THE ROLE OF VALUES & PRACTICAL IDENTITIES

IN MENTAL WELLBEING

by

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Abstract

More than 300 million people in the world suffer from depression. While traditional psychotherapies like cognitive behavioral therapy (CBT) continue to be effective for treating depression, a newer therapy known as acceptance and commitment therapy (ACT) has surfaced in recent decades that employs mindfulness and values-based techniques, *inter alia*, not explicitly targeted in CBT.

Significantly influenced by ACT, this thesis offers a direct, externalized means by which individuals can interact with their value systems. Specifically, I present *Psyche* – a novel computer-based psychological intervention that is designed to help individuals not only better understand what they value but also better align their actions with their values. This thesis posits that such intentionality vis-à-vis our values will improve mental wellbeing.

A two-week randomized controlled trial conducted on 29 participants compared *Psyche* (mind mapping one's value system) to an active control task (journaling). Both groups performed similarly for every therapeutic outcome measure. Given the fact that journaling is widely held to be therapeutically efficacious on its own and that the trial was a short two-week trial, the findings were encouraging. In addition to examining *Psyche* through the lens of therapeutic efficacy, I assess its ability to engage users.

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Chapter 1

Introduction

"Depression is a disorder of mood, so mysteriously painful and elusive in the way it becomes known to the self – to the mediating intellect – as to verge close to being beyond description." – William Styron

"He who has a 'why' to live for can bear almost any 'how.'" – Friedrich Nietzsche

1.1 Motivation

The fact that clinical depression is consuming people close to me was sufficient enough for me to explore the problem of depression and psychological suffering more broadly. I hope that this thesis will make even a small dent in the current mental health crisis.

At some point in one's life, existential questions arise vis-à-vis what it means to live a good life and whether or not one has done so, is doing so, or will do so. Such questions may arise when one experiences a lack of unity between what one is and what one wishes to be, between what one has done and what one wishes to do, between perceptual models of oneself and others, and so on. Simultaneously, some cases of depression appear to spawn from similar instances of disunity of experience; or more precisely, disunity in the conceptual frame put around one's experience. Usually something is out of sync (or at least feels so). With that said, the disunity I am speaking of can be a matter of perspective, and thus plausibly amendable to shifts. Each perspectival spotlight changes

the vector of attention within one's value system[1] and, as such, which facts are relevant, what motives are available, and what feels salient. Furthermore, it is this perspective – the frame of mind – by which each person perceives and makes contact with the world that ultimately determines the quality of his or her life. And it is with this intuition, I explore the problem of depression and general psychological suffering.

Mental disorders are significant global health problems. The World Health Organization (WHO) estimates that over 300 million people worldwide are saddled with depression ("Depression"). From psychotherapies and pharmacological methods to technological interventions and mindfulness meditation, the potential solutions to depression are manifold yet vary wildly in efficacy and depth. While traditional psychotherapies like cognitive behavioral therapy (CBT; Beck et al.) are quite effective for treating unipolar depression and anxiety disorders (Butler et al.), a lesser-known therapy called acceptance and commitment therapy (ACT; Hayes et al., 1999) employs mindfulness and values-based techniques, *inter alia*, not directly targeted in CBT. Additionally, due to growth of web and mobile applications in the digital age, computerized cognitive behavioral therapy (CCBT) interventions and other computer-based psychological interventions have become additional options. But needless to say, this is decidedly non-exhaustive of the collection of digital tools in the space of mental health: the space is vast, including meditation, mindfulness, mood, addiction, anxiety, and talk therapy apps.

Because I find much mirth in philosophy, I personally place great importance on thinking about values and what it means to live well. Coupling this with the fact that ACT is partially premised on values (a relation about which I will elaborate further in Section 2.2.2), I wondered about the potential need for a computer-based version of ACT interventions or at least one based on values. In Section 2.4, I will look at two mobile applications that target values but then go on to explain how they both fail to capture the totality of conceivable ideas relevant to what we valuable.

Moreover, while it is common knowledge that the demand for treatments to depression exceeds the availability, I wanted to verify the need for a values-based intervention. I herein mean "need" in the

[1] Herein, I presuppose that people have value systems, wittingly or not. The perspectives by which we choose to see the world with may be consciously perceived and acted upon in terms of our value systems or unconsciously embodied by one's actions.

scientifically-verifiable sense, not in the design-for-consumer-product sense – viz., I wondered if unifying or aligning one's actions with one's values (i.e. making *ex ante* self-reflective cognitive choices) could improve wellbeing, given the aforementioned intuition (that depression results from a disunity of experience). While ACT explicitly claims this is so, no researchers or practitioners have ever experimentally isolated values from ACT in a randomized control trial, in order to test this specific hypothesis. Thus, I decided to do exactly that, and such is the aim of my thesis.

My initial hypothesis was two-fold as follows:

1. Thinking in terms of values improves wellbeing and decreases depressive symptoms.
2. Aligning one's actions with one's values improves wellbeing and decreases depressive symptoms.

And after further consideration (to be mentioned in Chapter 1.2 and more extensively discussed in Chapter 3), I bifurcated "values" into "values and practical identities," yielding this *final hypothesis:*

1. Thinking in terms of values and practical identities improves wellbeing and decreases depressive symptoms.
2. Aligning one's actions with one's values and practical identities improves wellbeing and decreases depressive symptoms.

Nevertheless, given the scope of my thesis, only the first point in the hypothesis could be tested with my current system, as the extent to which alignment of one's actions and values and its effects on mental wellbeing is unclear from the experimental results. More experimentation is required to test the latter, and I will mention this again in the limitations section of the final chapter (Chapter 6).

The importance of this work is that the clinical literature on values and its effects on mental wellbeing is largely embedded within the context of cognitive therapies, while other discussion on values is reserved to the great works of religion and philosophy. While a truly de-contextualized, theoretical understanding of values has been the purview of academic philosophy, it is unclear whether we can have a better practical (and thus scientifically-grounded) understanding of values. Hopefully, this thesis pushes the envelope with regard to the science on human values.

1.2 A Mind Mapping System for Self-Reflection

Now, I will give a rather loose primer to the system that was developed and experimented with for my thesis. Practically speaking, it is "a mind mapping system for self-reflection," and I will henceforth call it just that.

1.2.1 Straw-Man Proposal

Regarding the form of visual representation, I thought in terms of a mind map from the beginning. Due to its graph-like structure, a mind map seemed apt with respect the presentation of connected (and perhaps) hierarchically-related ideas. I knew that at the top of a value system hierarchy there would be something akin to "living a good life for me." This central node would be followed by a collection of values, which would then be connected to a handful of ways of embodying those values. See Fig. 1.1 below for the straw-man proposal of a plausible value system mind map.

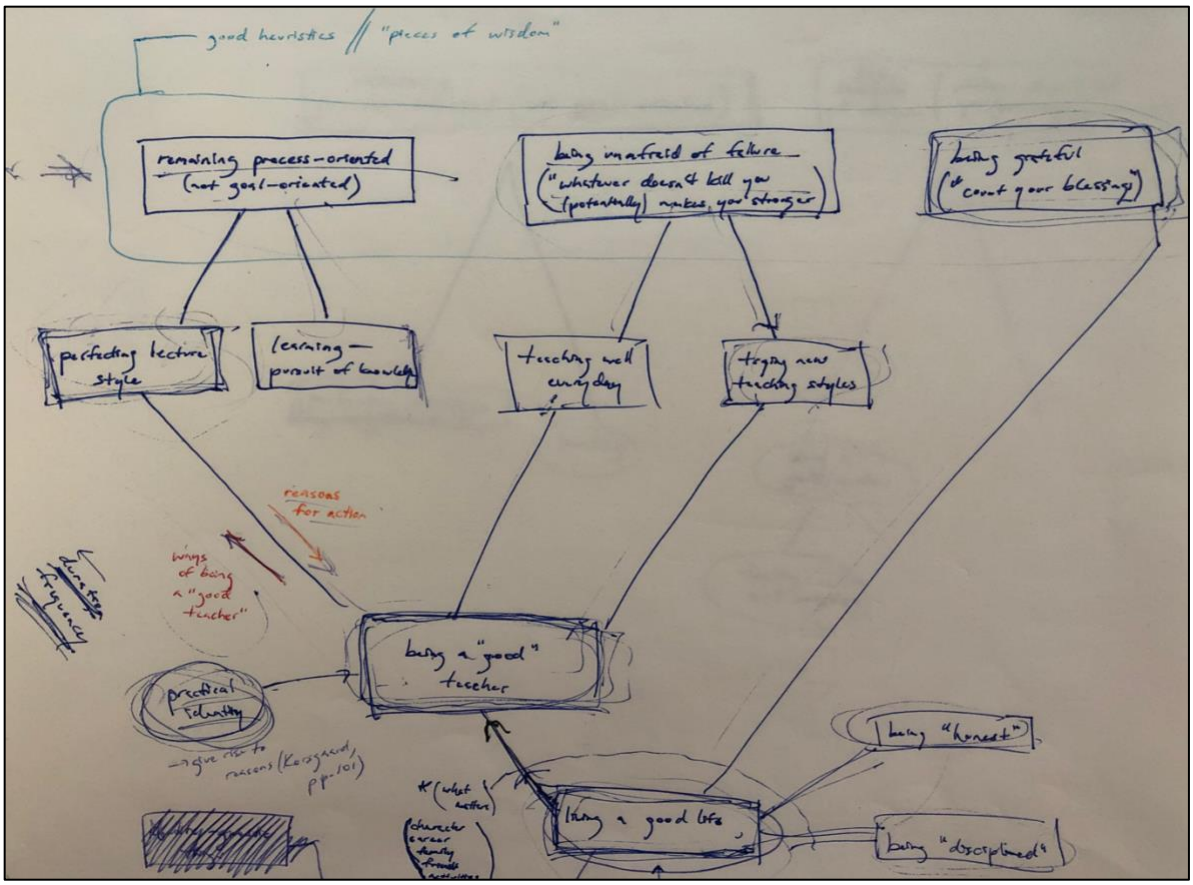

Fig. 1.1. Straw-man proposal of a plausible mind map for a value system.

In the relatively inchoate sketch, I specifically split "values" of one's "value system" into *practical identities*, *values*, and *heuristics*. While I will define and describe the term *practical identity* in Chapter 3, suffice it to say that it is, as it were, a role one has in their life (e.g. mother, father, student, teacher). By *values* in this example, I am including the objects of importance that reflect one's character:[2] the examples used here are being "honest" and being "disciplined." One's character can be described in terms of character traits or *virtues* (e.g. à la Aristotelian virtues[3] such as bravery or temperance, or à la David Brooks' notion of *eulogy virtues*[4] such as humility or honesty). Both the ancient Greek philosopher Aristotle to the modern cultural commentator Brooks believe that these virtues are cultivated, not innate – and the result of taking certain things to be important (i.e. valuing) over longer periods of time. For example, if I value honesty, it could make me an "honest person" according to others, but this would be a long-term, cultivated trait. The distinction between value and virtue is a nuance that I will not speak more about, but I will go into more depth in Chapter 2 on the various notions of value in psychotherapy and philosophy.

Heuristics can be viewed as pieces of wisdom. Although this may be refuted, a few examples of pieces of wisdom include "remaining process-oriented" and "being unafraid of failure." Remaining process-oriented allows an individual to be resilient against the feeling of failure when they do not reach their goals, since they are focused on the *process* of getting better rather than the *results* per se. Perhaps subsumed in this example is that one should be unafraid of failure: because we only learn, grow or get better at anything by trying and failing, without fear. Taken together, these two examples of heuristics may be reminiscent of the difference between a "growth mindset" and a "fixed mindset," as per Carol Dweck's book *Mindset: The New Psychology of Success*.

In the example above, several components of "living a good life" (the parent node) are exemplified

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[2] Needless to say, there could be other objects of importance or things one could value that are not closely tied to one's character (e.g. family, athletic activity, intellectual engagement, etc.), but this is the main sense that is used in this thesis.

[3] Here is more from Aristotle: "Virtue, then, is of two sorts, virtue of thought [e.g., wisdom, comprehension, intelligence] and virtue of character [e.g., generosity, temperance, courage, justice]. Virtue of thought arises and grows mostly from teaching, and hence needs experience and time. Virtue of character [i.e., of ethos] results from habit [ethos]; hence its name 'ethical', slightly varied from 'ethos'. Hence it is also clear that none of the virtues of character arises in us naturally" (1103a14-19).

[4] Eulogy virtues are the "virtues that get talked about at your funeral, the ones that exist at the core of your being — whether you are kind, brave, honest or faithful; what kind of relationships you formed" (Brooks).

by its children in the map: "being a good teacher" (practical identity), "being honest" and "being disciplined" (values), and "being grateful" (heuristic). Each of these may be expanded on in more ideas with more child nodes. In this example, "being a good teacher" has the following children: "perfecting lecture style," "teaching well every day," and "trying new teaching styles." These children nodes are ways of being a "good" teacher, according to the individual who is constructing the mind map. Also, it is worth noting that traversing the graph the other way – from the children of "being a good teacher" to "being a good teacher" give rise to *reasons* for action. The mind map or graph can thus be seen as bi-directional, given the aforementioned relationships. One way: the children of a practical identity describe ways of embodying that identity; another way: the parent of a practical identity's child is a reason for action.

Lastly, the heuristics are free and floating as it were: these heuristics may undergird some or all of the various components of the graph or mind map. For instance, the idea of experimenting or "trying new teaching styles" is bolstered by the outlook that "whatever does not kill you potentially makes you stronger" – viz., the heuristic that one should "be unafraid of failure." This heuristic idea needs to be fleshed out more in order to operationalize it. While the sample mind map provided to the thesis study participants (in the next section, 1.2.2) only included values and practical identities, hopefully this presentation of heuristics hints at some possibilities for extensions of my thesis.

1.2.2 Experimental Version

To test the experimental hypothesis, I selected the mind mapping web application *MindMup* (see Fig. 1.2 below). While I did review a handful of mind mapping tools, suffice it to say that I did not spend a lot of time comparing beyond price and seeming simplicity for the sake of getting the experiment up to speed: this may have been a limitation to the study, which I will again note in the final chapter of this thesis (Chapter 6). Moreover, it should be noted that I chose not to develop my own software due to time constraints, but such is certainly a future option so that the interface is as specific to the use case (self-reflection on values) as beneficial.

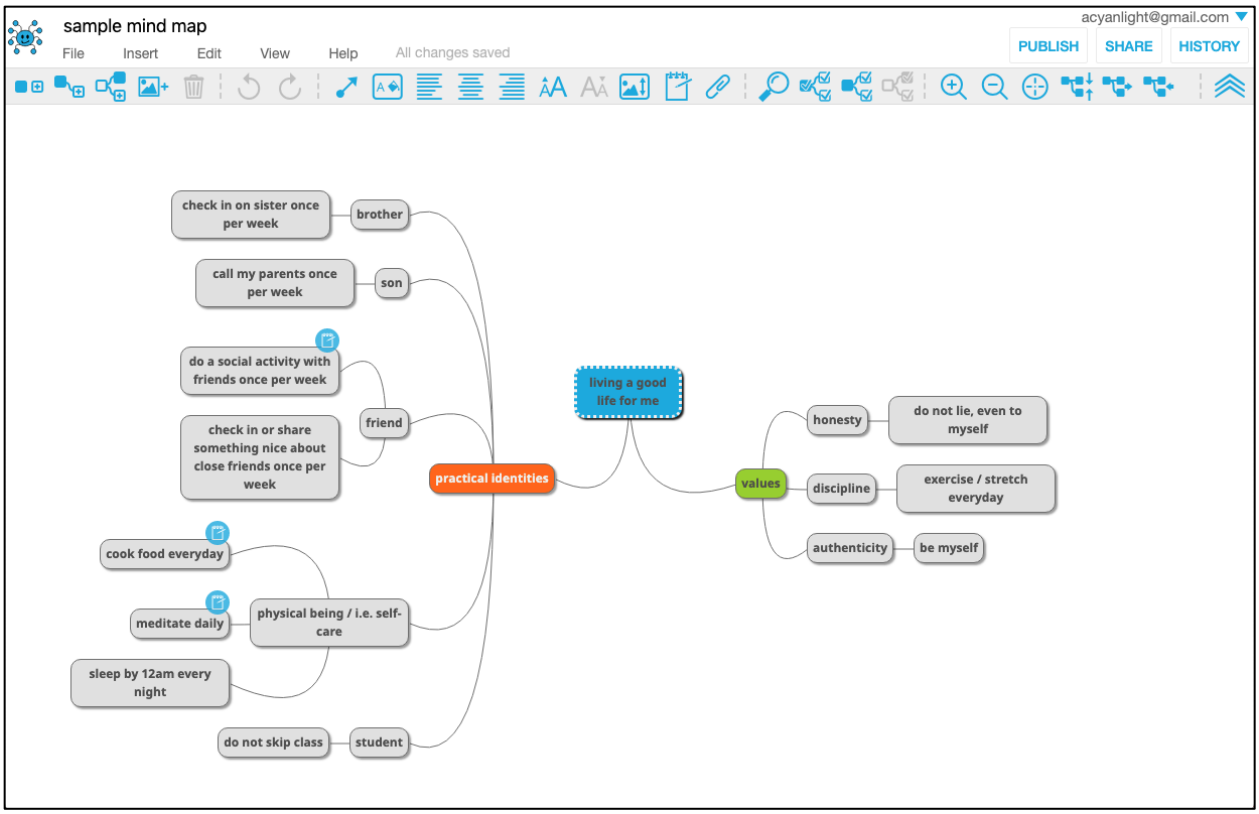


Fig. 1.2. A screenshot of sample *MindMup* mind map shared to study participants.

As can be seen in the screenshot above, only values and practical identities (as aforementioned in end of the last subsection, 1.2.1) were included in the sample mind map provided to participants in the experiment as a starting point. I will present a thorough description of the concepts in this mind map and the *MindMup* software in Chapter 3, but hopefully this overview serves as beneficial visual context for the remainder of the thesis.

1.3 *Psyche*: A Computational Value System

Ultimately, I imagine the system to be a computational value system, and I will henceforth call this vision of the system *Psyche*. Traditionally, notions of computation have been relegated as it were to mathematics, computer science, and other scientific fields; meanwhile, the humanities – and other "matters of the heart" (from literature to philosophy) – are often seen as incomputable, despite the efforts of social sciences and burgeoning fields such as experimental psychology and affective

computing.[5] While addressing the question of the computability of values is beyond the scope of this thesis, I mention it merely to hint at an interesting possibility for research and development.

While I will speak more about future possibilities for the system in the final chapter of this thesis, we can imagine that, with enough individual *Pscyhe* users, there would be pool of value systems that represent what the society at large tends to value and identify with (as well as the various goals or ways of embodying these values and identities). With enough data, the system could use machine learning and various statistical inference techniques to make recommendations at an individual level (and perhaps even population level). This would allow users to learn from others about deeply personal and significant ideas.[6] The conceivable possibilities seem endless, but I digress.

In this work, I am inspired by the inimitable mathematician, computer scientist, and educational theorist Seymour Papert who – while he was talking about the educational value of computers in his book *Mindstorms: Children, Computers, and Powerful Ideas* – wrote:

> This book is about how computers can be carriers of powerful ideas and of the seeds of cultural change, how they can help people form new relationships with knowledge that cut across the traditional lines separating humanities from sciences and knowledge of the self from both of these. (4)

Psyche must absolutely be informed by both the humanities and the sciences. I hope it can similarly be a "seed of cultural change" by starting to provide us a language and form by which to communicate and share our values and other existentially important ideas with each other.

Elsewhere, in a later book published with Idit Harel, Papert also wrote the following:

> Constructionism—the N word as opposed to the V word—shares constructivism's view of learning as "building knowledge structures" through progressive internalization of actions… It then adds the idea that this happens especially felicitously in a context where the learner is

[5] I am not concerned with defending the veracity of this claim, but I merely note it as part of the zeitgeist which characterizes epistemology since the Enlightenment. This postulated dichotomy between the sciences and the humanities is well known – even entire books have been written on it: see Stephen Jay Gould's *The Hedgehog, the Fox & the Magister's Pox: Mending the Gap Between Science & the Humanities*.

[6] Relatedly, the question of anonymity is an open one, and its risks and benefits should be properly assessed. I believe anonymity would probably be better for many of the same reasons that social networks are considered harmful or maladaptive, with the main one being the superficiality of optimizing our lives for prosocial reasons.

> consciously engaged in constructing a public entity, whether it's a sand castle on the beach or a theory of the universe. (Papert and Harel 1)

The distinction made above is that Jean Piaget's *constructivist* theory of learning emphasized the way in which children integrate and internalize knowledge via actions they make in the world, while Papert's *constructionist* theory emphasized the benefits of externalizing such processes (i.e. building something out in the world as a method of learning).[7] In a sense, *Psyche* has the potential to be such an "externalized" model for self-knowledge, or a publicly shared[8] "object-to-think-with" about profoundly important ideas – such as values and other things we take to be important in our lives. If shared, our own *Psyches* will not only augment our own minds (which often computes some action based on some inexplicit value system held inside itself) but also the minds of others, with the ultimate end of improving the psychological landscape of society.

1.4 Thesis Outline

- The next chapter (Chapter 2) reviews the background literature that informed the conceptualization and design of the thesis experiment. Clinical psychology studies and philosophical literature are integrated, along with a brief review of a few relevant computer-based psychological interventions.

- Chapter 3 describes the final sample mind mapping system for self-reflection that was provided to participants in the experiment as a starting point.

- Chapters 4-5 evaluate the mind mapping system for self-reflection from two different perspectives. A randomized controlled trial is used to assess (a) the therapeutic efficacy of the system (in Chapter 4) and (b) its ability to engage users (in Chapter 5).

[7] Papert developed his theory after studying with Piaget at the Center for Genetic Epistemology from 1958 to 1963 in Geneva, Switzerland ("Logo and Learning").

[8] As mentioned in an earlier footnote in this section, the risks and benefits of anonymity on *Psyche* needs to be fully assessed. More specifically, *Psyche* may be either completely private, public but anonymous, or public but not anonymous; however, a proper risk-benefit analysis is beyond the scope of this thesis.

- The final chapter (Chapter 6) offers a conclusion for the thesis. While limitations to the experiment and current system are acknowledged, it shines a light on two possible extensions of this work into the future: additional experimentation and consumer product development.

1.5 Summary of Findings

A randomized controlled trial was conducted on 29 participants over two weeks in order to examine whether mind mapping one's value system (on a prototype of the *Psyche* system via the mind mapping software *MindMup*) conferred any psychological benefits, when compared to an active control task. The active control task in the experiment was journaling (i.e. expressive writing), an intervention that has been shown to have its own positive psychological outcomes (Baikie & Wilhelm). In comparison, *Psyche* (or *MindMup*, as called in this experiment) – namely, mind mapping values and practical identities – conferred greater or equal benefits for every therapeutic outcome measure, despite not reaching statistical significance.

In addition to examining through the lens of therapeutic efficacy, both interventions were assessed with respect to various self-reported measures of engagement. There was too much variance, however, between the two experimental interventions to make between-groups comparisons. Nevertheless, both interventions had above-average usability scores.

Despite the non-statistically-significant quantitative results with regards to therapeutic efficacy, the qualitative feedback from study participants was very encouraging. 5 out of the 15 participants (33%) in the *MindMup* group stated that the fact that there was an artifact of their values to look back on was very useful. One participant even stated, it was like "having the constant thought in the back of their head." This was the key point of inquiry: would an artifact or "externalization" of an individual's value system be beneficial (perceptually or therapeutically)?

1.6 Summary of Contributions

The contributions of this thesis cover various disciplines, including clinical psychology, experimental psychology, and practical philosophy. Here are the main contributions:

- I present a novel system for guided self-reflection on one's values and practical identities.

- I evaluate the therapeutic efficacy of this system in a randomized controlled trial with 29 participants. I find *Pscyhe* (guided self-reflection through mind mapping values and practical identities on the software *MindMup*) conferred greater or equal benefits for every therapeutic outcome measure compared to an active control intervention, despite not reaching statistical significance.

- I evaluate the ability for both interventions to engage users through the use of self-report behavioral and usability measures. While I do not conduct a between-groups comparison, independent analyses of the two interventions provide considerations from which to design future interventions.

- Immediate contributions notwithstanding, this work serves as a model for future scientific studies on the effectiveness of values-based self-reflection, which may vary the form of representation, frequency of user interaction, and so on.

Chapter 2

Background & Related Work

This chapter contains a review of the psychological foundations that motivate the thesis. In particular, I will describe the problem of depression and other forms of psychological suffering, from sentiments to statistics. Then, while I will disregard pharmacological solutions to the problem, I will look at some clinical solutions in the form of the two prominent clinical therapies for depression. I will mainly focus on acceptance and commitment therapy (ACT), describing its theoretical and philosophical basis and outlining the framework and its efficacy. Following this, I will provide an analysis of *values* not only as it is construed in the ACT framework but also more broadly in the philosophical literature. Lastly, I will provide a brief overview of a few relevant computer-based psychological interventions, focusing mainly on those that have some conception of values.

2.1 Depression & Psychological Suffering

In his 1990 memoir *Darkness Visible: A Memoir of Madness*, the American novelist William Styron wrote the following two poignant quotes to express what it felt like to be in a state of severe depression:

1. *On the mental character of depression:* "In depression this faith in deliverance, in ultimate

restoration, is absent. The pain is unrelenting, and what makes the condition intolerable is the foreknowledge that no remedy will come—not in a day, an hour, a month, or a minute. If there is mild relief, one knows that it is only temporary; more pain will follow. It is hopelessness even more than pain that crushes the soul" (Styron 62).

2. *On the physical character of depression*: "The madness of depression is, generally speaking, the antithesis of violence. It is a storm indeed, but a storm of murk. Soon evident are the slowed-down responses, near paralysis, psychic energy throttled back close to zero. Ultimately, the body is affected and feels sapped, drained" (Styron 46).

Composed together, depression is a state which often consists in feelings of hopelessness, murkiness, and torpor.

While the above expresses the sentiment of depression, let us take a look at some statistics about depression and mental illnesses more broadly. As stated in the introductory chapter, 300 million people worldwide suffer from depression, according to the World Health Organization (WHO) ("Depression"). According to the National Institute of Mental Health (NIMH), a branch of the National Institutes of Health, there are 11.2 million adults 18 or older in the United States with a *serious mental illness*[9] ("Mental Illness"). Nearly 30 percent of the adult population in the United States will suffer from a known psychiatric disorder in their lifetime (Kessler et al.). More sobering still, according to WHO data, 800,000 people worldwide every year commit suicide: this is one person every 40 seconds ("Suicide Data"). In the United States specifically, suicide has been on a steady rise in the last decade (see Fig. 2.1 below).

[9] NIMH defines *serious mental illness* (SMI) as "a mental, behavioral, or emotional disorder resulting in serious functional impairment, which substantially interferes with or limits one or more major life activities" ("Mental Illness").

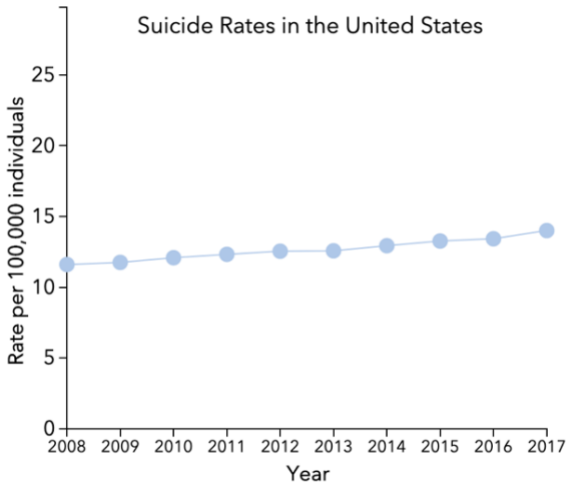


Fig. 2.1. Graph depicting rise in suicide rates in the US from 2008 to 2017 from: "Suicide Statistics." *AFSP*, afsp.org/about-suicide/suicide-statistics. Accessed 19 Apr. 2019.

Here is Styron again, but this time regarding suicide, the grimmest consequence of depression and other forms of psychological suffering:

> The pain of severe depression is quite unimaginable to those who have not suffered it, and it kills in many instances because its anguish can no longer be borne. *The prevention of many suicides will continue to be hindered until there is a general awareness of the nature of this pain.* Through the healing process of time—and through medical intervention or hospitalization in many cases—most people survive depression, which may be its only blessing; but to the tragic legion who are compelled to destroy themselves there should be no more reproof attached than to the victims of terminal cancer. (Styron *Vanities*; emphasis added)

As well as comparing suicide victims with victims of terminal cancer, Styron wanted to draw attention to the lack of attention to depression and psychological suffering in the late 20th century.

In addition to what are classified as "clinical disorders," there are also the countless forms of psychological suffering which every human being undergoes to some degree: feelings of loneliness, apathy, ennui, meaninglessness (i.e. existential angst), low self-esteem, and other forms of pain due to discrimination, racism, bullying, sexism, divorce, domestic violence, and so on (Harris, "Embracing Your Demons" 4). It can be said that we are enmeshed in a constant struggle with mental or spiritual pain, and this is a brutal yet inevitable fact of life. With a profound understanding of this fact, the psychologist Viktor Frankl wrote in his 1946 book *Man's Search for Meaning*:

> If there is a meaning in life at all, then there must be a meaning in suffering. Suffering is an eradicable part of life, even as fate and death. Without suffering and death, human life cannot be complete. The way in which a man accepts his fate and all the suffering it entails, the way in which he takes up his cross, gives him ample opportunity - even under the most difficult circumstances - to add a deeper meaning to his life. (88)

We must find **meaning** in the struggle.
We must discover **beauty** in the struggle.
We must try to be – as we imagine Sisyphus to be – **happy** in the struggle (Camus 24).

2.2 Psychotherapeutic Foundations

2.2.1 Philosophical Antecedents

Depression has more serious and prolonged symptoms (e.g. hopelessness, despair, and physical exhaustion, as aforementioned) than general psychological stress, which is a perennial feature of human life. While stress in particular is necessary for survival[10] and perhaps as a motivating force in life, some people experience it in *chronic* forms. In such cases, one's regrets about the past, fears about the future, and other negatively stressful thoughts compose a state of constant anxiety. This kind of chronic stress over long periods of time can result in multiple emotional disorders, maladaptive coping behaviors such as addiction, and even cardiovascular disease (Sapolsky).

To combat all these forms of psychological suffering (e.g. stress, anxiety, depression), many cognitive therapies and management techniques have been developed. These therapies and techniques can be bifurcated into two distinct philosophical traditions: Western and Eastern.

The most influential therapy under the Western tradition is Cognitive Behavioral Therapy (CBT), wherein clients are taught to challenge and reframe negative thoughts about a particular situation in

[10] It is well known that our stress response has perhaps evolved such that our bodies can maintain homeostasis in emergency, "fight or flight" situations. This is also empirically supported: according to neuroscientific research, the main bodily systems that respond to stress are the autonomic nervous system and hypothalamic-pituitary-adrenal (HPA) axis (Ulrich-Lai and Herman).

order to change their emotional experiences and relation to their behaviors. The belief that undergirds CBT is that *what* we think about – our thoughts, beliefs, and attitudes – ultimately shapes our emotional reactions (Craske). William Shakespeare famously captured this sentiment in *Hamlet* when he wrote, "for there is nothing good or bad but thinking makes it so" (Shakespeare 2.2). David Foster Wallace captured it further in the commencement speech he gave to the graduating class of 2005 of Kenyon College: "'Learning how to think' really means learning how to exercise some control over how and what you think. It means being conscious and aware enough to choose what you pay attention to and to choose how you construct meaning from experience. Because if you cannot or will not exercise this kind of choice in adult life, you will be totally hosed" (Wallace).

On the other hand, modern mindfulness-based techniques and Acceptance and Commitment Therapy (ACT)[11] are adaptations of Eastern philosophies. In such techniques and in ACT, one is recommended to accept thoughts as they come and go, while recognizing that thoughts are just thoughts – without being taken over by the common cognitive process of *reification*[12] (Harris, *ACT Made Simple* 8). On this view, accepting one's thoughts and negative emotions with *mindfulness*[13] allows them to pass away faster, while trying to suppress or control them cause them to exacerbate and prolong. The empirical evidence for this lies mainly in studies that show that efforts to suppress undesired thoughts tend to make them more difficult to placate (Wegner et al.). As Henry Miller wrote in consideration of the wisdom of our hearts, "By acceptance of all aspects of life, good and bad, right and wrong, the defensive life, which is what most people are cursed with, is converted into a dance, 'the dance of life.'"

In the next section, I will dive deeper into ACT because some of its key ideas will form the basis for my thesis technology. Thus, I will henceforth not address traditional CBT much, with the

[11] ACT is pronounced aa the word "act" and not as the initials A-C-T, and for good reason: ACT is about "values-guided action, according to ACT practitioner Russell Harris (*Act Made Simple* 2).

[12] In ACT, reification – the process of making our thoughts, memories, and emotions real – is combatted with the one of its six core therapeutic processes for achieving *psychological flexibility* (i.e. ACT's theorized process of change) (Harris, *ACT Made Simple* 11): *cognitive defusion*. Cognitive defusion is the process by which clients learn methods to reduce the propensity to become entangled in and reify their thoughts, memories, and emotions. I will describe it more later in Section 2.2.2.3 in which survey the key processes of ACT.

