlining negative thoughts and how the individual feels about the event), appraisal (reassessing the negative thoughts), and the outcome (reassessing how the individual feels about this event now). When deciding how an individual feels about the situation, the individual is able to

choose pre-prepared emotions or add ones of the individuals own. Privacy is an important aspect of this application. An app user is able to password protect their application, as well as knowing the data are stored on your device alone and cannot be viewed on another device. Lastly, there is the option to email the individual's work to anyone they would like, making it accessible when working alone or with a therapist.

iCBT™ can be purchased through the App Store on an Apple iOS device and cost \$8.99 at the time of the study. There were not enough ratings to have an overall user rating score. However, there are many 5-star reviews on the application's website. The application requires an operating system of iOS 8.0 or older and falls under the Medical application category in the store. iCBT™ has shown to significantly reduce depression symptoms of participants (Williams & Andrews, 2013).

### **ACT Companion™.**

The ACT Companion™ is an application developed by Dr. Russ Harris, author of *The Happiness Trap*. The application is available on both the Apple iOS and Google Android systems. According to the information given on the website, the application encourages individuals to “be present, open up, and do what matters” (Berrick Psychology, 2015). The application is said to be simple and to provide dozens of interactive exercises and tools. Furthermore, through the application, diffusion and acceptance techniques are taught; and the individual is encouraged to engage in value assessments, goal setting, self-observing, and self-compassion exercises. The application offers a limited-access free download. If the individual wants to purchase full access once they have experienced parts of the application, they are able to purchase a 1-month (USD 1.99), 3-month (USD 3.99), or unlimited (USD 9.99) subscription. Furthermore, there is the option to enter a promo code, which can be purchased by others (making it possible for someone to purchase the application for someone they know could benefit).

The application does not require previous knowledge of ACT techniques; however, it is strongly recommended that the user reads *The Happiness Trap*. The application is organised under four categories titled *be present*, *open up*, *do what matters*, and the *actometer*. There are various activities under each category, which range from audio meditation, reflection questions, and exercises the individual is physically asked to do. A person is asked to rate how they feel after an activity. The activities range from 5 to 30 min, making it flexible with their schedules. Furthermore, a crisis tool is included, which allows the individual to quickly balance their thinking. The actometer allows individuals to “apply your ACT skills to real-life situations and get immediate feedback on how well you did with a flexibility score” (Berrick Psychology, 2015). Data collected through the application can be emailed to anyone, making it accessible when working alone or with a therapist.

The ACT Companion™ is rated 4.3 stars (out of 5) on the Google Android store, and 4.8 stars on the Apple iOS store. There are also many 5-star reviews on the application.

### **The necessary considerations in changing thoughts**

It is important to ethically consider the implications of changing thoughts, as it is a very subjective and individual process. The researcher and or therapy provider need to consider whether the individual views their thoughts as positive or negative (Hardy, Hall, & Alexander, 2001). For example, if an individual views a certain self-thought as motivational, however, it is viewed negatively by others (regardless of its motivating effect on the individual), it could affect the individual negatively if it were to be replaced or discouraged. Self-thought can only be experienced by the individual, so the emphasis should be on helping the individual take the lead in how they change the way they think. Equipping the individual with the tools to improve their self-thought may address the subjective limitation of self-thinking. The individual is encouraged to be actively involved, willing and comfortable with the process of changing their negative self-thinking.

It is important to equip the individuals; however, it is also important to gauge whether they understand long term what they need to do to ensure they continue creating positive self-thought. Unless practiced long term, with the tools easily accessible, the individual may revert back to old patterns of thinking. Behaviour that has been put into extinction can re-surge if the new behaviour has not yet come into contact with stable reinforcers. It is important to measure the individual's confidence in their ability to work on their self-thought, as they are the only ones who can work in this area.

### **The importance of self-report when measuring negative thinking about oneself**

Skinner (1965) stated that “a private event may be distinguished by its limited accessibility but not, so far as we know, by any special structure or nature” (p. 275). Due to the limited access we have to private events, coupled with the fact that private events can only be observed by one individual, negative thinking about oneself becomes far more complex. An individual will speak to themselves more in their lifetime than they will speak to others.

The nature of my topic requires reliance on self-report measures. Many researchers have tested the reliability and validity of self-report measures, due to social desirability biases (Diener, Sandvik, Pavot, & Gallagher, 1991; Sandvik, Diener, & Seidlitz, 1993; Crane et al., 2018). These studies have shown self-report measures to be reliable and valid. Consequently, self-report measures are the most common measure used to assess well-being (Sandvik, Diener, & Seidlitz, 1993), and the only way to measure thinking.

### **Self-reflection, flexibility, and mood**

Due to negative thinking about oneself being a private event, the concept of self-reflection is central. Self-reflection can be defined as the ability to develop self-awareness through active and continual examination of one's knowledge, approaches, and beliefs (Grant, Franklin, & Langford, 2002). Self-reflection is a deliberate act of thinking. It is

important to develop a strong and positive method of self-reflection, as this will help an individual reduce negative thinking about oneself (Crane et al., 2018). Self-reflection is said to “enable the ongoing evolution of coping strategies for problem-solving, the capacity to reflect on and evaluate these strategies, and enables change to be brought about” (Crane et al., 2018, p. 3). Self-reflection was found to strengthen resilience in an individual’s behavioural response to environmental events (Crane et al., 2018).

Lastly, mood can be defined as a temporary state of mind or feeling (Singh, 2014). Mood is a by-product of reinforcement and punishment (Singh, 2014). Many studies have hypothesised that individuals engage in behaviours that are related to their mood (Morris & Reilly, 1987).

### **Research Design**

In this study, I used a single-subject single-treatment design (A-B-A or A-C-A). Single-subject approaches have been found to give more insight into the progression of change across treatments (Butler, Sargusom, & Elliffe, 2011). Through the single-subject single-treatment design I was able to determine successes of the interventions through individual changes, not having to take group percentages (Butler et al., 2011). Randomised control trials are popular methods for assessing health interventions (Singh, Sargisson, & Starkey, 2017). However, the limitations of RCT’s is that they are time-intensive, expensive, and require a large number of participants. Due to the limitations of RCT’s, I selected a single-subject research design due to it being quicker, less expensive, and having fewer participants required (Singh et al., 2017).

Moreover, I chose a single-subject single-treatment design as it ensured that all participants were exposed to an intervention. Furthermore, inter-subject variability is controlled due to each individual being their own control within the study. As a result of each individual being their own control, I was able to see the progression of change for each

individual under each treatment. Furthermore, I used a single-subject single-treatment design as it allowed me to gather a stable assessment through repeated measures at baseline (pre-intervention) and at extinction (post-intervention). The single-subject research design suited my studies time frame, as it allowed individuals to work through the intervention at their own pace and time. The participants were given guidelines of what I asked them to do, however, the design allowed for flexibility meaning they could find a time in the day that suited them.

### **The current study**

I focused on negative thinking about oneself, with the understanding that these are private events. I compared the effect of an ACT and a CBT app on individuals' negative self-thought. As the study was relatively short term, I investigated whether one approach is more effective than the other over a short period. Lastly, used the Self-Reflection and Insight Scale (SRIS) and the Acceptance and Action Questionnaire (AAQ-II) to further measure the effectiveness of the mobile applications.

I expected the ACT approach to be more effective when attempting to reduce negative thinking about oneself in this study because ACT has been shown to be effective in a shorter time frame (Forman et al., 2007) and in mobile-application-based therapy form (Plaza, et al., 2013).

## **Method**

### **Participants**

Sixteen individuals responded to a public post on two Tauranga community Facebook groups (Appendix A). Four individuals decided not to proceed.

Seven women and four men completed the study. Eight participants were located in various parts of New Zealand, two in South Africa, and one in Australia. Participant age ranged from 18 to 53 years ( $M_{age} = 39.36$ , 95% CI [31.9, 47]). For a complete summary of the demographic information see Table 1.

Table 1  
*Demographic Details for Each Participant*

| Participant Number | Sex    | Age | Ethnicity            | Relationship Status |
|--------------------|--------|-----|----------------------|---------------------|
| 1                  | Female | 18  | New Zealand European | Single              |
| 3                  | Male   | 42  | New Zealand European | Married             |
| 4                  | Female | 53  | New Zealand European | Married             |
| 5                  | Female | 51  | New Zealand European | Married             |
| 6                  | Female | 30  | European             | In a relationship   |
| 7                  | Female | 53  | Maori                | Married             |
| 8                  | Female | 34  | South African        | Married             |
| 9                  | Male   | 26  | South African        | In a relationship   |
| 10                 | Male   | 50  | New Zealand European | Married             |
| 11                 | Female | 50  | New Zealand European | Married             |
| 12                 | Male   | 27  | New Zealand European | Single              |

To participate, the individuals must have been able to speak English, have access to an email account and an iPhone (due to the fact that one of the mobile applications only works on iOS software), were happy to commit to sending daily data for the duration of the study, and had access to a printer and scanner, or had a phone that was able to take clear and readable photos. If a potential participant had met all inclusion criteria but had scored extremely high in the baseline phase, I would have referred them to appropriate services. There were no specific criteria for exclusion related to scores. Rather, this was treated case by case, and in consultation with my supervisors in order to be as sensitive as possible and act in the participants' best interests.

All participants provided written consent prior to commencing the study (Appendix B). Incentives to participate include full access to a lifetime membership of the mobile applications they used during the study.

## Materials

I used two scales (AAQ-II and SRIS) as both pre- and post-measurements. The pre-scale measurements ensured that participants with some level of negative self-thought were recruited; additionally, pre-scales were used to assess psychological inflexibility - the attempt to alter negative private events (Hayes, Wilson, Gifford, Follette, & Strosahl, 1996), and to measure private self-conscious/reflective constructs (Fenigstein et al., 1975).

The self-report AAQ-II is a measure of the effectiveness of the ACT model (Bond et al., 2011). Problems such as item wording issues, scale brevity etc, was addressed in the AAQ-II by improving the AAQ-I scale (Hayes, Luoma, Bond, Masuda, & Lillis, 2006). The AAQ-II is said to have better psychometric consistency than the AAQ-I scale, although, the two scales still correlate strongly ( $r = .97$ ; Bond et al., 2011).

The original 10-item scale became a 7-item scale in 2011 (Bond et al., 2011). Furthermore, the scale showed good internal consistency (mean alpha coefficient = .84), and test-retest reliability ( $r = .81$  and  $r = .79$  in 3- and 12-month measures; Bond et al., 2011).

I asked the participants to score the seven statements using a Likert scale (1 = *never true* to 7 = *always true*). An example statement is “*I’m afraid of my feelings.*” According to Bond et al.’s (2011) scoring instructions, the scale score is found by summing all seven items. High scores indicate elevated levels of psychological inflexibility; whilst low scores indicate extreme action and acceptance.

### **The Self-Reflection and Insight Scale (SRIS).**

The self-report SRIS measures private self-consciousness and reflection (Carver & Scheier, 1998). According to Carver and Scheier (1998), the SRIS assesses how an individual identifies and reflects on their thoughts, feelings, and behaviours. Furthermore, effective identification of these thoughts, feelings, and behaviours can, in turn, affect the process of working successfully towards a goal or behavioral change (Carver et al., 1998).



The SRIS is an advancement of the Private Self-Consciousness Scale (Fenigstein et al., 1975). The SRIS is said to measure three factors needed in self-regulating, including the need for self-reflection, engagement in self-reflection, and insight (Roberts & Stark, 2008). These factors have been supported by both exploratory and confirmatory factor analyses (Roberts & Stark, 2008).

Participants were asked to score the 20 statements using a Likert scale (1 = *strongly disagree* to 5 = *strongly agree*; Grant, Franklin, & Langford, 2002). According to Grant et al. (2002), certain items require reverse scoring. Furthermore, after reverse scoring, items were summed under three factors (engaging in self-reflection, need for self-reflection, and insight; Grant et al., 2002). An example statement is “*I frequently examine my feelings.*” Each subscale has shown good internal reliability, 0.83 for engagement in reflection, 0.87 for the need for reflection, and 0.85 for insight (Roberts & Stark, 2008).

### **Self-made Daily Mood Rating.**

I created the Daily Mood Rating to monitor the participants’ moods pre-treatment, during treatment, and post-treatment (Appendix C). I included the daily mood rating to ensure that the treatments were not having a negative effect on the participant, and so that I could intervene and make changes if needed. It is not expected that the treatments would have a negative impact on the participants, however, these negative impacts could include feeling overwhelmed, unsupported, or confused about what they needed to do. I changed the treatment the participant received if their daily mood rating score after application use was higher for 3 consecutive days than their daily mood rating score pre-application use.

Participants were asked to score five statements using a Likert scale (0 = *never* to 4 = *very often*). The maximum possible score was 20. A lower daily mood rating score meant less distress in the participant's thoughts, whereas, a high daily mood rating meant high levels of distress in the participant's thoughts. An example statement is “*I wish I could control my*

*thoughts more easily*". Items on the self-made daily mood rating were taken and adapted from the SRIS scale, as well as the AAQ-II. The Daily Mood Rating has shown good internal reliability (Cronbach's  $\alpha = 0.84$ ).

For recording the daily mood ratings, I suggested that the participants send the five letters that were chosen i.e. for *never* (N), *rarely* (R), *sometimes* (S), *often* (O), and *very often* (VO). For example, N, VO, O, N, S might be sent each day the participant used the application.

## **Materials**

Once an individual responded to the advertisement, I requested their email address which I used for further contact. I did this to ensure that all further communication took place in the same program, and to ensure a privately stored record could be kept. I sent potential participants a longer information sheet electronically via email (Appendix D). Once the individual had completed the video chat or face-to-face meeting, I asked them to complete a consent form (Appendix B). Once consent was completed, the participant received the AAQ-II and SRIS scales, and the daily mood rating electronically (Appendix C). I asked the participants to complete the two scales and return them to me via email. I asked the participants to record their daily mood ratings in a manner that was easiest for them, and then send the appropriate recordings via email each day. Ten of the 11 participants sent their five letters via email daily during the baseline phase, and then 10 letters (two sets - one pre-application use, one post-application use on the same day) during treatment phases. One participant printed the daily mood rating (Appendix C) and scanned back the completed copy each day.

**ACT Companion™ Application.**

The application developers agreed to provide participants with free, unlimited, lifetime access to the ACT Companion™ app, and a special code was created and sent to each participant, along with a set of instructions for downloading the application (Appendix E).

**iCBT™ Application.**

I asked participants to purchase the iCBT™ application in order to gain full access to the application. I then reimbursed the participants before they needed to download the application. In an email, I gave instructions for downloading the application (Appendix F).

**Design**

I used a single-subject single-treatment design (A-B-A or A-C-A). Participants entered the study at different times. A Phases were completed in the absence of the applications, and in Phases B and C, participants had access to either the ACT or CBT application. I assigned participants alternately to either the ACT Companion™ application (Treatment B) or the iCBT™ application (Treatment C) when they enrolled in the study (after they had given consent). Participants began treatment on different days of the week, i.e., Participant 1 and 2 started on a Monday, 3 and 4 on a Tuesday, 5 and 6 on a Wednesday, and so on (Appendix G). Some participants entered the study later than others. These participants started the treatment phase in different weeks to the individuals who were part of the original starting group (as they were 2 or 3 weeks behind). Appendix H shows the flowchart of participation throughout the study.

