Yoga as an Ancillary Treatment to Acceptance and Commitment Therapy for Depression

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YOGA AS AN ANCILLARY TREATMENT TO ACCEPTANCE AND COMMITMENT THERAPY FOR DEPRESSION

Jeralee M. Briggs, Ph.D.
Western Michigan University, 2016

It is estimated that up to 30% of college students feel clinically depressed, and these feelings can lead to poor grades, substance abuse, unsafe sex, and suicide (National Institute of Mental Health, 2016). Acceptance and Commitment Therapy (ACT) has shown to be an effective form of psychotherapy for depression and was listed in 2014 as an evidence-based treatment for depressive disorders according to the APA Presidential Task Force on Evidence-Based Practice (2006). In addition to psychological treatment, various exercise interventions have been shown to be effective in reducing depressive symptoms (e.g., Rehorst, Wipfli, & Landers, 2009). Yoga is one such exercise intervention that combines physical activity with mindfulness meditation practice, and demonstrates as an effective ancillary treatment for depression (Cramer, Lauche, Langhorst, & Dobos, 2013). ACT includes many treatment components and also incorporates mindfulness to promote contact with the present moment, thus yoga conceptually overlaps in this particular respect as an ancillary treatment with ACT. The purpose of the present study was to compare ACT alone to ACT plus a yoga component with college students, using a single-blind, randomized, active control design to determine if the addition of yoga helps to further relieve depression. Results from a small sample size revealed similarly improved outcomes on depression, mindfulness,
acceptance, and quality of life domains for both an individual ACT intervention condition and an ACT plus group yoga condition, suggesting yoga may not add to the effectiveness of ACT. However, an interesting trend was noted within social relationships quality of life suggesting that the addition of group-based yoga may help to further improve social quality of life. Further studies with increased sample size are needed to better determine effectiveness of yoga as an ancillary treatment for ACT for depression, and to further explore the effects of yoga on social well-being.
YOGA AS AN ANCILLARY TREATMENT TO ACCEPTANCE AND COMMITMENT THERAPY FOR DEPRESSION

by

Jeralee M. Briggs

A dissertation submitted to the Graduate College in partial fulfillment of the requirements for the degree of Doctor of Philosophy
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INTRODUCTION

Problem Background

Depressive disorders are among the most common mental disorders in the United States. Depression spans across populations and is associated with many social and financial costs and complications including increased substance use and related problems, caregiver burden, healthcare costs, behavioral problems in children of affected parents, absenteeism at work, short-term disability, and mortality rates in the case of suicide. In fact, suicide, a risk of untreated depression, is the 11th leading cause of death in the United States. Over 15% of individuals suffering from depression take their own lives (National Alliance on Mental Illness, 2014). In 2012, approximately 6.9% of individuals 18 years and older in the United States experienced at least one major depressive episode (a period of significant depressive symptoms lasting at least 2 weeks), resulting in 16 million people experiencing depression that year. According to Substance Abuse and Mental Health Services Administration (SAMHSA, 2012), just 68% of individuals 18 years and older received some form of treatment for their depressive symptoms in 2012.

Depression is especially a problem in the college student population. According to the 2012 National Survey on Drug Use and Health published by SAMHSA (2008), individuals aged 18-25 had the highest rate of depression compared to other age groups, with 8.9% reporting at least one depressive episode. While this prevalence is not specifically for college students, 18-25 represents the typical age range of college students in the United States. Incidence (the number of new cases in a population)
specifically in a college student population has been estimated at 16% (Eisenberg, Gollust, Golberstein, & Hefner, 2007). Additionally, research suggests that one-fourth of college freshman drop out or do not return after their first year of college and often attribute this to emotional reasons (Rickinson & Rutherford, 1995). These numbers are not surprising when the unique first-time stressors that college students may face are considered, including relocating away from family, living with a roommate, academic pressures, new independence, and exposure to alcohol, drugs and related peer pressure. The American College Health Association (2006) determined that close to 50% of college students reported feeling so depressed that it was difficult to function, and 10% seriously contemplated attempting suicide.

Treatment for depression can take many forms and can include both traditional (e.g., antidepressant medication) and alternative (e.g., massage, acupuncture, yoga) medicine. The most common forms of treatment for depression are pharmacologic treatments and psychotherapy. Both have been shown to be effective in lessening depressive symptoms, and the current clinical practice guideline for depression in adults by Kaiser Permanente Care Management Institute (2012) recommends the combination of antidepressant medication and evidence-based psychotherapy as first-line treatment for individuals with severe or chronic major depressive disorder. Of note, some research (e.g., Hollon, Stewart, & Strunk, 2006) has suggested psychotherapy for depression compared to psychopharmacological interventions results in longer-lasting effects and the development of skills that continue to improve over time, thus indicating psychotherapy as an important treatment for enduring outcomes to buffer against depression relapse.
Empirically supported psychotherapies for depression have been identified by the APA Presidential Task Force on Evidence-Based Practice (2006). Treatments such as Behavior Therapy, Cognitive Therapy, Interpersonal Therapy, Rational-Emotive Therapy, and Acceptance and Commitment Therapy demonstrated modest to strong research support.