[13] Mindfulness is a process of awareness or paying attention (not a thinking one) which involves an attitude of "openness and curiosity" (Harris, *ACT Made Simple* 8).

recognition that the value-oriented behavior espoused in ACT is often achieved with CBT techniques and that the two therapies are decidedly not mutually exclusive.

2.2.2 Acceptance & Commitment Therapy (ACT)

While traditional CBT is quite effective for treating depression and anxiety (Butler et al.), ACT is an alternative empirically-based psychological intervention that has had comparable effects according to a 2017 review by Michael P. Twohig and Michael E. Levin. According to their review of 36 randomized controlled trials (RCTs) evaluating the efficacy of ACT for depression and anxiety disorders, there is evidence that ACT has similar effects relative to CBT (Twohig and Levin 751).

2.2.2.1 Objective

Steven C. Hayes, the clinical psychologist who developed ACT in 1982, stipulates that the objective of ACT is precisely not to eliminate feelings or thoughts that cause mental suffering or anxiety: instead, it is to be present and open to what occurs to us in our lives and to "move toward valued behavior," towards what matters (e.g. values or meaning) (*Acceptance and Commitment Therapy* 240). According to Dr. Russell Harris, a well-known practitioner of ACT, the therapy can be seen in "contrast to the assumption of 'healthy normality'[14] of Western psychology [because it] assumes that the psychological processes of a normal human mind are often destructive and create psychological suffering" ("Embracing Your Demons" 2). Ultimately, the reduction of depressive symptoms – the main aim of CBT and most Western psychological interventions – is merely a "byproduct" within the ACT framework. ACT's fundamental goal is helping to create a meaningful life while simultaneously facilitating the acceptance of the inherent suffering in life.

2.2.2.2 Theoretical and Philosophical Basis

Contrary to the assumption of "healthy normality" of Western psychology, ACT assumes that the normal human mind can be potentially self-destructive, and that the source of its self-destructive

[14] Here is more from Harris on healthy normality: "Western psychology is founded on the assumption of healthy normality: that by their nature, humans are psychologically healthy, and given a healthy environment, lifestyle, and social context (with opportunities for 'self-actualisation'), humans will naturally be happy and content. From this perspective, psychological suffering is seen as abnormal; a disease or syndrome driven by unusual pathological processes" ("Embracing Your Demons" 3).

tendencies is our linguistic capacity.[15] ACT rests on a behavioral model of language and cognition known as *relational frame theory* (RFT).

An in-depth analysis of how ACT rests on RFT is beyond the scope of this thesis. Briefly, however, the basic idea is that one specific type of behavior, *arbitrarily applicable relational responding* (AARR), is the source of much suffering. RFT posits that AARR is a verbal process because it is "under the control of contextual features beyond the formal properties of the related stimuli or events" (Barnes-Holmes et al. 3). For instance, we can create linguistic relations between words and stimuli without even having direct experience or a "direct history" of the stimuli: for example, such relations could be arbitrarily constructed via social convention or social whim (e.g. I use the word "pig" to describe a pig, but I have no idea why it is called a pig; moreover, the French use the word "porc" to describe the same thing). Furthermore, the relation between the word ("pig" or "porc") and the thing-itself (pig) has nothing to do with the physical properties of the animal. Here is another example of creating linguistic relations without what can be inferred from physical properties [such as shape, size, quantity] of the stimuli: "I drink too much, people who drink too much are addicts, addicts are bad people, bad people should be avoided, I should stay away from people I love" (Twohig and Levin 753).

Moreover, there is a way in which such AARR changes the function of the stimuli; here is Twohig and Levin again:

> For example, previously neutral stimuli (eg, driving in a car) could be transformed into aversive stimuli to be avoided due to participation in relational frames, even when there is no direct learning history (eg, I could lose control if I have a panic attack, what if I had a panic attack in a car while driving, I have to avoid driving or else I'll crash and die). Thus, how individuals relate experiences can alter the function of these experiences; in lay words *how we think about things alters what these things mean.* (753; emphasis added)

Such relational responding can cultivate "a tendency for experiential avoidance" and "rigid patterns of behavior under the control of cognitions that are insensitive to current context," which together create a process known as "psychological inflexibility." In instances of psychological inflexibility,

[15] This linguistic capacity (i.e. the human capacity for language) that will be assessed in this thesis is the *private* use of language, which includes "thinking, imagining, daydreaming, planning, visualizing, analyzing, worrying, fantasizing, and so on. (A commonly used term for the private use of language is *cognition*.) (Harris *ACT Made Simple* 6).

"behavior is excessively guided/dominated by internal experiences at the expense of what would be more effective or valued" (Twohig and Levin 753). This psychological inflexibility is manifest by the way in which we can be entangled with our thoughts or be "in our own heads," creating a matrix of stories (about the past and future) and reasons that create and maintain psychological suffering.

In summary, according to ACT, the maladaptive functions of our linguistic capacity – namely, AARR – may give rise to psychological inflexibility, which theoretically is the key symptom of psychological suffering. From this theoretical ground, ACT's six core therapeutic processes are employed to develop psychological flexibility in its clients, which I will enumerate and describe in the next section.

Before that, it is important to know that ACT is situated within a pragmatic philosophy known as *functional contextualism*, in which the basic unit of analysis is the "ongoing act in context" (Hayes, "ACT, RFT, and the Third Wave" 645). ACT is specifically concerned with "the function of events, not their decontextualized form or frequency. The key question is thus "what is this in service of" not "is this true or false" (Hayes, "ACT, RFT, and the Third Wave" 652). Truth in ACT is defined and measured in terms of what "works" where working means the degree of congruency between an individual's actions[16] and values; and these values are defined *a priori* and cultivated over time by each individual's therapeutic development strategy (Hayes *Varieties*). To reiterate the key point, it can thus be said that the criterion for success in ACT is good functioning, defined as congruence between one's actions and values. And finally, the stance from which to assess the degree of this congruence is the reflective self (i.e. the *observing self* in ACT terminology) that is distinct from one's thoughts, feelings, sensations, and memories. I will describe this more thoroughly in the following section.

2.2.2.3 Six Core Therapeutic Processes

As aforementioned, ACT commonly engages six core therapeutic processes of change to help clients develop psychological flexibility. These processes can be bifurcated into two sets: acceptance and mindfulness processes and behavior change processes. The former set includes acceptance, defusion, being present, and self-as-context (or the observing self). The latter set includes values and committed action (Twohig and Levin 754).

[16] Because ACT is ultimately about action, it is behavior analytic in practice.

Acceptance is the process of allowing ourselves to experience thoughts, feelings, emotions, and memories as things which arise and pass away – without struggling against them. *Defusion* is the process of reducing the tendency to reify these thoughts, feelings, emotions, and memories. The third process in the set of acceptance and mindfulness processes is *being present*: this means paying attention to the here-and-now and being interested and receptive to the present moment, as opposed to being discursively taken into our past or future by thoughts (Harris, *ACT Made Simple* 9). The last process in the set is *self-as-context* or the observing self,[17] which is the process of experiencing ourselves as an inseparable part of the world that we are purely aware of or witnessing. As opposed to the *thinking self* in our mind which is constantly "generating thoughts, beliefs, memories, judgments, fantasies, plans, and so on," this process engages our *observing self* – that self in our mind that is "aware of whatever we're thinking feeling, sensing, or doing in any moment." Some call the experience of the observing self as "pure awareness" or the phenomenological experience of *consciousness*. The observing self is that seemingly unchanging consciousness – or the "you" that persists despite the fact that your body, thoughts, feelings, and roles in life change across time. (Harris, *ACT Made Simple* 10-11).

The second set of processes concern behavior change. In ACT, *values* represent the life domains that are important and therefore action-motivating for each individual (Twohig and Levin 755). While clarifying values is essential to providing direction,[18] enduring *committed action* (the sixth and final process) that is values-congruent is what ultimately makes a rich and meaningful life. In this part of the ACT model, any traditional behavioral interventions like exposure or goal setting can be used to help the client achieve this values-congruency of action (Harris, *ACT Made Simple* 11).

Now I will hone in on ACT's approach to values: the reason for this is precisely because ACT's conception of values and methodology of interacting with values was very helpful in formulating the experiment I conducted.

[17] As Harris mentions, the term "observing self" is used with clients, as opposed to the more technical term "self-as-context" (*ACT Made Simple* 11).

[18] In fact, values are often referred to as "chosen life directions" (Harris, *ACT Made Simple* 11).

2.2.2.4 Values in ACT

According to the book *Mindfulness for Two: An Acceptance and Commitment Therapy Approach to Mindfulness in Psychotherapy* by Kelly G. Wilson and Troy DuFrene (two prominent ACT practitioners), values in ACT are defined as "freely chosen, verbally constructed consequences of ongoing, dynamic, evolving patterns of activity, which establish predominant reinforcers for that activity that are intrinsic in engagement in the valued behavioral pattern itself" (Wilson and DuFrene 66). This goes beyond the original definition found in the primary text on ACT by Hayes et al. published in 1999 wherein values are defined as "verbally construed global desired life consequences" (*Experiential Approach* 206). According to Wilson and DuFrene, values are "constructed" as opposed to "construed," and such a characterization aptly emphasizes the active role for engaging with values in ACT. Values are "defined, elaborated, and constructed in an ongoing way by the client," not out in the world to be discovered. They are different from goals in that they are "more like directions in which one travels than like destinations at which one arrives" (Wilson et al. 252).

Valued Living Questionnaire

In the above-referenced 2010 paper, Wilson et al. present their system for the assessment of valued living across ten life domains, via their Valued Living Questionnaire (VLQ). It was derived from the primary text of ACT, *Acceptance and Commitment Therapy: An Experiential Approach to Behavior Change* by Hayes et al. The ten life domains are family, intimate relationships, parenting, friendship, work, education, recreation, spirituality, citizenship, and physical self-care.[19] The VLQ can be found in Appendix B as Fig. B.1 and Fig. B.2, where the former attempts to quantify "values importance" (i.e. the process of values in ACT) and the latter "values action" (i.e. the process of committed action in ACT, or how consistent one was with his or her values).

In the same paper, Wilson et al. assess its fitness for clinical use through their evaluations of reliability (internal consistency and test-retest reliability) and its validity. Internal consistency was not judged to be particularly relevant between the life domains since the life domains are relatively independent (Wilson et al. 264). Temporal consistency (i.e. test-retest reliability), however, was found to be present for the valued living composite (the product of "values importance" and "values

[19] These life domains were chosen based because they were "the most frequently reported valued domains of living in the clinical experience of the authors and consulted clinicians" (Wilson et al. 261).

action" scores) due to the brief interval[20] (i.e. one to two weeks) between administrations. More specifically, temporal consistency was observed for both "values importance" and "values action" individually, with higher levels of consistency observed for "values importance" (Wilson et al. 258). This was expected, according to existing claims that one of the purported benefits of using values to guide action is the relative stability of that which is valued across time (Hayes et al., *An Experiential Approach*; Wilson and Murrell). Lastly, Wilson et al. admit that their study does not establish validity but they hope that their initial attempt generates more interest in values and a theoretical understanding of it as well as a development of better instrumentation (265).

Now I will note briefly about how ACT practitioners help clients to engage with their values, as this informed how I had the study participants engage with their values.

Values in Practice

Here is how Hayes et al. describe what may be done in practice to engage with values:

> Various evocative exercises are used to develop more clarity about fundamental values. For example, the ACT therapist may ask the client to write out what he or she would most like to see on his or her tombstone, or the eulogy[21] he or she would want to hear at his or her own funeral. In essence, this focuses verbal processes away from literal truth toward psychological meaning and motivation. When values are clarified, achievable goals that embody those values, concrete actions that would produce those goals, and specific barriers to performing these actions are identified. ("ACT, RFT, and the Third Wave" 656)

Bramwell and Richardson (2017)

In 2017, Kate Bramwell and Thomas Richardson conducted a study that assessed the relationships of "values importance" and "values action" components of the VLQ with general mental health symptoms and depression symptoms.[22] Conducted on 33 clients who were currently undergoing

[20] VLQ specifically asks individuals to evaluate the value-consistency of their actions "during the past week" and thus is relatively brief.

[21] The definition of "values" in the example above is reminiscent of what is valued on David Brooks' notion of eulogy virtues, as described earlier in Chapter 1.2 of this thesis.

[22] While they also assessed the relationship between levels of fusion with thoughts and both wellbeing measures and found that decreases in levels of fusion increased wellbeing scores, I will not speak to this finding.

ACT in the South of England, the study was administered naturalistically by evaluating "existing data collected as part of routine service evaluation of existing clinical practice" (10).

General mental health symptoms and levels of distress over the last week were measured using the 34-item Clinical Outcomes in Routine Evaluation (CORE-OM) questionnaire (see Fig. B.3 and Fig. B.4), which is presented as reliable and valid according to Evans et al. (2000). Levels of depression symptoms over the last two weeks were measured by the Patient Health Questionnaire (PHQ-9) (see Fig. B.5), which is presented as reliable and valid according to Kroenke et al. (2001). In addition to these two wellbeing measures, the VLQ – as aforementioned – measures how important particular values were to people ("values importance") and the extent to which people were living in line with these values ("values action").

The researchers found significant negative correlations for both total PHQ-9 change scores and CORE-OM change scores when compared to VLQ "values action" change scores. Specifically, there was a correlative relationship between reductions in levels of distress and increases in values action. While an obvious limitation is that only correlation was proved and not causation, the results are nonetheless interesting. Moreover, the findings were consistent with those of a 2008 study which found that increases in values-based action levels were significantly correlated to lower levels of depression and distress in a population with chronic pain (Vowles and McCracken 397).

It should also be noted that no significant correlations were found with "values importance" component of the VLQ and the wellbeing measures. Bramwell and Richardson note that recent research from 2017 supports this result: namely, the process of "values importance" is initiated at the beginning of ACT before focusing on "values action" (Gloster et al.) and thus more time is perhaps spent on the latter (13).

Conclusion

In summary, the reason for focusing on values in ACT is the fact that "a key feature of the ACT-RFT approach to values that distinguishes it from many alternative approaches to values in the CBT tradition is an explicit focus on a bottom-up theoretical conception of this phenomenon that facilitates measurement and manipulation of contextual variables relevant to producing values-

consistent patterns of action" (Plumb et al. 89). There is a practical element in that values and value-based living are explicit theoretical elements and purportedly beneficial for mental wellbeing.

Now I will look to the discipline of philosophy for additional ideas concerning the construal of values in my thesis experiment.

2.3 Values in Philosophical Literature

While an adequate summary of all the conceptions of values in philosophy is well beyond the scope of this thesis, I will focus here on those that I found convincing and useful.

2.3.1 On What We Care About

While I am specifically concerned with mental wellbeing (and its adversaries like anxiety and depression), my thesis is an exploration into how focusing on particular components of our lives (whether physical, mental, or spiritual) may enhance or diminish the quality of our lives, and how we tend to *identify* ourselves with those components we take to be important, or care about. In a broad sense, what we care about is what I mean by *value* in this thesis. In the paper "The Importance of What We Care About," the American philosopher Harry Frankfurt discusses these ideas.

Like Frankfurt, I am interested in the task which concerns each us most from the first-person point of view: realizing, acquiring, achieving, or becoming what is *important to us* and the process of understanding what is important to us (257). The things that matter to us or we take to be important are the foundation for what we think we need to live well (granted we may be mistaken), and the "evaluative and justificatory" medium by which we assess how our lives are going is usually our mind[23] – through its affective, cognitive, or volitional states. What is crucial in Frankfurt's account of what we care about is that it is an inherently prospective frame of mind; that is, it looks forward with a consideration of our being into the future, a feature which does not seem to be true for our

[23] I use the word "mind" here in the way cognitive scientists would recognize the *embodied mind*, a term coined to characterize the human mind from the non-objectivist orientation (or "third wave") of cognitive science. The main insight from this view of the human mind is that knowledge (and consequential evaluation and justification) of our lives is the result of "an ongoing interpretation that emerges from our capacities of understanding" (Varela et al. 149). Herein, *embodied* means "reflection in which body and mind have been brought together" (Varela et al. 27).

moment-to-moment desires or beliefs. I am interested in this degree of persistence and long-term thinking presupposed in the notion of any genuine form of caring. In addition to this component of persistence, there seems to be a requirement for autonomy – an "active guiding and directing" of our lives – for authentic caring, according to Frankfurt (260-261).

I am interested in the process of how we come to care about certain things in our lives – whether consciously and intentionally or unconsciously and osmotically. An intuition I have is that many people do not know what they deeply care about; and if they do know, they may be mistaken about the degree of importance of certain things or what they actually care about may be something deeper, different, and so on. **A more abstract formulation of my hypothesis for this thesis is that caring about the process of caring (i.e. questions concerning evaluation and justification) may improve mental wellbeing.**

2.3.2 Reflective Values

Again, I am broadly interested in ideas apropos how to live well, by our own lights. Anxiety and depression are antagonists of the state of mental wellbeing found in feeling that one's life is going well; they are often the result of not being able to fully endorse the way our lives are going. In the book *The Reflective Life: Living Wisely with Our Limits*, Valerie Tiberius addresses the normative question of how we should live, if we are to live well by our own standards.

Tiberius's solution is what she calls the Reflective Wisdom Account: "To live well, we should develop the qualities that allow us both to be appropriately reflective and to have experiences that are not interrupted by reflection, and we should live our lives in accordance with the ends, goals, or values that stand up to appropriate reflection" (3). This resonates with my thesis: in a sense, I am similarly interested in the process of self-reflection that arrives at an answer (or better and better answers) to living well. Like Tiberius, I believe that "living a life that you can reflectively endorse," "[one] you approve of on the basis of the standards you take to be important [or "you care about," in Frankfurt's language]" (10), will be a feature of mental wellbeing.

Tiberius enumerates four virtues of reflective wisdom "that give us guidance about such matters as how informed we should be, or how much we should reflect before making a choice" (13): *perspective*,

flexibility, *self-awareness*, and *optimism*. I will provide a detail of some of these virtues, only so as to further illustrate the concept space in which my thesis sits.

According to Tiberius, while perspective is "a pattern of attention that highlights a subset of our values and brings the associated beliefs and emotions in to the foreground" (68), the *virtue of* perspective is the "[cultivated] ability to bring our thoughts, feelings, and actions in line with our values" (90). This is reminiscent of the committed value-based action process in ACT. According to Tiberius, our value commitments can serve two goals: either action-guiding goals or "standards of evaluation or justification for other value commitments and for general reflection on how our lives are going" (24). These value commitments may have numerous classifications, spanning "activities, relationships, goals, aims, ideals, principles, and so on, whether moral, aesthetic, or prudential" (Tiberius 24-25).

The second virtue of reflective wisdom, flexibility, is "knowing when to reflect and when not to, and being able to shift our attention among the various evaluative perspectives that engage us" (Tiberius 19). This notion of flexibility is reminiscent of the psychological flexibility that is ACT's theorized process of change (Harris, *ACT Made Simple* 11). Moreover, this virtue seems to highlight the distinction (in ACT and broadly speaking) between the more beneficial self-reflection that enhances value-aligned living and the maladaptive self-identifying fusion with and reification of thoughts.

Self-awareness is the process of acquiring self-knowledge, the "creative or constructive process" (and often, process of discovery) whereby we "organize the facts we learn into a self-conception or self-image" and through which "values are prioritized, emotions are labeled, and attitudes are endorsed" (Tiberius 116). Self-awareness is the process of coming to "know thyself," as the Ancient Greek aphorism goes. It is the total experiential, cognitive, and metacognitive process that "includes a set of ongoing commitments that acknowledge the transformative power of self-examination, the importance of taking an external point of view on oneself, and the possibility that there are things we simply cannot or should not know" (Tiberius 120). I will not speak much to optimism (the fourth and final virtue of reflection wisdom), but it is roughly speaking "the mean between cynicism and a kind of foolish optimism," according to Tiberius (137).

To sum up, here is Tiberius on the general process of gaining reflective wisdom: "Rather than practical life being a smooth and steady realization of an ideal conception of how to live, then, it will be a journey roughly guided by an ideal or goal that will itself change in response to the steps taken in that journey" (84). Like all dynamic processes, the self-reflective process of acquiring wisdom has an element of adaptiveness. Evaluating and justifying one's conception of what it means to live well is a perpetually dialectic process and the work of a lifetime; as will be seen in later chapters, this thesis proposes a system that assumes this is the case.

2.4 Computer-Based Psychological Interventions

Now I will do a very brief survey of a few computer-based psychological interventions, focused on those that consider some notion of values. While these two mobile applications did not directly inform the conceptualization of my thesis technology (as described in Chapter 1.2), I mention them only to provide ideas that future digital intervention designers may consider in the design process. I will mention these again in the final chapter.

2.4.1 *Aspire*

The first app I will consider is *Aspire* (see Fig. 2.2 below), part of Northwestern University's IntelliCare suite of applications: the suite was developed for an IRB-approved study examining the effectiveness of smartphone interventions for the treatment of anxiety and depression.

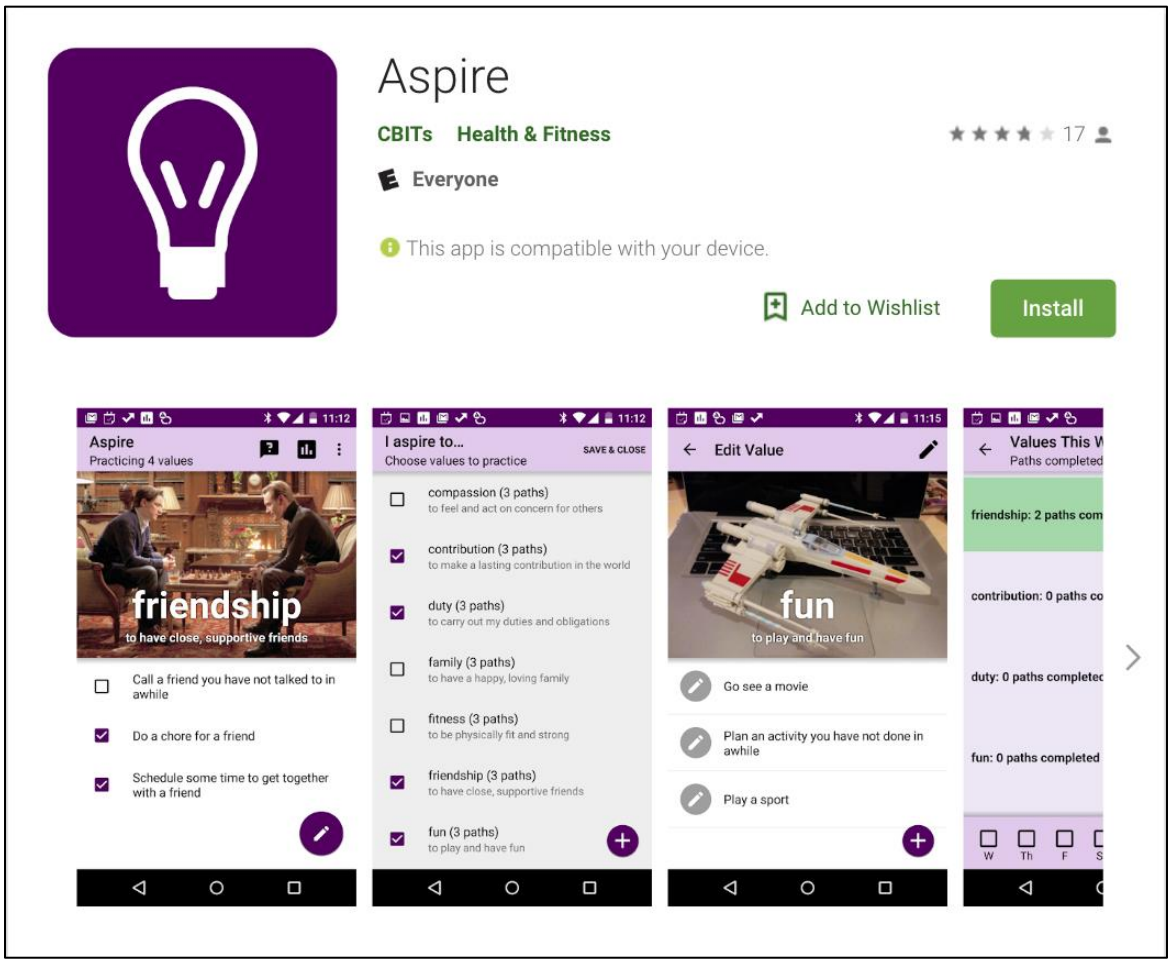


Fig. 2.2. A screenshot of *Aspire* on Google Play Store ("Aspire").

Here is *Aspire*'s description on the Google Play Store: "What do you want your life to be about? What do you aspire to? Use Aspire to identify the values that guide your life and the actions you take to live that value. Aspire will help you track those actions throughout the day and support you in living a more purpose-driven and satisfying life" ("Aspire"). This seems to be congruent with ACT's notion of values and committed action. On *Aspire*, users can practice a collection of self-defined values, each composed of different "paths" (i.e. concrete actions or goals). Users can check off when they complete their "paths," and track their degree of valued living as it were.

While the effectiveness of *Aspire* individually is not clear (and thus values alone), an 8-week pilot feasibility study on the entire suite of 14 IntelliCare mobile apps was conducted in 2017. Participants were only included if they had elevated symptoms of depression and anxiety, and they were coached on how to use the various apps over the duration of the study. The results found substantial

reductions in the PHQ-9 and Generalized Anxiety Disorder-7 (GAD-7) (P<.001) outcome measures for the 90 participants who completed the entire trial, and roughly 70% of participants satisfied criteria for full remission and recovery from depression. As noted in the research paper, one limitation of the study is that it was a single-arm trial, and thus the results could have been due to other factors (e.g. sample would have improved anyway) beyond IntelliCare app usage. Another limitation was that the study did not separate the effects due to coaching and the apps (Mohr et al.).

2.4.2 *Mitra*

The second and final smartphone app I will consider is *Mitra*, an app created by the Dalai Lama Center for Ethics and Transformative Values at MIT. Here is how the Center describes *Mitra* on the app's website:

> Mitra is based on the curriculum of the Center's *Transformative Leadership Program*, originally developed and delivered at the MIT Sloan School for Management in conjunction with leading business school faculty around the globe. Participants explore how to align their professional values with their deep personal values and develop reflective thinking skills for ethical development. The program is now used to foster value-driven, transformative leadership in leaders across all industries, from educators to executives. Although the app is designed for use by alumni of the program, anyone can benefit from Mitra's personalized experience of self-reflection. ("About the App")

Mitra allows users to add values (according to their own definition, in 80 characters or less) and track how well they performed each day with a self-given score out of 10 (see Fig. 2.3 below). In a similar manner, users can also add emotions and track how much they felt those emotions each day. In addition, users can view a graph and an analysis of their levels of value consistency and emotional experience across time (see Fig. 2.4 below). While I requested data regarding efficacy and engagement levels on *Mitra* from the developers on multiple occasions, I did not receive any response.

Fig. 2.3. A screenshot of daily scoring for valued living on *Mitra* (Dalai Lama Center).

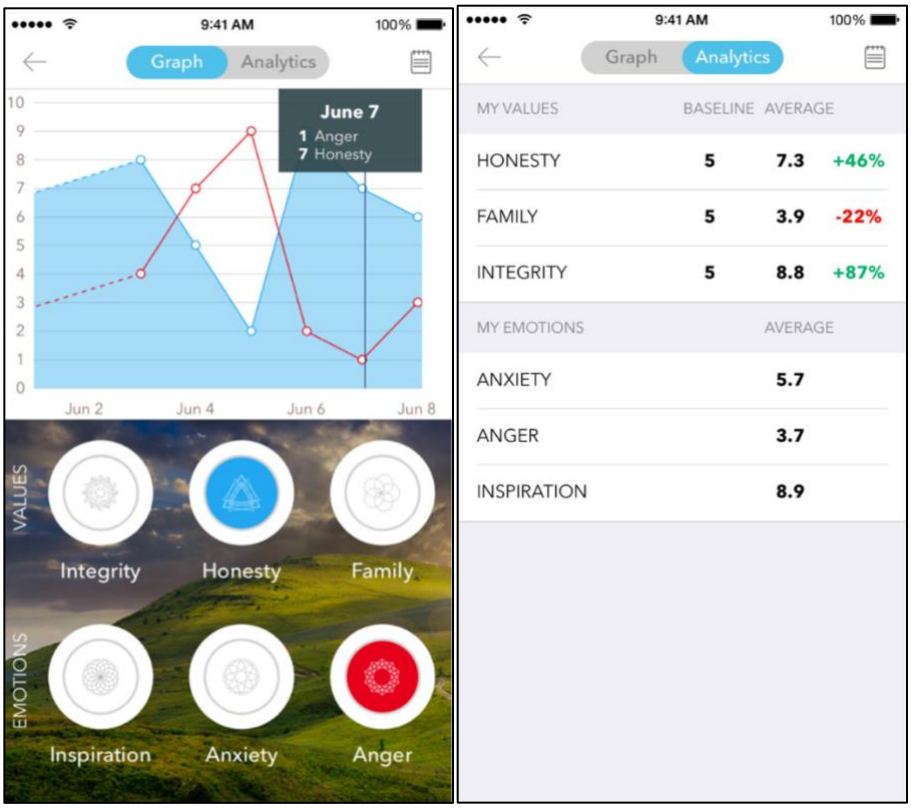


Fig. 2.4. Screenshots for *Mitra*'s graph (left) and analytics (right) features (Dalai Lama Center).

2.4.3 Comparison of *Aspire* & *Mitra*

To conclude this chapter, I will do a brief comparison of the features of *Aspire* and *Mitra*. While *Aspire* provides the ability to add concrete actions under each value, it does not provide a feature for tracking value consistency across time. On the other hand, while *Mitra* provides this tracking feature, it does not provide the ability to add concrete actions: thus, the ratings are relatively arbitrary. It seems that both features (adding specific actions or goals and tracking value consistency across time) may be necessary for more effective self-reflection and valued living, but I leave that only as a suggestion that must be addressed from two standpoints: that of therapeutic efficacy as well as user engagement.

Chapter 3

A Mind Mapping System for Self-Reflection

In this chapter, I offer a novel system for self-reflection – viz., I present a system that aids users to progressively align actions with what is deeply important to them (i.e. values and practical identities). The chapter contains a review of the final design of the mind mapping system used in the thesis experiment as well as a thorough description of how I arrived at it. Again, this system will ultimately be evaluated from the two perspectives: therapeutic efficacy (Chapter 4) and user engagement (Chapter 5).

3.1 Values Redux

To reiterate, this thesis is broadly an effort to understand the connection of human values to mental wellbeing. Situated with the initial intuition that some psychological suffering is the result of a disunity of experience (as presented in the first chapter), I am wondering if directly engaging one's values is an effective means by which to unify one's experience and thus ameliorate some quotient of suffering. Formulated as a question, does unifying values and action yield a better mental state, by one's own lights? Or more abstractly, does caring about the process of caring (i.e. questions concerning evaluation and justification) – or the process of finding out or clarifying what is important to oneself – improve mental wellbeing?

In the straw-man proposal in the first chapter, I introduced the vision of the system (*Psyyhe*) as including values, practical identities, and heuristics, but I went on to note that I only included the former two in the sample version provided to the study participants. I will describe this sample version, but only after first providing a bit more about values (in the following subsection 3.1.1) and then describing practical identities in full (in the next section 3.2).

3.1.1 Values in Modern Clinical Behavior Analysis

While I could have included this next subsection in the previous chapter, I thought it made more sense to place it in this chapter because of the way in which the ideas from a particular research paper map to a relevant type of visual representation (e.g. mind mapping). Historically speaking, it is important to know that I came across this paper much later than when I created the straw-man proposal of my system that I presented in the first chapter. Independently arriving at similar representations (i.e. mind mapping as a form of connecting ideas) suggests that the representation is intuitive, at least.