**Procedure****Pre-baseline.**

Ethical approval was granted by the University of Waikato Human Research Ethics Committee (Protocol Number 2018-08). I posted a public advertisement on two local

community Facebook groups (Appendix A). I asked participants to respond via private message on Facebook, email or phone/text if they were interested in participating. I included all contact information in the advertisement. Once a participant made contact, I asked for their email address if they did not respond via email. I informed the participant that all communication would be through email. I sent them longer pre-prepared information sheets electronically via email (Appendix D). These information sheets outlined what was required for the study, and how long the participant could expect the study to take. Once confirmation was made regarding continuing with the study, a skype or face-to-face meeting was arranged to discuss any questions the participant had, to go over the information sheet verbally, and to give the participant a consent form. After the meeting, I asked the participants to scan back the completed consent form if they wished to proceed, and begin the study.

Finally, once consent was given, I sent the participant a confirmation email and informed them that I would send information about the requirements of the week ahead each Sunday prior to the beginning of the week. The requirements were laid out in the longer information sheet, however, on a Sunday, I sent out information about the week ahead to remind participants about what they were being asked to do that week (Appendix I).

### **Baseline (A).**

I sent out the information email on Sunday. During this week (Monday to Friday), I asked participants to complete the daily mood rating once each day and to complete the AAQ-II and SRIS once each at any point during the week. The participants were encouraged to complete the mood rating at a similar time each day and email their responses to me. No time was officially recorded by the participant or myself. If a participant forgot to send their mood rating, I sent a reminder the next day.

The treatment could begin on the next weekday following 5 days in the Baseline Phase A, as long as the daily mood rating was stable and not improving over the week. All participants began their treatment phase after 5 days of baseline.

### **ACT (B) or CBT (C) Intervention.**

I sent information emails for the treatment phase (Week 2) on the Friday of participants' baseline weeks, with information on how to download the applications (Appendix E & F). When participants signed up to the study, they were alternatively assigned to the two treatments. I sent information specific to the treatment that the participant was signed up to, before they began treatment weeks.

I asked participants to complete 10-20 min on the application per day at a minimum, however, I encouraged them to spend as long as they liked. I gave no specific instructions on how to use the application, nor did I track what activities were completed. When a participant asked what they needed to do in the applications, I responded that they needed to follow the instructions of the application and to complete the activities that caught their attention. Furthermore, I reiterated that what was completed within the application was not seen by me, nor were there any requirements beyond spending 10-20 min on the application at a minimum. Participants were reminded to ask any questions they had and to get in touch if they were struggling at any point. With that being said, I gave the participant no information about how to use the application as the effectiveness of using the application independently was key. Again, during this phase, I sent a follow-up message the next day if the daily mood rating from the previous day was not received to ensure that the participants were actively using the application on a daily basis, and I could intervene if needed. If the individual gave feedback I felt would contribute to the understanding of the participant's experience, I stored it on email.

If the participant had higher scores on their post-application mood rating (during the treatment phase), compared to pre-application ratings (during the treatment phase) for 3 consecutive days, they were switched to the alternate application straight away. The participant needed to complete 20 weekdays (4 weeks) consecutively on the application before returning to the second Phase A (extinction). If the participant daily mood scores were higher after application use for 3 consecutive days, they were switched to the alternative application and asked to complete 20 weekdays on the new application.

The length of time a participant spent in the treatment phase varied for each participant and depended on whether and when they were switched to the alternate application. A participant's scores could be decreasing, however, they were not swapped onto the alternate application unless they had increasing scores on 3 consecutive days. Some participants never experienced the alternate application. All participants were asked to stop using the single application after 20 weekdays (treatment phase). The participation period for this phase varied from 4 to 6 weeks, due to the fact that some participants began on another application.

### **Extinction (A).**

The second A phase started on the following weekday after the completion of the treatment phase. For example, if the treatment phase finished on a Thursday, the extinction phase would start on Friday. I sent the information email to participants on the final day of their treatment phase. This included specific information about what I was asking them to do during the final week, including when I was asking them to stop using the application and begin the extinction phase (Appendix I). I customised this information email to the individual participant and their own progress. I asked the participants to complete the same process as the baseline week (daily mood ratings each day once, the AAQ-II and SRIS scale once each at any point during the week).

The duration of the extinction phase was 5 weekdays. I sent a debriefing email to the participants when all the necessary information was collected. I thanked the participants for their time and effort and explained that the study was now over. I reiterated that the participant could go back to using the application however they wanted; and that a summary of their individual results would be sent to them in the coming months (when all participant data were collected). The participants were encouraged to ask any questions in regards to the nature of the study. All feedback was stored and used to clarify each participant's experience.

### **Data Analysis**

I scored the AAQ-II scale by summing the seven items on the scale (Bond, 2011). I scored the SRIS on the three subscales; *insight* (Items 3, 4, 6, 9, 11, 14, 17, and 20), the *need for self-reflection* (Items 2, 5, 7, 12, 15, and 18) and *engaging in self-reflection* (Items 1, 8, 10, 13, 16, and 19; Roberts, 2008). Some items required reverse scoring (1, 2, 4, 8, 11, 13, 14, and 17). The daily mood rating was scored by assigning the words numeric values (Never = 0, rarely = 1, sometimes = 2, often = 3, and very often = 4), and summing the five items. The minimum score possible was zero, and the maximum 20.

Graphical analysis was used to track the individual changes of each participant. An individual record of the participant's daily mood rating was recorded every weekday in the baseline, treatment, and extinction phases. I created line graphs to track the changes in their negative self-thinking, and to compare which therapy style was more effective. Furthermore, all statistical testing (CI's, Anova, and T-tests) were done on excel. Cohen's effect sizes were also calculated (Cohen, 1988).

During the study, I collected qualitative data from participants when they gave feedback voluntarily, when scores seemed to be unusual, and if the participant had higher scores on their post-application mood rating compared to their pre-application rating. I used the qualitative data to clarify unusual quantitative findings.

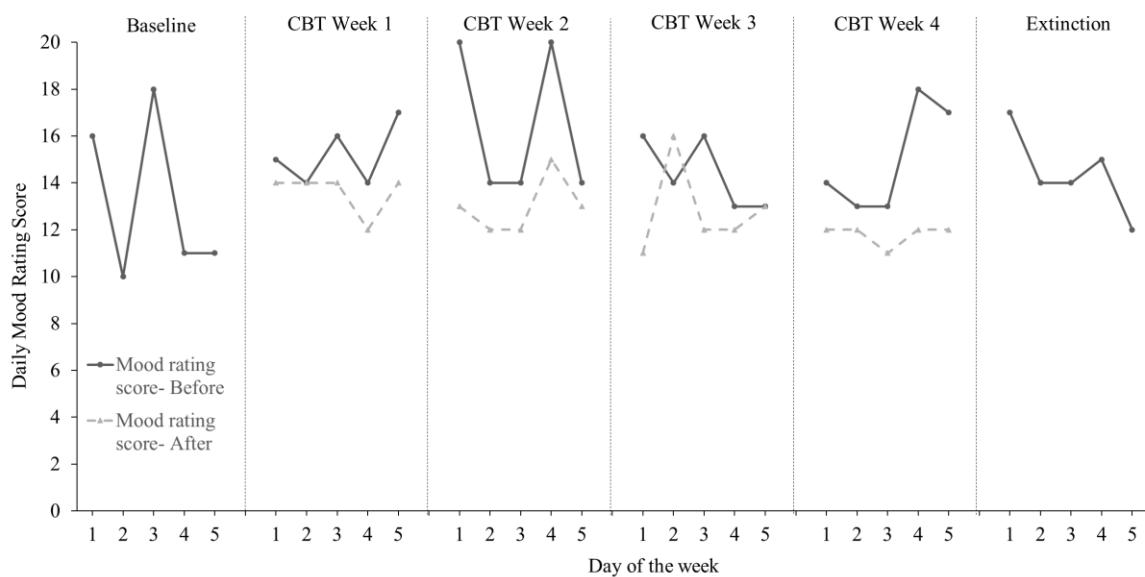
## Results

No data were missing from any participant. Sixteen participants entered the study. Eight were assigned to the CBT application, and eight to the ACT application. Four participants exited the study during the baseline phase ( $n = 2$  in the ACT group,  $n = 2$  in the CBT group). One participant exited the study during Week 3 of the treatment ( $n = 1$  in the CBT group). Two participants were swapped into the ACT group, from the CBT group. No participants were swapped from the ACT group (participants 3, 4, 5, 7, 9, 10, 11, and 12) into the CBT group (participants 1, 6 and 8).

### Individual Analysis

Participant 1 remained on the CBT treatment for the duration of the study. Participant 1's mean daily mood rating during baseline was 13.2, and during extinction, it was 14.4. Figure 1 shows that there was little effect of app use on mood ratings. Mood ratings just after app use (dashed lines) were consistently lower than before app use (solid lines) but, overall, the app appears to have had little effect on the participant's mood through the study.





*Figure 1.* Daily mood rating as a function of the day of the week for Participant 1; for the various weeks of nontreatment, and treatment phases across a single treatment study. The solid line is before application use, the dashed line is after application use.

Participant 3 remained on the ACT treatment for the duration of the study. Participant 3's mean daily mood rating during baseline was 13.92, and during extinction, it was 13.

Figure 2 shows that the app use did have an effect on the mood rating, however, the daily mood scores increased across treatment weeks (high scores = more negative self-thinking).

Mood rating taken just after app use (dashed lines) were consistently lower than the before app use (solid lines), specifically after Week 2. However, the app appears to have had little effect overall on the participant's mood through the study.

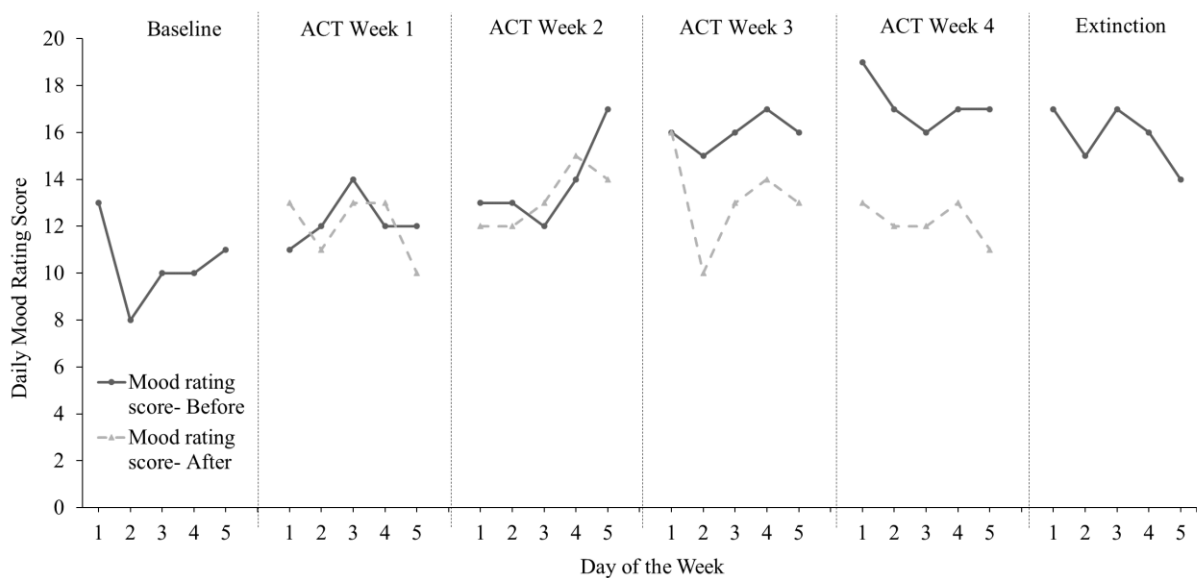
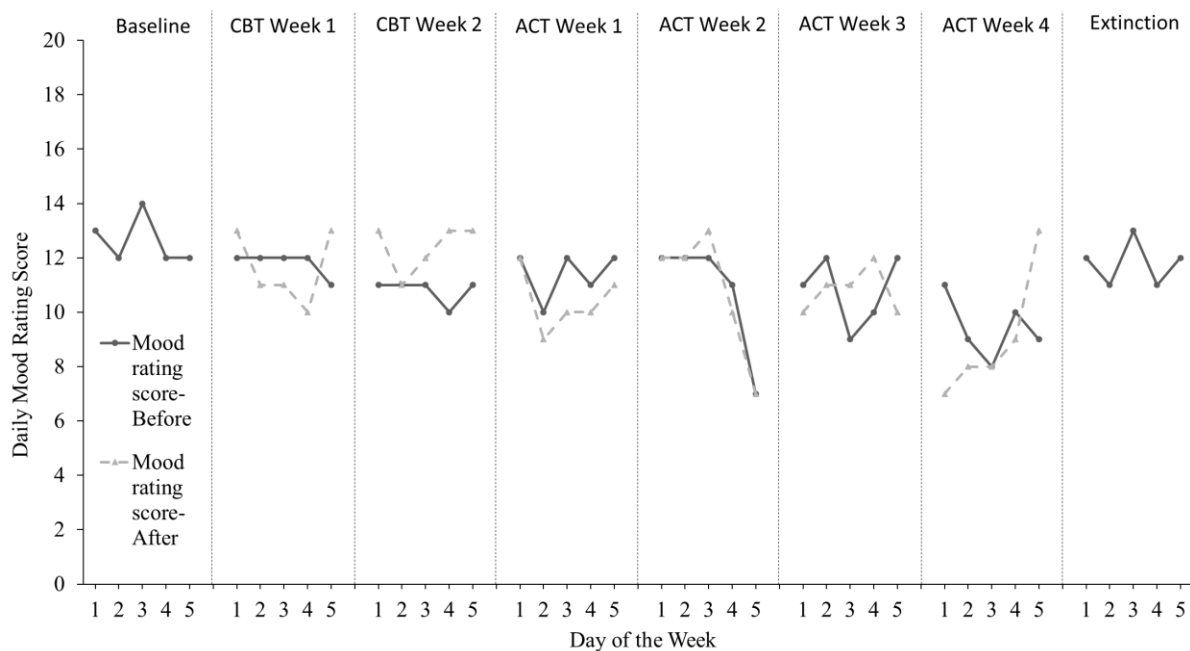


Figure 2. Daily mood rating as a function of the day of the week for Participant 3; for the various weeks of nontreatment, and treatment phases across a single treatment study. The solid line is before application use, the dashed line is after application use.

Participant 4 started on the CBT treatment. They completed two weeks of this treatment before being changed to the ACT therapy. Participant 4's mean daily mood rating during baseline was 11.09, and during extinction, it was 10.97. Figure 3 shows that there was little effect of app use on mood ratings, and mood ratings slightly decreased overall through the study. Mood ratings after app use (dashed lines) were consistently higher than before app use (solid lines) during the CBT treatment. When asked about the CBT application, after showing three consecutive lower daily mood scores after treatment than before; Participant 4 responded:

*I do not feel like I can frame my situation in any different way. I do not feel any differently about the situation after working through the application. I am a bit confused.*

Participant 4 was changed to the ACT application for the remainder of the study. During ACT treatment, the mood rating after app use fluctuated between lower and higher compared to the before app use. Overall, neither app appeared to have had an effect on the participant's mood through the study.



*Figure 3.* Daily mood rating as a function of the day of the week for Participant 4; for the various weeks of nontreatment, and treatment phases across a single treatment study. The solid line is before application use, the dashed line is after application use.

Participant 5 remained on the ACT treatment for the duration of the study. Participant 5's mean daily mood rating during baseline was 9.52, and during extinction, it was 7.95.

Figure 4 shows that there was some effect of the app use on mood ratings, and the daily mood ratings decreased overall through the study. Mood ratings just after app use (dashed lines) fluctuated from lower to higher compared to the before app use (solid lines), and, overall, the app appeared to lower the participant's mood scores, such that the participant reported fewer distressing moods, through the study.

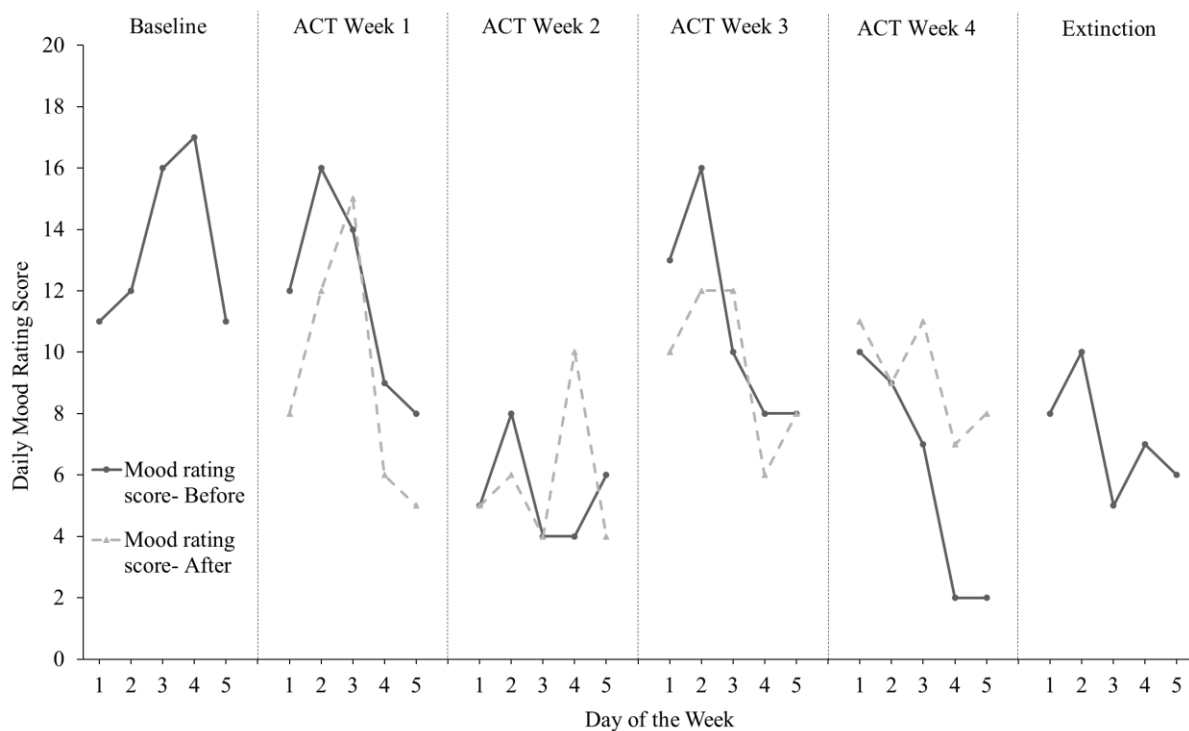


Figure 4. Daily mood rating as a function of the day of the week for Participant 5; for the various weeks of nontreatment, and treatment phases across a single treatment study. The solid line is before application use, the dashed line is after application use.

Participant 6 remained on the CBT treatment for the duration of the study. Participant 6's mean daily mood rating during baseline was 10.60, and after the application use, it was 8.40. Figure 5 shows that there was an effect of the app use on the mood ratings. Mood ratings taken just after app use (dashed lines) were consistently lower than before app use (solid lines). Overall, the app lowered the participant's mood rating. When asked about the CBT application after the sudden drop between Week 3 & 4; Participant 6 responded:

*I feel like I am thinking about my situations in different ways. I am immediately trying to process what my thoughts are surrounding a situation. I have also not had anything bad happen this week, it may be the way I am viewing life at the moment.*

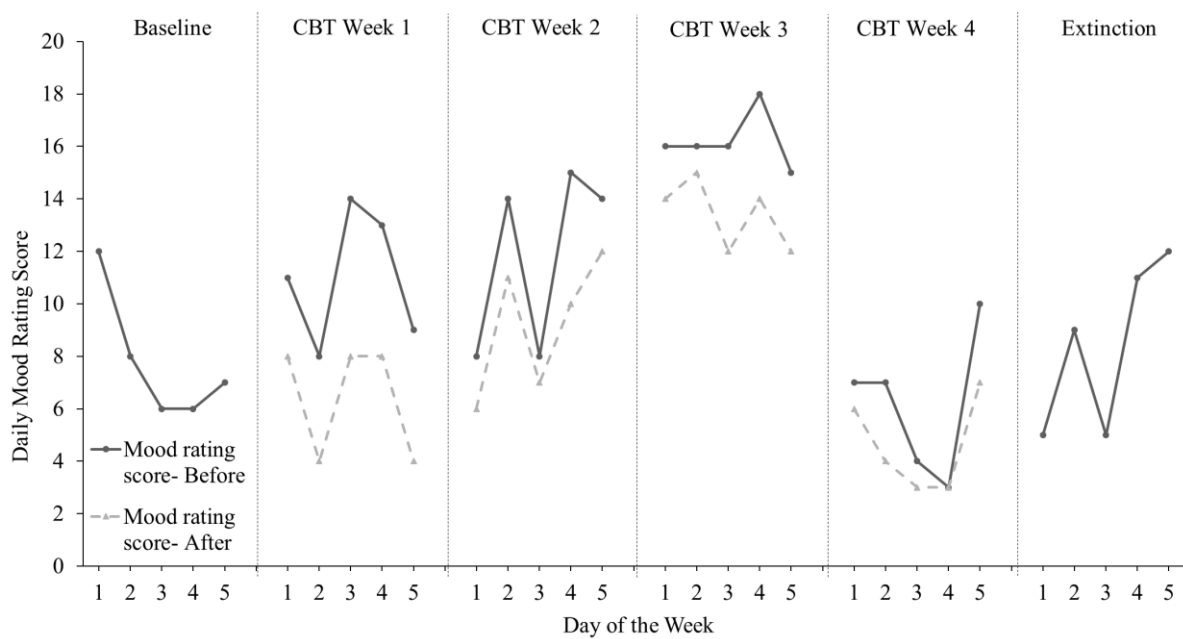


Figure 5. Daily mood rating as a function of the day of the week for Participant 6; for the various weeks of nontreatment, and treatment phases across a single treatment study. The solid line is before application use, the dashed line is after application use.

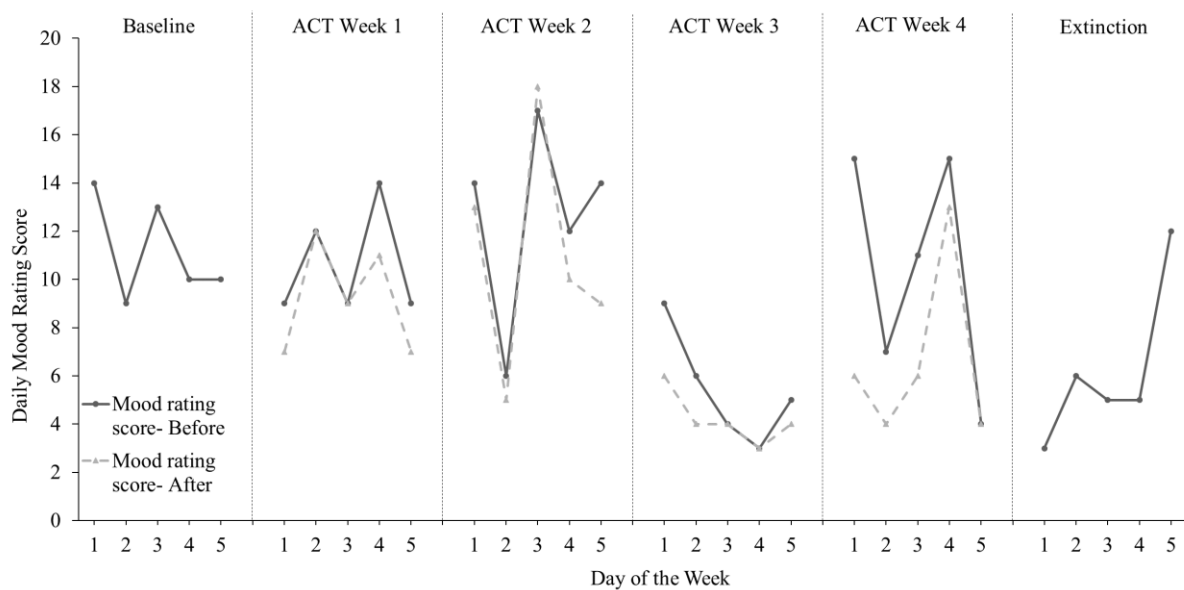
Participant 7 remained on the ACT treatment for the duration of the study. Participant 7's mean daily mood rating during baseline was 10.04, and during extinction, it was 7.44.

Figure 6 shows that there was an effect of the app use on mood ratings, as the daily mood rating decreased overall through the study. Mood rating taken just after app use (dashed lines) were consistently lower than before app use (solid lines). Overall, the app use appears to have had an effect on the participants' mood through the study. Participant 7 gave positive feedback voluntarily throughout the study. Some of the feedback included:

*Learning to be kind to myself will allow me to benefit from this more and more.*

*This application is encouraging me to be present and to do things around forgiveness. I spend a lot of time in my head. Being aware of those thoughts is helping me.*

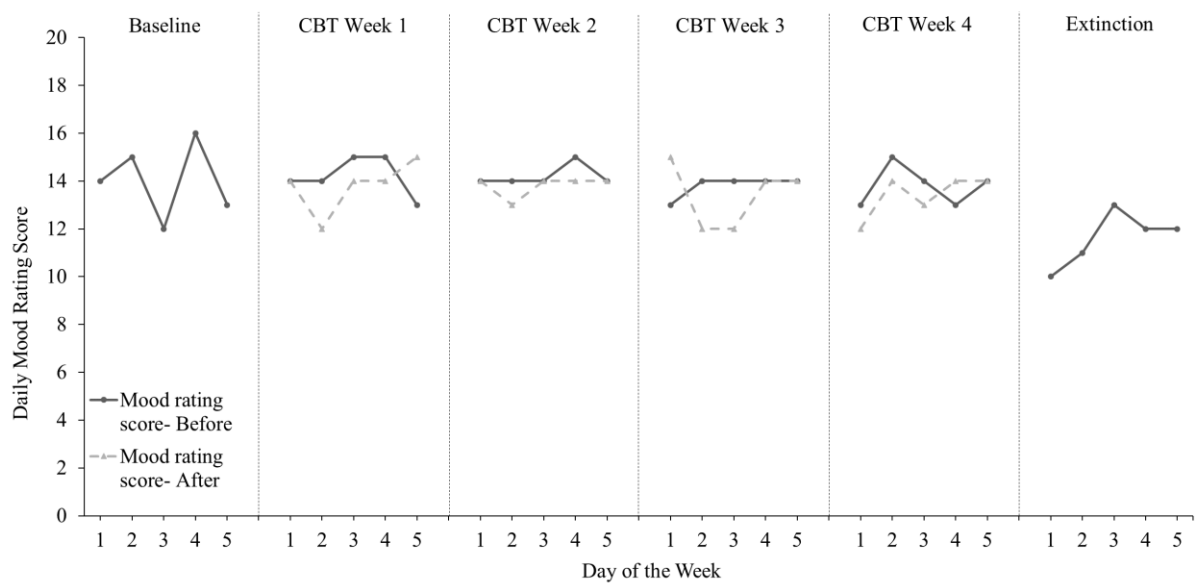
*How I process the thought is my struggle. I always wondered and pleaded with myself to think better but not known how to do that. Didn't think I was equipped but turns out I really was, if I changed my focus and listened (read the app). Will take a lot of practice. But with this apps guidance, I am up for it.*



*Figure 6.* Daily mood rating as a function of the day of the week for Participant 7; for the various weeks of nontreatment, and treatment phases across a single treatment study. The solid line is before application use, the dashed line is after application use.

Participant 8 remained on the CBT treatment for the duration of the study. Participant 8's mean daily mood rating during baseline was 14, and during extinction, it was 13.20.

Figure 7 shows that there was little effect of app use on mood ratings, however, there was a subtle decrease in the daily mood scores overall through the study. Mood rating taken just after app use (dashed lines) were consistently lower than before app use (solid lines) but, overall, the app appears to have had little effect on the participant's mood through the study.



*Figure 7.* Daily mood rating as a function of the day of the week for Participant 8; for the various weeks of nontreatment, and treatment phases across a single treatment study. The solid line is before application use, the dashed line is after application use.

Participant 9 remained on the ACT treatment for the duration of the study. Participant 9's mean daily mood rating during baseline was 10.72, and during extinction, it was 9.28.

Figure 8 shows that there is an effect of app use on mood ratings, as the daily mood scores decreased over the duration of the study. Mood rating taken just after app use (dashed lines) were consistently lower than before app use (solid lines) but, overall, the app appears to have had a slow and steady reduction in the participant's mood through the study.