In the 2009 paper "In Search of Meaning: Values in Modern Clinical Behavior Analysis," Jennifer C. Plumb et al. discuss values extensively vis-à-vis its place within the ACT-RFT literature. The following two excerpts stood out to me. Here is the first:

> "Verbally constructed consequences" refers to the idea that, from an RFT perspective, stated values are central nodes in complex extended hierarchical relational networks that include higher order abstract consequences, midlevel goals in the service of those consequences, and concrete actions directed towards achieving those goals. (Plumb et al. 93)

These "verbally constructed consequences" are the established motivations for valued action in the ACT framework. The authors then go on to describe an example of the verbally constructed concept (i.e. value) of *personal growth*:

> For someone for whom personal growth is a stated value, this term might be a central node in a complex hierarchical relational network that includes other relatively abstract concepts such as *understanding* and *insight* higher up the hierarchy, goals (e.g., taking an evening course or learning to play a musical instrument) at the midlevel of the hierarchy, and concrete actions in the service of one or more such goals (e.g., attending a class or taking an examination) at lower levels. In this example, *personal growth* and related concepts function as

> verbally constructed consequences of the performance of particular actions and the achievement of particular goals at lower and middle levels of the hierarchical relational network, and thus they work to verbally motivate the individual to continue to perform the actions and achieve the necessary goals. (Plumb et al. 93)

I will not say too much about this example but simply provide a figure (see Fig 3.1 below) which maps this idea to a hierarchical relational graph:

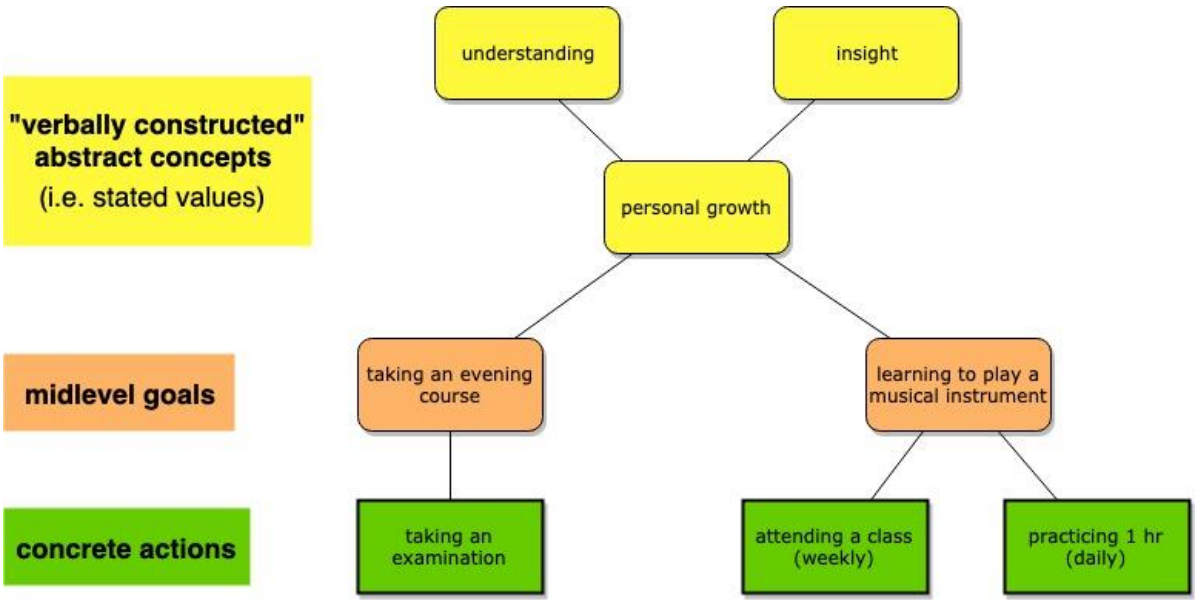


Fig. 3.1. Hierarchical relational graph constructed based on example in Plumb et al. (2009).

In essence, the fact that values in the psychological literature have been "verbally mind mapped" was a serendipitous affirmation of the visual mind mapping system that this thesis presents. Now, I will describe thoroughly the notion of practical identity, the second and final component of the mind mapping system for self-reflection provided to study participants.

3.2 Practical Identity

Prior to starting this thesis, I knew that values (e.g. honesty, discipline) that reflected one's virtues of character as well as certain heuristics were commonly-held features of living well, as I had learned such ideas through a few philosophy courses and the general osmosis of living. However, I had not

seriously considered the concept of identity, until I came across some philosophical literature (while simultaneously perusing the clinical literature on depression).

As per the philosopher Charles Taylor's magnum opus, *The Sources of the Self: The Making of the Modern Identity*, "Who am I?" is the question of identity. Here is his construal:

> What does answer this question for us is an understanding of what is of crucial importance to us. To know who I am is a species of knowing where I stand. My identity is defined by the commitments and identifications which provide the frame or horizon within which I can try to determine from case to case what is good, or valuable, or what ought to be done, or what I endorse or oppose. In other words, it is the horizon within which I am capable of taking a stand. (27)

Roughly in line with Taylor's notion is philosopher Christine Korsgaard's notion of practical identity. Here is Korsgaard:

> The conception of one's identity in question here is not a theoretical one … It is better understood as a description under which you value yourself, a description under which you find your life to be worth living and your actions to be worth undertaking. So I will call this a conception of your practical identity. Practical identity is a complex matter and for the average person there will be a jumble of such conceptions. You are a human being, a woman or a man, an adherent of a certain religion, a member of an ethnic group, a member of a certain profession, someone's lover or friend, and so on. And all of these identities give rise to reasons and obligations. Your reasons express your identity, your nature; your obligations spring from what that identity forbids (101).

Introspectively, this seems like a convincing point of view despite being a non-scientific one (as Korsgaard admits): it seems that considering ourselves as embodying practical roles in our life seems useful in deciding how to live our lives. Importantly, Korsgaard notes that there must be an element of autonomy in our conceptions of our practical identities if they are to have authority over us – to make demands on us or be what she calls a "source of normativity" (104). She states that, "Autonomy is commanding yourself to do what you think it would be a good idea to do, and that in turn depends on who you think you are" (i.e. your practical identity) (Korsgaard 107).

3.2.1 Synthesis with VLQ

In trying to synthesize this idea of practical identity encountered in the philosophical literature with those from the clinical literature (mentioned in the last chapter), I arrived at the following relationship: practical identities as a different way to construe the life domains found in the Valued Living Questionnaire. Below, I provide possible mappings for the VLQ life domains to practical identities (see Table 3.1).

Table 3.1.

Mapping of VLQ life domains to practical identities.

VLQ Life Domains	**Practical Identity**
Family relations (other than marriage or parenting)	Brother/sister Son/daughter
Marriage/couples/intimate relations	Husband/wife Boyfriend/girlfriend
Parenting	Father/mother
Friendships/social relations	Friend of A, friend of B, etc.
Employment	Employee
Education/training	Student
Recreation	Athlete/musician
Spirituality	Human/spirit/Christian/Muslim
Citizenship/community life	Citizen (of world, country, city, etc.)
Physical well-being	Animal

As opposed to the stance VLQ puts forward (i.e. that I value such and such life domain), the stance from which one considers themselves as having a practical identity appears to be the more practically useful starting point for thinking about what one should do to live well. Consider the following two cases to contrast the stances:

A. I am a swimmer, so I should do what I think a "good swimmer" would do, such as drills that help fix the ways my stroke is inefficient.
B. I value the life domain of "recreation" and, more particularly, I like to swim. I want to be a good swimmer so I should do what I think a "good swimmer" would do, such as drills that help fix the ways my stroke is inefficient.

Although the contrast above may not be so stark, it seems to me that in the practical identity case (A) there are fewer cognitive leaps necessary to get to the point of asking "what would a good swimmer do (in some particular context)" – i.e. to pose the question that gives rise to action related to what we take to be important. Case (A) seems to get us closer to what to do about the fact that we value something – that is, closer to value-aligned action.

My presupposition in this thesis is that normative questions of this sort (e.g. "what should I do as a [practical identity]?") have answers: either plausibly better answers or a firmer grounding for current answers. Again, this thesis takes the stance that this question is ultimately answered from a stance of evaluation and justification,[24] or a stance from which one can "reflectively endorse" à la Valerie Tiberius. Moreover, as I mentioned in the previous chapter, each perspective or (in this case) practical identity – wittingly or not – brings a change in which facts are relevant, what motives are available, what is most salient to us, and so on. If we imagined a directed graph as per 3.1.1, each practical identity would highlight a particular path of evaluation and justification for us – and therein "guide us" to what to do.

3.3 *MindMup* Platform

As explained in the introductory chapter, I selected the mind mapping web application *MindMup* for the purposes of the thesis experiment. While the software does not offer very much specific to the current use case of self-reflection, I will briefly highlight a few features of it that are relevant. In doing so, I will concurrently explain the main ideas in the mind mapping system provided to participants of the experiment.

MindMup allows users to create mind maps (or, relational graphs). The main functionalities include inserting root nodes, child nodes, or sibling nodes: respectively, these are invoked via the three icons on the left of the web application's toolbar as seen in Fig 3.2 below (the sample mind map provided to study participants[25]). Within each node, users can add text or change the background color. As can be seen below, "living a good life for me" is bifurcated into values and practical identities. These values and practical identities are then further broken down into goals, as more child nodes: for example, as a "son," I may want to give myself a goal to "call my parents once per week."

[24] Needless to say, questions of this sort may actually be answered by some combination of affect, reasoning, and randomness (the result of some computation) in our minds for which we may never fully understand – but the goal is a progressively better understanding.

[25] While this same figure is included in the first chapter, it is included again here for convenience. The sample mind map was provided with the Organizational Gold subscription of *MindMup* which allows the sharing of mind maps with teammates (i.e. study participants in the *MindMup* group).

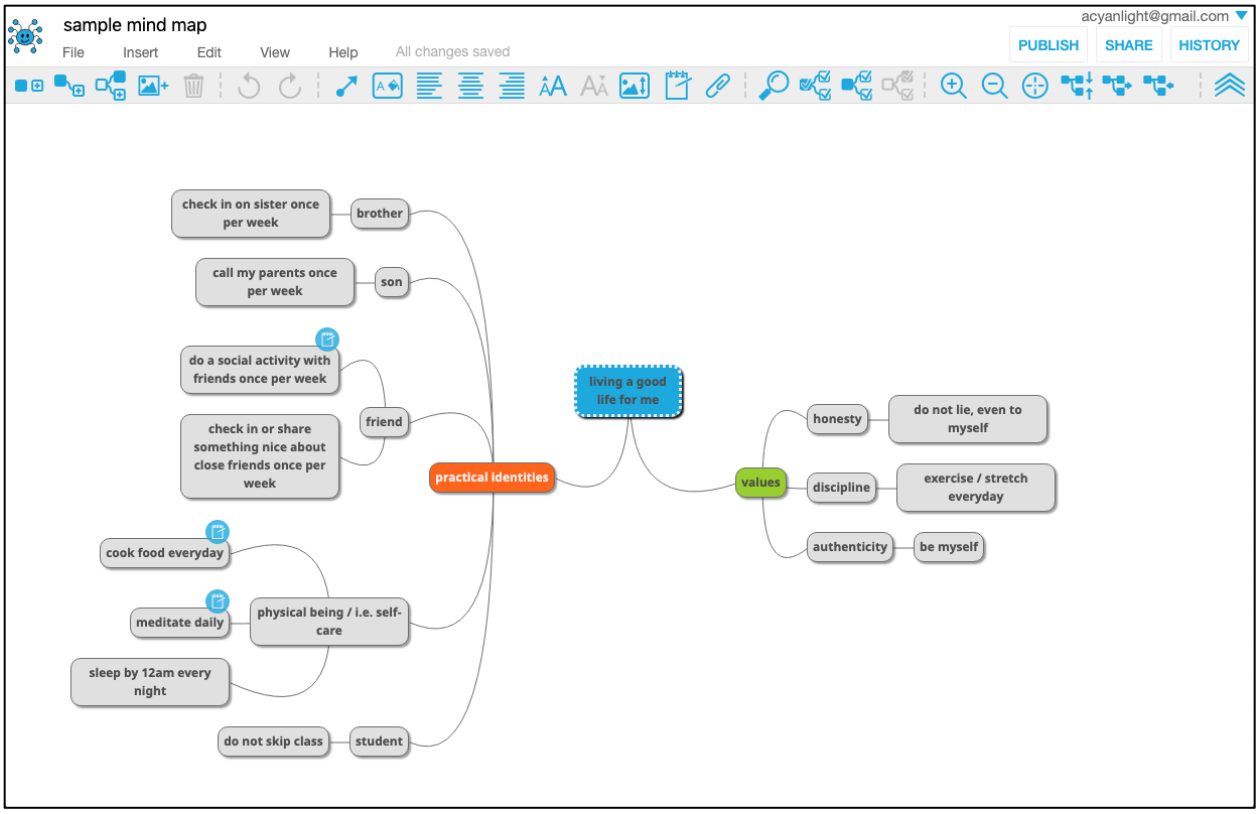


Fig. 3.2. A screenshot of sample *MindMup* mind map shared to study participants.

MindMup also allows users to add text notes to each node, supplementary to the text within each node. For the current use case, it was suggested that participants use this "edit text notes" feature to track the concrete goals underneath each value or practical identity. This functionality is invoked via the notepad icon near the center of the app's toolbar (as seen in top of Fig. 3.2 and Fig. 3.3). While I will say more about this in the next chapter when I describe the study protocol in full, Fig. 3.3 below shows the feature in action.

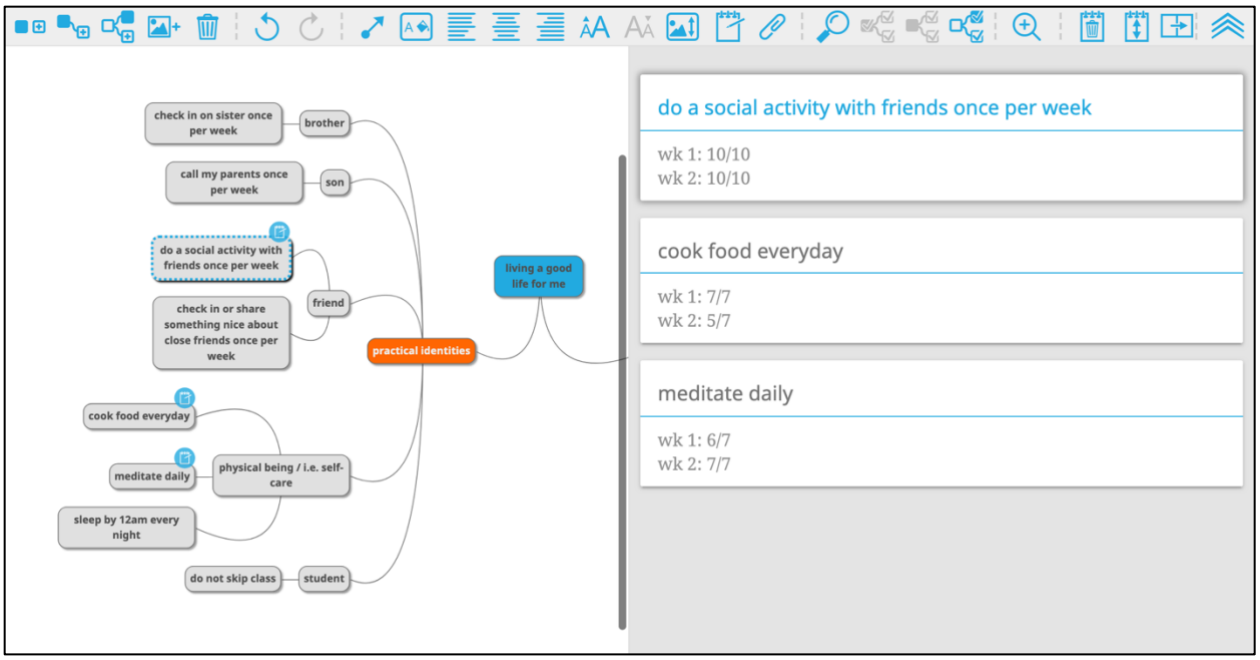


Fig. 3.3. A screenshot of "Edit text notes" feature in *MindMup* to track goals.

In essence, *MindMup* was a relatively easy-to-use software that provided features which could convey the essential ideas sufficiently enough to test the experimental hypothesis. Needless to say, the software could certainly be optimized (or a new one created) for the present use case in order to increase engagement – as the lack of use-case-specific functionalities could have greatly affected the results. I will discuss user engagement in Chapter 5, and then address the lack of use-case-specific functionalities in the final chapter (Chapter 6). In the next chapter (Chapter 4), I will discuss how the *MindMup* system was evaluated for therapeutic efficacy.

Chapter 4

Psychological Outcomes

A two-week randomized controlled trial (RCT) with 29 participants was conducted in order to evaluate this thesis's mind mapping system. While the system was ultimately evaluated from two perspectives (therapeutic efficacy and user engagement), I assess its effect on the former in this chapter and the latter in Chapter 5. Specifically, I examine mind mapping system's effect on various psychological outcomes, such as severity of depression symptoms, levels of psychological distress, and perceived improvements. Prior to this assessment, I fully describe the experimental procedures of the study.

4.1 Method

4.1.1 Participants

Participants were recruited by emails sent to MIT undergraduate student mailing lists and flyers placed around the MIT campus. The recruitment materials advertised the study as a two-week study on the effects of self-reflection on mental wellbeing: see Fig. A.1.1 for the recruitment email and Fig. A.1.2 for the flyer. All participants that responded to the recruitment materials were sent the same email (see Fig A.1.3) requesting completion of a pre-study screening questionnaire (see Fig A.1.4).

The inclusion criteria were that participants were required to be between 18 and 29 years old and undergraduate students at MIT: these criteria were set so as to reduce variability in the sample. Also, all participants needed to have access to the Internet via a computer, not currently have a journaling practice, and not currently be undergoing value-based counseling. The rationale for the latter two criteria was as follows: if participants had either a journaling practice or were undergoing value-based counseling, they might not show any further improvement. Upon completing the pre-study screening questionnaire (A.1.4), eligible participants were sent an email (see Fig A.1.5) with a link to schedule a private consent session, while those who were not eligible were sent a different email (see Fig A.1.6). All parts of this study – spanning participant recruitment, experimental procedures, and data collection – were approved by the Institutional Review Board at MIT.

Participants were paid a $30 TechCASH gift card (redeemable at MIT and various off-campus partner locations around Cambridge, MA) for completing the baseline and follow-up assessments of the study. Besides the private consent session during which the baseline assessment was administered and study instructions were provided, the entire study was conducted via email.

A total of 91 individuals expressed interest in participating in the study and were given the online pre-study screening questionnaire. Of these, 72 individuals completed the pre-study screening questionnaire, of which 40 individuals were screened through. Of the 32 individuals who did not get screened through, four were screened out due to currently undergoing value-based counseling,[26] while the remaining 28 had a journaling practice.[27] Of the 40 individuals who qualified for the study, six did not respond to scheduling an in-person consent session and another three scheduled but did not come to their consent session. Thus, 31 participants came to individual, private consent sessions. One participant was screened out in person: this person expressed confusion about the "value-based counseling" screening question and clarified that she was currently undergoing therapy. One person from the control group (journaling) was lost to the first follow-up (after the first week), due to not

[26] Upon clarification via email to those who asked, individuals undergoing any form of therapy were told to put "yes" and were thus excluded from the study.

[27] Upon further clarification, an email was sent to see the frequency of each person's journaling practice for those who answered affirmative to the screening question. If the individual's journaling practice was more frequent than monthly, they were excluded from the study.

completing the journaling task in time. The following diagram, Fig. 4.1, shows the enrollment patterns for the control group (journaling) and the treatment group (*MindMup*):

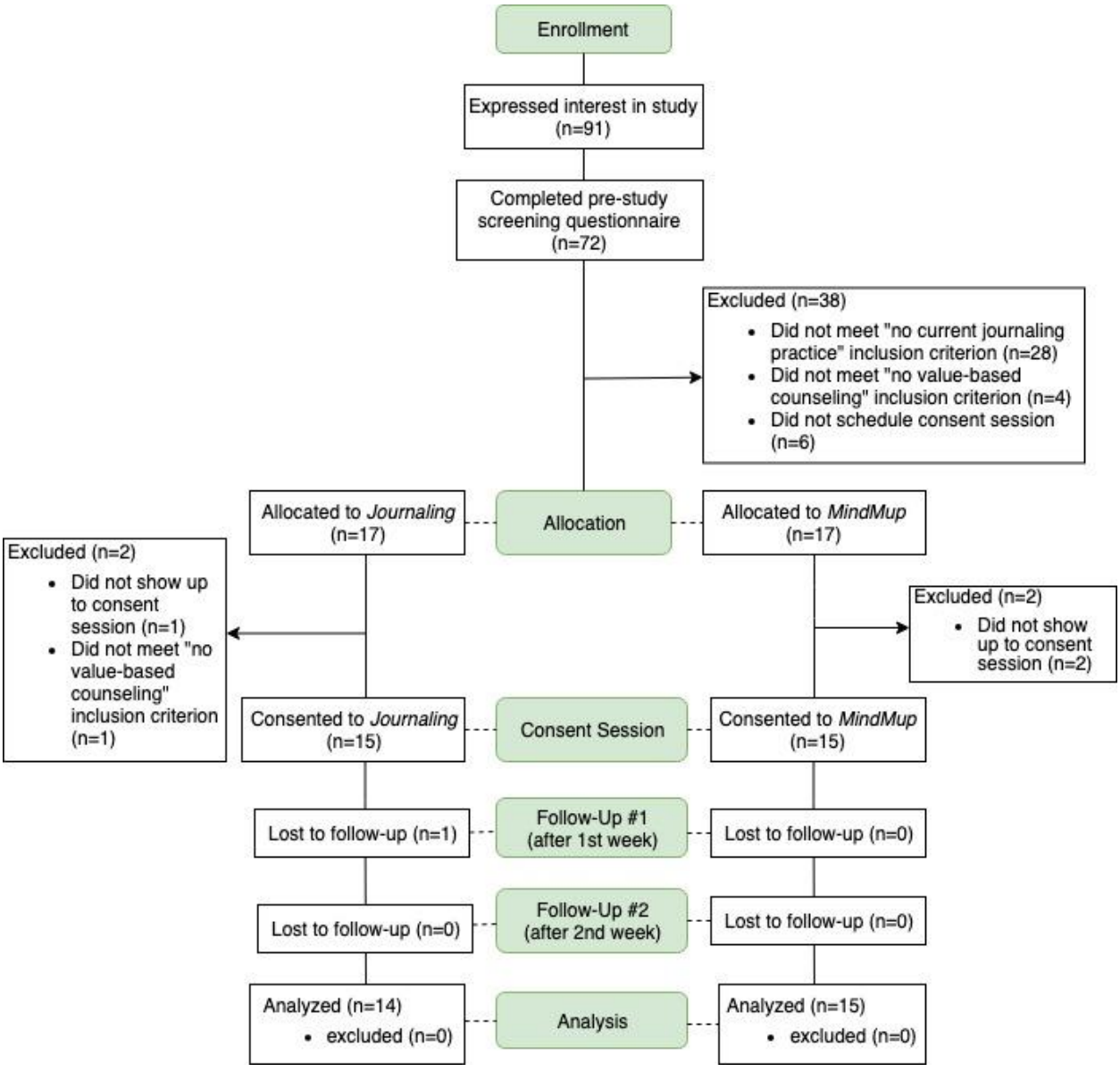


Fig. 4.1. Trial diagram depicting enrollment patterns for the control group (Journaling) and the treatment group (*MindMup*)

4.1.2 Control Group (Journaling)

Eligible participants who signed up for an in-person consent session were randomly assigned to either a control condition or the *MindMup* intervention. Group assignment was blind and conducted

via Google's coin flip web application (wherein heads was the control condition; tails was the *MindMup* treatment condition). Participants assigned to the control condition were told to journal about anything for 15 minutes on three occasions: one time during the private consent session, and one time for each of the following two weeks on that same day of the week. For example, if the consent session occurred on a Tuesday, the study participant was told to journal again for 15 minutes each of the following two Tuesdays. The experimental procedure will be more thoroughly discussed in Section 4.1.4.

Journaling, or expressive writing, is an intervention that has been studied for nearly thirty years. According to a 2005 meta-analysis, expressive writing can significantly improve both physical and psychological health outcomes (Baikie and Wilhelm). Therefore, this thesis experiment compared the *MindMup* condition with a journaling intervention, an active control with some purported therapeutic efficacy.

Also, the journaling condition was chosen to help assess engagement. It was hypothesized that an externalized form of self-knowledge, *MindMup* (or *Psyche*, in the future), would be more interactive due to its unique form (i.e. mind map), when compared to the more free-form journaling on a word processing application such as Microsoft Word. Coupled with this, the fact that it was pointed at deep elements of the human psyche (e.g. values and practical identities) was also hypothesized to perhaps make it more engaging than journaling to the user.

It should be noted that the original expressive writing procedure in the psychological literature calls for writing about traumatic events (i.e., cognitive, affective, or both) for 15 minutes per day over four consecutive days (Pennebaker and Beall). In contrast, as aforementioned, participants in this thesis experiment were asked to write for 15 minutes per day one day a week over three weeks. This difference is not unusual, however, given the hundreds of follow-up studies on the psychological benefits of expressive writing – together consisting of a great variety of writing frequency and variance from the original protocol's procedure. In a 2008 review, it was noted that expressive writing does not need to focus on traumatic life events and that writing "on three occasions over a single hour or even as briefly as for 5 minutes on different days" could yield benefits (Smyth and Pennebaker). Accordingly, this cited procedural flexibility seems to permit the current case of journaling about anything for 15 minutes per day one day a week over three weeks as an activity that

may be plausibly beneficial. With that said, the control condition will henceforth be referred to as the journaling intervention.

4.1.3 Treatment Group (*MindMup*)

As aforementioned, half of the eligible participants who scheduled their private in-person consent session were randomly assigned to the *MindMup* treatment condition. In essence, they received the task of interacting with a software called *MindMup* on which they created and developed a mind map of their personal values and practical identities. The duration and frequency for this task assigned to the *MindMup* group was identical to that of the journaling group – namely, 15 minutes (on the same day of the week) each week over course of three weeks. The procedural details of the *MindMup* group will be described more thoroughly in the next section, Section 4.1.4.

4.1.4 Procedure

While the more detailed, IRB-approved study procedure can be seen in the appendix to this thesis in A.2.1, I will now describe the experimental procedure from the point in time after the eligible participants (those who signed up for the 45-minute in-person consent session) were randomly assigned to their intervention groups. A full transcript for the consent session can be found in the appendix as A.2.2.

Participants from both groups were required to fill out a consent form for the first 15 minutes of their consent session: see A.2.3 for the journaling version and A.2.4 for the *MindMup* version. Upon reading and signing the appropriate consent form, participants were assigned non-personally-identifying subject IDs[28] and then instructed to fill out two online baseline assessments, which I will describe in full in the next section, 4.1.5. Upon completing these assessments, participants were given their respective task for the first day and the rest of the experiment: these differences in the requirements are as described below.

Journaling group

For the last 15 minutes of the consent session, the journaling group was asked to journal in self-reflection on Microsoft Word (or Diaro, TextEdit, Evernote; with the suggestion that Word

[28] Participants were required to use their subject IDs on all future questionnaires so that their identity was protected.

provided a word count feature). A few questions were provided (see Procedures section of journaling consent form in A.2.3 for the seven provided questions), which most participants used as a starting point. Upon completion, participants were asked for the word count of their journal.

Next, participants were given information about the tasks for the rest of the experiment. This entailed journaling for about 15 minutes on each of the following two weeks on the same day of their consent session, and then filling out a questionnaire (see the figure in A.2.5). This weekly questionnaire asked for word count and actual number of minutes journaled, and it was sent as a link in the weekly email follow-up (see A.2.6 for the email sent at the end of the first week).

***MindMup* group**

For the last 15 minutes of the consent session, the *MindMup* group was asked to create a mind map of their values and practical identities on *MindMup*, the mind mapping software. Upon creating an account on the software (clicking through on a link sent to them via email), listening to definitions of values and practical identities, and seeing a sample of a plausible mind map, the participants created their private mind map. As extensions to the collection of values and the collection of practical identities, it was recommended that participants add concrete goals to make the self-reflection more actionable and the software more interactive. Upon completion, participants were asked for the number of values and practical identities they added to their mind map.

Next, participants were given information about the tasks for the rest of the experiment. This entailed interacting with their mind map for about 15 minutes on each of the following two weeks on the same day of their consent session, and then filling out a questionnaire (see the figure in A.2.7). This weekly questionnaire asked for the number of values and practical identities the participant reflected on[29] and the actual number of minutes he or she used the software, and it was sent as a link in the weekly email follow-up (see A.2.8 for the email sent at the end of the first week).

Both groups

In the evening (around 9 p.m.) of the same day as their weekly task, participants who had yet to complete their task received another email as a reminder to do so (see A.2.9). In the few instances

[29] The *MindMup* weekly questionnaire (A.2.6) defined "reflected on" as thought about for a few minutes, took some notes about (using *MindMup*'s note-taking feature), or noted the consistency of goals underneath.

that these participants still did not complete their task (and weekly questionnaire) by the morning after, they received a final reminder (around 7 a.m.) to complete their task in the morning, lest they be removed from the study (see A.2.10).

4.1.5 Assessments

As aforementioned, psychological assessments were taken at baseline (during the consent session) and during the follow-up to examine any changes in levels of general mental wellbeing and distress, as well as changes in levels of depression symptoms. It should be noted that while this randomized controlled trial employed the same psychological assessments as Bramwell and Richardson (2017), it was distinct because it was not run in the context of an ongoing ACT practice and VLQ was not used to quantify value importance and committed action.

Also, follow-up analyses on responses to questions in a post-study general feedback survey (see A.2.11 for Journaling; A.2.12 for *MindMup*) examined the perceived benefits of each intervention. This was sent as a part of the follow-up email after the two weeks (see A.2.13 for the one sent to the Journaling group; A.2.14 for the *MindMup* group).

The psychological assessments were two empirically-validated questionnaires, which I will now describe.

Clinical Outcomes in Routine Evaluation (CORE-OM; Evans et al. 2000)

General mental health symptoms and levels of psychological distress over the last week were measured using an adapted version of the 34-item Clinical Outcomes in Routine Evaluation (CORE-OM) questionnaire found in Evans et al. (2000). The original CORE-OM is reliable, valid, and has "excellent" test–retest reliability (Evans et al. 2002). The experimental version excluded questions 9, 16, 23, and 34 from the original version because they were questions dealing with suicide or self-harm. Thus, this adapted version includes 30 questions, and I will henceforth call it CORE-OM-30 (see the figures in A.2.15).

Patient Health Questionnaire (PHQ-9; Kroenke et al.)

Severity of depression symptoms over the last two weeks was measured by an adapted version of the Patient Health Questionnaire (PHQ-9) found in Kroenke et al. (2001). The original PHQ-9 is reliable, valid, and has "excellent" test–retest reliability (Kroenke et al.). The experimental version excluded question 9 from the original version because it dealt with suicide and self-harm. Thus, this adapted version includes 8 numerical questions, plus the final one regarding how difficult the checked off problems made it to do daily tasks. I will henceforth call it PHQ-8 (see the figures in A.2.16).

For both assessments, higher scores mean worse wellbeing as it were. During the consent session, participant responses were immediately summed and checked against thresholds to take appropriate action if poor mental health was observed. These thresholds can be found in the Mental Health Info Sheet in A.2.17 of the Appendix. This sheet was shared with only one participant, whose PHQ-8 score was 14 – a score exactly at the threshold. Also, a recommendation was made to this participant to make an appointment with MIT's mental health services.

4.2 Results

The following fact should be noted prior to an analysis of the results: while demographic analysis was not conducted because no identity information was tracked (besides checking potential participants against the inclusion criteria), it is plausible that individual differences (such as race, gender, etc.) may have differential effects on the population level. Now, I will examine *MindMup*'s effect – as compared to the journaling task – on various psychological outcomes, such as severity of depression symptoms, levels of psychological distress, and perceived improvements.

4.2.1 Baseline Analyses

See Table 4.1 for the baseline psychological variables for participants assigned to the journaling and *MindMup* conditions. Independent samples t-tests assuming unequal variances (Welch) were conducted in order to examine potential differences at baseline between the groups on both psychological variable (namely, CORE-OM-30 and PHQ-8). Neither of the tests were significant.

Table 4.1.

Baseline characteristics for participants assigned to the journaling and *MindMup* conditions. Differences in baseline scores between the control and treatment groups were not significant.

	Journaling (n=14)	*MindMup* (n=15)
Baseline Levels of Psychological Distress, M (SD) Clinical Outcomes in Routine Evaluation (CORE-OM-30)	25.64 (14.28)	26.6 (14.36)
Baseline Level of Depression, M (SD) Patient Health Questionnaire (PHQ-8)	5.86 (2.80)	6.47 (3.61)

4.2.2 Follow-Up Analyses

Follow-up analyses were conducted across the entire sample of participants. It was hypothesized that, compared to the journaling condition, *MindMup* would yield better psychological outcomes across both measured variables.

Using SPSS Statistics, a 2 (Group: *MindMup*, Journaling) x 2 (Time: Pre, Post) repeated-measures analysis of variance (ANOVA) was conducted for each outcome variable. Within group t-tests (Welch) were also conducted to examine changes from baseline to follow-up (after the two-week experiment) for both conditions (see Table 4.2).

Findings revealed that there were no significant interactions of group by time for both psychological measures (see Table B.1 in Appendix B). Nonetheless, the means of the outcome measures for the *MindMup* group improved (i.e. decreased) over time (see Fig. 4.2 below). For the journaling group, while the means decreased slightly less for the case for the CORE-OM-30, the means for the PHQ-8 even increased slightly over time. However, none of the follow-up within-group t-tests were significant ($p < 0.05$).

Table 4.2.

Within-group comparisons for journaling (J) and *MindMup* (M), showing means and standard deviations across all outcome measures.

Psychological Outcome Variable	Group	Pre-Test (SD)	Post-Test (SD)	*t-value*	*p-value*	*d* [95% CI]
CORE-OM-30	J	25.64 (14.28)	24.79 (14.22)	0.156	0.879	.06 [-7.41, 7.51]
	M	26.60 (14.36)	24.40 (14.43)	0.409	0.689	.16 [-7.11, 7.46]
PHQ-8	J	5.86 (2.80)	6.00 (3.04)	-0.176	0.863	-.05 [-1.52, 1.54]
	M	6.47 (3.68)	6.07 (3.94)	0.505	0.621	.12 [-1.75, 1.88]

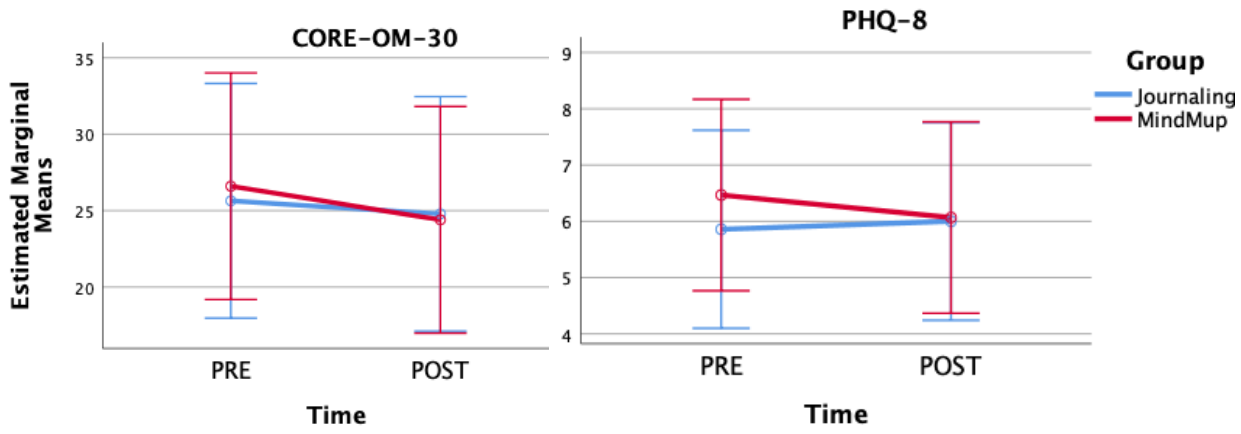


Fig. 4.2. Interaction plots comparing both groups from pre-study to post-study. Error bars represent 95% confidence intervals.

Discussion

There were no significant differences in the observed performance between the two interventions. Nevertheless, it is important to consider two facts: (1) all outcome variables moved in the direction of the hypothesis for the *MindMup* intervention and (2) as aforementioned, journaling has been held to be therapeutically efficacious by itself (Baikie and Wilhelm). Thus, if *MindMup* was compared to a wait-list or another less active control group, there may have been larger between-groups effects.

It seems plausible that the between-groups effects may have been larger had there been functionalities in the *MindMup* software for assessing value consistency of action (as opposed to the

free form nature of the task – i.e. generally "reflecting" on values or practical identities, and perhaps the goals underneath). Additionally, the weekly frequency of intervention interaction may have been too sparse and the two-week duration of the experiment may not have been sufficient time to observe larger between-groups effects. These limitations will be echoed in the final chapter of this thesis.

4.2.3 Perceived Improvements

Quantitative Feedback

At the end of the two-week study, participants in both experimental groups were asked to reflect on any perceived improvements they experienced, if any. Specifically, in the post-study general feedback survey, participants were asked to rate their level of agreement or disagreement with the following two statements on a 7-point Likert scale: (1) X helped my mental wellbeing, and (2) X made me reflect on my wellbeing more than I would have otherwise. Herein, 'X' denotes either task: the "journaling task" or the "mind mapping values & practical identities task."

Independent t-tests assuming unequal variances (Welch) were performed, but no significant differences were found between the two groups for both measures of perceived improvements. Despite this fact, both groups reported experiencing above-neutral (i.e. means greater than 4) levels of perceived improvements as per Table 4.3 below.

Table 4.3.

Between-group comparisons for Journaling (J) and *MindMup* (M), showing means and standard deviations of perceived improvements.

	Journaling (n=14)	*MindMup* (n=15)
X helped my mental wellbeing.	5.07 (1.00)	4.87 (1.25)
X made me reflect on my wellbeing more than I would have otherwise.	5.57 (1.34)	5.93 (1.03)

Qualitative Feedback

Additional questions in the post-study general feedback survey included questions about participants' favorite and least favorite parts of the study procedure, their suggestions for what to

change about the study, and so on. Also, participants made valuable comments regarding perceived improvements in the weekly questionnaires. Some of these responses were quite notable, and they ranged from the domain of the software, the study procedure, and even the spirit of the study. Here are a few positive and negative comments that relate to the perceived improvements the participants may have experienced:

Positive Feedback:

- *"I feel that consciously identifying my values is powerful and has made me more committed to, and thereby able to satisfy them!"* – *MindMup* participant, 2nd weekly questionnaire
- *"I was stressed about the journaling at first since I have alot [sic] to do tonight, but I actually was calm and happy about doing it at the end!"* – Journaling participant, 2nd weekly questionnaire
- *"I really appreciate the value of daily reflection since that helps me keep my perspective on all my goals in check."* – *MindMup* participant, 1st weekly questionnaire
- *"The general act of reflecting on where I am versus where/who I want to be, and what I have to do to get there [was useful]*." – *MindMup* participant, 1st weekly questionnaire
- *"At the end, I found I had actually fell short of a lot of my goals, but regardless felt a positive impact in trying to pursue them (for example I didn't read everyday [sic] but felt good about making the effort to try to read everyday)."* – *MindMup* participant, 2nd weekly questionnaire
- *"The initial journaling session really helped me think and feel better about some of the things in my life. It was like talking to someone about things I have to keep secret. The other sessions were less valuable."* – Journaling participant, post-study general feedback survey
- *"I really enjoyed this experiment and it has improved my personal well-being and outlook on life :)"* – *MindMup* participant, post-study general feedback survey
- *"I think this study was a great idea! Again, it was hard for me to see huge results since it was over such a short duration, but I will 100% be continuing to log and track my goals. I think it helps me put my life into better perspective, and I've been more appreciative of where I am and the work I put in my when I log my progress."* – *MindMup* participant, post-study general feedback survey

Negative Feedback:

- *"Feeling substantially less happy than when I started writing 15 minutes ago. Enjoying the good moments of life is more fun than thinking about the general course of it."* – Journaling participant, 2nd weekly questionnaire
- *"I didn't do some of my goals and felt pretty bad about that :(I'll try to do better this week!" – MindMup* participant, 1st weekly questionnaire
- *"I guess I felt that it was hard to write out all my personal thoughts and feelings about certain events."* – Journaling participant, post-study general feedback survey
- *"Interacting with my existing mind map often felt repetitive: like I was just keeping count of things I had done. Not very meaningful interactions.*" – *MindMup* participant, post-study general feedback survey

Discussion

Composed together, both the quantitative Likert-scale responses and the qualitative text responses provide a sense of the breadth of perceived improvements (or lack thereof) experienced in the study. Again, despite the quantitative feedback results not being statistically significant between groups, it is plausible that larger differences would have been observed had certain limitations been overcome, such as increasing both frequency of usage as well as total experiment duration – as noted before – as well as increasing the total number of participants. Despite these experimental limitations, it is important to note that effects were comparable between the two experimental conditions, and that there was broadly more within-group perceived improvements than lack thereof in the *MindMup* case.

Chapter 5

Engagement

This chapter contains a brief evaluation of how engaging the *MindMup* system was compared to the journaling system. All collected data was self-reported and considered the domains of behavioral engagement and usability.

5.1 Self-Report Behavioral Data

5.1.1 Journaling

As previously mentioned, for each of the three sessions (consent session, plus the following two weekly journaling sessions), I asked the journaling group to report their number of words per journal entry as well as the number of minutes spent on the entry. The number of suggested minutes was fifteen, but participants were free to journal for shorter or longer. See Table 5.1 below for this data, represented across the duration of the experiment.

Table 5.1.

Self-report behavioral data for Journaling group (n=14), showing means and standard deviations of words and minutes per journal entry across the duration of the experiment.

	Consent Session	Week 1	Week 2
Word Count, M (SD)	534 (190)	474 (152)	506 (170)
Minute Count, M (SD)	15.0 (0)*	14.0 (2.11)	14.14 (2.18)

(*) denotes enforced time limit of 15 minutes during consent session

Moreover, in the post-study general feedback survey, participants were asked if they would continue their practice of journaling in some form. This indicated usage intent, perhaps not necessarily Microsoft Word or their journaling software (as this was left ambiguous) but at least whether they would continue their practice of journaling. In response, 14% (2 out of 14 participants) said they would continue the journaling practice, while 71% (10 out of 14) answered "maybe" and the remaining (2 participants) answered they would not continue the journaling practice.

5.1.2 *MindMup*

Participants in the *MindMup* group were also asked to report their number of minutes spent on the software across the same three sessions (consent session, plus the following two weekly sessions). In addition, participants were asked how many values and identities they created on their mind map during their consent session. For the following two weekly sessions, they were asked how many values and identities they reflected on, where examples of countable "reflected on" items were as follows: "thought about for a few minutes, took some notes about, or noted the consistency of goals underneath," as can be seen in the weekly questionnaire shown in A.2.7. The relative non-specificity of this latter data point (i.e. number of values and identities reflected on) made it not very analytically fruitful, but I will nevertheless present it.

Table 5.2.

Self-report behavioral data for *MindMup* group (n=15), showing means and standard deviations of the total number of values and practical identities reflected on as well as minutes per session across the duration of the experiment.

	Consent Session	Week 1	Week 2
Total Values & Practical Identities, M (SD)	9.8 (2.0)	7.1(3.2)	6.9 (3.1)
Minute Count, M (SD)	15.0 (0)*	15.2 (4.9)	16.1 (7.1)

(*) denotes enforced time limit of 15 minutes during consent session

Moreover, in the post-study general feedback survey, participants were asked if they would continue the practice of mind mapping values, either on *MindMup* or elsewhere. In response, 20% (3 out of 15 participants) said they would continue the practice, while 73% (11 out of 15) answered "maybe" and the remaining participant said they would not.

5.1.3 Comparison

Only actual minutes spent could be compared between groups, and only the reported minutes in the two follow-up weekly questionnaires were worth considering due to the time limit of 15 minutes during the initial consent session. Using SPSS Statistics, a 2 (Group: *MindMup*, Journaling) x 2 (Time: Week 1, Week 2) analysis of variance (ANOVA) was conducted for the self-reported minute counts. The between-groups comparison revealed non-significant effects on minutes spent for all modes of comparison: Group, Time, and the interaction of Group x Time.

Regarding usage intent data, while more participants (3 for *MindMup* versus 2 for journaling) said they would continue to do the "mind mapping values" task, this difference was negligible and a larger study needs to be conducted to make statistically significant claims.

5.2 System Usability

As part of the set of final follow-up surveys, participants were also asked to fill out the System Usability Scale (SUS) questionnaire (see A.2.18 for Journaling version and A.2.19 for *MindMup* version). It should be noted that the journaling group was permitted to use any writing software they desired, but the majority (10 out of 14 participants, or 71%) used Microsoft Word, as recommended. For the purposes of this section, I will only consider an analysis of this majority's usability ratings of Microsoft Word.

System Usability Scale (SUS; Brooke)

The SUS asks individuals to indicate their level of agreement with a collection of ten usability assessments of the system (e.g. "I found the system unnecessarily complex"), according to a 5-point Likert scale. Half of the statements are positively worded, while the other half are negatively worded. It is designed to evaluate how easy a system is to use.

Results

Each group was assigned different tasks and thus interacted with very different functionalities with their respective software. Although the few *MindMup* features needed to complete the weekly tasks were described to the participants (as described in Chapter 3), there were other features available and these may have confused or distracted the participants from the task. However, the *MindMup* software was not necessarily very complex, and thus it was unclear at the outset how usable it would be for the participants. On the other hand, Microsoft Word is simply a word processing application and, for the purposes of this experiment, served as a blank canvas for users to type on – so was plausible very easy to use.

In addition, most participants in the journaling group mentioned they had familiarity with Word, while it was clear none of the participants in the *MindMup* group had used the *MindMup* software before. This is a notable limitation of the baseline usability level for the two systems.

For the reasons above – not to mention the difference in number of participants for it (n=10 for Journaling, n=15 for *MindMup*) – a between-groups comparison was not conducted. There was simply too much variance between the groups. Table 5.3 below, however, shows that *MindMup* had a considerably lower mean SUS score than Microsoft Word. Overall, both SUS scores were higher than the often-cited average SUS score of 68 though (Sauro).

Table 5.3.

Means and standard deviations for SUS scores for Microsoft Word and *MindMup*.

	Microsoft Word (n=10)	*MindMup* (n=15)
SUS, M (SD)	85.75 (18.45)	71.17 (10.52)

5.3 Qualitative Feedback

In addition to self-report behavioral data and assessing usability via the SUS, participants were asked to give general feedback throughout the experiment about the study procedure, the software, and their self-reflection task. Inevitably, on a few occasions, participants mentioned their opinions on how engaging the experiment was or how usable the software was. The feedback spanned the comments section of the weekly questionnaires, the comments section at the end of the SUS questionnaire, and the post-study general feedback survey. At the outset, it was very clear that aspects of the study procedure, the software (and its usability), and their self-reflection task may have affected levels of engagement. In this section, for both experimental groups, I will list some of the positive and negative feedback related to engagement and usability, and then follow that up with a brief, general discussion.

5.3.1 Journaling

Positive Feedback

Regarding engagement:

- *"It's pretty nice to just sit and think for ~10 min or so... usually I'm always doing things and never get some time just to reflect."* – SUS questionnaire
- *"[My favorite part of the study procedure was] the fact that it let me take time to sit peacefully and write freely."* – post-study general feedback survey
- *"Helps to write things down because you're forced to think through thoughts."* – post-study general feedback survey

Regarding usability:

- *"I am very confident and comfortable with Microsoft Word and find it very easy to work with."* – SUS questionnaire
- *"[Microsoft Word] is suitable for journaling because it can be easily locked."* – SUS questionnaire
- *"I've been using Microsoft words [sic] since primary school and using it as a journal is quite easy."* – SUS questionnaire

Negative Feedback

Regarding engagement:

- *"It's the end of the day and I'm very sleepy, which probably made me type more words without being concerned about coherence."* – 1st weekly questionnaire
- *"After about 7-10 minutes I started to get impatient, but getting my thoughts down on paper was nice. I'm still not sure if this is something I have the patience to keep up or not, though."* – 1st weekly questionnaire
- *"I find writing to be useful in certain moods, but pausing to write in the middle of a productive day slows me down and makes me feel less motivated."* – post-study general feedback survey
- *"I do wish there were guiding questions.[30] I felt my journal entries jumped around too much, from topic to topic, and having a guiding question would've helped centralize my thoughts."* – post-study general feedback survey

Regarding usability:

- *"Recently, my eyes have been feeling strained from using computers a lot, so if I were to continue doing this on my own, I'd like to use paper and pencil/pen instead."* – 1st weekly questionnaire

[30] Two other participants in the journaling group also wished they were given more guidance for the journaling task. This will be reiterated in the limitations section of the final chapter.

- *"[Microsoft Word] was good for tracking word counts and typing out all my thoughts. However, saving the entries and keeping track of them felt like a hassle, because I'd have to save a new file for every entry."* – SUS questionnaire

Discussion

With regards to engagement of the journaling task, many participants enjoyed the compulsory nature of the weekly block of time to write and reflect on their life. On the other hand, 3 out of 14 participants (21%) claimed that they would have preferred some thought-provoking questions (akin to the ones provided during the consent session). In addition, some participants did not like the requirement to journal in the middle of a productive day.

With regards to the usability of the software (i.e. Microsoft Word), many participants were very familiar with how to use it and enjoyed the private, non-online nature of it. On the contrary, some participants stated that saving files (i.e. journal entries) was cumbersome, while others simply would have rather journaled with pencil and paper.

5.3.2 *MindMup*

Positive Feedback

Regarding engagement:

- *"It was helpful having your example, because it would have been too tough to develop my MindMup on my own."* – SUS questionnaire
- *"[My favorite part of the study procedure was] the process of setting values and goals*[31] *initially – made me reflect on what really matters to me and what habits align with them."* – post-study general feedback survey

[31] One-thirds of the participants (5 out of 15) stated that the process of creating the mind map was engaging or beneficial for them.

- *"The tangible goals I was able to log ~daily~ were significantly easier to focus on than the intangible or weekly ones. I really appreciate the value of daily reflection since that helps me keep my perspective on all my goals in check."* – 1st weekly questionnaire

Regarding usability:

- *"The interface was nice. It had nice visuals that weren't over the top."* – SUS questionnaire
- *"The software was very easy to use and helped me organize my life in a productive way."* – SUS questionnaire

Negative Feedback

Regarding engagement:

- *"The task is too open-ended to be really productive. Software should allow child nodes to be moved around freely; they can only be moved vertically. In general the lack of direction makes the task feel purposeless and dull. I'd say I'm in the control group if I had to guess."* – 1st weekly questionnaire
- *"I never specifically designated any time for revising/reflecting on the mind mapping software other than on Wednesday - this made me forget about actionable goals at times."* – post-study general feedback survey

Regarding usability:

- *"The user interface is poor (if there are keyboard shortcuts it'd be nice to have a tutorial for them)."* – SUS questionnaire
- *"Easy to use for college students, seems like it would be hard to use for people not very used to working computers, not all the buttons seemed incredibly intuitive."* – SUS questionnaire
- *"Easy to use, but too many features!"* – SUS questionnaire
- *"[My least favorite part of the study procedure was] the software itself*[32] *(not a problem in short term, but I feel usage would be difficult over time)... also, I found the identities portion far less meaningful than values."* – post-study general feedback survey

[32] One-thirds of the participants (5 out of 15) stated that the software was their least favorite part of the study.

Discussion

With regards to engagement of the mind mapping task, 5 out of 15 participants (33%) stated that they found the process of creating the mind map engaging or beneficial for them. 5 out of 15 participants (33%) also stated that the fact that there was an artifact of their values to reflect on was very useful and, as one participant stated, it was like "having the constant thought in the back of their head." Others found the logging of goals useful. On the contrary, some participants felt that the process of reflecting on the mind map after the initial creation phase was not very meaningful or useful, and 6 out 15 participants (40%) felt that interactions should have been more frequent or for a longer duration. Also, 3 out of 15 participants (20%) found it difficult to think in terms of practical identities or not very useful.

With regards to *MindMup*'s usability, many did not find it very usable: as mentioned in a prior footnote, 5 out of 15 participants (33%) in fact stated that the software itself was their least favorite part of the study procedure. Many felt, however, that the software was relatively easy to use for the given tasks.

To conclude this chapter, I will merely list a few usefully nuanced comments that I found particularly insightful. While I will not discuss them, I hope they serve as an appropriate segue into the concluding chapter, wherein I will address similar limitations in the experiment and make similar suggestions for the future:

- *"I think it works well for simplicity. I wasn't a fan of the notes for "logging" progress, so I logged quantitative results on a separate Google excel sheet; however, I liked the visual for the high level overview. It was a clear way of viewing all my goals and values in one place."* – SUS questionnaire
- "*I'm afraid that a Mindmup would get overcrowded in time and it would become laborious to trace back to the center node once the software has been used a lot/there are many parent and child nodes. I feel that a system with each value and identity listed and an option to view history going from last entry/node to first with the last entry/node visible while one produces a new entry/node would be perfect and I would be excited to work with a software like this!"* – SUS questionnaire
- *"I think about these values at least a couple of times a week independently of the MindMup software, and I see that MindMup is a visualization strategy, but I don't know if visualizing values as a map deepens my understanding of my personal values or what they mean to me. But it definitely does help me to go over my*

existing values and remember all the ones I want to think about! I think it's nice to have something that holds you accountable to your values and identities, or if anything, reminds you of them." – 2nd weekly questionnaire

Chapter 6

Conclusion

We are immersed in an increasingly technological world, in which many of the recent technologies are designed to be augmentations of our minds. This is not a novel observation: it was notably summarized in the 1998 paper "The Extended Mind," in which philosophers Andy Clark and David Chalmers argue that the objects in our environment are part of my mind – and that the seeming duality of (i.e. separation between) what is contained within our brain and our environment is not as stark as it is purported to be. While the paper presents a thought experiment in which Otto, an Alzheimer's patient, uses a notebook to help him remember the location of a museum (Clark and Chalmers 12-13), modern mapping technologies such as Google Maps serve the same purpose: they augment our sense of direction and therein help us to navigate the world. These modern technologies, however, augment our minds with more effectiveness, speed, robustness, security, and abundance than in the past. Similarly, search engines and the Internet more broadly increase our access to information and therein help us understand our world. While such a list of technologies is endless, the point is that what used to be science fiction is now becoming reality with regards to augmenting the human mind. *Psyche* – the ultimate vision and extension of *MindMup* – augments our minds with regards to the things we take to be important (i.e. our values and practical identities): it not only helps us understand ourselves but also helps keep ourselves accountable to the best versions of ourselves.

The experiment described in this thesis suggests that mind mapping one's values and practical identities via *MindMup* confers some psychological benefits, despite not reaching statistical significance when compared across time, against the active control condition of journaling, or the interaction between time and group. While testing therapeutic efficacy of the mind mapping intervention was the primary focus of this thesis, assessing engagement was also a necessary component in the analysis of the intervention's total efficacy. In this final chapter, I discuss experimental limitations and possible future directions along both of these lines of inquiry (therapeutic efficacy and user engagement).

6.1 Experimental Limitations

I will now enumerate some of the limitations of the experiment in no particular order.

One potentially significant experimental limitation was that the study was conducted on students from the MIT undergraduate population over a two-week period near the end of their spring semester. The last group to consent to the experiment finished their final tasks on May 3, 2019, approximately two weeks before finals week. While the experiment's inclusion criteria of only undergraduates controlled for this fact and thus ensured that the high stress accompanying impending final examinations, papers, and projects was not a confounding variable, it nevertheless could have attenuated participant engagement levels with the interventions.

Another limitation was that, due to the experimental design of being administered mostly via email, a few participants (one from each experimental group) completed their weekly task and submitted their end-of-first-week questionnaire the morning after the assigned date. Likewise, one participant completed their final weekly task the morning after the assigned date. Not only could these deviations the from protocol affected the results (since these participants were included in the analysis), but the multiple reminder emails could have made the task seem coercive (i.e. participants plausibly could have been influenced by some negative affect when prompted multiple times, thus distorting the study results). Inevitably, the mood of the person at the time of filling the psychological questionnaire could have greatly influenced the results. According to Norbert Schwarz and Fritz Strack (1999), "it has been shown that life-satisfaction reports are subject to distortion by

trivial and temporary conditions like mood and the weather" (qtd. in Tiberius 37). Thus, while the obligatory nature of certain tasks is inherent to scientific experimentation, ideally the final system (*Psyche*) engenders *self-initiated reflection*.

A third experimental limitation was that one non-native English speaker was included in the journaling group. Here is what that participant wrote in his or her general feedback survey: "If I had used Chinese, I could wrote [sic] more... The contents are basically comments to what just happenend [sic] to me." While this language barrier affected the length of his or her responses, it likely did not have too much effect on the study results. It seems that, however, this would have affected the *MindMup* group more, as ideas may be lost in translation from "values" and "practical identities" to one's native language. So, this demographic could be controlled for in future studies.

Furthermore, one participant in the journaling group revealed in the post-study general feedback survey that he or she was diagnosed with clinical depression. Upon analyzing this participant's baseline assessments with respect to the journaling group, it was found that his or her PHQ-8 score was approximately one standard deviation above the mean and CORE-OM-30 score nearly two standard deviations.[33] In the future, participants with such high baseline levels could have been screened out by setting an inclusion criterion such as "not seen a mental health professional at some point in the past." In hindsight, for my experiment, it was not sufficient to check whether participants were not currently undergoing value-based counseling or therapy.

I will address additional limitations in the following section, as it makes more sense to couple them to future directions.

6.2 Future Directions

Extensions of this work lie in additional values-based scientific studies or the development of a consumer product.

[33] To be clear, this was not the same participant as the one with the baseline PHQ-8 of 14, as mentioned in Chapter 4.

6.2.1 Additional Experimentation

Therapeutic Efficacy

With regards to therapeutic efficacy (the main focus of the thesis), one possible future experiment includes specifically testing whether aligning one's actions with one's values and practical identities improves wellbeing and decreases depressive symptoms (the second point in the two-fold hypothesis presented in Chapter 1). This thesis mainly focused on having participants in the *MindMup* group reflect about values (in terms of mind mapping); subsequently, psychological benefits were then assessed. While it was suggested to participants to set concrete goals under their values and practical identities and track their levels of goal achievement (and thus value consistency), the extent to which this occurred was not assessed. The reason for this was that the *MindMup* software did not have such a functionality built in; in the future, this could be part of the software provided to study participants. In addition to plausibly increasing between-groups effects, such a value-consistency-assessment functionality could help assess within-group effects (i.e. levels of valued action vs. psychological outcomes) in future experiments.

In addition to this deeper assessment of value-aligned action, alternative experimental procedures to the current one could be used. For instance, increasing the current study's duration (e.g. six to eight weeks, instead of two weeks[34]) or increasing the frequency of engagement with the respective systems (e.g. daily or every other day, instead of weekly) could have helped yield statistically significant between-groups effects, contrary to the current study's findings. Notably, 6 out 15 participants (40%) in the *MindMup* group felt that interactions should have been more frequent or for a longer duration.

Furthermore, as mentioned in the previous chapter (Chapter 5), participants from both the journaling group and the *MindMup* group wished that there was more guidance for the weekly tasks. Two participants in the journaling group wished they were provided thought-provoking questions as in the consent session, while a few participants in the *MindMup* group felt that the process of

[34] While this thesis experiment's procedures spanned two weeks, the participants were asked (during the first day consent session) to reflect on their past week. Thus, it could be conceived that the experiment's reflection process spanned three weeks.

reflecting on the mind map after the initial map creation phase was not very meaningful or useful. Giving more specific weekly tasks should be considered in future experimentation.

Future experiments may also consider increasing the total number of participants, as this may bring about statistically significant results. With only 29 total participants, it was not useful to further subdivide the populations (i.e. depressed vs. non-depressed) in order to assess how the interventions may have differentially affected populations, according to baseline depression or even distress levels. Additionally, in a larger study, the CORE-OM-30 and PHQ-8 could be decomposed into specific pre-defined subsets for different domains (e.g. for the CORE-OM, the domains are wellbeing, symptoms, functioning, and risk), and particular effects on these could be analyzed.

As mentioned in the previous chapter, 5 out of 15 participants (33%) in the *MindMup* group stated that the software was their least favorite part of the study procedure: this could have also been a substantial limitation. The reportedly unengaging user experience of *MindMup* could have contributed to the current study's insignificant effects with regards to therapeutic efficacy. As opposed to the generic mind mapping software of *MindMup*, a software should be specifically designed for the present use case (i.e. assessing psychological benefits of self-reflection on values and practical identities) in the future. This last suggestion brings us to the next section in which I will very briefly make suggestions for future experimentation with regards to engagement.

Before this, I would like to note that engagement is basically inextricable from therapeutic efficacy in reality, and the bifurcation I have made in my analysis is a theoretical one; but I will not argue this point.

User Engagement & Experience

While this thesis presented a brief analysis of engagement data, this data was mostly self-reported and its analysis was certainly not the focus of the thesis. For future experimentation, however, web applications with slightly different user experiences (UX) designed for the present use case of mind mapping values could be iteratively considered against each other via UX techniques such as A/B testing. Specifically, different types of "externalizations" of one's values could be developed. For instance, this thesis experiment's active control task could be adapted to a journaling task specifically targeted at values (prompts with explicit questions regarding participants' set of values and value-

aligned action); meanwhile, the treatment group could be assigned the same *MindMup* task. Such an experiment would test whether a question-and-response system or mind mapping system is a better form of "externalization" for values. Additionally, the User Experience Questionnaire (UEQ; Laugwitz et al, 2008) could be specifically used in future experimentation in order to find the optimal computer-based design for contemplating one's values and degree of value-aligned action. Again, the main idea is that an artifact or "externalization" of an individual's value system would make it so that he or she does not need to maintain these ideas in their own head. In fact, it was very encouraging that 5 out of the 15 participants (33%) in the *MindMup* group stated that the fact that there was an artifact of their values to look back on was very useful and, as one participant stated, it was like "having the constant thought in the back of their head."

Now I will briefly speak about the possibility for *Psyche* to be a consumer product.

6.2.2 Consumer Product

While I will not speak at all about the business viability or user desirability of *Psyche*, its development seems feasible within the current landscape of technology systems of better computational tools, better AI systems, and so on.

The existence of various mobile applications such as *Aspire* and *Mitra* (as presented at the end of Chapter 2) shows that value-based applications are in the mind of some researchers and technologists, to varying degrees of scientific bases. As aforementioned, both apps have one of the two following features but neither has both: adding specific actions or goals and tracking value consistency across time. As I suggested in Chapter 2, it seems that both of these features may be necessary for effective self-reflection and valued living. Nevertheless, to go beyond these existing applications, *Psyche* should be developed through a thorough execution of the human-centered design process: this would span the stages of need-finding (via observational research and user interviews on how people currently develop their value systems and whether something like *Psyche* is desirable) to iterative prototype testing. And of course, the ultimate hope is that such a system is not only therapeutically effective but also interesting and engaging to its users. As I have said before, engagement is inextricable from therapeutic efficacy in practice.

Also, while this thesis experiment only assessed the role of values and practical identities in mental wellbeing, the idea of heuristics (or pieces of wisdom) (as presented in the first chapter) is also an option for consideration in the design of future products (or even experimentation).

Finally, as I mentioned in the introductory chapter to this thesis, with enough individual *Psyche* users, there would be pool of value systems that represent what the society at large tends to value and identify with (as well as the various goals or ways of embodying these values and identities). With enough data, such a system would be able to use machine learning and various statistical inference techniques to make recommendations at an individual level (and perhaps even population level) – allowing users to learn from each other about deeply personal and significant ideas.

6.3 Concluding Remarks

As per Papert, I hope this work offers a language (values, practical identities, heuristics) in a form (mind map or connected graph) over a medium (software) by which to be more intentional about what we personally take to be important and meaningful. *Psyche* is an externalized system for self-knowledge and, due to its constructionist nature, has the potential to be a publicly shared "object-to-think-with." In this spirit, *Psyche* can be a model for communicating and sharing what is meaningful to each of us with others: our own *Psyches* as it were will not only augment our own minds but also the minds of others.

And if there is anything that will help us through the current mental health crisis, it is the two things *Psyche* proposes: the development of self-knowledge and, potentially, the creation of deeper human connection.

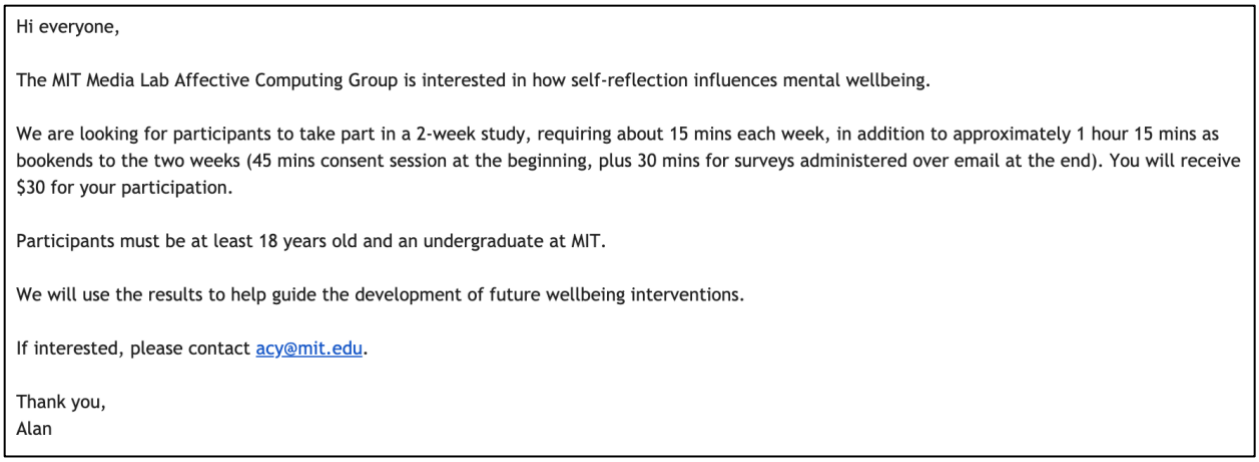
Appendix A

Experimental Study Materials

A.1 Pre-Study Materials

This section contains all materials for the study prior to the consent session: it includes recruitment materials, emails to interested and selected participants, and the pre-study screening questionnaire.

A.1.1 Recruitment Email



Hi everyone,

The MIT Media Lab Affective Computing Group is interested in how self-reflection influences mental wellbeing.

We are looking for participants to take part in a 2-week study, requiring about 15 mins each week, in addition to approximately 1 hour 15 mins as bookends to the two weeks (45 mins consent session at the beginning, plus 30 mins for surveys administered over email at the end). You will receive $30 for your participation.

Participants must be at least 18 years old and an undergraduate at MIT.

We will use the results to help guide the development of future wellbeing interventions.

If interested, please contact acy@mit.edu.

Thank you,
Alan

Fig. A.1.1. A screenshot of the recruitment email sent to MIT undergraduates.