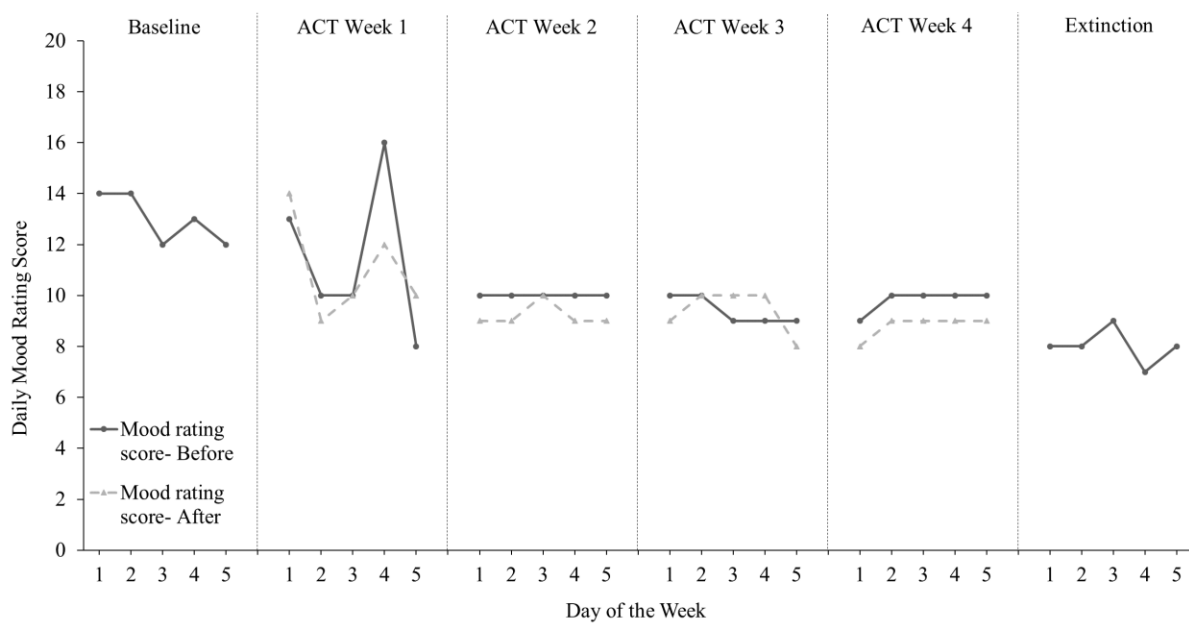
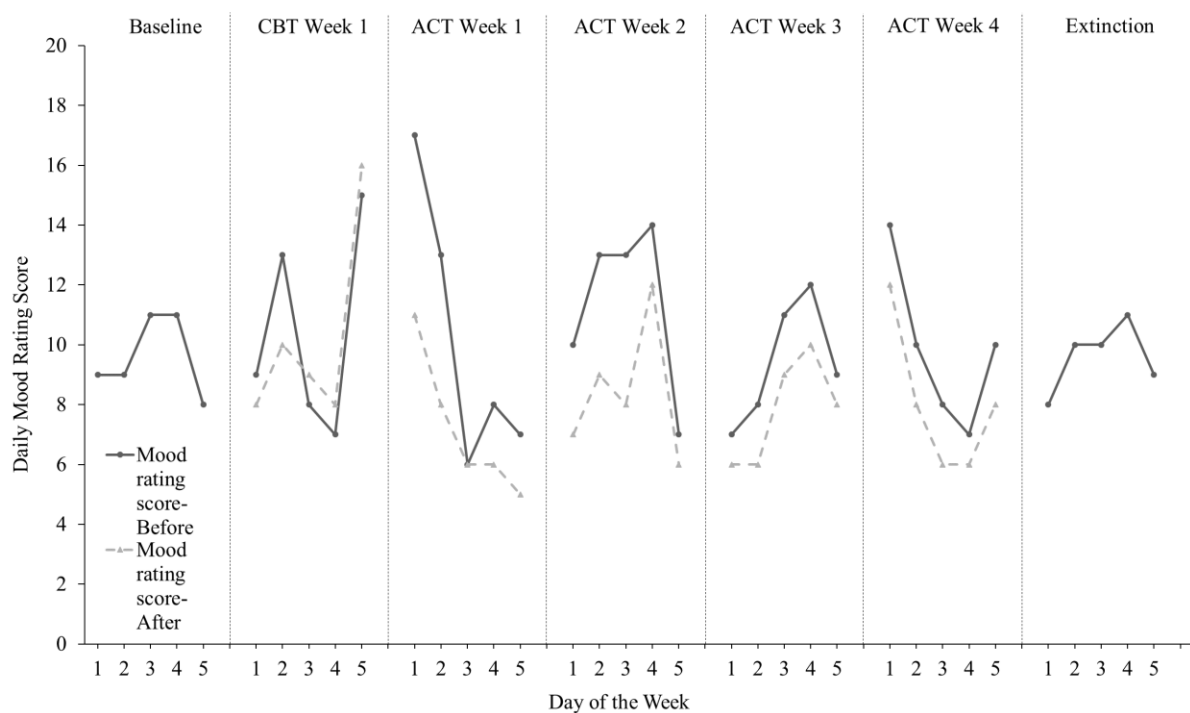


Figure 8. Daily mood rating as a function of the day of the week for Participant 9; for the various weeks of nontreatment, and treatment phases across a single treatment study. The solid line is before application use, the dashed line is after application use.

Participant 10 started on the CBT treatment. They completed one week of this treatment before being changed to the ACT therapy. Participant 10's mean daily mood rating during baseline was 10.13, and during extinction, it was 8.53. Figure 9 shows that there was some effect of app use on mood ratings. Mood rating taken just after app use (dashed lines) were consistently lower than before app use (solid lines). Overall, the app appears to have had some effect on the participant's mood through the study. The ACT app did not seem to have much effect on the mood rating, however, it did have an effect on reducing the participants after scores, compared to the before app use scores. When asked about the CBT application, after showing three consecutive lower daily mood scores after treatment than before, Participant 10 responded:

*I am finding this application a bit confusing and difficult. I feel like I need more explanation and guidance as to how it works. I am not feeling different after using the application.*





*Figure 9.* Daily mood rating as a function of the day of the week for Participant 10; for the various weeks of nontreatment, and treatment phases across a single treatment study. The solid line is before application use, the dashed line is after application use.

Participant 11 used the ACT treatment for the duration of the study. Participant 11's mean daily mood rating during baseline was 10.28, and during extinction, it was 7.40. Figure 10 shows the app use did reduce the daily mood rating substantially through the study (reducing the negative self-thinking). Mood rating taken just after app use (dashed lines) were consistently lower than before app use (solid lines). Overall, a clear reduction in the daily mood rating can be seen in figure 10.

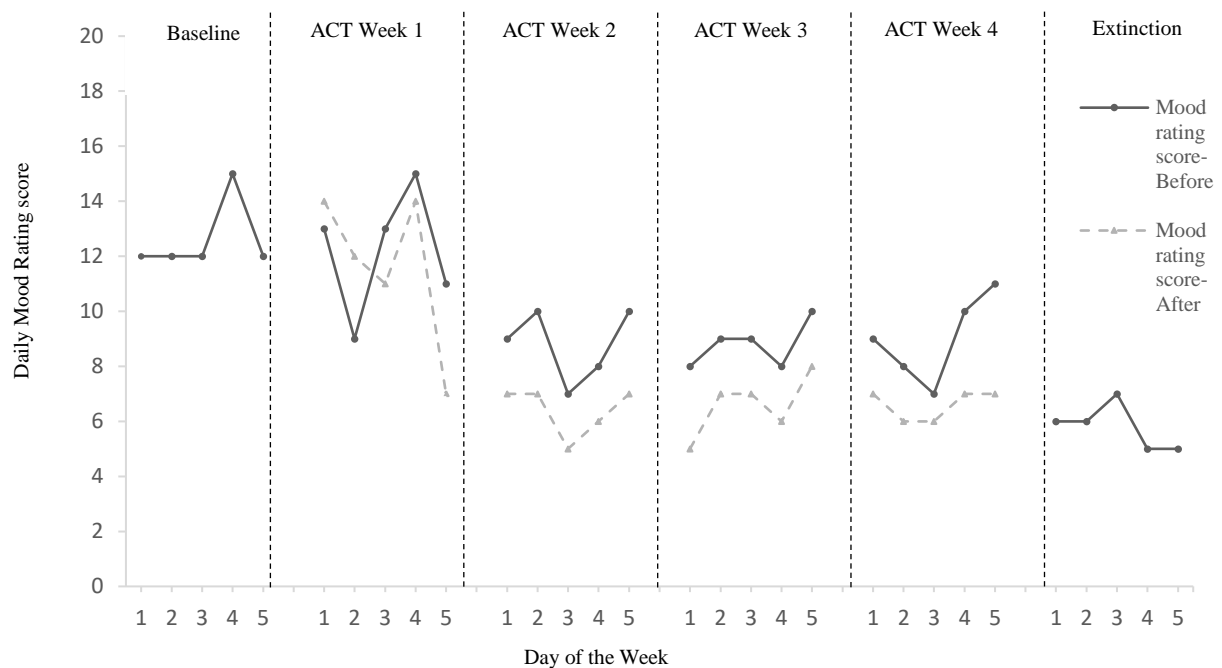
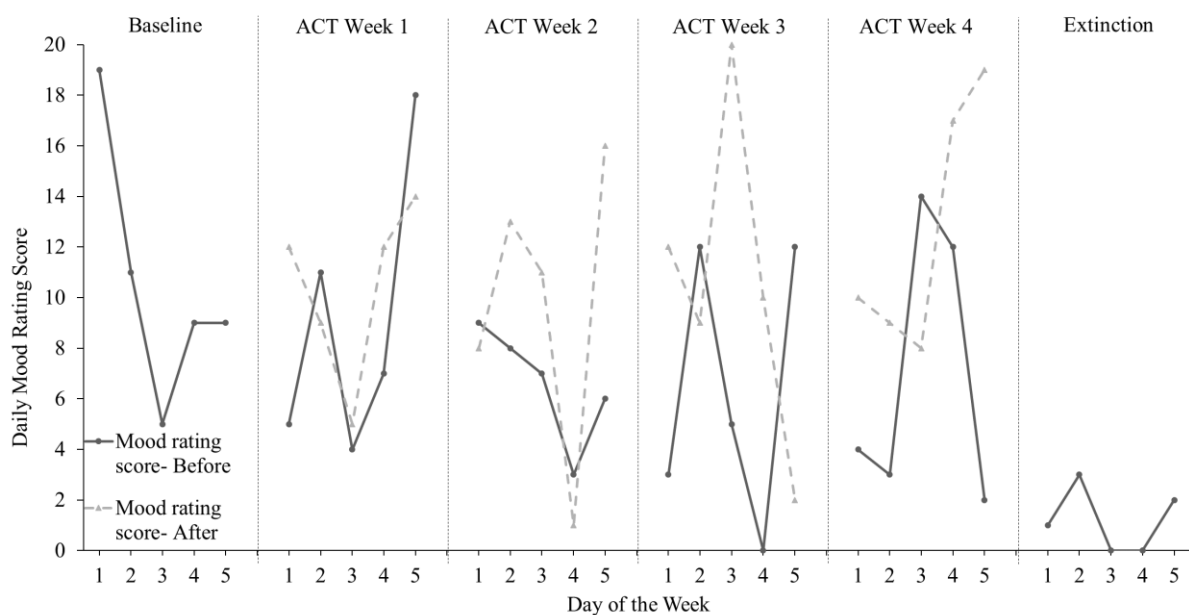


Figure 10. Daily mood rating as a function of the day of the week for Participant 11; for the various weeks of nontreatment, and treatment phases across a single treatment study. The solid line is before application use, the dashed line is after application use.

Participant 12 used the ACT app for the duration of the study. Participant 12's mean daily mood rating during baseline was 7.92, and during extinction, it was 8.92. Figure 11 shows that there was an overall decreasing effect of app use on mood rating (reducing negative self-thinking). Mood rating taken just after app use (dashed lines) were consistently higher than before app use (solid lines). Furthermore, the scores are extremely variable, however, the app appears to have reduced the daily mood rating overall. Participant 12 was asked how they were finding the application, due to the results. Their feedback was:

*I am finding the application pretty good, just the open section makes me really think about all the stuff I try not to lol. But I am finding it useful, definitely helping figure some things out.*

*Taking time to process and think about things I normally wouldn't give myself time for, I am definitely finding it beneficial.*



*Figure 11.* Daily mood rating as a function of the day of the week for Participant 12; for the various weeks of nontreatment, and treatment phases across a single treatment study. The solid line is before application use, the dashed line is after application use.

The mean daily mood score for all 11 participants during the baseline phase was 11.67 (95% CI[9.94, 13.4]). This decreased with a mean daily mood score for the 11 participants during the extinction phase of 9.09 (95% CI[6.53, 11.70]).

Overall, the Daily Mood Rating mean baseline and extinction scores produced excellent internal reliability (Cronbach's alpha= 0.90). Participants on the ACT app showed a greater effect of app use, with 5/8 participants improving their mood scores through the study. Participants on the CBT app showed very little effect of app use, with 1/3 participants improving their mood scores through the study. Furthermore, there was a significant decrease in after daily mood (after treatment all of the 5 weekdays, and the extinction phase) scores compared to the before (before treatment all of the 5 weekdays, and the baseline phase),  $M_{before} = 11.39$ , 95% CI[9.22, 13.60],  $M_{after} = 9.59$ , 95% CI[7.43, 11.8]),  $t(10) = 3.90$ ,  $p < 0.001$ ,  $r = 0.88$ . A significant decrease in the participant's daily mood rating for the ACT group was found ( $p < 0.05$ ). A small effect size was found between CBT participants daily mood ratings during the baseline phase and the extinction phase. A large effect size was

found between ACT participants daily mood ratings during the baseline phase and the extinction phase. Additionally, there was a significant decrease in daily mood ratings.

Furthermore, Cohen's effect size between the mean daily mood score during baseline and the mean daily mood score during extinction ( $d = 0.70$ ) was large. There was a small effect size ( $d = 0.06$ ) between the mean daily mood score during baseline and the mean daily mood score during extinction in the CBT group ( $n = 3$ ). There was a large effect size ( $d = 0.96$ ) between the mean daily mood score during baseline and the mean daily mood score during extinction in the ACT group ( $n = 8$ ).

There was a significant decrease in the after AAQ-II scores compared to the before scores,  $M_{before} = 27.82$ , 95% CI[23.1, 32.5],  $M_{after} = 21.36$ , 95% CI[17.9, 24.9],  $t(10) = 2.14$ ,  $p = 0.03$ ,  $r = 0.37$ . Furthermore, Cohen's effect size between the AAQ-II scores before and the AAQ-II scores after ( $d = 0.92$ ) was large.

Among the participants taking part in the study ( $n = 11$ ), there was no significant difference in the SRIS scores before compared to after,  $M_{before} = 23.88$ , 95% CI[21.3, 26.4],  $M_{after} = 23.73$ , 95% CI[21, 26.4],  $t(10) = 0.10$ ,  $p = 0.46$ ,  $r = 0.64$ . There was no significant decrease in the after SRIS scores compared to the before scores in Subscale 1 (engaging in self-reflection),  $M_{before} = 21.73$ , 95% CI[18.7, 24.7],  $M_{after} = 21.55$ , 95% CI[19, 24.1],  $t(10) = 0.31$ ,  $p = 0.38$ ,  $r = 0.64$ . There was a significant decrease in the after SRIS scores compared to the before scores in Subscale 2 (need for self-reflection),  $M_{before} = 24.82$ , 95% CI[23, 26.7],  $M_{after} = 23.18$ , 95% CI[21.7, 24.6],  $t(10) = 2.04$ ,  $p = 0.03$ ,  $r = 0.42$ . There was a significant increase in the after SRIS scores compared to the before scores in subscale three (insight),  $M_{before} = 25.09$ , 95% CI[22.7, 27.5],  $M_{after} = 26.45$ , 95% CI[23.2, 29.7],  $t(10) = 2.18$ ,  $p = 0.03$ ,  $r = 0.76$ . Furthermore, Cohen's effect size between the SRIS scores before, and the SRIS scores after ( $d = 0.03$ ) was small.