A.1.2 Recruitment Flyer

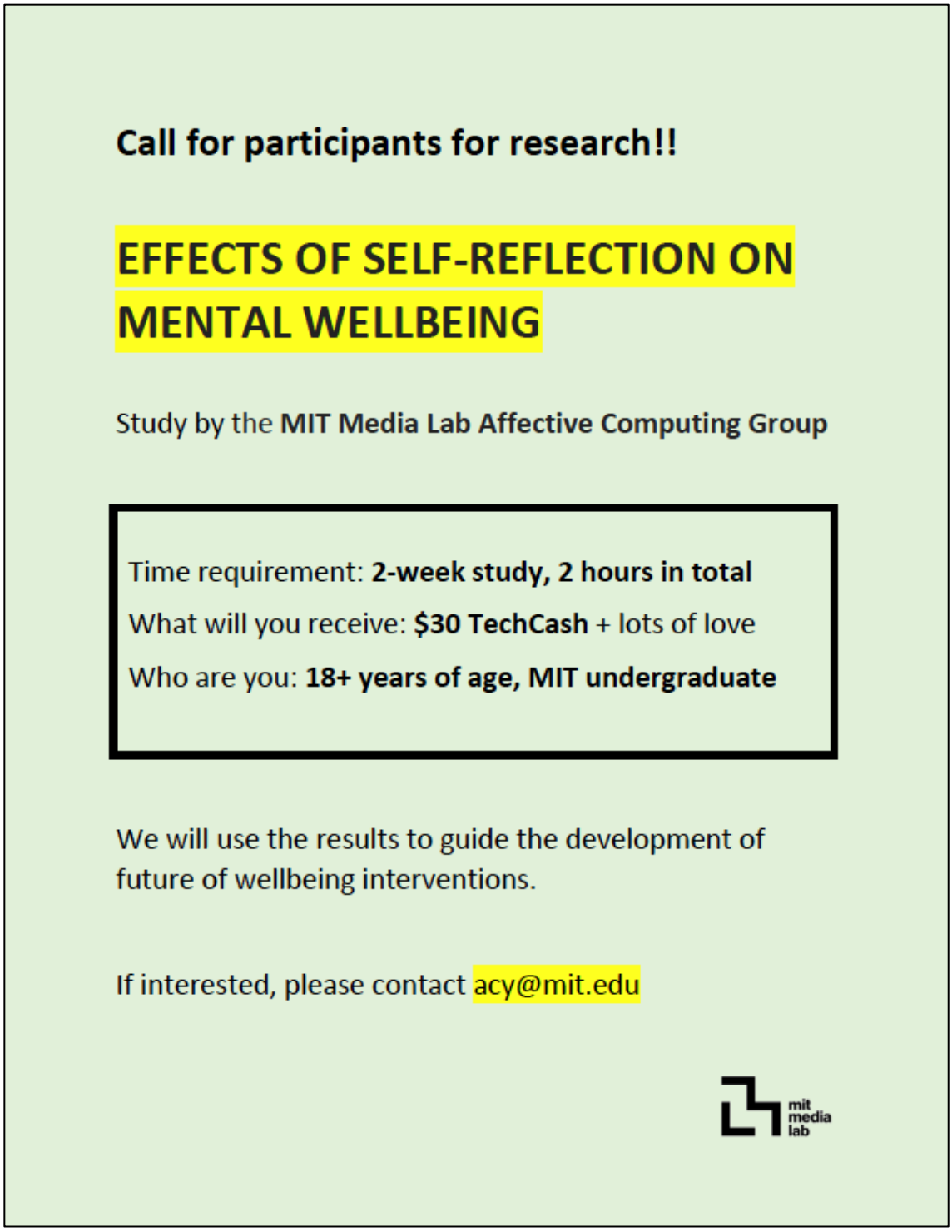
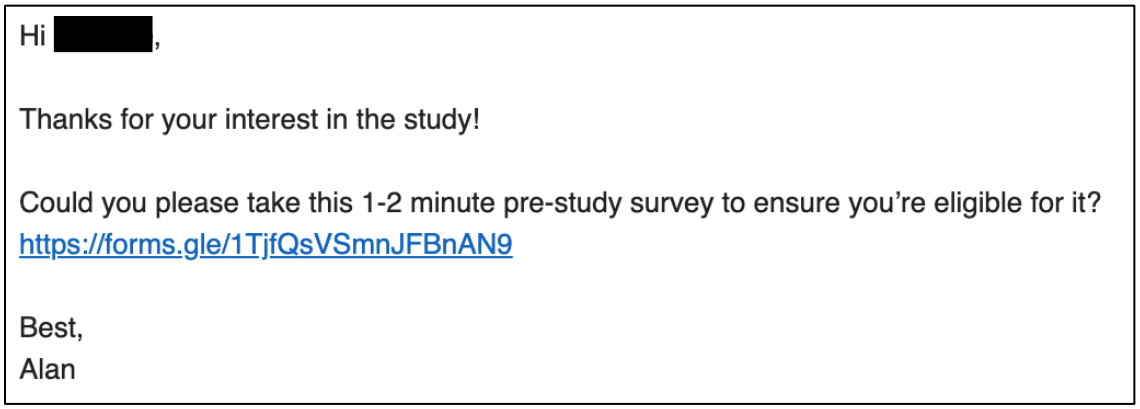


Fig. A.1.2. Recruitment flyer posted around the MIT campus.

A.1.3 Pre-Study Email


Hi [redacted],

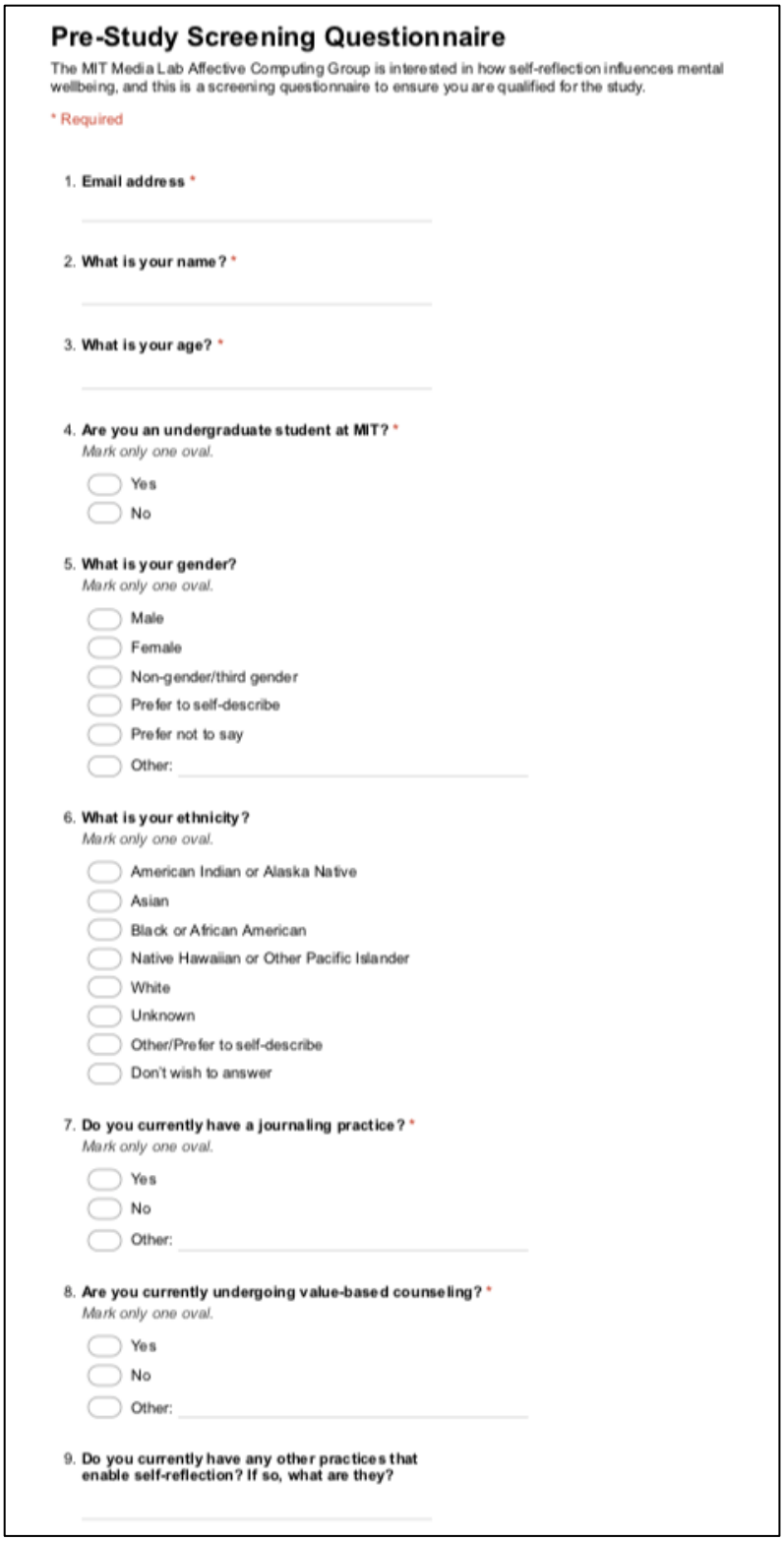
Thanks for your interest in the study!

Could you please take this 1-2 minute pre-study survey to ensure you're eligible for it?
https://forms.gle/1TjfQsVSmnJFBnAN9

Best,
Alan

Fig. A.1.3. A screenshot of email sent to interested participants.

A.1.4 Pre-Study Screening Questionnaire



Pre-Study Screening Questionnaire

The MIT Media Lab Affective Computing Group is interested in how self-reflection influences mental wellbeing, and this is a screening questionnaire to ensure you are qualified for the study.

* Required

1. **Email address** *

2. **What is your name?** *

3. **What is your age?** *

4. **Are you an undergraduate student at MIT?** *
   Mark only one oval.
   - ◯ Yes
   - ◯ No

5. **What is your gender?**
   Mark only one oval.
   - ◯ Male
   - ◯ Female
   - ◯ Non-gender/third gender
   - ◯ Prefer to self-describe
   - ◯ Prefer not to say
   - ◯ Other: _____

6. **What is your ethnicity?**
   Mark only one oval.
   - ◯ American Indian or Alaska Native
   - ◯ Asian
   - ◯ Black or African American
   - ◯ Native Hawaiian or Other Pacific Islander
   - ◯ White
   - ◯ Unknown
   - ◯ Other/Prefer to self-describe
   - ◯ Don't wish to answer

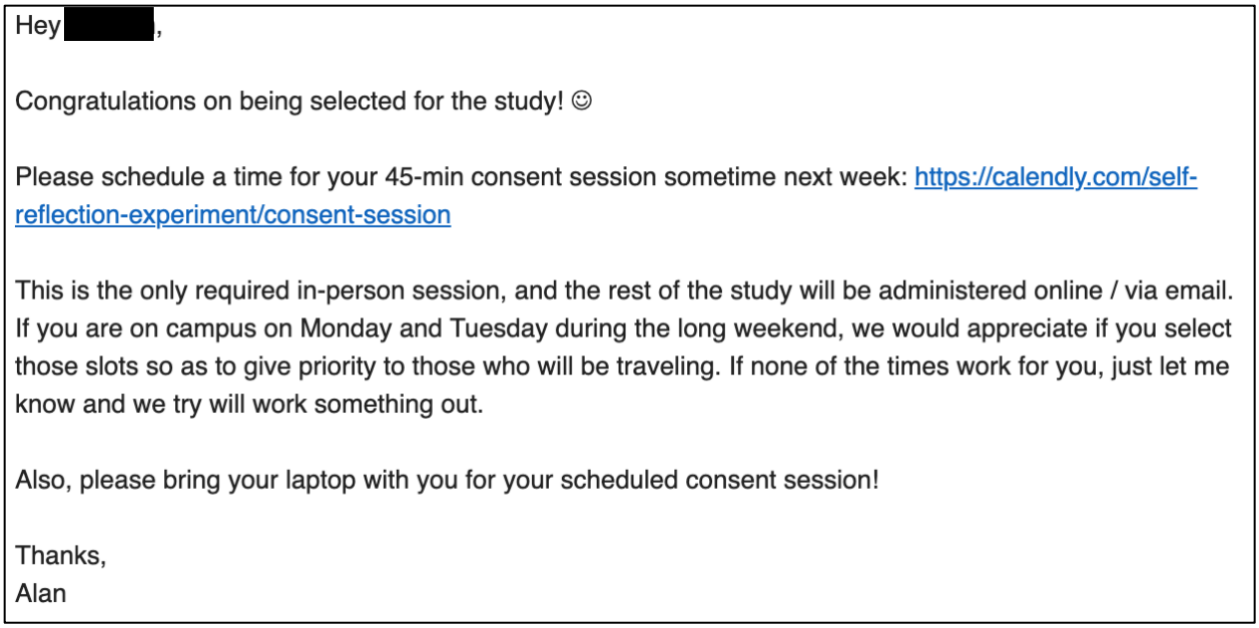
7. **Do you currently have a journaling practice?** *
   Mark only one oval.
   - ◯ Yes
   - ◯ No
   - ◯ Other: _____

8. **Are you currently undergoing value-based counseling?** *
   Mark only one oval.
   - ◯ Yes
   - ◯ No
   - ◯ Other: _____

9. **Do you currently have any other practices that enable self-reflection? If so, what are they?**

Fig. A.1.4. Printable version of pre-study screening questionnaire.

A.1.5 Consent Scheduling Email



Hey [redacted],

Congratulations on being selected for the study! ☺

Please schedule a time for your 45-min consent session sometime next week: https://calendly.com/self-reflection-experiment/consent-session

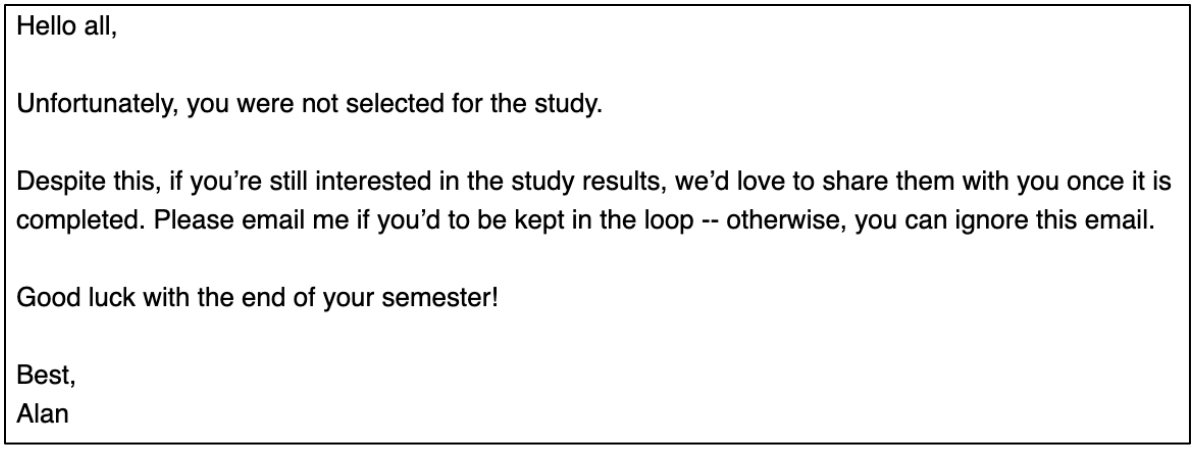
This is the only required in-person session, and the rest of the study will be administered online / via email. If you are on campus on Monday and Tuesday during the long weekend, we would appreciate if you select those slots so as to give priority to those who will be traveling. If none of the times work for you, just let me know and we try will work something out.

Also, please bring your laptop with you for your scheduled consent session!

Thanks,
Alan

Fig. A.1.5. A screenshot of email sent to eligible participants to schedule consent session.

A.1.6 Rejection Email



Hello all,

Unfortunately, you were not selected for the study.

Despite this, if you're still interested in the study results, we'd love to share them with you once it is completed. Please email me if you'd to be kept in the loop -- otherwise, you can ignore this email.

Good luck with the end of your semester!

Best,
Alan

Fig. A.1.6. A screenshot of email sent to ineligible participants.

A.2 Approved Procedure & Study Materials

This section contains the IRB-approved experimental procedure and all remaining experimental materials – from the consent session to the follow-ups.

A.2.1 IRB-Approved Study Protocol Text

Amendments to the study protocol are shown: red text is removed text and green text is removed. These deviations from the approved protocol have been submitted to the IRB at MIT, for their logging purposes.

----------Study Protocol----------

Participants will be recruited via emails as part of the MIT Undergraduate Administration's Byte (a weekly newsletter sent out to MIT undergraduates) and other undergraduate mailing lists. The email will instruct potential participants to email the investigators about their interest in partaking in the study; then, an online survey will be administered in order to make sure the potential participant meets the inclusion criteria (see Pre-study Screening Questions in attachments). We will not track any identity information, outside of checking the potential participants against the inclusion criteria.

Then, ~~two separate~~ private consent sessions will be held in a room on campus (location TBD) where the study will be explained, questions will be answered, and a consent form will be given and signed by individuals who still would like to be part of the study. Half of the participants will receive the control group version of the consent form, and half the experimental group version: see attached for the two form versions. Participants will be informed that they will be involved in the study for ~~four~~ two weeks.

After signing the consent form, participants will be assigned a non-personally-identifying-subject ID #, which will be the only identifier on their questionnaires, and then they will be given two standardized pre-study surveys. The two standardized surveys are the Clinical Outcomes in Routine Evaluation (CORE-OM) survey, which measures general mental wellbeing and levels of distress, and the Patient Health Questionnaire (PHQ-9), which measures levels of depression. These surveys (as adapted to include the omissions from the following paragraph) are included in the attachments.

If poor mental health is observed after these surveys, we will encourage the participant to make an appointment with MIT's mental health services. If the participant feels uncomfortable with the suggestion, he or she may decline the suggestion and still participate or may drop out of the study. Participants will be given an info sheet (see Info Sheet in attachments), which specifies the thresholds for the suggestion as well as what resources are available for those who wish to seek a

mental health referral. Question 9 of the original PHQ-9 and questions 9, 16, 24, 34 – questions dealing with suicide or self-harm – have been omitted from the mental health questionnaires.

After filling in the questionnaires, the two groups will be given a separate first-day task. The control group will be asked to journal in self-reflection on Microsoft Word (or Diaro, TextEdit, Evernote; but Word provides a word count feature) on their laptops (which I will remind them to bring) for about 15 minutes about their life. They will be given a few questions to get them thinking, but this will mostly be free-form. We will make sure they succeed in using the software. The experimental group will be asked to create a mind map from the Mindmup web application of the participant's values and practical identities with some explicit self-defined goals (weekly or daily goals, either abstract or concrete) – see *Figure 1* below. This should also take about 15 minutes.

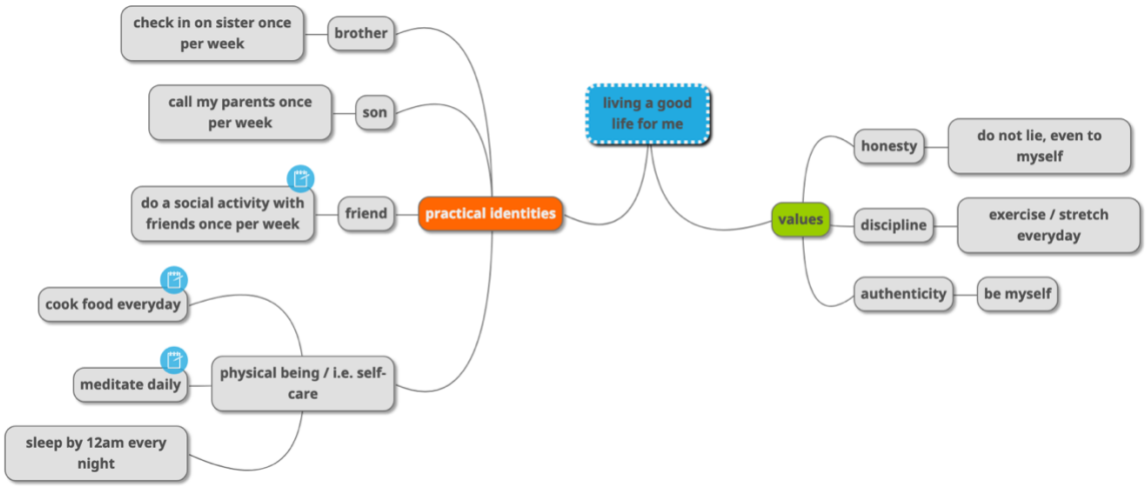


Figure 1. A sample mind map of a participant's values & identities created using the Mindmup software.

Upon completing the first-day task, both groups will be given their task for the next two weeks. The control group will be asked to journal at the end of each week (for a total of two times) on the same app for about 15 minutes. The experimental group will be asked to rate their level of consistency at the end of each week (for a total of two times) and take any additional descriptive notes they would like if they wish using the "Edit text notes" feature of the Mindmup software.

After each week of the experiment, an email will be sent to check in on both groups to see their general comments about the study progress, make sure they are doing the weekly task, and see if they have any new questions. For the control group, we will ask approximately how many minutes and the word count of their journal entry each week in the email. For the experimental group, we will ask participants to report the number of values and identities they reflected on (e.g. thought about for a few minutes, took some notes about, or noted the consistency of) and the actual number of minutes they spent using the software each week in the email.

After the two weeks are complete, both groups will receive the PHQ-9 and CORE-OM surveys as well as a general post-study survey (included in the attachments) via email. Both groups will also

receive the System Usability Scale (SUS) survey, which is also included in the attachments. Upon completing these online surveys, participants will receive a $30 TechCash card.

The proration schedule should the participant decide to withdraw or is withdrawn by the investigator is as follows, as quoted from the consent forms:

- Should you leave on the first day of the experiment, you will receive no compensation.
- Should you leave after the first week of the experiment, you will receive a $10 TechCash card.

---------- Post-Study Contact ----------

All participants in the full study will remain on a list for two years after they complete the study so that the investigators can contact them to invite them to participate in a follow-up study if desired. Also, participants can be removed from the list at any time upon request.

A.2.2 Consent Session Transcript

Hello, ___. Thank you for joining the experiment I'm running in conjunction with the Affective Computing group at the MIT Media Lab for my Master's degree thesis. As you know, we are running an experiment on the effects of self-reflection on mental wellbeing.

First, I'll give you a consent form, which you should read fully and sign if you agree.

pass out consent form [varies based on participant group]

Some highlights on the form that you should note are:

- Regarding the honesty pledge: I want re-iterate how important it is not only to the research but also to my thesis that you do what the experiment requires completely and to the best of your ability.

Now, I'll give your subject ID that are non-personally-identifying.

pass out ID slips

From now on, we'll identify you by this number in order to keep all private information confidential. Please put this number on all surveys you fill out.

Let's do the two initial questionnaires now. The first one is the Clinical Outcomes in Routine Evaluation (CORE-OM) questionnaire which measures general mental wellbeing and levels of distress. I'll share it via Google Forms now.

Also, please note that your participation is voluntary, and you may skip any question you do not want to answer. But my experiment is highly dependent on getting responses on this so it'd be great if you could fill it out.

The second one is the Patient Health Questionnaire (PHQ-9) which measures levels of depression. I'll share it via Google Forms now.

Again, your participation is voluntary, and you may skip any question you do not want to answer. But my experiment is highly dependent on getting responses on this so it'd be great if you could fill it out.

Ok, now let's do the task to get you started, and then we'll be finished with the session.

[varies based on participant group]

Control group:
Your task is to journal for about 15 minutes about your life on Microsoft Word (or Diaro, Evernote, TextEdit or any note-taking app of your choice). Microsoft Word has a word count feature which is handy, since we will ask that you tell us how many words your response was for this first-day task as well as at the end of both weeks.

Some questions to consider are:
1) Describe where you are in your life.
2) What have you done in your life?
3) What do you wish for your life?
4) What would change about the world if you could?
5) What makes you most happy?
6) What makes you sad?
7) What are you afraid of?

Do you understand the task? Please let know if you have any questions.

Experimental group:
For the next 15 minutes, your task is to create a mind map of your personal values and practical identities, along with some concrete self-defined goals (can be weekly or daily, abstract or concrete). Show example.

Values are pretty broad but they are related to your character: Aristotlean virtues (e.g. generosity, temperance, courage, justice) or in the sense of David Brooks in his book *The Road to Character* (e.g. kindness, bravery, honesty, faithfulness)

Regarding practical identity: There's this American philosopher Christine Korsgaard who writes that "Practical identity is a complex matter and for the average person there will be a jumble of such conceptions. You are a human being, a woman or a man, an adherent of a certain religion, a member of an ethnic group, a member of a certain profession, someone's lover or friend, and so on. And all

of these identities give rise to reasons and obligations. Your reasons express your identity, your nature; your obligations spring from what that identity forbids" (Korsgaard, pp. 101).

I'll now share a link to your email so you have access to the software we will be using called MindMup.

I am also sharing a sample mind map (which you will have access to over the next two weeks), and I will describe what I've done.

When you make your map, make sure it is private!

Do you understand the task? Please let know if you have any questions.
after 15 minutes

How was that experience?

Control group:
How many words was your journal entry?

Experimental group:
How many values + practical identities did you add?

Ok now we are basically finished.
So, for every [day (e.g. Monday)] of the next 2 weeks, we will have you do the same task.

[varies based on participant group]

Control group:
Your task is to journal for about 15 minutes about your week on Microsoft Word (or Diaro, Evernote, TextEdit or any note-taking app of your choice).

We'll ask you to fill out an online questionnaire requesting your word count and time spent on the weekly task at the end of each week on **[day (e.g. Monday)]**. We recommend you write for at least 15 minutes, but if you choose to go a bit shorter or longer, please let us know.

After the second and final week, you will also receive a link to four online questionnaires, which you should complete on that **[day (e.g. Monday)].** As described in the consent form, you will complete both wellbeing surveys you've done today, as well as a System Usability survey and a general feedback survey.

Experimental group:
Your task is to interact with the mind map you created today for about 15 minutes each week. You may note the consistency (out of 10) for some goals you may have under each identity or value or simple take some notes regarding any aspect of your mind map.

We'll ask you to fill out an online questionnaire requesting the number of values/identities you reflected on (e.g. thought about for a few minutes, took some notes about, or noted the consistency of) and time spent on the weekly task at the end of each week on **[day (e.g. Monday)]**. We

recommend you use the software for at least 15 minutes, but if you choose to go a bit shorter or longer, please let us know.

After the second and final week, you will also receive a link to four online questionnaires, which you should complete on that **[day (e.g. Monday)]**. As described in the consent form, you will complete both wellbeing surveys you've done today, as well as a System Usability survey and a general feedback survey.

A.2.3 Consent Form (Journaling)

Revised 4/8/2019 12:28 PM

CONSENT TO PARTICIPATE IN NON-BIOMEDICAL RESEARCH

The Role of Values and Identities in Mental Wellbeing

Journaling Population Group

You have been asked to participate in a research study conducted by Alan Yan from the Integrated Design & Management program and Professor Rosalind Picard from the Affective Computing Group at the Media Lab at the Massachusetts Institute of Technology (M.I.T.). The results will be contributed to Alan Yan's master's thesis.

You were selected as a possible participant in this study because of your interest in learning how self-reflection affects your mental wellbeing.

The purpose of the study is to investigate whether a practice of journaling can be beneficial for improving mental wellbeing. Because of the sensitive nature of writing journal notes (even though it will be private), you may experience some discomfort. If you no longer feel comfortable at any time throughout the experiment, you may choose to withdraw from the study.

The 2-week study will require about 15 mins each week, in addition to approximately 1 hour 15 mins as bookends to the two weeks (45 mins consent session at the beginning, plus 30 mins for surveys administered over email at the end). The weekly task will be journaling at the end of each week for about 15 minutes. In the 45 min consent session, you will sign an honesty pledge, take two wellbeing surveys, and do a 15-minute journaling task. At the end of two weeks, you will do four surveys: the same two wellbeing surveys, a system usability survey, and a general study feedback survey. In total, you should expect to spend approximately 1 hour 45 mins over the study duration. Upon completion of all necessary tasks, you will receive a $30 TechCash card for your participation.

You may expect to benefit from participating because your participation is not only an opportunity for a paid self-reflection on your life, but also a contribution to ending the great mental health crisis in our world.

All study data gathered from you will be associated with a number, which will be kept separately from your contact information and in a secure password-protected location and encrypted on a machine. This de-identified study data (pre-study and post-study survey results) may be presented to the public to illustrate the result of the study, but this data will be mostly presented in aggregate and, if it is individual, will be untraceable back to you. This study data as well as your contact information will be stored in a secure password-protected place and encrypted on a machine for two years after you complete the study. However, you may drop out and opt to be removed from these records.

You should read the information below, and ask questions about anything you do not understand, before deciding whether or not to participate.

- **PARTICIPATION AND WITHDRAWAL**

In order to participate in the study, you must be between 18 and 29 years old.

Your participation in this study is completely voluntary and you are free to choose whether to be in it or not. If you choose to be in this study, you may subsequently withdraw from it at any time without penalty or consequences of any kind. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

If you contract a medical condition or start a drug regimen during the study, please inform the investigators of the study immediately. You may be withdrawn from the study if this is the case.

- **PURPOSE OF THE STUDY**

The purpose of the study is to investigate whether a practice of self-reflection can be beneficial for improving mental wellbeing.

- **PROCEDURES**

If you volunteer to participate in this study, we would ask you to do the following things:

1. Take two standardized pre-study surveys at an intake session:
   1) Patient Health Questionnaire (PHQ-9)
   2) Clinical Outcomes in Routine Evaluation (CORE-OM)

2. At the intake session, journal for about 15 minutes about your life. We will provide some short prompts to consider, such as:
   1) Describe where you are in your life.
   2) What have you done in your life?
   3) What do you wish for your life?
   4) What would change about the world if you could?
   5) What makes you most happy?
   6) What makes you sad?
   7) What are you afraid of?

3. At the end of each week (every Sunday) in the next two weeks during the experiment, you will journal on Microsoft Word (or Diaro, TextEdit, Evernote; but Word provides a word count feature) on your laptop for about 15 minutes. This is relatively free-form and as expressive as you like, but we will provide some short prompts to consider if you would like. This journaling can take place anywhere, although we suggest that respondents complete it on a computer in a confidential location.

4. After each week of the experiment (two times total), we will check in with you via email to see if you have any comments or questions about the procedure. We will ask you to report the word count and the actual number of minutes spent you spent journaling each week in the email

as well. Your comments and questions can be directly made in response to the email, while all other information will be requested via an anonymized Google survey.

5. At the end of the 2-week study, you will be asked to complete post-study surveys, including:

1) General usability and thoughts about the intervention method.
2) Patient Health Questionnaire (PHQ-9)
3) Clinical Outcomes in Routine Evaluation (CORE-OM)
4) System Usability Scale (SUS)

- **POTENTIAL RISKS AND DISCOMFORTS**

Because of the sensitive nature of writing journal notes (even though it will be private), you may experience some discomfort. If you no longer feel comfortable at any time throughout the experiment, you may choose to withdraw from the study.

If your results in some of the mental health surveys reflect poor mental health condition, we will encourage you to make an appointment with mental health services. Pleases take care of your health. You are free to ignore our suggestion or to drop out of the study at any time.

If you experience ill effects or have questions/concerns regarding the study, please contact the investigators (information listed at the end of this consent form). If you experience any ill effects (either mentally or physically) during or after the study, inform the investigators immediately.

- **POTENTIAL BENEFITS**

You will receive an opportunity for a paid self-reflection on your life. Also, because of your participation, you are contributing to the progress of science and influencing the way we, as a society, deal with the great mental health crisis in the world.

- **PAYMENT FOR PARTICIPATION**

After completing the 2-week study, you will be given a $30 TechCash card for your participation within two weeks of the experiment's completion date. The proration schedule should you decide to withdraw or are withdrawn by the investigator is as follows:

- Should you leave on the first day of the experiment, you will receive no compensation.
- Should you leave after the first week of the experiment, you will receive only $10 TechCash card.

Legally, you can be paid only if you are a US citizen, a legal resident alien (e.g., possess a "green" card), or have a work eligible visa sponsored by the paying institution. You will not be reimbursed for transportation costs to and from the experiment site.

- **PRIVACY AND CONFIDENTIALITY**

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. In addition, your information may be reviewed by authorized MIT representatives to ensure compliance with MIT policies and procedures.

We will keep your contact information in a password-protected location (that is not linked to an inter-net or intra-net) and encrypted on a machine. This contact information will be kept separate from your study data for two years after you complete the study in the event that we would like to contact you about a follow-up study. You can ask to be removed from this list at any time.

We will not track your dorm, major, or any other identity information. All the data gathered from you will be associated with a number, which will be kept separately from your name and also in a password-protected location (that is not linked to an inter-net or intra-net) and encrypted on a machine. No information, such as name, address, or other private identifying information will be included in any public materials.

Your de-identified data (pre-study and post-study survey results) may be presented to the public to illustrate the result of the study, but this data will be mostly presented in aggregate and, if it is individual, will be untraceable back to you. This data will be used only for scientific and educational purposes, and only without your name being associated with it. At any time during or after this experiment you may request to review the data or have it destroyed. The data will be stored in the secure password-protected location and encrypted on a machine for two years after you complete the study, and you may drop out and opt not to be contacted at any time. Please sign below to give permission for the collection of this material.

If you choose to use Diaro or Evernote instead of Microsoft Word, please note that these third-party applications have their own privacy policy and data storage features.

- **IDENTIFICATION OF INVESTIGATORS**

If you have any questions or concerns about the research, please feel free to contact Alan Yan (412-328-1375, IDM MIT; 77 Massachusetts Avenue, Building E40-315, Cambridge, MA 02139) or Professor Rosalind Picard, Faculty Sponsor (617-253-0611, MIT Media Lab; 20 Ames Street, Cambridge, MA 02139).

- **EMERGENCY CARE AND COMPENSATION FOR INJURY**

If you feel you have suffered an injury, which may include emotional trauma, as a result of participating in this study, please contact the person in charge of the study as soon as possible.

In the event you suffer such an injury, M.I.T. may provide itself, or arrange for the provision of, emergency transport or medical treatment, including emergency treatment and follow-up care, as needed, or reimbursement for such medical services. M.I.T. does not provide any other form of

compensation for injury. In any case, neither the offer to provide medical assistance, nor the actual provision of medical services shall be considered an admission of fault or acceptance of liability. Questions regarding this policy may be directed to MIT's Insurance Office, (617) 253-2823. Your insurance carrier may be billed for the cost of emergency transport or medical treatment, if such services are determined not to be directly related to your participation in this study.

- **RIGHTS OF RESEARCH SUBJECTS**

You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you feel you have been treated unfairly, or you have questions regarding your rights as a research subject, you may contact the Chairman of the Committee on the Use of Humans as Experimental Subjects, M.I.T., Room E25-143B, 77 Massachusetts Ave, Cambridge, MA 02139, phone 1-617-253 6787.

- **HONESTY PLEDGE**

While I understand that I have the right to drop out of the study at any time, I also understand that if I choose to participate in this study, that it is vital to the science and to Alan's thesis, that I honestly do the tasks that it asks me to do.

By signing below, I promise to make my best effort to put the time requested into the study activities and to accurately report my participation.

SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE

I understand the procedures described above. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

_____
Name of Subject

_____
Name of Legal Representative (if applicable)

_____ _____
Signature of Subject or Legal Representative Date

SIGNATURE OF PERSON OBTAINING INFORMED CONSENT

In my judgment the subject is voluntarily and knowingly giving informed consent and possesses the legal capacity to give informed consent to participate in this research study.

_____
Name of Person Obtaining Informed Consent

_____ _____
Signature of Person Obtaining Informed Consent Date

A.2.4 Consent Form (*MindMup*)

Revised 4/8/2019 12:29 PM

CONSENT TO PARTICIPATE IN NON-BIOMEDICAL RESEARCH

The Role of Values and Identities in Mental Wellbeing

Mindmup Population Group

You have been asked to participate in a research study conducted by Alan Yan from the Integrated Design & Management program and Professor Rosalind Picard from the Affective Computing Group at the Media Lab at the Massachusetts Institute of Technology (M.I.T.). The results will be contributed to Alan Yan's master's thesis.

You were selected as a possible participant in this study because of your interest in learning how self-reflection affects your mental wellbeing.

The purpose of the study is to investigate whether a practice of mapping out values and identities can be beneficial for improving mental wellbeing. Because of the sensitive nature of the sharing your personal thoughts on values and identities via a mind map (even though it will be private), you may experience some discomfort. If you no longer feel comfortable at any time throughout the experiment, you may choose to withdraw from the study.

The 2-week study will require about 15 mins each week, in addition to approximately 1 hour 15 mins as bookends to the two weeks (45 mins consent session at the beginning, plus 30 mins for surveys administered over email at the end). The weekly task will be to interact with your mind map for about 15 minutes. In the 45 min consent session, you will sign an honesty pledge, take two wellbeing surveys, and create your mind map on MindMup (a mind mapping software) for about 15 minutes about your values and identities in life. At the end of two weeks, you will do four surveys: the same two wellbeing surveys, a system usability survey, and a general study feedback survey. In total, you should expect to spend approximately 1 hour 45 mins over the study duration. Upon completion of all necessary tasks, you will receive a $30 TechCash card for your participation.

You may expect to benefit from participating because your participation is not only an opportunity for a paid self-reflection on your life, but also a contribution to ending the great mental health crisis in our world.

All study data gathered from you will be associated with a number, which will be kept separately from your contact information and in a secure password-protected location and encrypted on a machine. This de-identified study data (pre-study and post-study survey results) may be presented to the public to illustrate the result of the study, but this data will be mostly presented in aggregate and, if it is individual, will be untraceable back to you. This study data as well as your contact information will be stored in a secure password-protected place and encrypted on a machine for two years after you complete the study. However, you may drop out and opt to be removed from these records.

You should read the information below, and ask questions about anything you do not understand, before deciding whether or not to participate.

1

- **PARTICIPATION AND WITHDRAWAL**

In order to participate in the study, you must be between 18 and 29 years old.

Your participation in this study is completely voluntary and you are free to choose whether to be in it or not. If you choose to be in this study, you may subsequently withdraw from it at any time without penalty or consequences of any kind. The investigator may withdraw you from this research if circumstances arise which warrant doing so.

If you contract a medical condition or start a drug regimen during the study, please inform the investigators of the study immediately. You may be withdrawn from the study if this is the case.

- **PURPOSE OF THE STUDY**

The purpose of the study is to investigate whether a practice of self-reflection can be beneficial for improving mental wellbeing.

- **PROCEDURES**

If you volunteer to participate in this study, we would ask you to do the following things:

1. Take two standardized pre-study surveys at an intake session:
   1) Patient Health Questionnaire (PHQ-9)
   2) Clinical Outcomes in Routine Evaluation (CORE-OM)

2. At the intake session, you will create a mind map on MindMup (a mind mapping software) for about 15 minutes about your values and identities in life; in extension of these values and identities, you will write down a few goals if you wish to. A helpful example will be provided.

3. At the end of each week (every Sunday) in the next two weeks during the experiment, you will interact with your mind map for about 15 minutes. You may note the consistency (out of 10) for some goals you may have under each identity or value; or simply take some notes regarding any aspect of the mind map. You may do this anywhere, although we suggest that you complete it on a computer in a confidential location.

4. After each week of the experiment (two times total), we will check in with you via email to see if you have any comments or questions about the procedure. We will ask you to report the number of values and identities you reflected on (e.g. thought about for a few minutes, took some notes about, or noted the consistency of) and the actual number of minutes spent using the software each week in the email as well. Your comments and questions can be made directly in response to the email, while all other information will be requested via an anonymized Google survey.

5. At the end of the 2-week study, you will be asked to complete post-study surveys, including:

1) General usability and thoughts about the intervention method.
2) Patient Health Questionnaire (PHQ-9)
3) Clinical Outcomes in Routine Evaluation (CORE-OM)
4) System Usability Scale (SUS)

Note: If you would like to share your mind map digitally with us, noting any notable changes (e.g. consistency ratings for goals) you have made to it throughout the duration of the study, it would greatly help our study. This will be described again in the first survey on "General usability and thoughts about the intervention method."

- **POTENTIAL RISKS AND DISCOMFORTS**

Because of the sensitive nature of the sharing your personal thoughts on values and identities via a mind map (even though it will be private), you may experience some discomfort. If you no longer feel comfortable at any time throughout the experiment, you may choose to withdraw from the study.

If your results in some of the mental health surveys reflect poor mental health condition, we will encourage you to make an appointment with mental health services. You are free to ignore the suggestion or to drop out of the study at any time.

If you experience ill effects or have questions/concerns regarding the study, please contact the investigators (information listed at the end of this consent form). If you experience any ill effects (either mentally or physically) during or after the study, inform the investigators immediately.

- **POTENTIAL BENEFITS**

You will receive an opportunity for a paid self-reflection on your life. Also, because of your participation, you are contributing to the progress of science an influencing the way we, as a society, deal with the great mental health crisis in the world.

- **PAYMENT FOR PARTICIPATION**

After completing the 2-week study, you will be given a $30 TechCash card for your participation within two weeks of the experiment's completion date. The proration schedule should you decide to withdraw or are withdrawn by the investigator is as follows:

- Should you leave on the first day of the experiment, you will receive no compensation.
- Should you leave after the first week of the experiment, you will receive a $10 TechCash card.

Legally, you can be paid only if you are a US citizen, a legal resident alien (e.g., possess a "green" card), or have a work eligible visa sponsored by the paying institution. You will not be reimbursed for transportation costs to and from the experiment site.

- **PRIVACY AND CONFIDENTIALITY**

Any information that is obtained in connection with this study and that can be identified with you will remain confidential and will be disclosed only with your permission or as required by law. In addition, your information may be reviewed by authorized MIT representatives to ensure compliance with MIT policies and procedures.

We will keep your contact information in a password-protected location (that is not linked to an inter-net or intra-net) and encrypted on a machine. This contact information will be kept separate from your study data for two years after you complete the study in the event that we would like to contact you about a follow-up study. You can ask to be removed from this list at any time.

We will not track your dorm, major, or any other identity information. All the data gathered from you will be associated with a number, which will be kept separately from your name and also in a password-protected location (that is not linked to an inter-net or intra-net) and encrypted on a machine. No information, such as name, address, or other private identifying information will be included in any public materials.

Your de-identified data (pre-study and post-study survey results) may be presented to the public to illustrate the result of the study, but this data will be mostly presented in aggregate and, if it is individual, will be untraceable back to you. This data will be used only for scientific and educational purposes, and only without your name being associated with it. At any time during or after this experiment you may request to review the data or have it destroyed. The data will be stored in the secure password-protected location and encrypted on a machine for two years after you complete the study, and you may drop out and opt not to be contacted at any time. Please sign below to give permission for the collection of this material.

MindMup has its own privacy policy which can be found on their website. For data storage, MindMup allows users to store data on Google Drive or MindMup Cloud storage.
MindMup Cloud storage is essentially Amazon Web Service's S3 File system for data storage. The mechanism for both data storage options is as follows: changes to your mind map will be sent directly from your browser to Google Drive or S3 using HTTPS, and only when directed by you (i.e. no auto-saving). No additional backups are made on MindMup servers or anywhere else. While the content is unencrypted on these cloud storage systems, they will be secured in a private location only accessible to you via a pre-signed URL. The data will be stored as long as your MindMup Personal Gold account is active.

- **IDENTIFICATION OF INVESTIGATORS**

If you have any questions or concerns about the research, please feel free to contact Alan Yan (412-328-1375, IDM MIT; 77 Massachusetts Avenue, Building E40-315, Cambridge, MA 02139) or Professor Rosalind Picard, Faculty Sponsor (617-253-0611, MIT Media Lab; 20 Ames Street, Cambridge, MA 02139).

- **EMERGENCY CARE AND COMPENSATION FOR INJURY**

If you feel you have suffered an injury, which may include emotional trauma, as a result of participating in this study, please contact the person in charge of the study as soon as possible.

In the event you suffer such an injury, M.I.T. may provide itself, or arrange for the provision of, emergency transport or medical treatment, including emergency treatment and follow-up care, as needed, or reimbursement for such medical services. M.I.T. does not provide any other form of compensation for injury. In any case, neither the offer to provide medical assistance, nor the actual provision of medical services shall be considered an admission of fault or acceptance of liability. Questions regarding this policy may be directed to MIT's Insurance Office, (617) 253-2823. Your insurance carrier may be billed for the cost of emergency transport or medical treatment, if such services are determined not to be directly related to your participation in this study.

- **RIGHTS OF RESEARCH SUBJECTS**

You are not waiving any legal claims, rights or remedies because of your participation in this research study. If you feel you have been treated unfairly, or you have questions regarding your rights as a research subject, you may contact the Chairman of the Committee on the Use of Humans as Experimental Subjects, M.I.T., Room E25-143B, 77 Massachusetts Ave, Cambridge, MA 02139, phone 1-617-253 6787.

- **HONESTY PLEDGE**

While I understand that I have the right to drop out of the study at any time, I also understand that if I choose to participate in this study, that it is vital to the science and to Alan's thesis, that I honestly do the tasks that it asks me to do.

By signing below, I promise to make my best effort to put the time requested into the study activities and to accurately report my participation.

SIGNATURE OF RESEARCH SUBJECT OR LEGAL REPRESENTATIVE

I understand the procedures described above. My questions have been answered to my satisfaction, and I agree to participate in this study. I have been given a copy of this form.

_____

Name of Subject

_____

_____

Name of Legal Representative (if applicable)

_____ _____

Signature of Subject or Legal Representative Date

SIGNATURE OF PERSON OBTAINING INFORMED CONSENT

In my judgment the subject is voluntarily and knowingly giving informed consent and possesses the legal capacity to give informed consent to participate in this research study.

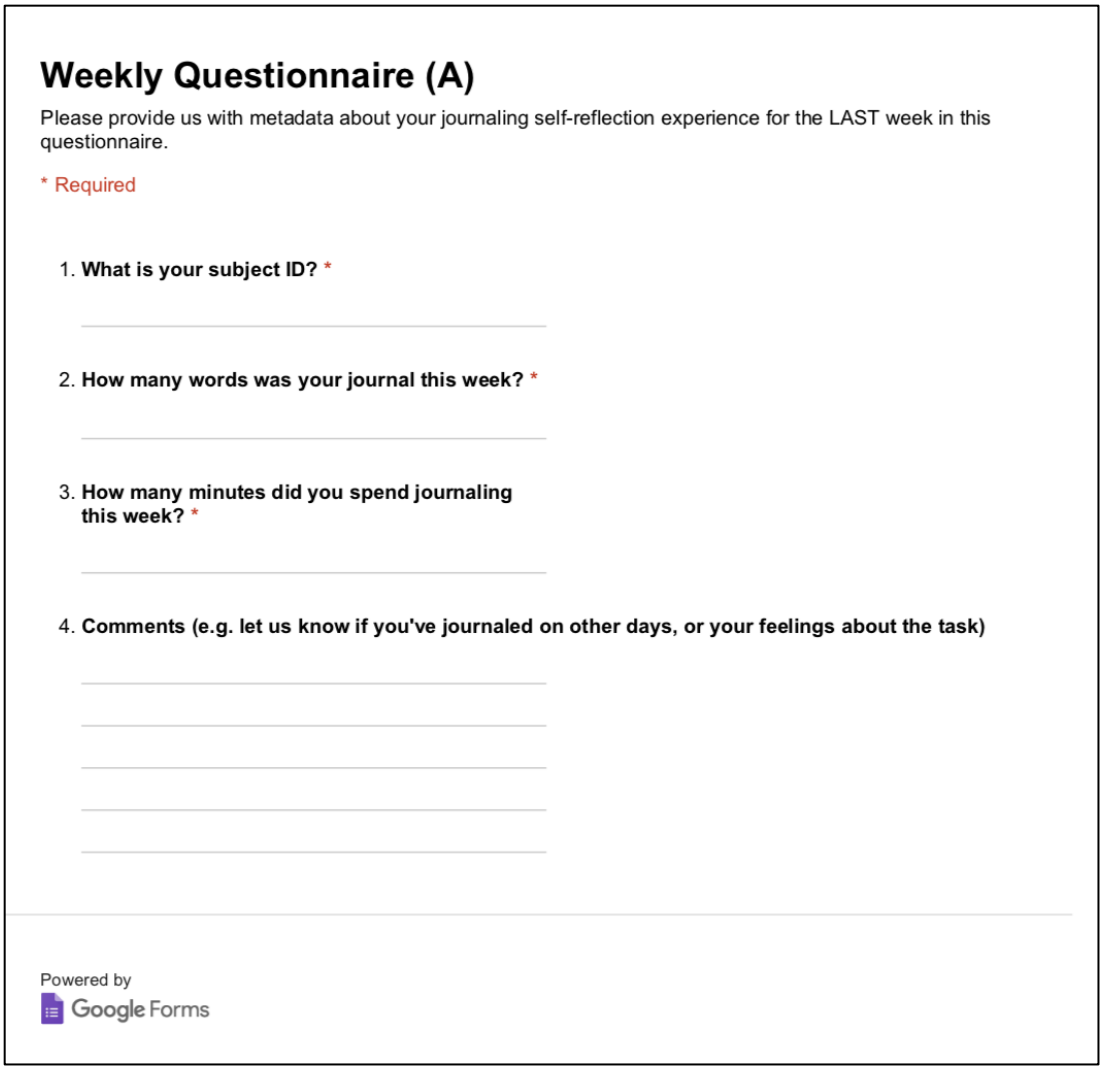
_____

Name of Person Obtaining Informed Consent

_____ _____

Signature of Person Obtaining Informed Consent Date

A.2.5 Weekly Questionnaire (Journaling)



Weekly Questionnaire (A)

Please provide us with metadata about your journaling self-reflection experience for the LAST week in this questionnaire.

* Required

1. **What is your subject ID?** *

2. **How many words was your journal this week?** *

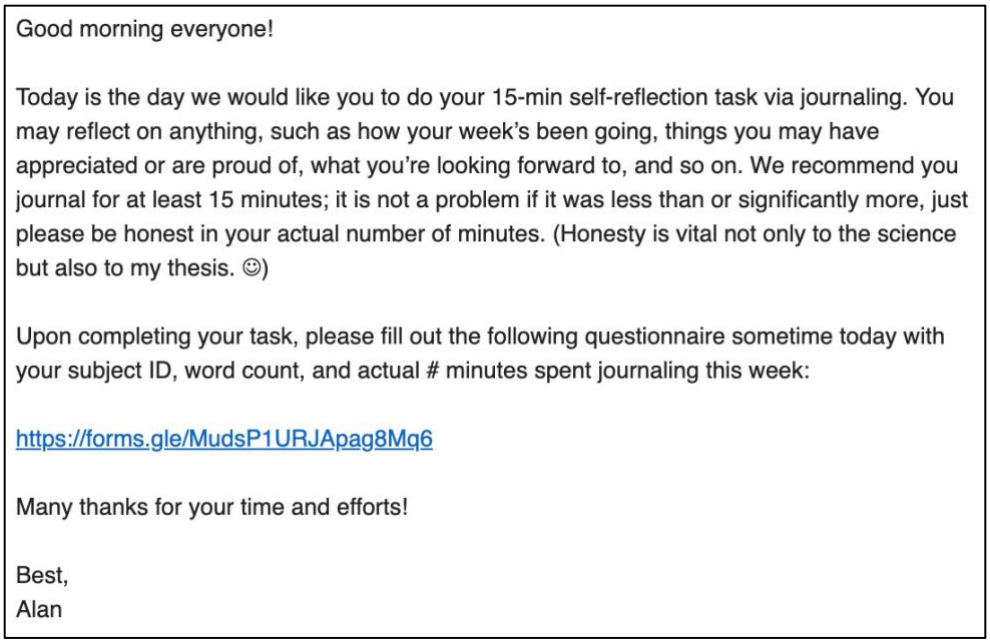
3. **How many minutes did you spend journaling this week?** *

4. **Comments (e.g. let us know if you've journaled on other days, or your feelings about the task)**

Powered by Google Forms

Fig. A.2.1. Printable version of weekly questionnaire sent to Journaling group.

A.2.6 Week 1 Follow-Up Email (Journaling)



Good morning everyone!

Today is the day we would like you to do your 15-min self-reflection task via journaling. You may reflect on anything, such as how your week's been going, things you may have appreciated or are proud of, what you're looking forward to, and so on. We recommend you journal for at least 15 minutes; it is not a problem if it was less than or significantly more, just please be honest in your actual number of minutes. (Honesty is vital not only to the science but also to my thesis. ☺)

Upon completing your task, please fill out the following questionnaire sometime today with your subject ID, word count, and actual # minutes spent journaling this week:

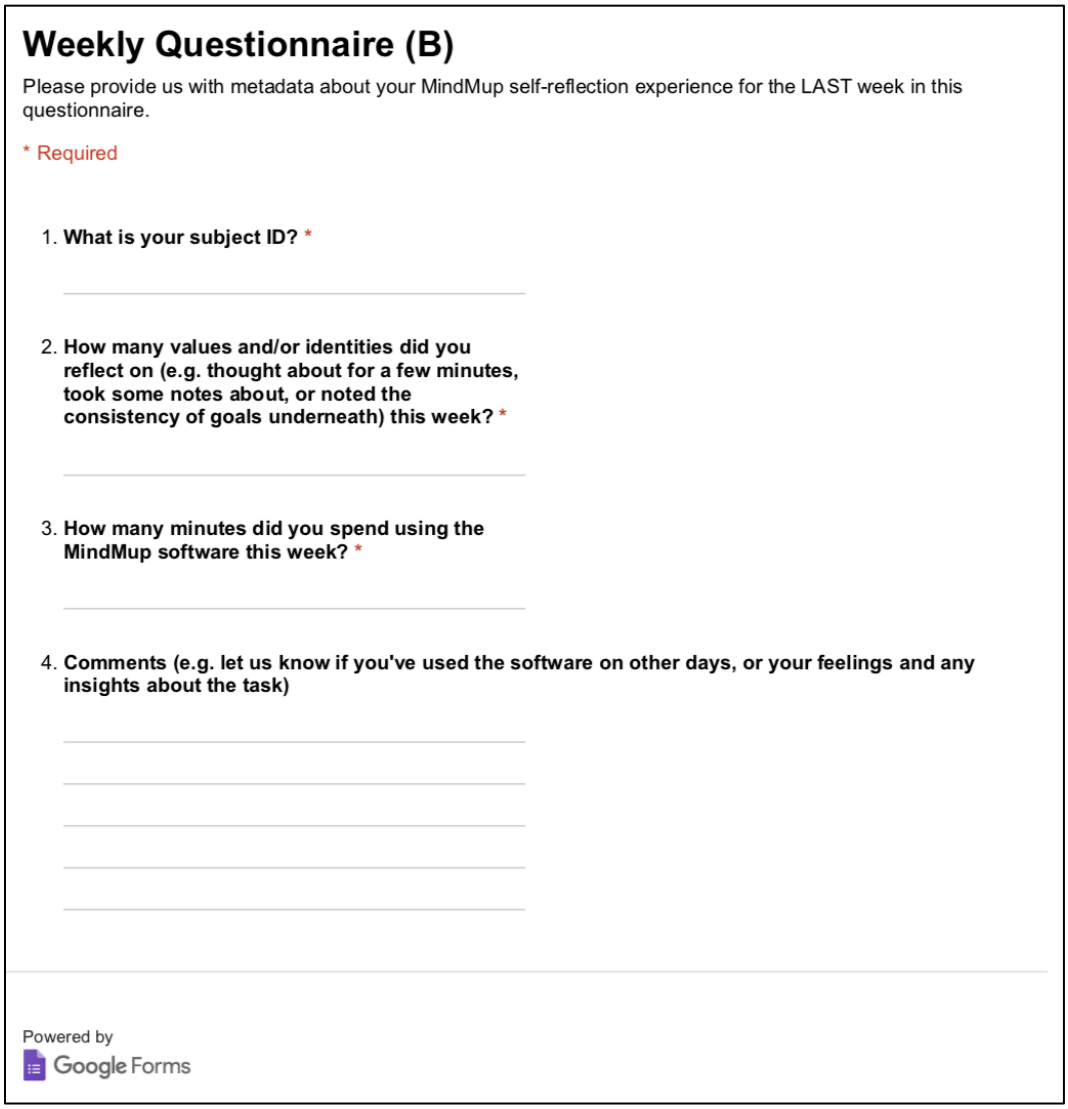
https://forms.gle/MudsP1URJApag8Mq6

Many thanks for your time and efforts!

Best,
Alan

Fig. A.2.2. A screenshot of follow-up email sent to Journaling group after week 1.

A.2.7 Weekly Questionnaire (*MindMup*)



Weekly Questionnaire (B)

Please provide us with metadata about your MindMup self-reflection experience for the LAST week in this questionnaire.

* Required

1. **What is your subject ID?** *

2. **How many values and/or identities did you reflect on (e.g. thought about for a few minutes, took some notes about, or noted the consistency of goals underneath) this week?** *

3. **How many minutes did you spend using the MindMup software this week?** *

4. **Comments (e.g. let us know if you've used the software on other days, or your feelings and any insights about the task)**

Powered by Google Forms

Fig. A.2.3. Printable version of weekly questionnaire sent to *MindMup* group.

A.2.8 Week 1 Follow-Up Email (*MindMup*)

Good morning everyone!

Today is the day we would like you to do your 15-min self-reflection task via MindMup.

We recommend you interact with the software for at least 15 minutes: you may reflect on each goal you set and note how you're doing, or you may add goals/values/identities to your map as you see fit. It is not a problem if you spend a bit less than or significantly more than 15 minutes, just please be honest in your actual number of minutes. (Honesty is vital not only to the science but also to my thesis. ☺)

Upon completing the task, please fill out the following questionnaire sometime today with your subject ID, the number of values and/or identities you reflected on, and the actual # minutes spent using MindMup this week:

https://forms.gle/XGyqV4FoUgbWausN6

Many thanks for your time and efforts!

Best,
Alan

Fig. A.2.4. A screenshot of follow-up email sent to *MindMup* group after week 1.

A.2.9 Weekly Reminder Email

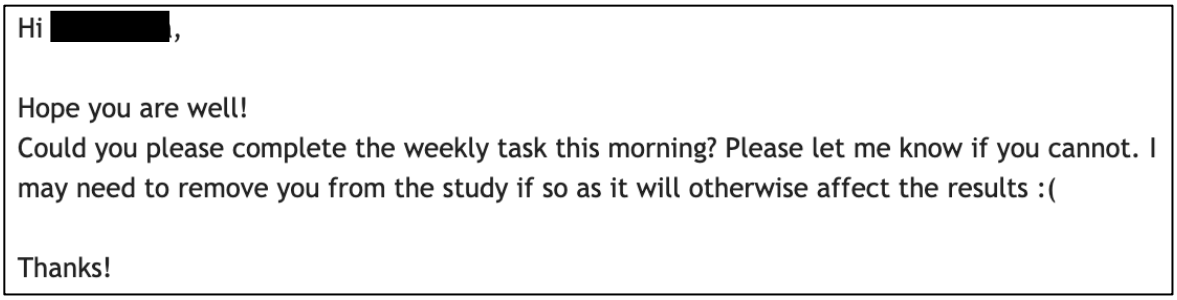
Hey everyone,

Just a reminder to please do the daily task. The research (and my thesis!) depends on you completing it.

Thank you!

Fig. A.2.5. A screenshot of weekly reminder email sent to participants.

A.2.10 Weekly Final Reminder Email

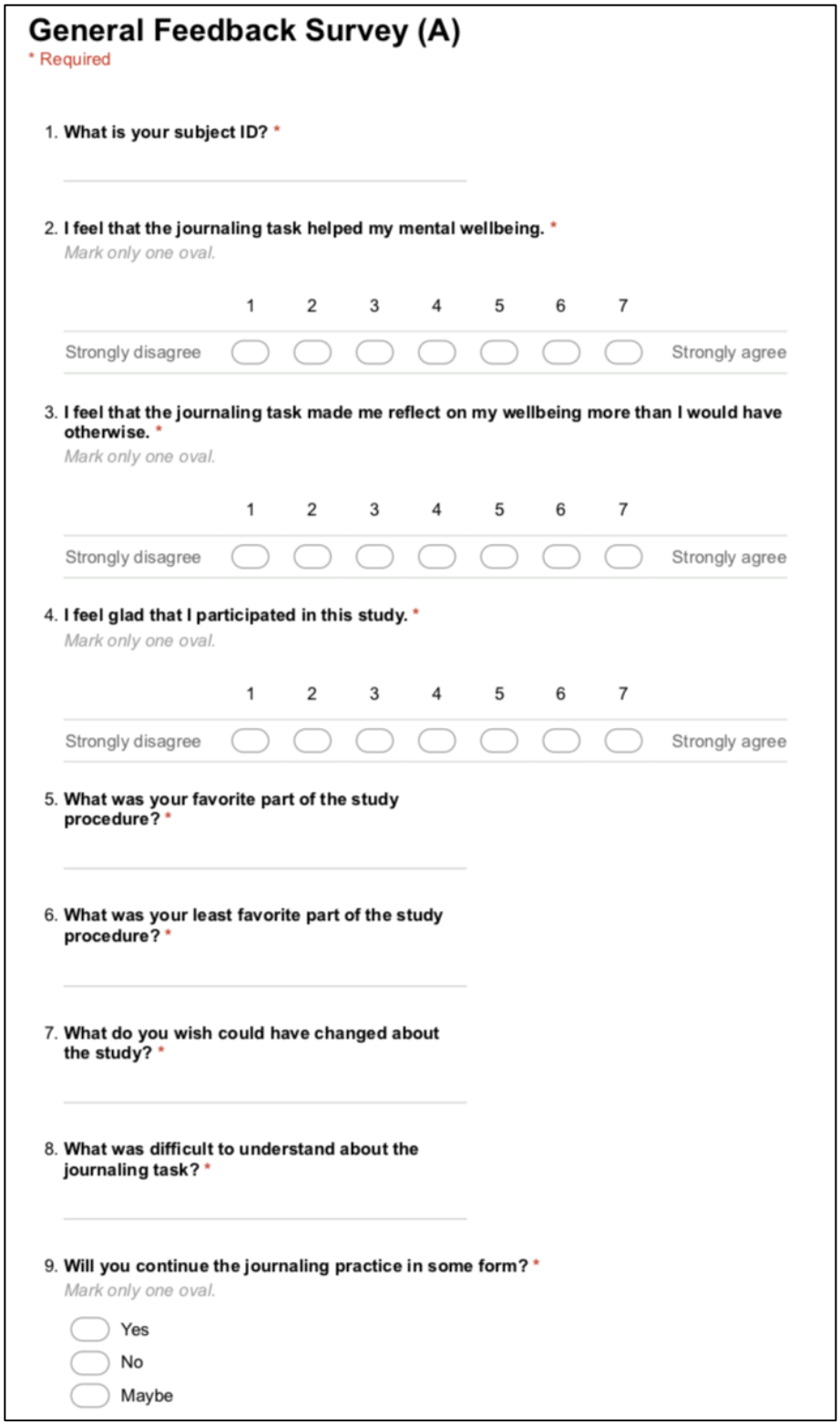

Hi [redacted],

Hope you are well!
Could you please complete the weekly task this morning? Please let me know if you cannot. I may need to remove you from the study if so as it will otherwise affect the results :(

Thanks!

Fig. A.2.6. A screenshot of final weekly reminder email sent to participants.

A.2.11 Post-Study General Feedback Survey (Journaling)



General Feedback Survey (A)

* Required

1. **What is your subject ID?** *

2. **I feel that the journaling task helped my mental wellbeing.** *
   Mark only one oval.

	1	2	3	4	5	6	7	
Strongly disagree	◯	◯	◯	◯	◯	◯	◯	Strongly agree

3. **I feel that the journaling task made me reflect on my wellbeing more than I would have otherwise.** *
   Mark only one oval.

	1	2	3	4	5	6	7	
Strongly disagree	◯	◯	◯	◯	◯	◯	◯	Strongly agree

4. **I feel glad that I participated in this study.** *
   Mark only one oval.

	1	2	3	4	5	6	7	
Strongly disagree	◯	◯	◯	◯	◯	◯	◯	Strongly agree

5. **What was your favorite part of the study procedure?** *

6. **What was your least favorite part of the study procedure?** *

7. **What do you wish could have changed about the study?** *

8. **What was difficult to understand about the journaling task?** *

9. **Will you continue the journaling practice in some form?** *
   Mark only one oval.

   ◯ Yes
   ◯ No
   ◯ Maybe

Fig. A.2.7a. First page of printable version of general feedback questionnaire (Journaling).