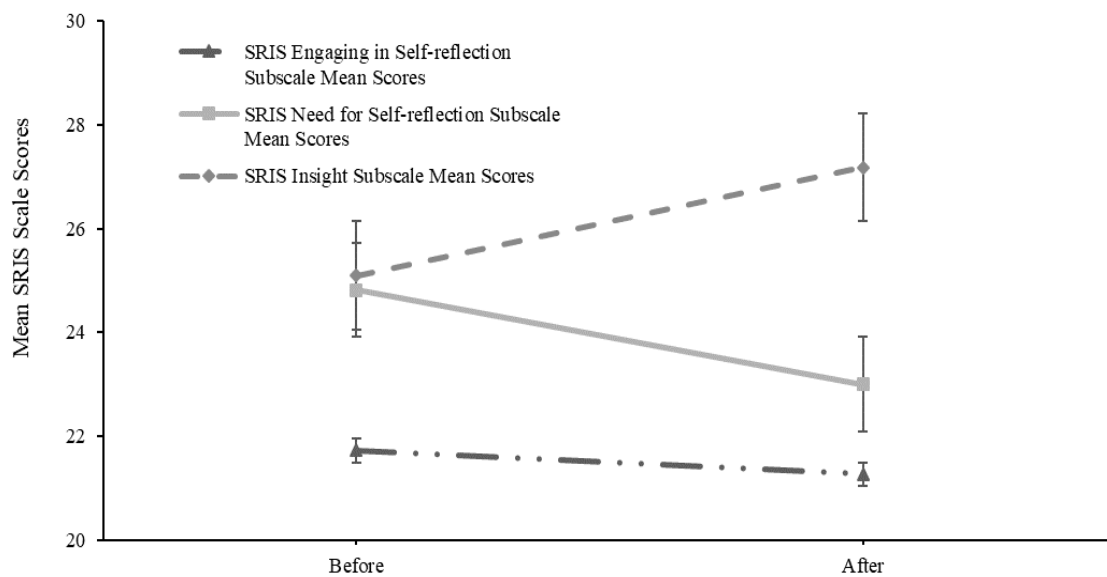


Figure 12. Mean SRIS scores before and after measures for each SRIS subcategory for the ACT group. Error bars represent standard error of the mean.

### CBT Participant Findings

Note that for CBT-only participants, I did not conduct significance testing due to the small sample size ( $n = 3$ ). The mean daily mood scores for the CBT participants increased from baseline to the extinction phase. Furthermore, the mean AAQ-II score for participants in the CBT group during the baseline phase was 33 (95% CI[24, 42]) which decreased during the extinction phase to 24.33 (95% CI[17.6, 31]). The mean SRIS score for participants in the CBT group for Subcategory 1 (engaging in self-reflection) decreased from baseline to extinction, for Subcategory 2 (need for self-reflection) the score also decreased and, for Subcategory 3 (insight) the score increased. There was a large effect size ( $d = 1.22$ ) between the AAQ-II scores before, and the AAQ-II scores after in the CBT group ( $n = 3$ ). There was no effect ( $d = 0$ ) between the SRIS scores before and the SRIS scores after in the CBT group.

### ACT Participant Findings

The mean daily mood scores for the ACT participants decreased significantly from baseline to the extinction phase ( $p < 0.05$ ). Furthermore, the mean AAQ-II score for participants in the ACT group during the baseline phase was 25.88 (95% CI[20.40, 31.40])

which decreased during the extinction phase to 20.25 (95% CI[16.1, 24.4]). The mean SRIS score for participants in the ACT group for Subcategory 1 (engaging in self-reflection) stayed the same from baseline to extinction, for Subcategory 2 (need for self-reflection) the score also decreased and, for Subcategory 3 (insight) the score increased. There was a large effect size ( $d = 0.84$ ) between the AAQ-II scores before, and the AAQ-II scores after in the ACT group ( $n = 8$ ). There was no effect ( $d = 0$ ) between the SRIS scores before, and the SRIS scores after in the ACT group ( $n = 8$ ).

### **Summary of the Outcome Measures**

Overall, the daily mood rating for participants significantly decreased after the treatment was introduced. One out of three participants in the iCBT™ application had lower after-application ratings than before, and 5/8 of participants in the ACT application had lower after-application ratings than before. Two participants were changed from the CBT treatment onto the ACT treatment. No participants were changed from the ACT treatment to the CBT treatment. All individuals on the ACT application expressed that they were happy on the application. Two participants who were changed onto the ACT application expressed confusion with the CBT application.

Generally, most participants' daily mood scores decreased (improved) after the intervention. Furthermore, most of the participant's scores increased again once the treatment was taken away during the extinction phase. The exceptions were for Participant 4, 5, 10, and 12. Participant 4's mood scores were worse after treatment (iCBT™ application) for 3 consecutive days (Figure 4). Once changed onto the ACT application, their mood scores after treatment decreased. Furthermore, Participant 4's mood scores during extinction increased again, showing the treatment was effective. Participant 5's scores on the ACT app fluctuated throughout the study (Figure 5). Their mood scores during the extinction phase were lower on average than the baseline and treatment scores. Participant 10's mood scores were worse after

treatment (iCBT™ application) than before for 3 consecutive days (Figure 10). Once changed onto the ACT application during Week 2, their mood scores started to decrease after treatment immediately. Furthermore, Participant 10's scores during extinction increased again, showing that the treatment was effective. Finally, Participant 12's scores fluctuated throughout the study (Figure 12). Participant 12 never had three consecutively higher after scores than before, so I never changed them onto the alternative application. I did check on Participant 12 to see if they were satisfied, in which they expressed that they were really enjoying the application (ACT Companion™), it was just bringing up a lot of things they had suppressed. During the extinction phase, Participant 12 expressed little to no negative self-thoughts.

### **Discussion**

In the current study, 11 participants experiencing some level of negative self-thought received either the iCBT™ or ACT Companion™ mobile phone application. The purpose of this treatment was to compare whether the CBT or ACT application was more effective in reducing negative thinking about oneself. I used a single-subject single-treatment design (A-B-A). I hypothesised that the ACT Companion™ application would be more effective in reducing negative thinking about oneself over a relatively short period.

I found that both interventions were effective, however, participants using the ACT Companion™ application showed greater improvements overall. Additionally, two participants were changed to the ACT application, whereas no participant changed to the iCBT™ application. This supports my hypothesis that the ACT application was more effective than the CBT application in changing negative thinking about oneself.

### **Daily mood rating**

Mean negative self-thought significantly decreased over my study overall, however, not all daily mood ratings decreased for all participants. This result builds on previous

findings that CBT and ACT are effective treatments for negative thinking about oneself (Arch, et al., 2012; Hayes et al., 1999). The decrease in mean mood rating also suggests that self-thought can be changed (Roberts et al., 2017).

Although the results fluctuated for some, the general trend was a decrease in negative thinking about oneself during the intervention, with an increase in daily mood scores after the intervention was removed. The daily mood scores during baseline were higher on average than the daily mood scores after the intervention. Furthermore, there was a large effect for the ACT application participants, compared to a small effect for the iCBT™ application participants. Given the average scores were higher before treatment, I suggest that the decrease in scores during intervention is related to the intervention. The results indicate that the type of therapy style (ACT vs CBT) influences the amount of self-thought change. This finding differs from the results of Luborsky et al. (2002) who found an ACT or CBT intervention was not strongly associated with the amount of self-thought change. Furthermore, my findings contradict those of Roberts (2006), who found that self-thought can change, but only over a longer period. Not only did I find a significant decrease in negative thinking about oneself for both therapy styles, but this occurred within a 4-week treatment period.

### **AAQ-II scores**

I used the AAQ-II scale to measure psychological flexibility and experiential avoidance. The AAQ-II is used to assess an individual's level of acceptance, whilst also measuring their psychological flexibility. A lower score indicates that the individual has excessive acceptance and action, whereas a high score indicates that the individual is inflexible, immobile, and display experiential avoidance (Hayes et al., 2012). Experiential avoidance describes individuals who try and avoid experiences that may be uncomfortable for them. Mean AAQ-II scores significantly decreased after treatment, suggesting a positive



effect of the applications on psychological flexibility. As psychological flexibility is closely associated with acting in a manner that holds value to the individual, despite distress that could be going on internally or externally (Bond & Flaxman, 2006), psychological flexibility and negative thinking about oneself closely align. A decrease in psychological inflexibility is a positive finding in terms of what the application is doing for an individual's negative thinking about oneself. Furthermore, previous studies suggesting that psychological flexibility negatively correlates with various mental health issues, making it a very encouraging finding (Hayes et al., 2006). Lastly, a decrease in psychological inflexibility is said to reflect a decrease in psychological distress (Hayes, et al., 2012).

I expected the level of psychological flexibility to improve, especially for the ACT Companion™ users. The flexibility scores on a whole improved, irrespective of which application the individual was using. The results showed a significant improvement in psychological flexibility and acceptance post-intervention. A level of psychological flexibility was found to be associated with improved functional outcomes (Hayes et al., 2012). Psychological flexibility was shown to increase in my study, particularly through ACT. This aligns with previous studies which have also found that the use of ACT therapy produces increased psychological flexibility (Masuda et al., 2012).

The AAQ-II scores of Participants 3, 4, and 10, did not improve after treatment. Participant 3 was on the ACT application for the duration of the study. These results do not align with those that have found ACT a highly viable treatment for psychological distress (e.g., Arch et al., 2012). As psychological flexibility is a key component in the ACT therapy, I did not expect it to worsen.

Overall, it is promising that 8/10 of participants' psychological flexibility scores significantly increased after treatment. I found support for the use of a smartphone application (either CBT or ACT) as an effective and successful tool when trying to decrease

the impact of psychological distress. My finding contradicts that of Bach, Hayes, and Kendall (2002), whose intervention was not effective in a short period.

### **SRIS scores**

I used the SRIS to measure private self-conscious and reflection (Carver & Scheier, 1998). Furthermore, the SRIS contains items that reference three important concepts: thoughts, feelings, and behavior (Crane et al., 2018). I expected individuals to improve in the way they reflected and identified their thoughts, feelings, and behaviours. My findings showed the opposite. The mean post-treatment SRIS scores were not significantly different from the baseline mean scores. However, the need for self-reflection and insight subscale showed a significant improvement. This was surprising, as the SRIS has been shown as a valid and popular means of measuring self-reflection (an important outcome measure in this study); however, the intervention did not produce significant results under the SRIS. The reason that these results could be, is due to the behaviour not actually changing (but the scale is still valid), or that the change was too small to detect with the sample size that I had.

### **Understanding the individual's role in purposeful behavioral change**

All participants reported that they had used the application daily as required, and results were recorded through their daily mood rating. This is a promising result as it shows users outside of the treatment that it is obviously not too difficult to maintain using the application over a 4-week period. A few participants needed to be reminded the next day when a daily mood rating was not received the previous day. The participants reported that they had used the application but had forgotten to send the information. I received this information immediately after the reminders. I received positive feedback at the end of the week regarding how much the participants were learning, in particular, from the individuals using the ACT app. Given that the application had a variety of exercises within the application, the participants could explore various areas. The participants were also

empowered to choose what area they would like to explore, taking control of their behavioral change. On the other hand, the two participants changed from the iCBT™ application to the ACT Companion™ application, expressed frustration and confusion regarding the iCBT™ application. Furthermore, one participant expressed that they did not view the situation any differently as they felt the outcome would remain the same. Perhaps the lack of guidance through this treatment could account for the frustration.

The participants used the application at various points in the day. However, they reported that they used the application at a similar point in the day, as was encouraged. Participant 12's score was often higher after the application use, as opposed to the before score. The participant explained that this could be related to the application encouraging them to deal with things from the past. The participant expressed that they were happy with this and that it felt good to do. Their AAQ-II score was dramatically improved after the treatment, displaying an increase in psychological flexibility. This result aligns with their feeling of being satisfied to deal with distressing thoughts.

In general, participants expressed that they found the applications helpful, in particular, the ACT application due to the variety of exercises. The participants could choose if they wanted to write or to listen to a mediation. All participants in the ACT group expressed a desire to continue using the application after the study. One participant in the iCBT™ group expressed interest in the other application (ACT Companion™), despite not using it during the study. The participants expressed that they were better able to recognise when they were distressed, and felt they had a tool to manage this distress.

### **Self-reflection, flexibility, and mood as outcome measures**

The daily mood rating showed an improvement, on average, in the participants' moods post-treatment. As an individual's mood influences behaviour, the finding is promising (Singh, 2014). Participants expressed that doing the treatment in the morning

really helped them with their day. Furthermore, participants reported during Weeks 3 and 4 that they would use the application more than once on a day that was very distressing. This could be due to the confidence building and familiarity with the application (Hayes et al., 2012). Furthermore, this finding confirms the importance of having a means of treatment that is readily accessible for the participant.

### **The theoretical and practical importance of results**

My main findings were that both treatments resulted in significant improvements in reducing negative thinking about oneself. This occurred in a relatively short period. A significant and large effect size was found for the overall AAQ-II scores after treatment compared to before (this was true for the ACT and CBT groups). Furthermore, a large effect for the daily mood rating for the ACT group was found. There was a small effect on the daily mood rating for the CBT group. No effect was found with SRIS scores after treatment compared to before the treatment.

Studies have suggested that guided treatments are more beneficial to individuals, which may be the case for CBT (Richards & Richardson, 2012). However, my results show that the participants enjoyed working through exercises they chose at a time convenient to them. With a successful mobile application, my study has shown that improvements can be made to reduce psychological distress and negative thinking about oneself, an underlying issue for many mental health problems.

### **Strengths**

One of the key strengths in this study was its relatively small sample size, as well as the single-subject design. The behaviours of each individual could be monitored frequently throughout the study. As a result, strong conclusions could be drawn from the baseline, intervention, and extinction stages. Each participant was encouraged to take control of their treatment and engage with what they felt necessary. Having no guidelines on how to use the

application showed that anyone could have the same experience, even if they used the application outside of my study.

Due to the nature of this study and dealing with negative thinking about oneself; each participant was gifted the applications they used, adding to the tools they have to deal with psychological distress. Furthermore, every participant benefitted from the application use, i.e., there was no control group in which someone did not receive treatment. Each individual's results were compared to their own baseline, and extinction phases, avoiding inter-subject variability.

Lastly, daily monitoring of the participant's progress on the application through the daily mood rating, allowed me to maintain close observations with the intention of keeping participants safe. I was able to recognise any unusual findings promptly and clarify them. I was also able to recognise if the application was not beneficial to the participant. I was able to change two participants to the alternate application as their daily scores became worse after application use for 3 consecutive days. The participants were able to express their confusion and frustration over the application and be changed onto the other application. In doing so, the participants were able to benefit from the alternate application, rather than being removed from the study.

### **Limitations and future research**

One limitation of my study was that I did not gather information on which exercises were being used in each of the applications. A brief record of the activities used may give a richer understanding of the participants' results. The study may have benefited from a scale including the exercises they used. For example, when the individual experienced distress, which exercise or area of the application brought them the most comfort.

Secondly, no effect size was shown in the results for the SRIS. Although there were significant increases in the need for self-reflection, and insight; these were overshadowed by

the insignificant overall score and the absence of an effect. Perhaps implementing the scale once during the treatment would have produced more insightful results. Furthermore, I feel the study would have benefited from the PrSCS (Private self-consciousness scale). By implementing the PrSCS the motive behind engaging in self-reflection, as well as the need for self-reflection could be compared with the actual level of self-reflection the individual engages in. An exit interview may have been more helpful in gaining more insight into the participants' experience with the application.

Lastly, the study could benefit from a longer-term follow up for participants. It would also have been beneficial to see if the app had an effect on their behaviour, as one of the goals of ACT is to get people to behave in line with their goals. It was nice to see a reduction of negative self-thinking; however, I wonder if this translated into actual behaviour. Carlbring et al. (2013) suggested that treatment effects are maintained longer with professional guidance; however, I believe it would be beneficial to determine how long the positive effects of this treatment can last, and whether participants maintain motivation to use the apps, or rather begin to incorporate the app activities into the daily lives, reducing their reliance on the app.