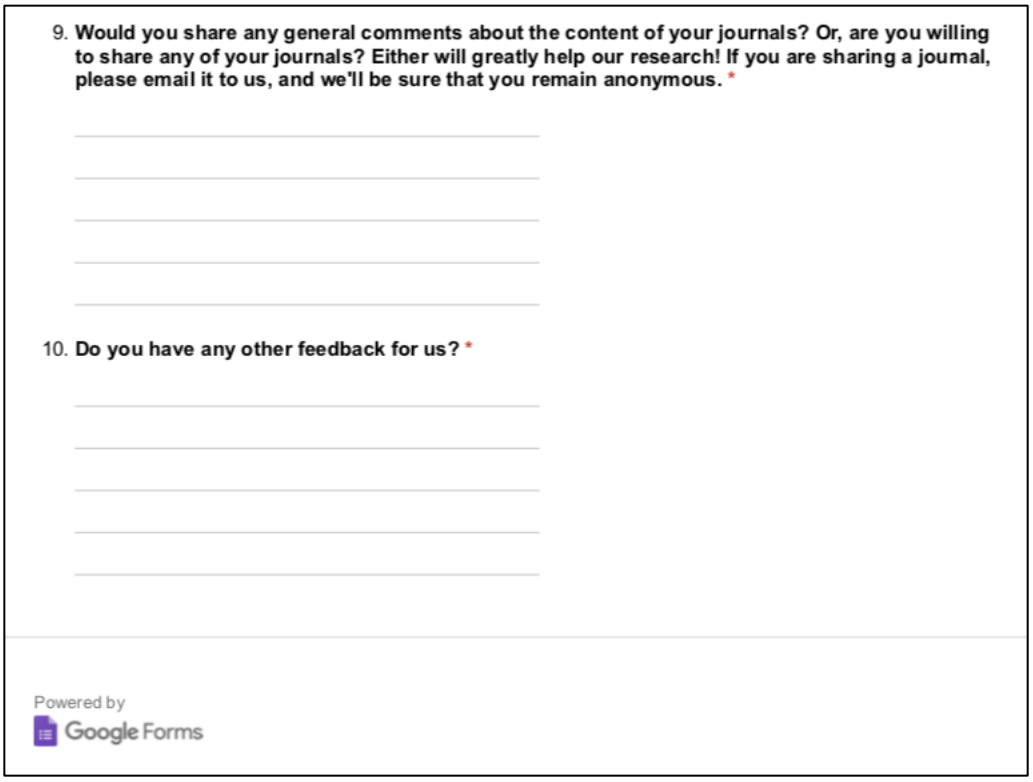
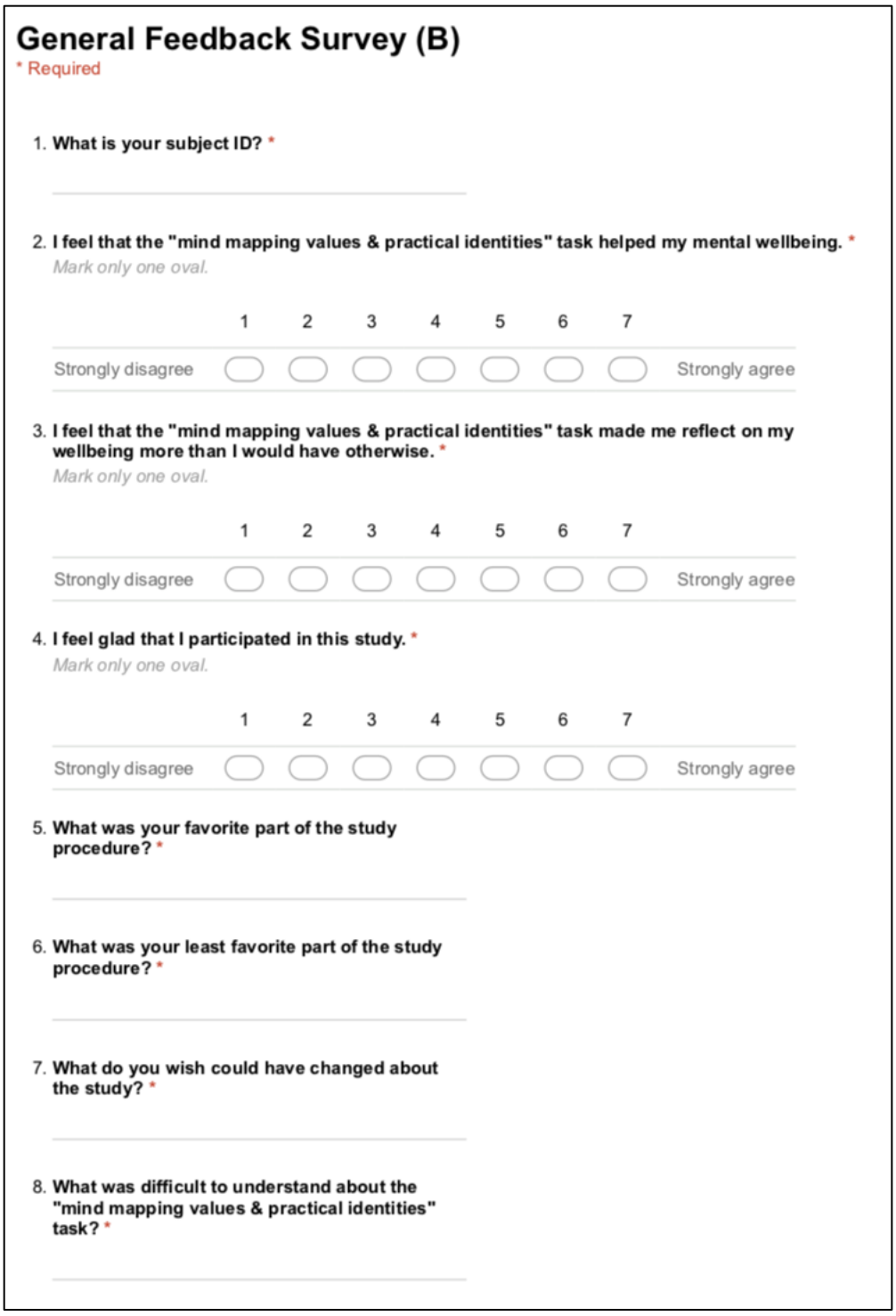


Fig. A.2.7b. Second page of printable version of general feedback questionnaire (Journaling).

A.2.12 Post-Study General Feedback Survey (*MindMup*)



General Feedback Survey (B)

* Required

1. **What is your subject ID?** *

2. **I feel that the "mind mapping values & practical identities" task helped my mental wellbeing.** *
   Mark only one oval.

	1	2	3	4	5	6	7	
Strongly disagree	◯	◯	◯	◯	◯	◯	◯	Strongly agree

3. **I feel that the "mind mapping values & practical identities" task made me reflect on my wellbeing more than I would have otherwise.** *
   Mark only one oval.

	1	2	3	4	5	6	7	
Strongly disagree	◯	◯	◯	◯	◯	◯	◯	Strongly agree

4. **I feel glad that I participated in this study.** *
   Mark only one oval.

	1	2	3	4	5	6	7	
Strongly disagree	◯	◯	◯	◯	◯	◯	◯	Strongly agree

5. **What was your favorite part of the study procedure?** *

6. **What was your least favorite part of the study procedure?** *

7. **What do you wish could have changed about the study?** *

8. **What was difficult to understand about the "mind mapping values & practical identities" task?** *

Fig. A.2.8a. First page of printable version of general feedback questionnaire (*MindMup*)

9. **Will you continue using the practice of mind mapping values, either on MindMup or elsewhere?** *

Mark only one oval.

- Yes
- No
- Maybe

10. **Would you share any general comments about the content of your mind map? Or, are you willing to share your mind map? Either will greatly help our research! If you are sharing your mind map, go to your map, click "SHARE" in the top right, and "Move to Team" in the pop-up. Before sharing, be sure to remove any identifying information (such as your name in the map title, etc.).** *

11. **Do you have any other feedback for us?** *

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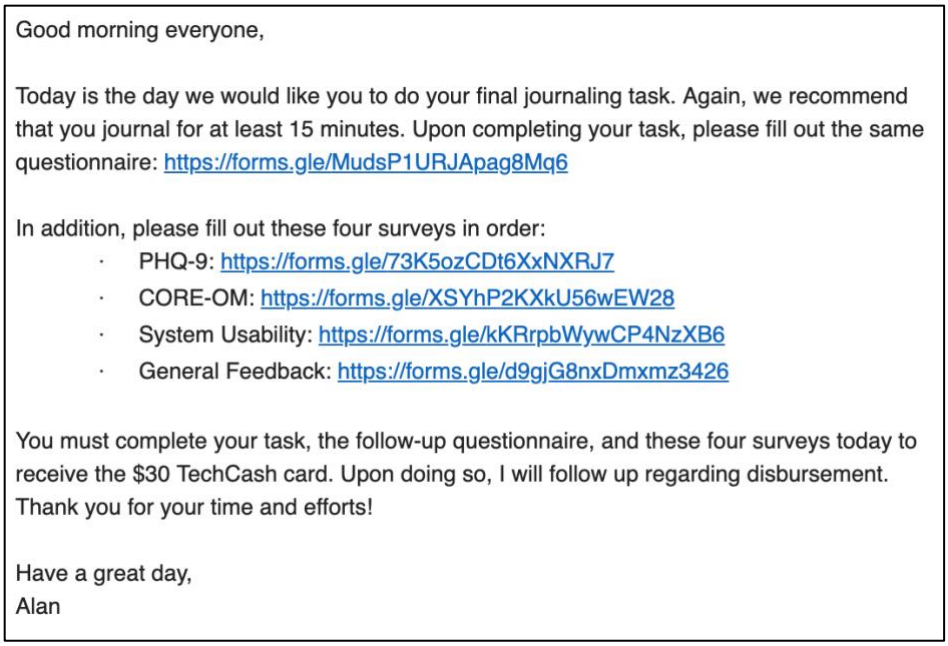
Fig. A.2.8b. Second page of printable version of general feedback questionnaire (*MindMup*).

A.2.13 Week 2 Follow-Up Email (Journaling)



Good morning everyone,

Today is the day we would like you to do your final journaling task. Again, we recommend that you journal for at least 15 minutes. Upon completing your task, please fill out the same questionnaire: https://forms.gle/MudsP1URJApag8Mq6

In addition, please fill out these four surveys in order:

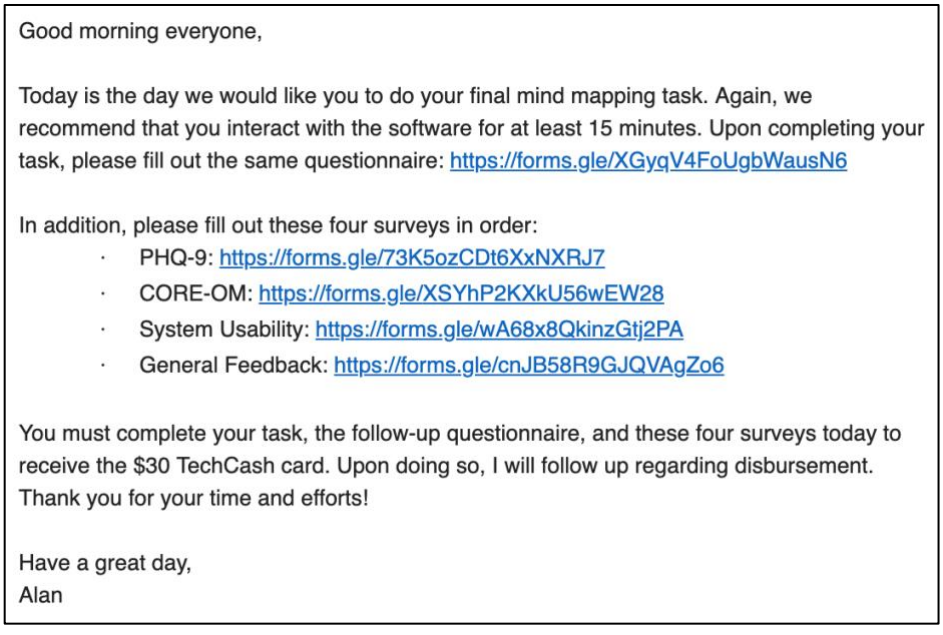
- PHQ-9: https://forms.gle/73K5ozCDt6XxNXRJ7
- CORE-OM: https://forms.gle/XSYhP2KXkU56wEW28
- System Usability: https://forms.gle/kKRrpbWywCP4NzXB6
- General Feedback: https://forms.gle/d9gjG8nxDmxmz3426

You must complete your task, the follow-up questionnaire, and these four surveys today to receive the $30 TechCash card. Upon doing so, I will follow up regarding disbursement. Thank you for your time and efforts!

Have a great day,
Alan

Fig. A.2.9. A screenshot of follow-up email sent to Journaling group after week 2.

A.2.14 Week 2 Follow-Up Email (*MindMup*)



Good morning everyone,

Today is the day we would like you to do your final mind mapping task. Again, we recommend that you interact with the software for at least 15 minutes. Upon completing your task, please fill out the same questionnaire: https://forms.gle/XGyqV4FoUgbWausN6

In addition, please fill out these four surveys in order:

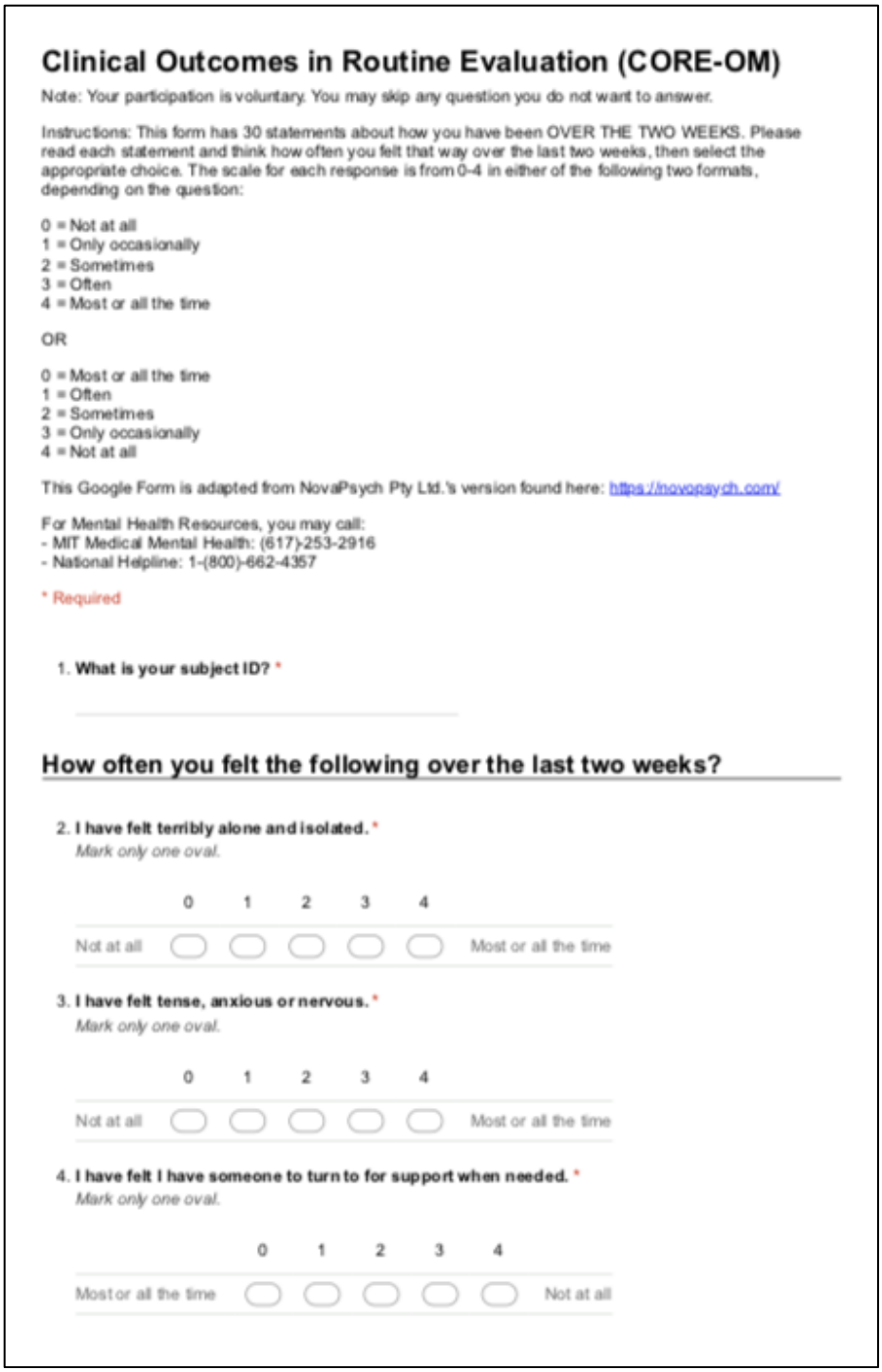
- PHQ-9: https://forms.gle/73K5ozCDt6XxNXRJ7
- CORE-OM: https://forms.gle/XSYhP2KXkU56wEW28
- System Usability: https://forms.gle/wA68x8QkinzGtj2PA
- General Feedback: https://forms.gle/cnJB58R9GJQVAgZo6

You must complete your task, the follow-up questionnaire, and these four surveys today to receive the $30 TechCash card. Upon doing so, I will follow up regarding disbursement. Thank you for your time and efforts!

Have a great day,
Alan

Fig. A.2.10. A screenshot of follow-up email sent to *MindMup* group after week 2.

A.2.15 CORE-OM-30



Clinical Outcomes in Routine Evaluation (CORE-OM)

Note: Your participation is voluntary. You may skip any question you do not want to answer.

Instructions: This form has 30 statements about how you have been OVER THE TWO WEEKS. Please read each statement and think how often you felt that way over the last two weeks, then select the appropriate choice. The scale for each response is from 0-4 in either of the following two formats, depending on the question:

0 = Not at all
1 = Only occasionally
2 = Sometimes
3 = Often
4 = Most or all the time

OR

0 = Most or all the time
1 = Often
2 = Sometimes
3 = Only occasionally
4 = Not at all

This Google Form is adapted from NovaPsych Pty Ltd.'s version found here: https://novopsych.com/

For Mental Health Resources, you may call:
- MIT Medical Mental Health: (617)-253-2916
- National Helpline: 1-(800)-662-4357

* Required

1. **What is your subject ID?** *

How often you felt the following over the last two weeks?

2. **I have felt terribly alone and isolated.** *
Mark only one oval.

	0	1	2	3	4	
Not at all	◯	◯	◯	◯	◯	Most or all the time

3. **I have felt tense, anxious or nervous.** *
Mark only one oval.

	0	1	2	3	4	
Not at all	◯	◯	◯	◯	◯	Most or all the time

4. **I have felt I have someone to turn to for support when needed.** *
Mark only one oval.

	0	1	2	3	4	
Most or all the time	◯	◯	◯	◯	◯	Not at all

Fig. A.2.11a. First page of printable version of CORE-OM-30.

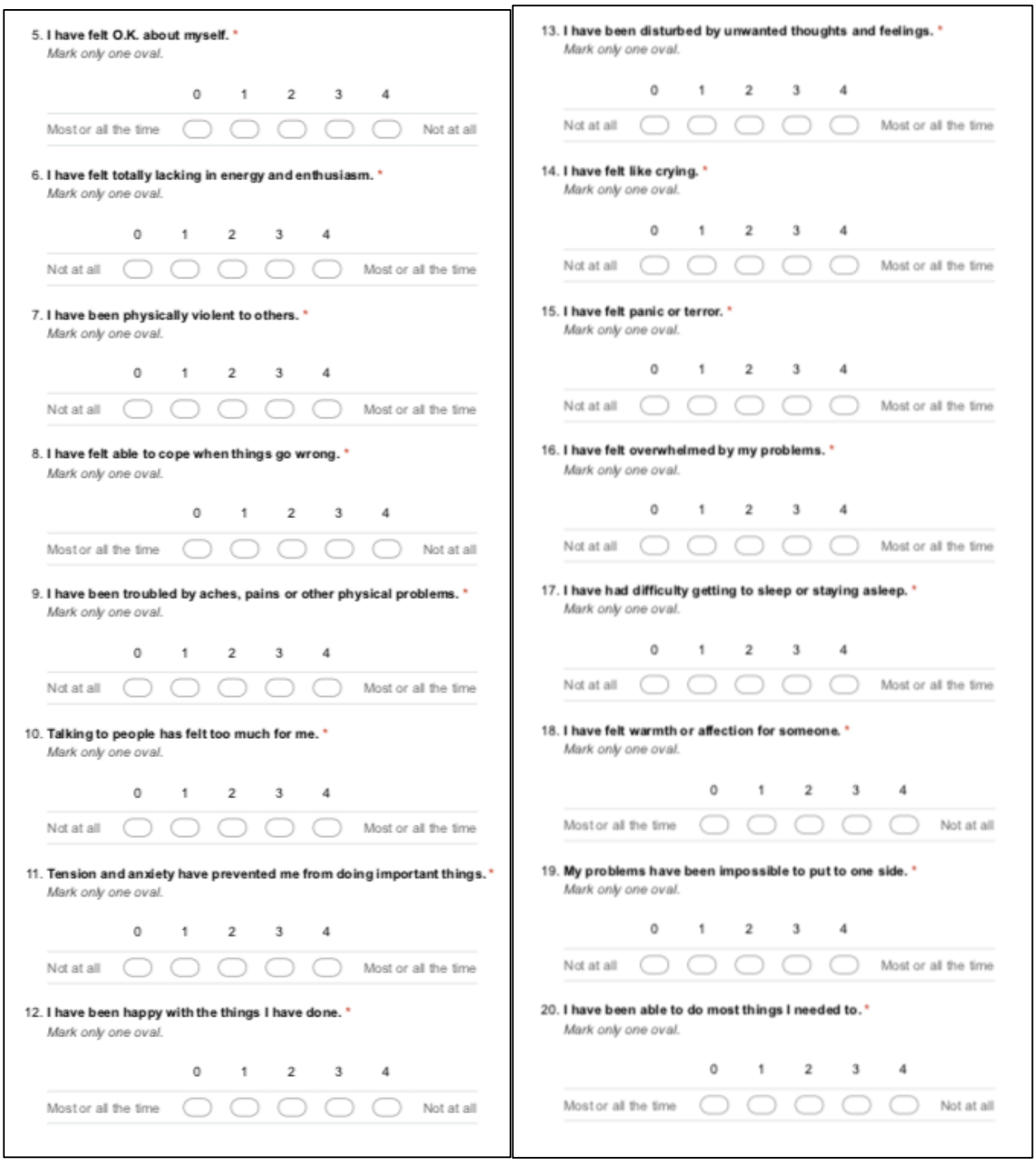


Fig. A.2.11b. Second and third pages of printable version of CORE-OM-30.

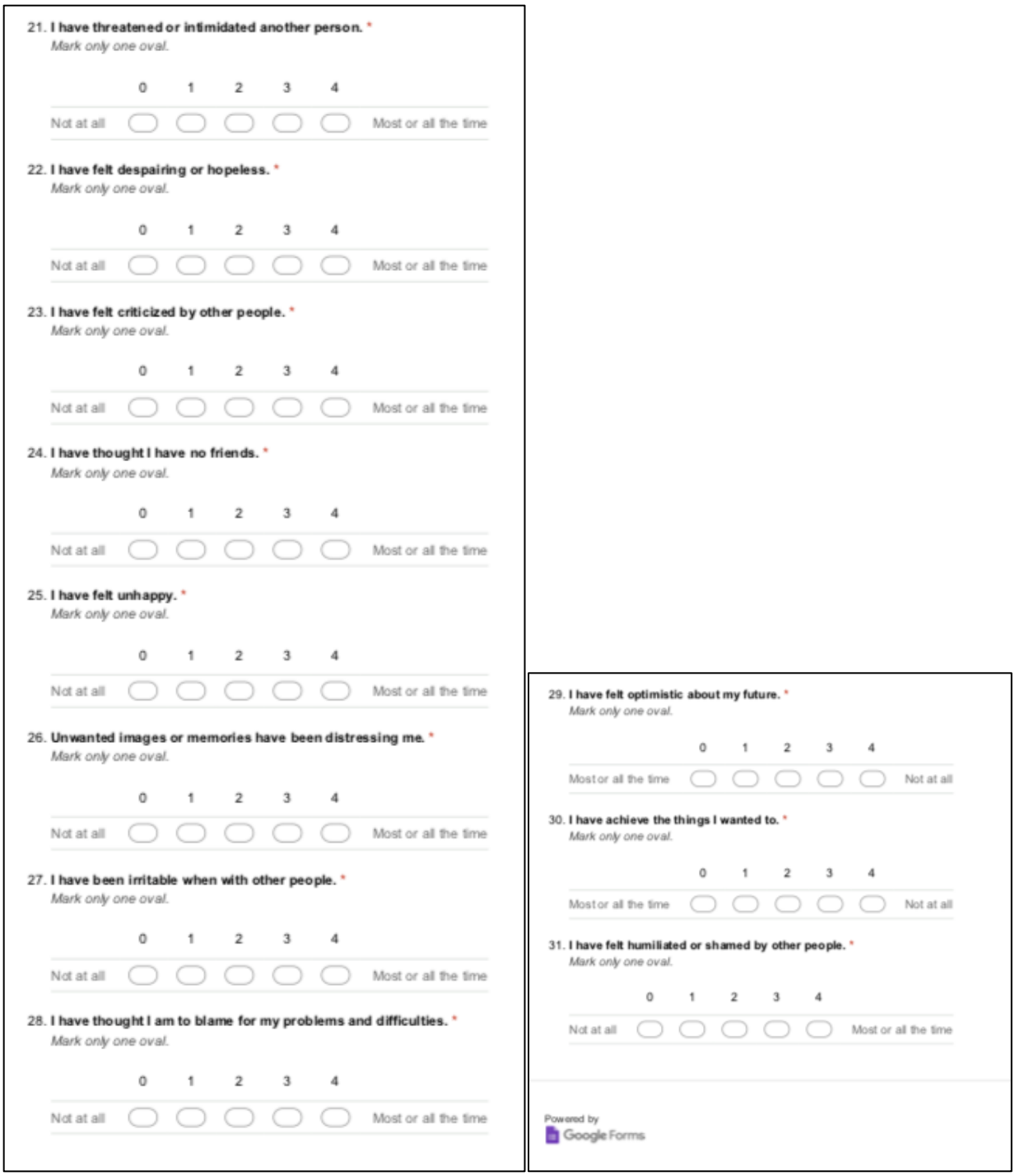
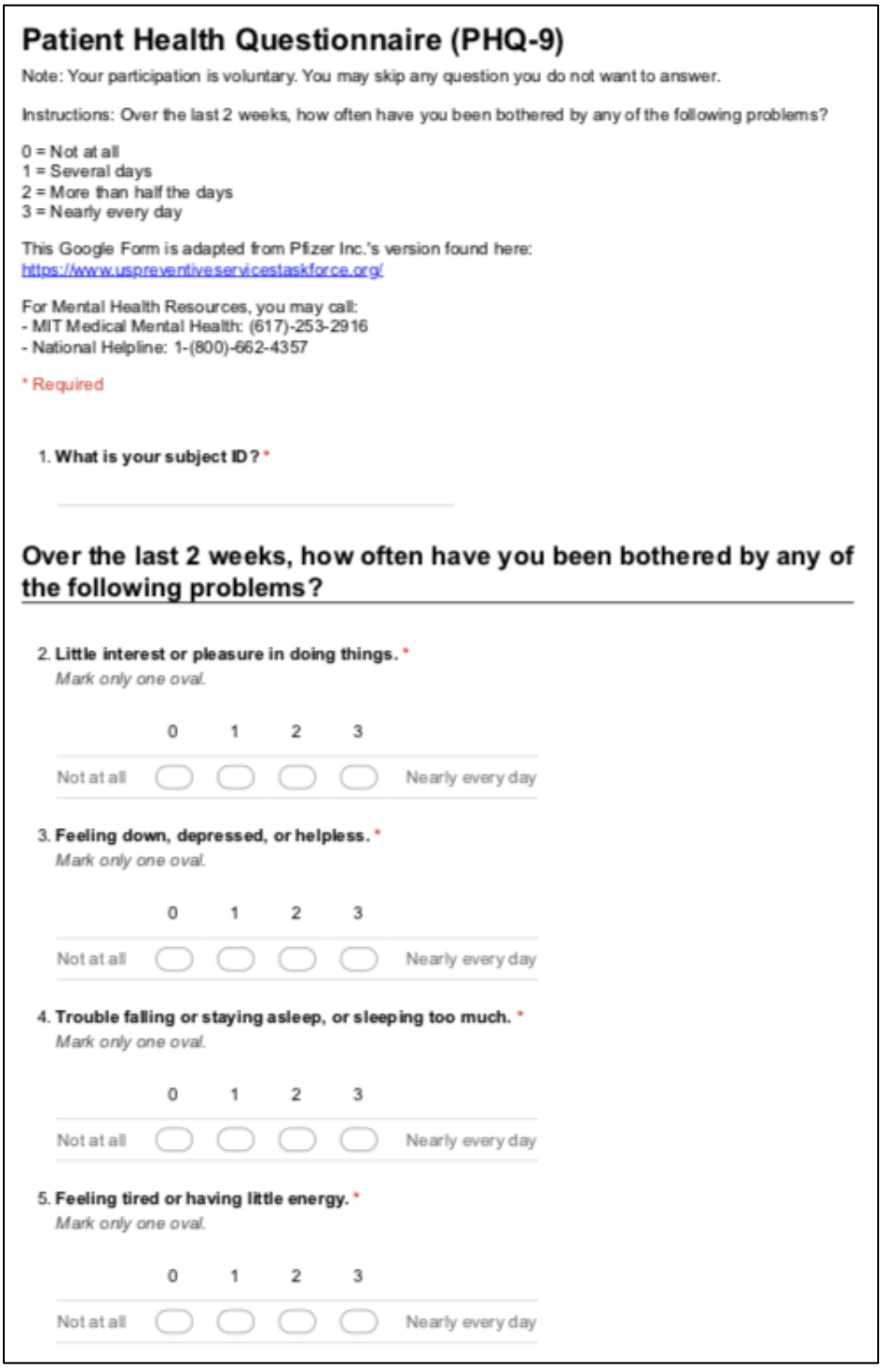


Fig. A.2.11c. Fourth and fifth page of printable version of CORE-OM-30.

A.2.16 PHQ-8



Patient Health Questionnaire (PHQ-9)

Note: Your participation is voluntary. You may skip any question you do not want to answer.

Instructions: Over the last 2 weeks, how often have you been bothered by any of the following problems?

0 = Not at all
1 = Several days
2 = More than half the days
3 = Nearly every day

This Google Form is adapted from Pfizer Inc.'s version found here:
https://www.uspreventiveservicestaskforce.org/

For Mental Health Resources, you may call:
- MIT Medical Mental Health: (617)-253-2916
- National Helpline: 1-(800)-662-4357

* Required

1. **What is your subject ID?** *

Over the last 2 weeks, how often have you been bothered by any of the following problems?

2. **Little interest or pleasure in doing things.** *
Mark only one oval.

	0	1	2	3	
Not at all	◯	◯	◯	◯	Nearly every day

3. **Feeling down, depressed, or helpless.** *
Mark only one oval.

	0	1	2	3	
Not at all	◯	◯	◯	◯	Nearly every day

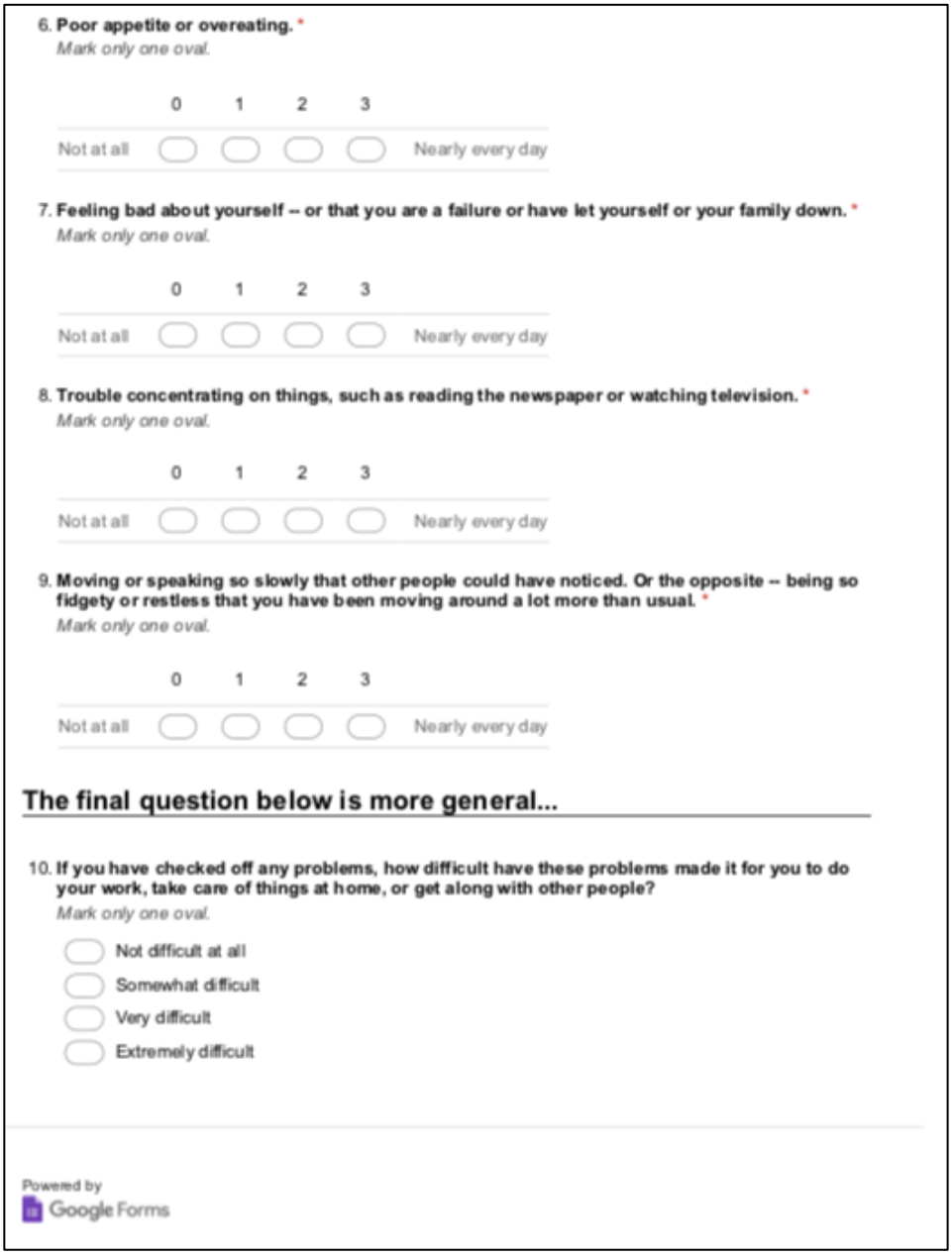
4. **Trouble falling or staying asleep, or sleeping too much.** *
Mark only one oval.

	0	1	2	3	
Not at all	◯	◯	◯	◯	Nearly every day

5. **Feeling tired or having little energy.** *
Mark only one oval.

	0	1	2	3	
Not at all	◯	◯	◯	◯	Nearly every day

Fig. A.2.12a. First page of printable version of PHQ-8.



6. **Poor appetite or overeating.** *
Mark only one oval.