Overall, my findings add to the growing evidence that treatment in the form of a mobile phone application can be effective (Firth et al., 2017). Furthermore, I found that the ACT Companion™ application was more effective than the CBT app in a relatively short period. ACT interventions use a different approach to CBT (Eifert et al., 2009), which was popular with the participants during this study. My finding is significant for reducing negative thinking about oneself, whilst equipping individuals with a cost-effective tool to improve their overall wellbeing.

### **Conclusion**

Using a single subject single treatment design (A-B-A or A-C-A), I explored whether iCBT™ (Cognitive behavioural therapy in an app form) or ACT Companion™ (acceptance and commitment therapy in an app form) was more effective in reducing negative self-thought. After using the applications for 4 weeks, the mean daily mood rating decreased. Mean participant insight, measured using the SRIS, significantly increased, and experiential avoidance significantly decreased during the study. Two participants were moved from the iCBT™ to the ACT Companion™ application. Overall, the findings of the present study support that the ACT Companion™ application was more effective at reducing negative self-thought in a relatively short period of time.

### References

- Andersson, G., & Cuijpers, P. (2009). Internet-based and other computerized psychological treatments for adult depression: A meta-analysis. *Cognitive Behavioural Therapy*, 38, 196-205.
- Arch, J. J., Eifert, G. H., Davies, C., Vilardaga, J. C. P., Rose, R. D., & Craske, M. G. (2012). Randomized clinical trial of cognitive behavioural therapy (CBT) versus acceptance and commitment therapy (ACT) for mixed anxiety disorders. *Journal of Consulting and Clinical Psychology*, 80, 750-765.
- Bach, P. A., & Moran, D. J. (2008). *Act in practice: Case conceptualization in acceptance and commitment therapy*. Oakland: New Harbinger Publications Inc.
- Barlow, D. H., Gorman, J. M., Shear, M. K., & Woods, S. W. (2000). Cognitive-behavioural therapy, imipramine, or their combination for panic disorder: A randomized trial. *Journal of the American Medical Association*, 283, 2529-2536.
- Bass, C., Nevel, J., & Swart, J. (2014). A comparison between dialectical behavior therapy, mode deactivation therapy, cognitive behavioral therapy, and acceptance and commitment therapy in the treatment of adolescents. *International Journal of Behavioral Consultation and Therapy*, 9, 4-8.
- Baum, W. M. (2005). *Understanding behaviorism: Behavior, culture, and evolution* (2nd Ed.). Malden: Blackwell Publishing.
- Baumeister, R. F. (2014). Self-regulation, ego depletion, and inhibition. *Neuropsychologia*, 65, 313-319.
- Beck, A. T. (2008). The evolution of the cognitive model of depression and its neurobiological correlates. *The American Journal of Psychiatry*, 165, 969-977.
- Beck, A. T., Rush, A. J., Shaw, B. F., & Emery, G. (1979). *Cognitive therapy of depression*. New York, NY: The Guilford Press.



- Berrick Psychology. (2015). *The ACT Companion™*. The Happiness Trap. Retrieved from [www.actcompanion.com](http://www.actcompanion.com)
- Bond, F. W., & Flaxman, P. E. (2006). The ability of psychological flexibility and job control to predict learning, job performance, and mental health. *Journal of Organizational Behavior Management*, 26, 113-130.
- Bond, F. W., Hayes, S. C., Baer, R. A., Carpenter, K. M., Guenole, N., Orcutt, H. K., Waltz, T., & Zettle, R. D. (2011). Preliminary psychometric properties of the Acceptance and Action Questionnaire - II: A revised measure of psychological flexibility and experiential avoidance. *Behavior Therapy*, 42, 676-688.
- Bonfire Development Advisors. (2016). *iCBT™ and iCBT™ for iPad*. Retrieved from [www.bonfireda.com/iCBT.html](http://www.bonfireda.com/iCBT.html).
- Bradley, B., & Mathews, A. (1983). Negative self-schemata in clinical depression. *British Journal of Clinical Psychology*, 22, 173-181.
- Bunker, L., Williams, J. M., & Zinsser N. (1993). Cognitive techniques for improving performance and building confidence. In Williams, J. M. (Ed.) *Applied Sport Psychology: Personal Growth to Peak Performance* (2nd Ed.). Mountainview, CA: Mayfield.
- Butler, R., Sargisson, R. J., & Elliffe, D. (2011). The efficacy of systematic desensitization for treating the separation-related problem behaviour of domestic dogs. *Applied Animal Behaviour Science*, 129, 136-145
- Carlbring, P., Hagglund, M., Luthstrom, A., Dahlin, M., Kadowaki, A., Vernmark, K., & Andersson, G. (2013). Internet-based behavioral activation and acceptance-based treatment for depression: A randomized controlled trial. *Journal of Affective Disorders*, 148, 331-337.

- Carver, C. S., & Scheier, M. F. (1998). *On the self-regulation of behavior*. Cambridge, UK: Cambridge University Press.
- Churchill, R. (2013). *'Third wave' cognitive and behavioural therapies versus others*. Cambridge, UK: Cambridge University Press.
- Cohen, J. (1988). *Statistical power analysis for the behavioral sciences* (2nd Ed.). Hillsdale, NJ: Lawrence Earlbaum Associates.
- Costello, E. J., Egger, H. L., & Angold, A. (2004). Developmental epidemiology of anxiety disorders in children and adolescents. *A clinician's guide to effective psychosocial and pharmacological interventions*. New York: Oxford University Press.
- Crane, M. F., Boga, D., Karin, E., Gucciardi, D. F., Rapport, F., Callen, J., & Sinclair, L. (2018). Strengthening resilience in military officer cadets: A group-randomized controlled trial of coping and emotion regulatory self-reflection. *Journal of Consulting and Clinical Psychology*, 87, 1-140.
- Cully, J. A., & Teten, A. L. (2008). *A therapist's guide to brief cognitive behavioral therapy*. Department of Veterans Affairs South Central MIRECC, Houston. Retrieved from [https://depts.washington.edu/dbpeds/therapists\\_guide\\_to\\_brief\\_cbtmanual.pdf](https://depts.washington.edu/dbpeds/therapists_guide_to_brief_cbtmanual.pdf)
- Cutler, D. M. (2004). Behavioral health interventions: What works and why? Retrieved from <http://www.ncbi.nlm.nih.gov/books/NBK25527/?report=reader>.
- Diener, E., Sandvik, E., Pavot, W., & Gallagher, D. (1991). Response artifacts in the measurement of subjective well-being. *Social Indicators Research*, 24, 35-56.
- Eifert, G. H., Forsyth, J. P., Arch, J., Espejo, E., Keller, M., & Langer, D. (2009). Acceptance and commitment therapy for anxiety disorders: Three case studies exemplifying a unified treatment protocol. *Cognitive and Behavioral Practice*, 16, 368-385.
- Fenigstein, A., Scheier, M. F., & Buss, A. H. (1975). Public and private self-consciousness: Assessment and theory. *Journal of Counselling and Clinical Psychology*, 43, 522-527.

Firth, J., Torous, J., Nicholas, J., Carney, R., Pratap, A., Rosenbaum, S., & Sarris, J. (2017).

The efficacy of smartphone-based mental health interventions for depressive symptoms: a meta-analysis of randomized controlled trials. *World Psychiatry, 16*, 287–298.

Fletcher, L., & Hayes, S. (2005). Relational frame theory, acceptance and commitment therapy, and a functional analytic definition of mindfulness. *Journal of Rational-Emotive and Cognitive-Behavior Therapy, 23*, 315-336.

Forman, E. M., Herbert, J. D., Moitra, E., Yeomans, P. D., & Geller, P. A. (2007). A randomized controlled effectiveness trial of acceptance and commitment therapy and cognitive therapy for anxiety and depression. *Behavior Modification, 31*, 772-799.

Gartner. (2013). Gartner says android to command nearly half of worldwide smartphone operating system market by year-end 2012. Retrieved from <http://www.gartner.com/newsroom/id/1622614>.

Gaudiano, B. A., & Herbert, J. D. (2005). Believability of hallucinations as a potential mediator of their frequency and associated distress in psychotic inpatients. *Behavioural and Cognitive Psychotherapy, 34*, 497-502.

GBD 2015 Disease and Injury Incidence and Prevalence Collaborators. (2016). Global, regional, and national incidence, prevalence, and years lived with disability for 310 diseases and injuries, 1990-2015: a systematic analysis for the Global Burden of Disease Study 2015. *The Lancet, 388*, 1545-1602.

Germer, C. K. (2009). *The mindful path to self-compassion: freeing yourself from destructive thoughts and emotions*. New York: Guilford Press, 2009.

Goodhart, D. E. (1985). Some psychological effects associated with positive and negative thinking about stressful event outcomes: Was Pollyanna right? *Journal of Personality and Social Psychology, 48*, 216-232.

- Grant, A. M., Franklin, J., & Langford, P. (2002). The self-reflection and insight scale: A new measure of private self-consciousness. *Social Behavior and Personality: an international journal*, 30, 821-835.
- Hackfort, D., & Schwenkmezger, P. (1993). Anxiety. In Singer, R. N., Murphey, M., & Tennant, L. K. (Eds.), *Handbook of research on sport psychology*. New York: Macmillian.
- Hanton, S., & Jones, G. (1999). The effects of a multimodal intervention program on performers. II. Training the butterflies to fly in formation. *The Sport Psychologist*, 13, 22-41.
- Hardy, J. (2006). Speaking Clearly: A critical review of the self-talk literature. *Psychology of Sport and Exercise*, 7, 81-97.
- Hardy, J., Hall, C. R., & Alexander, M. R. (2001). Exploring self-talk and affective states in sports. *Journal of Sports Science*, 19, 469-475.
- Hardy, J., Roberts, R., & Hardy, L. (2009). Awareness and motivation to change negative self-talk. *The Sport Psychologist*, 23, 435-450.
- Harris, R. (2009). *Act made simple: An easy-to-read primer on acceptance and commitment therapy*. California: New Harbinger Publications.
- Hatcher, R., Hatcher, S., Berlin, M., & Okla, K. (1990). Psychological mindedness and abstract reasoning in late childhood and adolescence: An exploration using new instruments. *Journal of Youth and Adolescence*, 19, 307-326.
- Hayes, S. C. (2004). Acceptance and commitment therapy, relational frame theory, and third wave of behavioral and cognitive therapies. *Behavior Therapy*, 35, 639-665.
- Hayes, S. C., Luoma, J. B., Bond, F. W., Masuda, A., & Lillis, J. (2006). Acceptance and commitment therapy: Model, processes and outcomes. *Behavior Research and Therapy*, 44, 1-25.

- Hayes, S. C., Strosahl, K., & Wilson, K. G. (2012). *Acceptance and commitment therapy: The process and practice of mindful change* (2nd Ed.) New York: Guilford Press.
- Hayes, S. C., Strosahl, K. D., & Wilson, K. G. (1999). *Acceptance and commitment therapy: An experiential approach to behavior change*. New York, NY: Guilford Press.
- Hayes, S. C., Wilson, K. W., Gifford, E. V., Follette, V. M., & Strosahl, K. (1996). Experiential avoidance and behavioral disorders: A functional dimensional approach to diagnosis and treatment. *Journal of Consulting and Clinical Psychology*, 64, 1152-1168.
- Healthx Team. (2012). Mobile healthcare technology. Retrieved from <http://healthx.com/infographics/mobile-healthcare-technology/>.
- Hicdurmaz, D., Inci, F., & Karahan, S. (2017). Predictors of mental health symptoms, automatic thoughts, and self-esteem among university students. *Psychological Reports*, 120, 650-669. doi:10.1177/0033294117707945.
- Hofmann, S. G., & Smits, J. A. J. (2008). Cognitive behavioural therapy for adult anxiety disorders: A meta-analysis of randomized placebo-controlled trials. *Journal of Clinical Psychiatry*, 69, 621-632.
- Kabat-Zinn, J. (1982). An outpatient program in behavioral medicine for chronic pain patients based on the practice of mindfulness meditation: Theoretical considerations and preliminary results. *General Hospital Psychiatry*, 4(33), 33-47.
- Keng, S. L., Smoski, M. J., & Robins, C. J. (2011). Effects of mindfulness on psychological health: A review of empirical studies. *Clinical Psychology Review*, 31, 1041-1056.
- Kent State University. (2018). *SPSS Tutorials*. Retrieved from <https://libguides.library.kent.edu/SPSS/>
- Kvalsvig, A. (2018). *Wellbeing and mental distress in Aotearoa New Zealand*. Wellington, New Zealand: Health Promotion Agency

- Leleux-Labarge, K., Hatton, A. T., Goodnight, B. L., & Masuda, A. (2015). Psychological distress in sexual minorities: Examining the roles of self-concealment and psychological inflexibility. *Journal of Gay and Lesbian Mental Health, 19*, 40-54.
- Liu, J., Lewis, G., & Evans, L. (2013). Understanding aggressive behavior across the life span. *Journal of Psychiatric Mental Health Nurse, 20*, 156-168.
- Longmore, R. J., & Worrell, M. (2007). Do we need to challenge thoughts in cognitive behavioural therapy? *Clinical Psychology Review, 27*, 173-187.
- Luborsky, L., Rosenthal R., Diguer, L., Andrusyna, T. P., Berman J. S., Levitt, J. T., & Krause, E. D. (2002). The Dodo bird verdict is alive and well- Mostly. *Clinical Psychology: Science and Practice, 9*, 2-12.
- Martin, B. (2016). In-Depth: Cognitive behavioral therapy. *Psychology Central*. Retrieved from <https://psychcentral.com/lib/in-depth-cognitive-behavioral-therpay/>.
- Masuda, A., Hayes, S. C., Sackett, C. F., & Twohig, M. P. (2012). Cognitive defusion and self- relevant negative thoughts: Examining the impact of a ninety year old technique. *Behaviour Research and Therapy, 42*, 477-485.
- Mental Health Foundation. (2014). Quick facts and stats. Retrieved from <https://www.mentalhealth.org.nz/assets/Uploads/MHF-Quick-facts-and-stats-FINAL.pdf>
- Miller, G. (2012). The smartphone psychology manifesto. *Perspectives on Psychological Science, 7*, 221-237. doi:10.1177/1745691612441215.
- Moore, J. (2000). Thinking about thinking and feeling about feeling. *The Behaviour analyst, 23*, 45-56.
- Morris, W. N., & Reilly, N. P. (1987). Toward the self-regulation of mood: theory and research. *Motivational Emotion, 11*, 215-249.

- Philippi, C. L., Cornejo, M. D., Frost, C. P., Walsh, E. C., Hoks, R. M., Birn, R., & Abercrombie, H., C. (2018). Neural and behavioral correlates of negative self-focused thought associated with depression. *Human Brain Mapping, 39*, 2246-2257.
- Piet, J. & Hougaard, E. (2011). The effect of mindfulness-based cognitive therapy for prevention of relapse in recurrent major depressive disorder: A systematic review and meta-analysis. *Clinical Psychology Review, 31*, 1032-1040.
- Plaza, I., Demarzo, M. M. P., Herrera-Marcadal, P., & Garcia-Campayo, J. (2013). Mindfulness-based mobile applications: Literature review and analysis of current features. *JMIR Mhealth Uhealth, 1*, 1-25.
- Powers, M. B., Zum Vorde Sive Vording, M. B., & Emmelkamp, P. M. G. (2009). Acceptance and commitment therapy: A meta-analytic review. *Psychotherapy and Psychosomatics, 78*, 73-80.
- Riley, K. E., Lee, J. S., & Safren, S. A. (2017). The relationship between automatic thoughts and depression in a cognitive-behavioural treatment for people living with HIV/AIDS: Exploring temporality and causality. *Cognitive Therapy and Research, 41*, 712-719.
- Roberts, B. W. (2006). Personality development and organizational behaviour. In Staw, B. M. (Ed.), 1-41, *Research and organizational behavior*. New York, NY: Elsevier Science/JAI Press.
- Roberts, B. W., Luo, J., Briley, D. A., Chow, P. I., Su, R., & Hill, P. L. (2017). A systematic review of personality trait changes through intervention. *Psychological Bulletin, 143*, 117-141.
- Roberts, C., & Stark, P. (2008), Readiness for self-directed change in professional behaviours: factorial validation of the Self-reflection and Insight Scale. *Medical Education, 42*, 1054-1063. doi:10.1111/j.1365-2923.2008.03156.x

- Rudiger, J. A., & Winstead, B. A. (2013). Body talk and body-related co-rumination: Associations with body image, eating attitudes, and psychological adjustment. *Body Image, 10*, 462-471.
- Sandvik, E., Diener, E., & Seidlitz, L. (1993). Subjective well-being: The convergence and stability of self-report and non-self-report measures. *Journal of Personality, 61*, 317-342.
- Singh, M. (2014). Mood, food and obesity. *Frontline Psychology, 5*, 1-49
- Singh, S., Sargisson, R. J., & Starkey, N. J. (2017). Using SmartQuit, an acceptance and commitment therapy smartphone application, to reduce smoking intake. *Digital Health, 3*, 1-9
- Skinner, B. F. (1945). The operational analysis of psychological terms. *Psychological Review, 52*, 270-294.
- Skinner, B. F. (1965). Science and human behaviour. New York: Free Press
- Spasojevic, J., & Alloy, L. B. (2001). Rumination as a common mechanism relating depressive risk factors to depression. *Emotion, 1*, 25-37.
- Sutin, A. R., & Terracciano, A. (2015). Body weight misperceptions in adolescence and incident obesity in young adulthood. *Psychological Science, 26*, 507-511.
- Sutton, A., Williams, H. M., & Allinson, C. W. (2015). A longitudinal, mixed method evaluation of self-awareness training in the workplace. *European Journal of Training and Development, 39*, 610-627
- Sze, K. M., & Wood, J. J. (2007). Cognitive behavioral treatment of comorbid anxiety disorder and social difficulties in children with high-functioning autism: A case report. *Journal of contemporary Psychotherapy, 37*, 133-143.



- Theodorakis, Y., Weinberg, R., Natsis, P., Douma, I., & Kazakas, P. (2000). The effects of motivational and instructional self-talk on improving motor performance. *The Sport Psychologist, 14*, 253-271.
- Tolin, D. F. (2010). Is cognitive-behavioral therapy more effective than other therapies?: A meta-analytic review. *Clinical Psychology Review, 30*, 710-720.
- Tourinho, E. Z. (2006). Private stimuli, covert responses, and private events: conceptual remarks. *The Behavior analyst, 29*, 13-31.
- Twohig, M. P., Hayes, S. C., Plumb, J. C., Pruitt, L. D., Collins, A. B., Hazlett-Stevens, H., & Woidneck, M. R. (2010). A randomized clinical trial of acceptance and commitment therapy vs. progressive relaxation training for obsessive compulsive disorder. *Journal of Consulting and Clinical Psychology, 78*, 705-716.
- Wetherell, J. L., Afari, N., Ayers, C. R., Stoddard, J. A., Ruberg, J., Sorrell, J. T., & Patterson, T. L. (2011). Acceptance and commitment therapy for generalised anxiety disorder in older adults: A preliminary report. *Behavior Therapy, 41*, 127-134.
- Wilson, A. C., Schwannauer, M., McLaughlin, A., Ashworth, F., & Chan, S. W. Y. (2017). Vividness of positive mental imagery predicts positive emotional response to visually presented project soothe pictures. *Brittan Journal of Psychology, 109*, 259-276.

## Appendices

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## Appendix A

### Social media recruitment advertisement



# What if you could reduce your negative self-thought?

Negative self-thought are thoughts or feelings that do not help the situation or make it worse. Thinking negatively can also demotivate an individual within certain contexts, i.e. telling yourself you can't do something, or are not good enough. We all struggle with some form of negative self-thought, some more severely than others.

*Are you looking to understand the way you think?*

*Are you looking to reduce negative self-thought?*

*Do you want to get your thinking under control, and improve your quality of life?*

If you answered yes to any of the previous questions, I am looking for participants to take part in my Master's research. The research will look at the effectiveness of mobile phone applications in changing negative self-thought. This research will take 9-12 weeks to complete. During this time, you will be asked to complete a short questionnaire regularly, two longer questionnaires (once pre-application use, and once after); and to use a phone application. Overall, you will be asked to use the phone application daily for a total of 4 weeks, from Monday-Friday. The application use will take between 10-20 minutes a day.

If you would like to find out more about this exciting research and have an iPhone, please contact me on:

*Mobile- 0278424675*

*or*

*Email- [tjd19@student.waikato.ac.nz](mailto:tjd19@student.waikato.ac.nz)*

*This research project has been approved by the Human Research Ethics Committee (Health) of the University of Waikato. Any questions about the ethical conduct of this research may be addressed to the chairman of the committee ([humanethics@waikato.ac.nz](mailto:humanethics@waikato.ac.nz)). This research is under supervision of Dr. Rebecca Sargisson ([rebecca.sargisson@waikato.ac.nz](mailto:rebecca.sargisson@waikato.ac.nz)), and Professor Maree Roche ([maree.roche@waikato.ac.nz](mailto:maree.roche@waikato.ac.nz))*

## Appendix B

### Participant consent form



#### CONSENT FORM

A completed copy of this form should be retained by both the researcher and the participant.

*Research Project: The effectiveness of a CBT (Cognitive Behaviour Therapy) application, vs an ACT (Acceptance and Commitment Therapy) application; when changing negative self-thought*

| Please complete the following checklist. Tick (✓) the appropriate box for each point.  | YES | NO |
|--|-----|----|
| 1. I have read the Participant Information Sheet (or it has been read to me) and I understand it.  |     |    |
| 2. I have been given sufficient time to consider whether or not to participate in this study   |     |    |
| 3. I am satisfied with the answers I have been given regarding the study and I have a copy of this consent form and information sheet                                    |     |    |
| 4. I understand that taking part in this study is voluntary (my choice) and that I may withdraw from the study at any time without penalty                               |     |    |
| 5. I have the right to decline to participate in any part of the research activity   |     |    |
| 6. I know who to contact if I have any questions about the study in general.   |     |    |
| 7. I understand that the information supplied by me will be published, and could be used in future academic publications.  |     |    |
| 8. I understand that my participation in this study is confidential and that no material, which could identify me personally, will be used in any reports on this study. |     |    |
| 9. I understand that I will receive a summary of the findings at the end of the research project.  |     |    |

#### Declaration by participant:

I agree to participate in this research project and I understand that I may withdraw at any time. If Any questions about the ethical conduct of this research may be addressed to the Secretary of the Committee, email [humanethics@waikato.ac.nz](mailto:humanethics@waikato.ac.nz), postal address, University of Waikato, Te Whare Wananga o Waikato, Private Bag 3105, Hamilton 3240.

Participant's name (Please print): \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

#### Declaration by a member of the research team:

I have given a verbal explanation of the research project to the participant, and have answered the participant's questions about it. I believe that the participant understands the study and has given informed consent to participate.

Researcher's name (Please print): \_\_\_\_\_

Signature: \_\_\_\_\_

Date: \_\_\_\_\_

## Appendix C

**The AAQ-II scale, SRIS scale, and Daily mood rating sent to participants in one document**

The self-reflection and insight scale (SRIS)- Done once at pre-application use, during the 1<sup>st</sup> week (baseline week). Done again once after the application use at the end, during the last week (during extinction)

| Self reflection and insight questionnaire: subjects respond on a likert scale as follows: "Strongly agree, agree, neutral, disagree, strongly disagree" |  |
|---|--|
| 1   | I don't often think about my thoughts <sup>1</sup>   |
| 2   | I am not really interested in analyzing my behaviour <sup>2</sup>                                |
| 3   | I am usually aware of my thoughts <sup>3</sup>   |
| 4   | I am often confused about the way that I really feel about things <sup>3</sup>                   |
| 5   | It is important for me to evaluate the things that I do <sup>2</sup>                             |
| 6   | I usually have a very clear idea about why I have behaved in a certain way <sup>3</sup>          |
| 7   | I am very interested in examining what I think about <sup>2</sup>                                |
| 8   | I rarely spend time in self reflection <sup>1</sup>  |
| 9   | I'm often aware that I am having a feeling, but I often don't quite know what it is <sup>3</sup> |
| 10  | I frequently examine my feelings <sup>1</sup>  |
| 11  | My behaviour often puzzles me <sup>3</sup>   |
| 12  | It is important to me to try to understand what my feelings mean <sup>2</sup>                    |
| 13  | I don't really think about why I behave in the way that I do <sup>1</sup>                        |
| 14  | Thinking about my thoughts make me more confused <sup>3</sup>                                    |
| 15  | I have a definite need to understand the way my mind works <sup>2</sup>                          |
| 16  | I frequently take time to reflect on my thoughts <sup>1</sup>                                    |
| 17  | Often I find it difficult to make sense of the way I feel about things <sup>3</sup>              |
| 18  | It is important to me to be able to understand how my thoughts arise <sup>2</sup>                |
| 19  | I often think about the way I feel about things <sup>1</sup>                                     |
| 20  | I usually know why I feel the way I do <sup>3</sup>  |

The acceptance and action questionnaire (AAQ-II)- Done once at pre-application use, during the 1<sup>st</sup> week (baseline week). Done again once after the application use at the end, during the last week (during extinction)

Below you will find a list of statements. Please rate how true each statement is for you by using the scale below to fill in your choice.

| 1  | 2                | 3           | 4              | 5               | 6                  | 7                    |
|--|------------------|-------------|----------------|-----------------|--------------------|----------------------|
| never true   | very seldom true | seldom true | sometimes true | frequently true | almost always true | always true          |
| 1. My painful experiences and memories make it difficult for me to live a life that I would value. |                  |             |                |                 |                    | <input type="text"/> |
| 2. I'm afraid of my feelings.  |                  |             |                |                 |                    | <input type="text"/> |
| 3. I worry about not being able to control my worries and feelings.                                |                  |             |                |                 |                    | <input type="text"/> |
| 4. My painful memories prevent me from having a fulfilling life.                                   |                  |             |                |                 |                    | <input type="text"/> |
| 5. Emotions cause problems in my life.   |                  |             |                |                 |                    | <input type="text"/> |
| 6. It seems like most people are handling their lives better than I am.                            |                  |             |                |                 |                    | <input type="text"/> |
| 7. Worries get in the way of my success.   |                  |             |                |                 |                    | <input type="text"/> |
| TOTAL  |                  |             |                |                 |                    | <input type="text"/> |

The short 5 question scale- Done once daily during baseline (Mon-Fri), at a similar time each day. When applications are being used, this should be done twice daily (Mon-Fri) (once pre-application use, and once after using the application).

Answer the following questions relating to your thoughts today (i.e. not in the last month, just today), with:

Never, Rarely, Sometimes, Often, or Very often

1. I feel distressed or overwhelmed by my thoughts
2. I am aware of what thoughts are passing through my mind
3. I try to put my problems out of my mind
4. I wish I could control my thoughts more easily
5. There are things I try not to think about

## Appendix D

### Longer information sheet



(Date)

Dear

I, Tamsyn du Toit, am a student from the School of Psychology at the University of Waikato, completing my Master's in Behaviour Analysis. I am hoping to carry out research into the effectiveness of a Cognitive Behaviour Therapy mobile app, compared to an Acceptance and Commitment Therapy app, in changing negative self-thought. Negative self-thought is any thoughts or feelings that do not help the situation/makes it worse; it also can demotivate an individual within certain contexts i.e. telling yourself you can't do something. This research work will be used as part of my Master's Thesis.

#### **What you will be asked to do**

- After you have read this information sheet, if you are still interested in participating or want to ask questions, you can contact me to arrange an initial visit. This initial visit can take place over skype, or in person.
- During the visit, I will discuss a schedule of data collection that suits both you and I.
- The assessment process will involve 9-12 weeks of participation.
- In the first and last week of the assessment (baseline pre- app use, and baseline after app use), I will ask you to complete two larger 20-question, and 7 question scales. Lastly, you will be asked to complete a short 5 question scale once daily (Mon-Fri) during the baseline phase (i.e. the weeks not using the applications).
- Furthermore, during the weeks you are using the app, you will be asked to complete the same short 5 question scale twice daily, once before the app use and again after using the app (again Mon-Fri).
- This is a simple 5-question scale will allow me to monitor your progress both immediately, and over a period.
- I ask that these scores please be sent daily, as I will be able to monitor your progress and make any adjustments necessary.

#### **Confidentiality**

The applications used in this study do not store data. Meaning that the only place data can be found is on your device. The applications are also password protected, and you will be the only one who has access to the information written in the applications. All data collected will remain confidential, and I will not disclose your identity to anyone. All electronic data will be given to my supervisors at the end of my thesis and will be stored on a password-protected University drive for a minimum of 5 years. A copy of the summary of results will be provided to you electronically at the end of the study.

#### **Withdrawal**

It is important that you understand that taking part in this study is voluntary (your choice), and that you may withdraw from the study at any time without penalty. If you do wish to withdraw from the study, you can contact me via email, or phone at any point. If you are not comfortable in contacting me, you are able to contact my supervisors too. The contact details are listed below.

#### **Who to contact**

I will be responsible for ensuring that you remain as informed and involved as you require. If you need to take more time to consider your participation, consent is not required at the initial meeting. A further meeting can be arranged at your convenience.

If you have any comments or concerns, feel free to email me at any time. Thank you for your interest in my study.

Tamsyn du Toit- [tjd19@students.waikato.ac.nz](mailto:tjd19@students.waikato.ac.nz)

Chairperson of the Ethics Committee- [humanethics@waikato.ac.nz](mailto:humanethics@waikato.ac.nz)

Rebecca Sargisson (Supervisor)- [rebecca.sargisson@waikato.ac.nz](mailto:rebecca.sargisson@waikato.ac.nz)

Maree Roche (Second Supervisor)- [maree.roche@waikato.ac.nz](mailto:maree.roche@waikato.ac.nz)

*This research project has been approved by the Human Research Ethics Committee (Health) of the University of Waikato under HREC(Health)#2018-06. Any questions about the ethical conduct of this research may be addressed to the Secretary of the Committee, email [humanethics@waikato.ac.nz](mailto:humanethics@waikato.ac.nz), postal address, University of Waikato, Te Whare Wananga o Waikato, Private Bag 3105, Hamilton 3240.*

Kind regards,  
Tamsyn du Toit



## Appendix E

### **Email instructions for participants sent during baseline week, explaining how to download the ACT Companion™ application**

Other – you will be using the acceptance and commitment therapy app. In this therapy style, you are in courage to act effectively despite the disruption of negative self-thoughts. You will be taught acceptance and mindfulness strategies, as well as commitment and behavioral change strategies to increase psychological flexibility. The application you will be using is the ACT Companion. I have sent this email early so that you can download the application, and have an extra day to get in contact if you have trouble.