	0	1	2	3	
Not at all	◯	◯	◯	◯	Nearly every day

7. **Feeling bad about yourself -- or that you are a failure or have let yourself or your family down.** *
Mark only one oval.

	0	1	2	3	
Not at all	◯	◯	◯	◯	Nearly every day

8. **Trouble concentrating on things, such as reading the newspaper or watching television.** *
Mark only one oval.

	0	1	2	3	
Not at all	◯	◯	◯	◯	Nearly every day

9. **Moving or speaking so slowly that other people could have noticed. Or the opposite -- being so fidgety or restless that you have been moving around a lot more than usual.** *
Mark only one oval.

	0	1	2	3	
Not at all	◯	◯	◯	◯	Nearly every day

The final question below is more general...

10. **If you have checked off any problems, how difficult have these problems made it for you to do your work, take care of things at home, or get along with other people?**
Mark only one oval.

- ◯ Not difficult at all
- ◯ Somewhat difficult
- ◯ Very difficult
- ◯ Extremely difficult

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Fig. A.2.12b. Second page of printable version of PHQ-8.

A.2.17 Mental Health Info Sheet

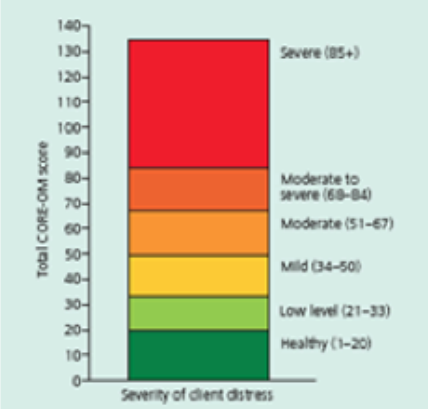
Mental Health Info Sheet (provided with PHQ-9 & CORE-OM)

We recommend you consider contacting MIT Medical in the following two cases:

if total PHQ-9 >= 12 without question 9 filled (note: usually >=15 including question 9):

- i.e. 15-19 (moderately severe, with question 9) OR 20-27 (severe, with question 9), ranges within which the questionnaire states "warrants active treatment with psychotherapy, medications, or combination"

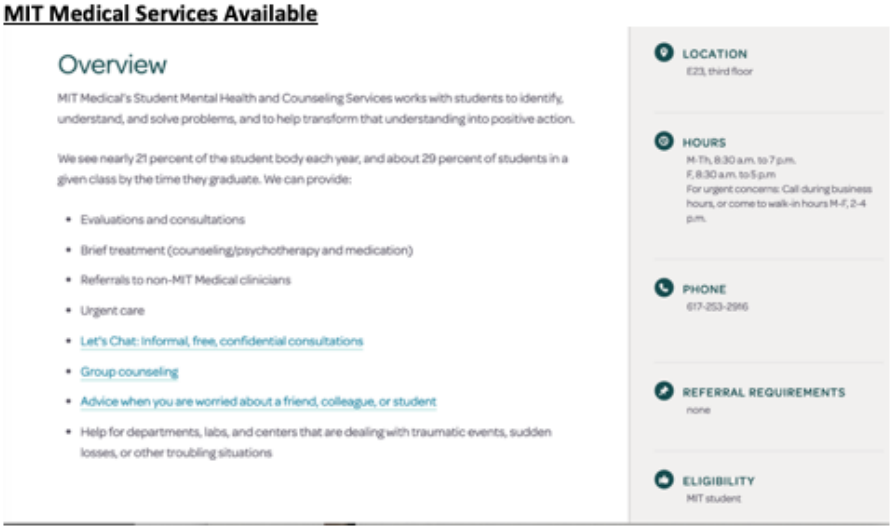
OR total CORE-OM >= 54 without questions 9, 16, 24, 34 filled (note: usually >=68 with those questions filled): see diagram below



Look-up scale of CORE-OM scores and severity levels

from: http://www.coreims.co.uk/About_Core_System_How_Used.html

MIT Medical Services Available



Overview

MIT Medical's Student Mental Health and Counseling Services works with students to identify, understand, and solve problems, and to help transform that understanding into positive action.

We see nearly 21 percent of the student body each year, and about 29 percent of students in a given class by the time they graduate. We can provide:

- Evaluations and consultations
- Brief treatment (counseling/psychotherapy and medication)
- Referrals to non-MIT Medical clinicians
- Urgent care
- Let's Chat: informal, free, confidential consultations
- Group counseling
- Advice when you are worried about a friend, colleague, or student
- Help for departments, labs, and centers that are dealing with traumatic events, sudden losses, or other troubling situations

LOCATION
E23, third floor

HOURS
M-Th, 8:30 a.m. to 7 p.m.
F, 8:30 a.m. to 5 p.m.
For urgent concerns: Call during business hours, or come to walk-in hours M-F, 2-4 p.m.

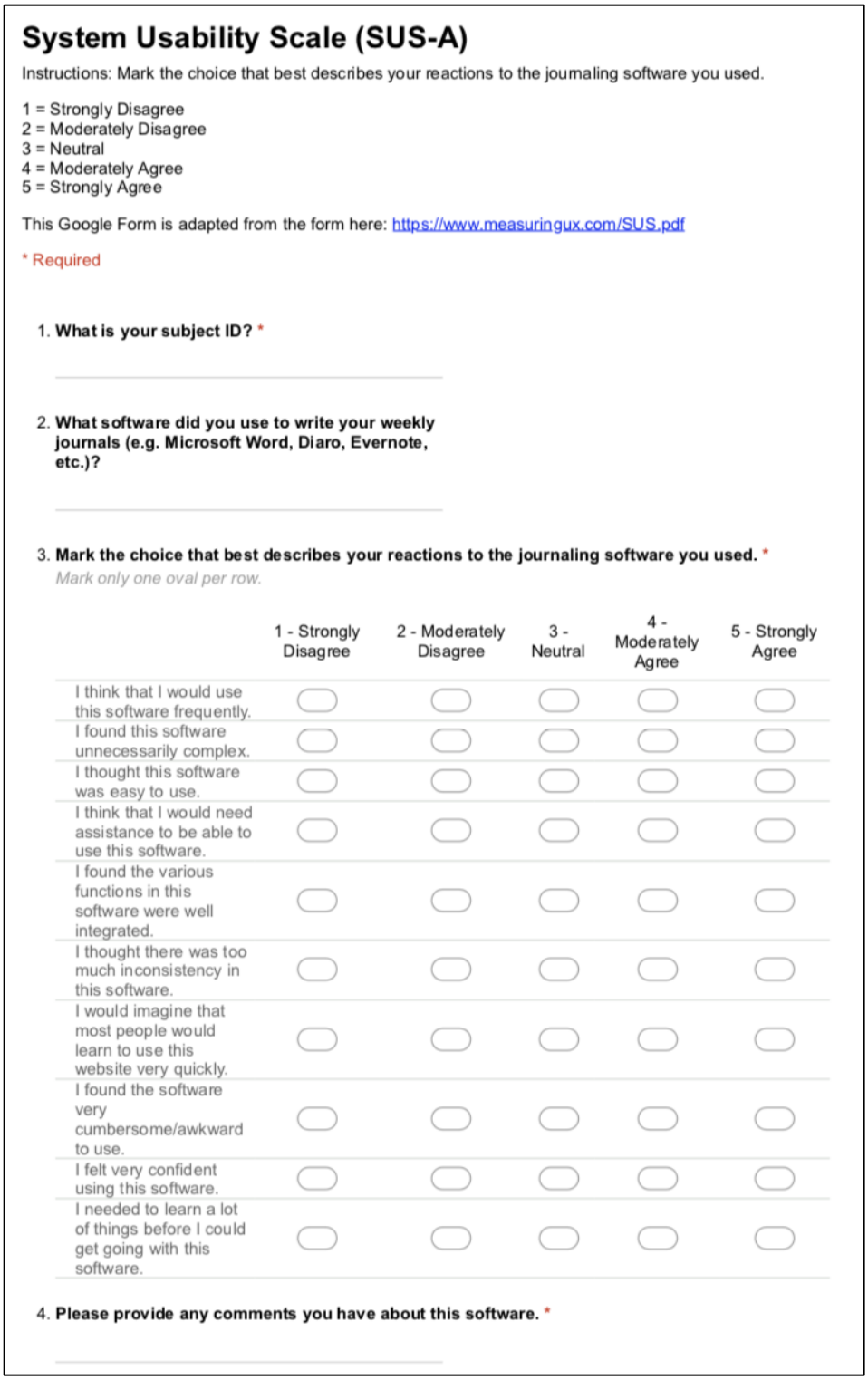
PHONE
617-253-2916

REFERRAL REQUIREMENTS
none

ELIGIBILITY
MIT student

from: https://medical.mit.edu/services/mental-health-counseling

A.2.18 System Usability Scale (Journaling)



System Usability Scale (SUS-A)

Instructions: Mark the choice that best describes your reactions to the journaling software you used.

1 = Strongly Disagree
2 = Moderately Disagree
3 = Neutral
4 = Moderately Agree
5 = Strongly Agree

This Google Form is adapted from the form here: https://www.measuringux.com/SUS.pdf

* Required

1. **What is your subject ID?** *

2. **What software did you use to write your weekly journals (e.g. Microsoft Word, Diaro, Evernote, etc.)?**

3. **Mark the choice that best describes your reactions to the journaling software you used.** *
Mark only one oval per row.

	1 - Strongly Disagree	2 - Moderately Disagree	3 - Neutral	4 - Moderately Agree	5 - Strongly Agree
I think that I would use this software frequently.					
I found this software unnecessarily complex.					
I thought this software was easy to use.					
I think that I would need assistance to be able to use this software.					
I found the various functions in this software were well integrated.					
I thought there was too much inconsistency in this software.					
I would imagine that most people would learn to use this website very quickly.					
I found the software very cumbersome/awkward to use.					
I felt very confident using this software.					
I needed to learn a lot of things before I could get going with this software.					

4. **Please provide any comments you have about this software.** *

Fig. A.2.13. Printable version of System Usability Scale (Journaling).

A.2.19 System Usability Scale (*MindMup*)

System Usability Scale (SUS-B)

Instructions: Mark the choice that best describes your reactions to the MindMup software you used.

1 = Strongly Disagree
2 = Moderately Disagree
3 = Neutral
4 = Moderately Agree
5 = Strongly Agree

This Google Form is adapted from the form here: https://www.measuringux.com/SUS.pdf

* Required

1. **What is your subject ID?** *

2. **Mark the choice that best describes your reactions to the MindMup software you used.** *
Mark only one oval per row.

	1 - Strongly Disagree	2 - Moderately Disagree	3 - Neutral	4 - Moderately Agree	5 - Strongly Agree
I think that I would use this software frequently.					
I found this software unnecessarily complex.					
I thought this software was easy to use.					
I think that I would need assistance to be able to use this software.					
I found the various functions in this software were well integrated.					
I thought there was too much inconsistency in this software.					
I would imagine that most people would learn to use this website very quickly.					
I found the software very cumbersome/awkward to use.					
I felt very confident using this software.					
I needed to learn a lot of things before I could get going with this software.					

3. **Please provide any comments you have about this software.** *

Fig. A.2.14. Printable version of System Usability Scale (*MindMup*).

Appendix B

Supplementary Tables & Figures

Valued Living Questionnaire

Below are domains of life that are valued by some people. We are concerned with your subjective experience of your quality of life in each of these domains. One aspect of quality of life involves the importance one puts on the different domains of living. Rate the importance of each domain (by circling a number) on a scale of 1 to 10; 1 means that domain is not at all important, and 10 means that domain is very important. Not everyone will value all of these domains, or value all domains the same. Rate each domain according to *your own personal sense of importance*.

In this section, we would like you to give a rating of how *consistent* your actions are with each value. Everyone does better in some domains than others. We are NOT asking about your ideal in each domain. We want to know how you think you have been doing **during the past week**. Rate each item (by circling a number) on a scale of 1 to 10; 1 means that your actions have been fully inconsistent with your value, and 10 means that your actions have been fully consistent with your value.

During the past week

Domain	not at all important									extremely important
1. Family relations (other than marriage or parenting)	1	2	3	4	5	6	7	8	9	10
2. Marriage/couples/ intimate relations	1	2	3	4	5	6	7	8	9	10
3. Parenting	1	2	3	4	5	6	7	8	9	10
4. Friendships/social relations	1	2	3	4	5	6	7	8	9	10
5. Employment	1	2	3	4	5	6	7	8	9	10
6. Education/training	1	2	3	4	5	6	7	8	9	10
7. Recreation	1	2	3	4	5	6	7	8	9	10
8. Spirituality	1	2	3	4	5	6	7	8	9	10
9. Citizenship/ community life	1	2	3	4	5	6	7	8	9	10
10. Physical well-being	1	2	3	4	5	6	7	8	9	10

Fig. B.1. Values importance section of Valued Living Questionnaire (Wilson et al.).

Domain	not at all consistent									extremely consistent
1. Family relations (other than marriage or parenting)	1	2	3	4	5	6	7	8	9	10
2. Marriage/couples/ intimate relations	1	2	3	4	5	6	7	8	9	10
3. Parenting	1	2	3	4	5	6	7	8	9	10
4. Friendships/social relations	1	2	3	4	5	6	7	8	9	10
5. Employment	1	2	3	4	5	6	7	8	9	10
6. Education/training	1	2	3	4	5	6	7	8	9	10
7. Recreation	1	2	3	4	5	6	7	8	9	10
8. Spirituality	1	2	3	4	5	6	7	8	9	10
9. Citizenship/community life	1	2	3	4	5	6	7	8	9	10
10. Physical well-being	1	2	3	4	5	6	7	8	9	10

Fig. B.2. Values action section of Valued Living Questionnaire (Wilson et al.).

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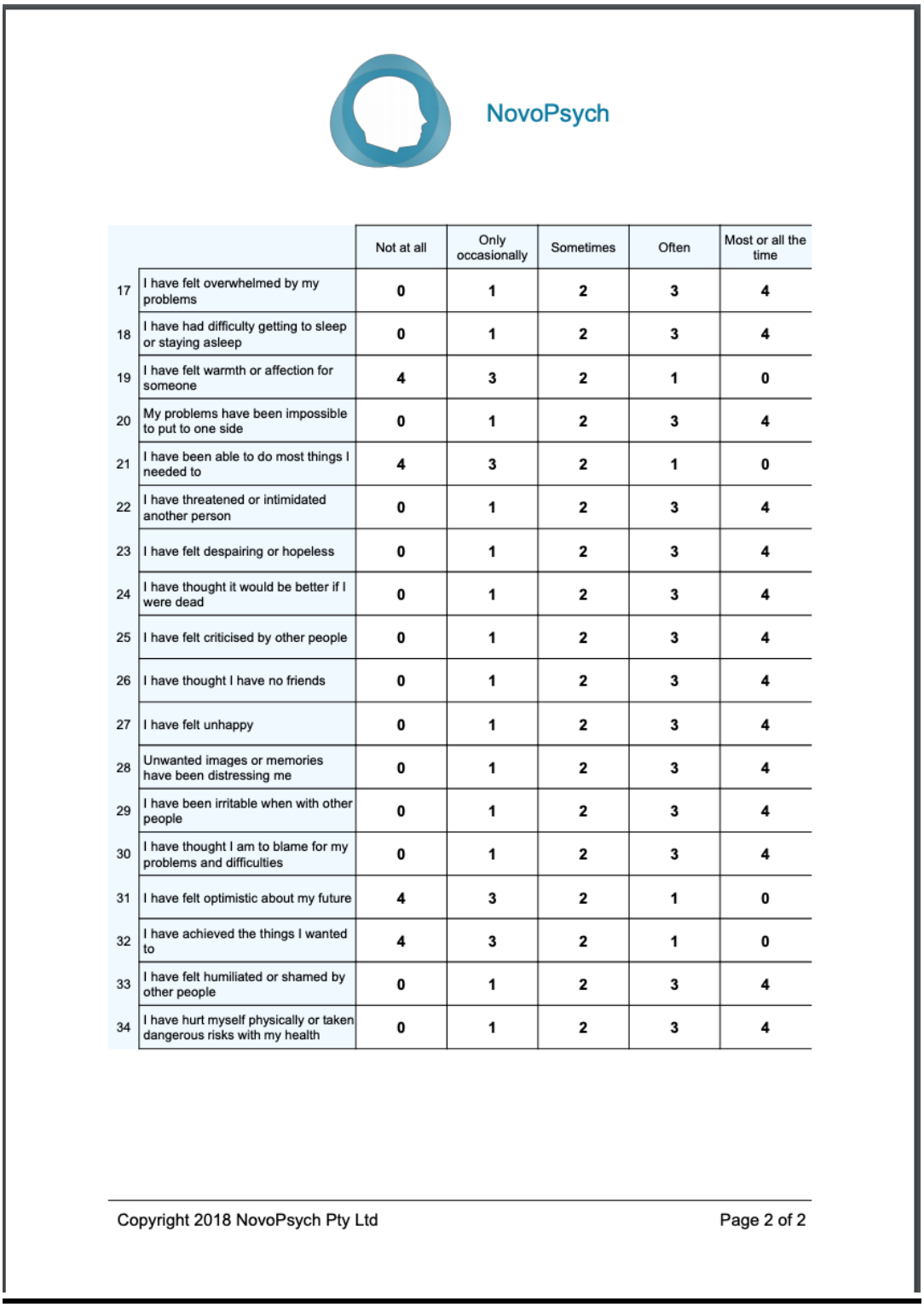
Clinical Outcomes in Routine Evaluation (CORE-OM)

Instructions:

This form has 34 statements about how you have been OVER THE LAST WEEK. Please read each statement and think how often you felt that way last week. Then tap the box which is closest to this.

		Not at all	Only occasionally	Sometimes	Often	Most or all the time
1	I have felt terribly alone and isolated	0	1	2	3	4
2	I have felt tense, anxious or nervous	0	1	2	3	4
3	I have felt I have someone to turn to for support when needed	4	3	2	1	0
4	I have felt O.K. about myself	4	3	2	1	0
5	I have felt totally lacking in energy and enthusiasm	0	1	2	3	4
6	I have been physically violent to others	0	1	2	3	4
7	I have felt able to cope when things go wrong	4	3	2	1	0
8	I have been troubled by aches, pains or other physical problems	0	1	2	3	4
9	I have thought of hurting myself	0	1	2	3	4
10	Talking to people has felt too much for me	0	1	2	3	4
11	Tension and anxiety have prevented me doing important things	0	1	2	3	4
12	I have been happy with the things I have done	4	3	2	1	0
13	I have been disturbed by unwanted thoughts and feelings	0	1	2	3	4
14	I have felt like crying	0	1	2	3	4
15	I have felt panic or terror	0	1	2	3	4
16	I made plans to end my life	0	1	2	3	4

Fig. B.3. First page of Clinical Outcomes in Routine Evaluation questionnaire from: "Clinical Outcomes in Routine Evaluation (CORE-OM)." *NovoPsych Psychometrics*, novopsych.com/assessments/clinical-outcomes-in-routine-evaluation-core-om/.



NovoPsych

		Not at all	Only occasionally	Sometimes	Often	Most or all the time
17	I have felt overwhelmed by my problems	0	1	2	3	4
18	I have had difficulty getting to sleep or staying asleep	0	1	2	3	4
19	I have felt warmth or affection for someone	4	3	2	1	0
20	My problems have been impossible to put to one side	0	1	2	3	4
21	I have been able to do most things I needed to	4	3	2	1	0
22	I have threatened or intimidated another person	0	1	2	3	4
23	I have felt despairing or hopeless	0	1	2	3	4
24	I have thought it would be better if I were dead	0	1	2	3	4
25	I have felt criticised by other people	0	1	2	3	4
26	I have thought I have no friends	0	1	2	3	4
27	I have felt unhappy	0	1	2	3	4
28	Unwanted images or memories have been distressing me	0	1	2	3	4
29	I have been irritable when with other people	0	1	2	3	4
30	I have thought I am to blame for my problems and difficulties	0	1	2	3	4
31	I have felt optimistic about my future	4	3	2	1	0
32	I have achieved the things I wanted to	4	3	2	1	0
33	I have felt humiliated or shamed by other people	0	1	2	3	4
34	I have hurt myself physically or taken dangerous risks with my health	0	1	2	3	4

Fig. B.4. Second page of Clinical Outcomes in Routine Evaluation questionnaire from: "Clinical Outcomes in Routine Evaluation (CORE-OM)." *NovoPsych Psychometrics*, novopsych.com/assessments/clinical-outcomes-in-routine-evaluation-core-om/.

PATIENT HEALTH QUESTIONNAIRE (PHQ-9)

NAME:_____ DATE:_____

Over the last 2 *weeks*, how often have you been bothered by any of the following problems?
(use "✓" to indicate your answer)

	Not at all	Several days	More than half the days	Nearly every day
1. Little interest or pleasure in doing things	0	1	2	3
2. Feeling down, depressed, or hopeless	0	1	2	3
3. Trouble falling or staying asleep, or sleeping too much	0	1	2	3
4. Feeling tired or having little energy	0	1	2	3
5. Poor appetite or overeating	0	1	2	3
6. Feeling bad about yourself—or that you are a failure or have let yourself or your family down	0	1	2	3
7. Trouble concentrating on things, such as reading the newspaper or watching television	0	1	2	3
8. Moving or speaking so slowly that other people could have noticed. Or the opposite – being so figety or restless that you have been moving around a lot more than usual	0	1	2	3
9. Thoughts that you would be better off dead, or of hurting yourself	0	1	2	3
		add columns	+	+

(Healthcare professional: For interpretation of TOTAL, please refer to accompanying scoring card). TOTAL:

10. If you checked off *any problems*, how *difficult* have these problems made it for you to do your work, take care of things at home, or get along with other people?

- Not difficult at all _____
- Somewhat difficult _____
- Very difficult _____
- Extremely difficult _____

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Fig. B.5. Patient Health Questionnaire from: "US Preventive Services Task Force." *US Preventive Services Task Force*, www.uspreventiveservicestaskforce.org/.

Table B.1.

Change scores from pre-study to post-study for the full cohort – all participants assigned to the journaling and *MindMup* groups. F-values represent the interaction of Group (Journaling, *MindMup*) x Time (Pre, Post), as calculated using SPSS.

Psychological Outcome Variable	Journaling Condition M (SD)	*MindMup* Condition M (SD)	*F-value*	*p-value*	*d* [95% CI]
CORE-OM-30	-0.85 (20.60)	-2.20 (20.86)	0.03	0.86	.07 [-10.72, 10.62]
PHQ-8	0.14 (3.03)	-0.40 (3.066)	0.01	0.75	.18 [-1.40, 1.74]

References

Aristotle. *Nicomachean Ethics*. Translated by Terence Irwin, Hackett Publishing Co., 1985.

"Aspire - Apps on Google Play." *Google*, CBITs, play.google.com/store/apps/details?id=edu.northwestern.cbits.intellicare.aspire.

Baikie, Karen A., and Kay Wilhelm. "Emotional and Physical Health Benefits of Expressive Writing." *Advances in Psychiatric Treatment*, vol. 11, no. 5, 2005, pp. 338–346., doi:10.1192/apt.11.5.338.

Barnes-Holmes, Yvonne, et al. "Teaching Derived Relational Responding to Young Children." *Journal of Early and Intensive Behavior Intervention*, vol. 1, no. 1, 2004, pp. 3–12., doi:10.1037/h0100275.

Beck, Aaron T., et al. *Cognitive Therapy of Depression*. Guilford Press, 1979.

Bramwell, Kate, and Thomas Richardson. "Improvements in Depression and Mental Health After Acceptance and Commitment Therapy Are Related to Changes in Defusion and Values-Based Action." *Journal of Contemporary Psychotherapy*, vol. 48, no. 1, 2017, pp. 9–14., doi:10.1007/s10879-017-9367-6.

Brooke, John. "SUS: A quick and dirty usability scale." 1996.

Brooks, David. *The Road to Character*. Random House USA, 2016.

Butler, Andrew C., et al. "The Empirical Status of Cognitive-Behavioral Therapy: A Review of Meta-Analyses." *Clinical Psychology Review*, vol. 26, no. 1, 2006, pp. 17–31., doi:10.1016/j.cpr.2005.07.003.

Camus, Albert. The Myth of Sisyphus and Other Essays. Translated by Justin O'Brien. New York: Vintage Books, 1991.

Clark, Andy, and David Chalmers. "The Extended Mind." *Analysis*, vol. 58, no. 1, 1998, pp. 7–19., doi:10.1093/analys/58.1.7.

Craske, Michelle G. *Cognitive-Behavioral Therapy (Theories of Psychotherapy)*. 1st ed., American Psychological Association, 2010.

Dalai Lama Center for Ethics and Transformative Values. *Mitra*. The Dalai Lama Center for Ethics and Transformative Values, 2019. Version 1.2. *Mitra App*, https://itunes.apple.com/us/app/mitra-track-what-matters-most/id1020233743?mt=8.

"Depression." *World Health Organization*, World Health Organization, 22 Mar. 2018, www.who.int/en/news-room/fact-sheets/detail/depression.

Dweck, Carol S. *Mindset: The New Psychology of Success*. Ballantine Books, 2006.

Evans, Chris, et al. "CORE: Clinical Outcomes in Routine Evaluation." *Journal of Mental Health*, vol. 9, no. 3, 2000, pp. 247–255., doi:10.1080/jmh.9.3.247.255.

Evans, Chris, et al. "Towards a Standardised Brief Outcome Measure: Psychometric Properties and Utility of the CORE–OM." *British Journal of Psychiatry*, vol. 180, no. 01, 2002, pp. 51–60., doi:10.1192/bjp.180.1.51.

Frankfurt, Harry. "The Importance of What We Care About." *Synthese*, vol. 53, no. 2, 1982, pp. 257–272., doi:10.1007/bf00484902.

Frankl, Viktor E. *Man's Search for Meaning.* Beacon Press, 2006.

Gloster, Andrew T., et al. "Increasing Valued Behaviors Precedes Reduction in Suffering: Findings from a Randomized Controlled Trial Using ACT." *Behaviour Research and Therapy*, vol. 91, 2017, pp. 64–71., doi:10.1016/j.brat.2017.01.013.

Harris, Russ. *ACT Made Simple: An Easy-to-Read Primer on Acceptance and Commitment Therapy*. New Harbinger Publications, 2009.

Harris, Russ. "Embracing Your Demons: An Overview of Acceptance and Commitment Therapy." *Psychotherapy in Australia*. 12 (4): 2–8, 2006.

Hayes, Steven C. "Acceptance and Commitment Therapy, Relational Frame Theory, and the Third Wave of Behavioral and Cognitive Therapies." *Behavior Therapy*, vol. 35, no. 4, 2004, pp. 639–665., doi:10.1016/s0005-7894(04)80013-3.

Hayes, Steven C., et al. *Acceptance and Commitment Therapy: An Experiential Approach to Behavior Change*. Guilford Press, 1999.

Hayes, Steven C., et al. *Acceptance and Commitment Therapy: The Process and Practice of Mindful Change*. 2nd ed., Guilford Press, 2012.

Hayes, Steven C., et al. *Mindfulness and Acceptance: Expanding the Cognitive-Behavioral Tradition*. Guilford Press, 2004.

Hayes, Steven C., et al. *Varieties of Scientific Contextualism*. Context Press, 1993.

Kessler, Ronald C, et al. "Lifetime and 12-Month Prevalence of DSM-III-R Psychiatric Disorders in the United States." *Archives of General Psychiatry*, vol. 51, no. 1, 1994, p. 8., doi:10.1001/archpsyc.1994.03950010008002.

Korsgaard, Christine M. *The Sources of Normativity*. Edited by Onora O'Neill, Cambridge University Press, 2004.

Kroenke, Kurt, et al. "The PHQ-9: Validity of a Brief Depression Severity Measure." *Journal of General Internal Medicine*, vol. 16, no. 9, 2001, pp. 606–613., doi:10.1046/j.1525-1497.2001.016009606.x.

Laugwitz, Bettina, et al. "Construction and Evaluation of a User Experience Questionnaire." *Lecture Notes in Computer Science HCI and Usability for Education and Work*, 2008, pp. 63–76., doi:10.1007/978-3-540-89350-9_6.

"Logo and Learning." *Logo and Learning*, Logo Foundation, 2015, el.media.mit.edu/logo-foundation/what_is_logo/logo_and_learning.html.

"Mental Illness." *National Institute of Mental Health*, U.S. Department of Health and Human Services, www.nimh.nih.gov/health/statistics/mental-illness.shtml#part_154785.

Miller, Henry. *Wisdom of the Heart*. New Directions Books, 1941.

Mohr, David C, et al. "IntelliCare: An Eclectic, Skills-Based App Suite for the Treatment of Depression and Anxiety." *Journal of Medical Internet Research*, vol. 19, no. 1, 2017, doi:10.2196/jmir.6645.

Papert, Seymour, and Idit Harel. "Situating Constructionism." *Constructionism*, Ablex Publishing Corporation, 1991.

Papert, Seymour. *Mindstorms: Children, Computers, and Powerful Ideas*. Basic Books, 1980.

Pennebaker, James W., and Sandra K. Beall. "Confronting a Traumatic Event: Toward an Understanding of Inhibition and Disease." *Journal of Abnormal Psychology*, vol. 95, no. 3, 1986, pp. 274–281., doi:10.1037//0021-843x.95.3.274.

Plumb, Jennifer C., et al. "In Search of Meaning: Values in Modern Clinical Behavior Analysis." *The Behavior Analyst*, vol. 32, no. 1, 2009, pp. 85–103., doi:10.1007/bf03392177.

Robb, Hank. "Values as Leading Principles in Acceptance and Commitment Therapy." *International Journal of Behavioral Consultation and Therapy*, vol. 3, no. 1, 2007, pp. 118–122., doi:10.1037/h0100170.

Sapolsky, Robert M. "Stress, Stress-Related Disease, and Emotional Regulation." *Handbook of Emotion Regulation*, by James J. Gross, Guilford Press, 2007, pp. 606–615.

Sauro, Jeff. "Measuring Usability with the System Usability Scale (SUS)." *MeasuringU*, 2 Feb. 2011, measuringu.com/sus/.

Smyth, Joshua M., and James W. Pennebaker. "Exploring the Boundary Conditions of Expressive Writing: In Search of the Right Recipe." *British Journal of Health Psychology*, vol. 13, no. 1, 2008, pp. 1–7., doi:10.1348/135910707x260117.

Shakespeare, William. *Hamlet*. Cambridge University Press, 1936.

Stewart, Ian, and John Mcelwee. "Relational Responding and Conditional Discrimination Procedures: An Apparent Inconsistency and Clarification." *The Behavior Analyst*, vol. 32, no. 2, 2009, pp. 309–317., doi:10.1007/bf03392194.

Styron, William. *Darkness Visible: A Memoir of Madness*. Random House, 1990.

Styron, William. "Darkness Visible." *Vanities*, Vanity Fair, 27 Oct. 2017, www.vanityfair.com/magazine/1989/12/styron198912.

"Suicide Data." *World Health Organization*, World Health Organization, 5 Nov. 2018, www.who.int/mental_health/prevention/suicide/suicideprevent/en/.

Taylor, Charles. *Sources of the Self: the Making of the Modern Identity*. Cambridge University Press, 2012.

Tiberius, Valerie. *The Reflective Life: Living Wisely with Our Limits*. Oxford University Press, 2010.

Twohig, Michael P., and Michael E. Levin. "Acceptance and Commitment Therapy as a Treatment for Anxiety and Depression." *Psychiatric Clinics of North America*, vol. 40, no. 4, 2017, pp. 751–770., doi:10.1016/j.psc.2017.08.009.

Ulrich-Lai, Yvonne M., and James P. Herman. "Neural Regulation of Endocrine and Autonomic Stress Responses." *Nature Reviews Neuroscience*, vol. 10, no. 6, 2009, pp. 397–409., doi:10.1038/nrn2647.

Varela, Francisco J., et al. *The Embodied Mind: Cognitive Science and Human Experience*. The MIT Press, 1993.

Vowles, Kevin E., and Lance M. McCracken. "Acceptance and Values-Based Action in Chronic Pain: A Study of Treatment Effectiveness and Process." *Journal of Consulting and Clinical Psychology*, vol. 76, no. 3, 2008, pp. 397–407., doi:10.1037/0022-006x.76.3.397.

Wegner, Daniel M., et al. "Ironic Processes in the Mental Control of Mood and Mood-Related Thought." *Journal of Personality and Social Psychology*, vol. 65, no. 6, 1993, pp. 1093–1104., doi:10.1037//0022-3514.65.6.1093.

Wallace, David Foster. *This Is Water: Some Thoughts, Delivered on a Significant Occasion about Living a*

Compassionate Life. Little, Brown, 2009.

Wilson, Kelly G., and Troy DuFrene. *Mindfulness for Two: An Acceptance and Commitment Therapy Approach to Mindfulness in Psychotherapy*. New Harbinger Publications, 2009.

Wilson, Kelly G., and Amy R. Murrell. "Values Work in Acceptance and Commitment Therapy: Setting a Course for Behavioral Treatment." *Mindfulness and Acceptance: Expanding the Cognitive-Behavioral Tradition*, by Steven C. Hayes et al., Guilford Press, 2004, pp. 120–151.

Wilson, Kelly G., et al. "The Valued Living Questionnaire: Defining and Measuring Valued Action within a Behavioral Framework." *The Psychological Record*, vol. 60, no. 2, 2010, pp. 249–272., doi:10.1007/bf03395706.