Steps to download the application:

1. Open the link: [www.actcompanion.com](http://www.actcompanion.com)
2. Click download on the app store and download. You will not need to pay for this.
3. Follow the download steps in the application. You will be required to set up your account. This is a new user account.
4. Once you have set up the account, go to the menu. The menu will give you the option Subscription, click this.
5. The app will give you a few subscription options, use the bottom one which asks you to enter a code. Enter the code “Tamsynmasters2018”.
6. This code will give you access to an unlimited lifetime subscription.

## Appendix F

### **Email instructions for participants sent during baseline week, explaining how to download the iCBT™ application**

Other – you will be using the cognitive behavioral therapy app (iCBT). In this therapy style, negative thoughts are highlighted and challenged. The aim is to replace negative thoughts patterns with more realistic and positive ones. The application you will be using is iCBT. Unfortunately, this program will not allow us to create key codes for you to type in. Instead each time it is downloaded it needs to be paid for. I will need your bank details so I can transfer the money into your account. This money should be in your account on Monday, so you will not need to purchase it out of your money. If you wish to download the application this weekend, the money will only be in your account on Monday. If you wait until Monday, the money will be in your account and you will still have time to complete Monday's activities. It is important for you to please send me your account details as soon as possible, so I can transfer this money over the weekend. I have sent this email early so I can get your details and transfer the money before Monday.

Steps to download the application:

1. Open the link: [www.bonfireda.com/iCBT.html](http://www.bonfireda.com/iCBT.html)
2. Through this link, the application should only cost \$12.70 New Zealand dollars.
3. Click buy iCBT (the one with the phones, not the iPad)
4. You should be in the app store now
5. Download and pay for the app. I apologise that I wasn't able to create a key code. The alternate application uses a key code, so if you are to change to this one later in the study, you will not need to make any purchases.

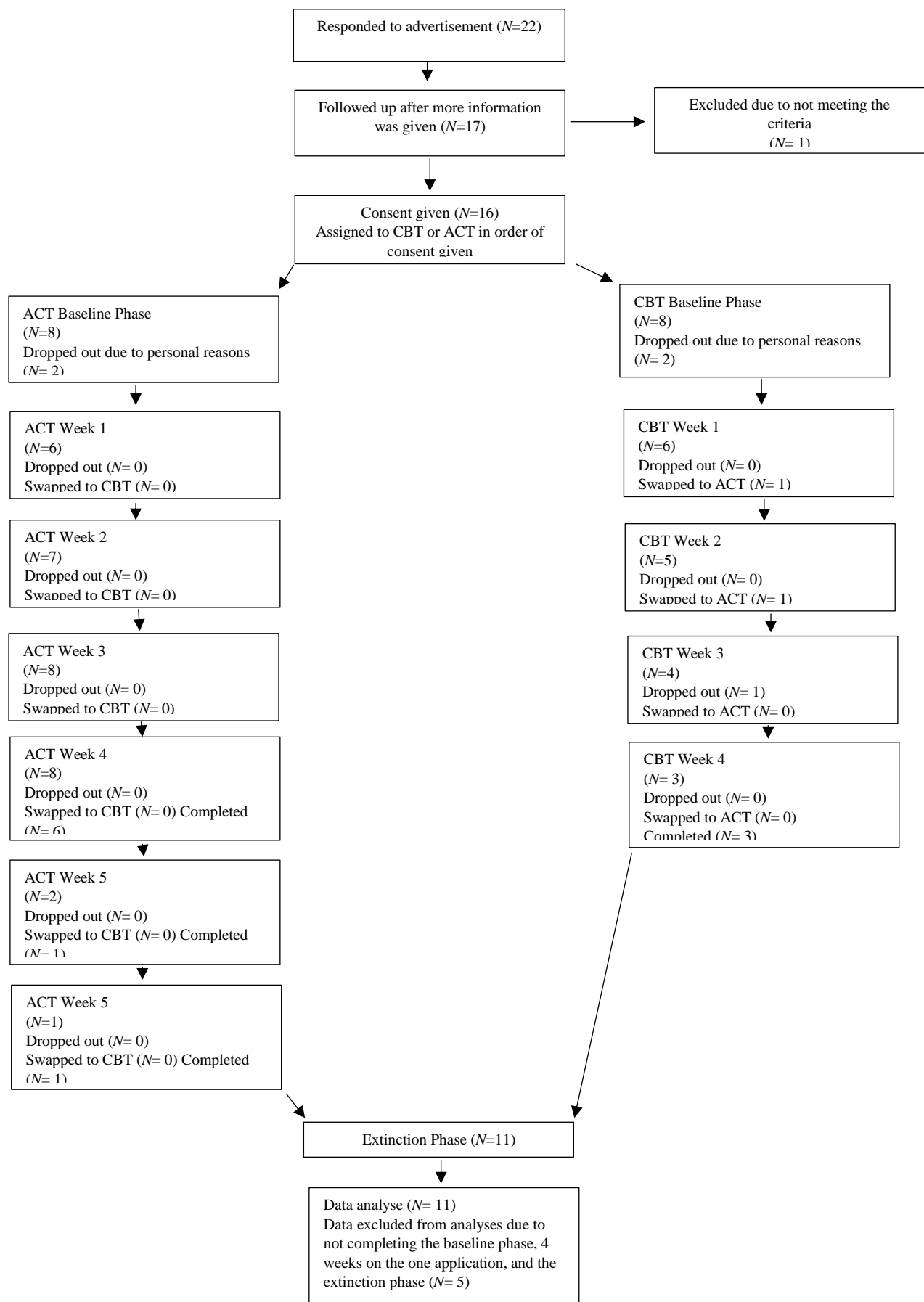
## Appendix G

## Periods of participation for each participant

| Participant                 | 1   | 2   | 4  | 5   | 6   | 7   | 8   | 9   | 10   | 11   | 12   |
|-----------------------------|---|---|--|---|---|---|---|---|--|--|--|
| <b>Wk1<br/>(baseline)</b>   | 23 <sup>rd</sup> -<br>27 <sup>th</sup><br>April | 23 <sup>rd</sup> -<br>27 <sup>th</sup><br>April | 30 <sup>th</sup> -4 <sup>th</sup><br>May       | 23 <sup>rd</sup> -<br>27 <sup>th</sup><br>April                           | 23 <sup>rd</sup> -<br>27 <sup>th</sup><br>April   | 23 <sup>rd</sup> -<br>27 <sup>th</sup><br>April   | 23 <sup>rd</sup> -<br>27 <sup>th</sup><br>April   | 23 <sup>rd</sup> -<br>27 <sup>th</sup><br>April | 7 <sup>th</sup> -11 <sup>th</sup><br>May       | 7 <sup>th</sup> -11 <sup>th</sup><br>May       | 7 <sup>th</sup> -11 <sup>th</sup><br>May       |
| <b>Wk2</b>                  | 30 <sup>th</sup> -4 <sup>th</sup><br>May        | 30 <sup>th</sup> -4 <sup>th</sup><br>May        | 7 <sup>th</sup> -11 <sup>th</sup><br>May       | 1 <sup>st</sup> -4 <sup>th</sup><br>May,<br>7 <sup>th</sup><br>May        | 2 <sup>nd</sup> -4 <sup>th</sup><br>May,<br>7 <sup>th</sup> -8 <sup>th</sup><br>May             | 2 <sup>nd</sup> -4 <sup>th</sup><br>May,<br>7 <sup>th</sup> -8 <sup>th</sup><br>May             | 3 <sup>rd</sup> -4 <sup>th</sup><br>May,<br>7-9 <sup>th</sup><br>May                            | 7 <sup>th</sup> -9 <sup>th</sup><br>May         | 14 <sup>th</sup> -<br>18 <sup>th</sup><br>May  | 14 <sup>th</sup> -<br>18 <sup>th</sup><br>May  | 14 <sup>th</sup> -<br>18 <sup>th</sup><br>May  |
| <b>Wk3</b>                  | 7 <sup>th</sup> -11 <sup>th</sup><br>May        | 7 <sup>th</sup> -11 <sup>th</sup><br>May        | 14 <sup>th</sup> -<br>18 <sup>th</sup><br>May  | 8 <sup>th</sup> -11 <sup>th</sup><br>May,<br>14 <sup>th</sup><br>May      | 9 <sup>th</sup> -11 <sup>th</sup><br>May,<br>14 <sup>th</sup> -<br>15 <sup>th</sup><br>May      | 9 <sup>th</sup> -11 <sup>th</sup><br>May,<br>14 <sup>th</sup> -<br>15 <sup>th</sup><br>May      | 10 <sup>th</sup> -<br>11 <sup>th</sup><br>May,<br>14 <sup>th</sup> -<br>16 <sup>th</sup><br>May | 14 <sup>th</sup> -<br>18 <sup>th</sup><br>May   | 21 <sup>st</sup> -<br>25 <sup>th</sup><br>May  | 21 <sup>st</sup> -<br>25 <sup>th</sup><br>May  | 21 <sup>st</sup> -<br>25 <sup>th</sup><br>May  |
| <b>Wk4</b>                  | 14 <sup>th</sup> -<br>18 <sup>th</sup><br>May   | 14 <sup>th</sup> -<br>18 <sup>th</sup><br>May   | 21 <sup>st</sup> -<br>25 <sup>th</sup><br>May  | 15 <sup>th</sup> -<br>18 <sup>th</sup><br>May,<br>21 <sup>st</sup><br>May | 16 <sup>th</sup> -<br>18 <sup>th</sup><br>May,<br>21 <sup>st</sup> -<br>22 <sup>nd</sup><br>May | 16 <sup>th</sup> -<br>18 <sup>th</sup><br>May,<br>21 <sup>st</sup> -<br>22 <sup>nd</sup><br>May | 17 <sup>th</sup> -<br>18 <sup>th</sup><br>May,<br>21 <sup>st</sup> -<br>23 <sup>rd</sup><br>May | 21 <sup>st</sup> -<br>25 <sup>th</sup><br>May   | 28 <sup>th</sup> -1 <sup>st</sup><br>June      | 28 <sup>th</sup> -1 <sup>st</sup><br>June      | 28 <sup>th</sup> -1 <sup>st</sup><br>June      |
| <b>Wk5</b>                  | 21 <sup>st</sup> -<br>25 <sup>th</sup><br>May   | 21 <sup>st</sup> -<br>25 <sup>th</sup><br>May   | 28 <sup>th</sup> -<br>1 <sup>st</sup><br>June  | 22 <sup>nd</sup> -<br>25 <sup>th</sup><br>May,<br>28 <sup>th</sup><br>May | 23 <sup>rd</sup> -<br>25 <sup>th</sup><br>May,<br>28 <sup>th</sup> -<br>29 <sup>th</sup><br>May | 23 <sup>rd</sup> -<br>25 <sup>th</sup><br>May,<br>28 <sup>th</sup> -<br>29 <sup>th</sup><br>May | 24 <sup>th</sup> -25<br>May,<br>28 <sup>th</sup> -<br>30 <sup>th</sup><br>May                   | 28 <sup>th</sup> -1 <sup>st</sup><br>June       | 4 <sup>th</sup> -8 <sup>th</sup><br>June       | 4 <sup>th</sup> -8 <sup>th</sup><br>June       | 4 <sup>th</sup> -8 <sup>th</sup><br>June       |
| <b>Wk6</b>                  | -   | -   | 4 <sup>th</sup> -8 <sup>th</sup><br>June       | -   | -   | -   | -   | -   | 11 <sup>th</sup> -<br>15 <sup>th</sup><br>June | -  | -  |
| <b>Wk6<br/>(extinction)</b> | 28 <sup>th</sup> -<br>1 <sup>st</sup><br>June   | 28 <sup>th</sup> -<br>1 <sup>st</sup><br>June   | -  | 29 <sup>th</sup> -1 <sup>st</sup><br>June,<br>6 <sup>th</sup><br>June     | 30 <sup>th</sup> -1 <sup>st</sup><br>June,<br>4 <sup>th</sup> -5 <sup>th</sup><br>June          | 30 <sup>th</sup> -1 <sup>st</sup><br>June,<br>4 <sup>th</sup> -5 <sup>th</sup><br>June          | 31 <sup>st</sup> -1 <sup>st</sup><br>June,<br>4 <sup>th</sup> -6 <sup>th</sup><br>June          | 4 <sup>th</sup> -8 <sup>th</sup><br>June        | -  | 11 <sup>th</sup> -<br>15 <sup>th</sup><br>June | 11 <sup>th</sup> -<br>15 <sup>th</sup><br>June |
| <b>Wk7</b>                  | -   | -   | 11 <sup>th</sup> -<br>15 <sup>th</sup><br>June | -   | -   | -   | -   | -   | -  | -  | -  |
| <b>Wk7<br/>(extinction)</b> | -   | -   | -  | -   | -   | -   | -   | -   | 18 <sup>th</sup> -<br>22 <sup>nd</sup><br>June | -  | -  |
| <b>Wk8<br/>(extinction)</b> | -   | -   | 18 <sup>th</sup> -<br>22 <sup>nd</sup><br>June | -   | -   | -   | -   | -   | -  | -  | -  |

## Appendix H

### A flowchart of the participant's activity throughout the study



## Appendix I

### Email instructions for what to do during the baseline week, the treatment week, and the extinction week

#### ***Baseline week:***

Monday the (date)- daily mood rating once  
Tuesday the (date)- daily mood rating once  
Wednesday the (date)- daily mood rating once  
Thursday the (date)- daily mood rating once  
Friday the (date)- daily mood rating once

Other- 2x longer questionnaires once each at any point during the week. Please scan them back to me once completed. Or take a clear picture, please. Also please include the following demographic information: age, gender, ethnicity, currently the country of residence, and relationship status.

#### ***During treatment week(s):***

Monday the (date)- daily mood ratings before application use, 10 to 20 minutes of application use, then the daily mood rating again after application use.  
Tuesday the (date)- daily mood ratings before application use, 10 to 20 minutes of application use, then the daily mood rating again after application use.  
Wednesday the (date)- daily mood ratings before application use, 10 to 20 minutes of application use, then the daily mood rating again after application use.  
Thursday the (date)- daily mood ratings before application use, 10 to 20 minutes of application use, then the daily mood rating again after application use.  
Friday the (date)- daily mood ratings before application use, 10 to 20 minutes of application use, then the daily mood rating again after application use.

#### ***Extinction week:***

Monday the (date)- daily mood rating once  
Tuesday the (date)- daily mood rating once  
Wednesday the (date)- daily mood rating once  
Thursday the (date)- daily mood rating once  
Friday the (date)- daily mood rating once

Other- 2x longer questionnaires once each at any point during the week. Please scan them back to me once completed. Or take a clear picture, please.