Acceptance and Commitment Therapy

The APA identified Acceptance and Commitment Therapy (ACT) as showing modest research support for relieving depression, according to multiple randomized-controlled trials and meta-analyses (e.g., Hayes, Luoma, Bond, Masuda, & Lillis, 2006; Powers, Zum Vorde Sive Vording, & Emmelkamp, 2009; Ruiz, 2012). ACT is a treatment that is behavioral in its theoretical and conceptual roots, which postulate that experiential avoidance (attempts to avoid or alter contact with aversive private events) and cognitive fusion (holding tight to one’s thoughts and evaluations, even when they are not effective) are responsible for human suffering. ACT is purported to disrupt these processes by honing new skills of mindfulness, acceptance, and valued action in order to increase psychological flexibility and willingness to contact private events as natural parts of human experience (Hayes, Strosahl, & Wilson, 1999). To fully understand the active behavioral processes that underlie ACT, it is first helpful to understand the underlying philosophy.

ACT Philosophy and Theory

Functional contextualism. ACT has clearly defined philosophical and theoretical roots. The philosophy underlying ACT is called functional contextualism (Hayes, 1993). This philosophy is related to radical behaviorism in which behaviors are understood as a
subject matter in their own right and are considered to occur naturally (Baum, 2011). The goals of functional contextualism are prediction and influence of behavior with scope (generalizability), precision (accuracy), and depth (analyzable across multiple domains) (Gifford & Hayes, 1999).

The “functional” aspect of functional contextualism refers to the importance of a behavior’s function and the consequence that follows. The function of a behavior is considered part of its context (Hayes, 2004). This focus on function allows for a pragmatic approach to behavior. This “pragmatic truth criterion” is employed in ACT, and behaviors are analyzed according to “workability,” or whether or not the behavior contributes to an effective and meaningful life (Hayes et al., 1999). The client’s personal values are the medium through which workability is assessed.

The “contextualism” aspect of functional contextualism refers to analyzing a behavior in its entire context. In this sense, context refers to an individual’s unique learning history and past experiences, as well as current setting events like discriminative stimuli and motivating operations, and available consequences (Hayes, 2004). In functional contextualism, behavior is seen as a whole event in its context, whereas traditional behavior analysis may analyze these parts of context at a molecular level.

**Relational frame theory background.** Relational frame theory (RFT; Hayes, Barnes-Holmes, & Roche, 2001) is the underlying theory of ACT. RFT is a behavioral approach to language and was developed with the understanding that language is an important part of human development and functioning. It is understood that humans interact with their environment in such a way that external stimuli, internal stimuli, and language stimuli come to expand their experience and responses to various stimuli.
Stimuli that differ from each other in physical attributes may come to elicit similar responding (e.g., a person responds similarly to the spoken word spider, written word spider, and physical form of a spider). Stimuli that elicit similar responding are said to make up a relational frame as a result of verbal and non-verbal conditioning processes. The action of responding similarly to these various stimuli is called relational framing (Hayes, Blackledge & Barnes-Holmes, 2001). Aspects of RFT include derived relational responding which demonstrates mutual and combinatorial entailment, transformation of stimulus function, and arbitrary applicability according to social context and rules.

Mutual and combinatorial entailment are aspects of relational framing that are borrowed from Sidman’s (1986) account of equivalence. Equivalence classes, referred to as relational frames in RFT, are groups of stimuli to which an individual responds similarly to all members of that group of stimuli on at least one response dimension. Some relations between stimuli are directly trained, and others are not. An example to illustrate this point involves what the general public refers to as a “phobia.” Consider a little boy who has a spider phobia. In the presence of spiders, the boy exhibits fear responses (e.g., sweating, heart racing, crying, and escape). He then learns in school that the word for this object is “spider.” Similar responses occur when he hears the word “spider,” such that an actual spider = “spider,” and vice versa, “spider” = an actual spider. This reciprocal relationship demonstrates mutual entailment. Then the boy learns that “spider” is spelled s-p-i-d-e-r. The spelling is trained to the auditory stimulus, and the boy does not have to be formally taught that s-p-i-d-e-r is related to an actual spider for him to have similar fear responses to the spelled word. This third, derived and not formally taught stimulus relation demonstrates combinatorial entailment. These three stimuli (a
spider, “spider,” and s-p-i-d-e-r) are part of a frame of coordination (Blackledge, 2003) because they share a common function (in that the boy says spider or responds in some other way, such as a fear response, to all of the stimuli in that class) and are not necessarily related on the basis of physical form—one stimulus is a physical object, one stimulus is auditory, and the other is written.

Through further life experiences, these frames of coordination or relational frames can expand to include other stimuli. For example, imagine this same boy who fears spiders. One of his favorite places is his basement because that’s where all of his toys are. The basement has been paired with pleasant experience. However, a friend later tells him “spiders live in basements.” Now, the relational frame of spiders has been expanded and the function of spiders has been transferred to basements. No longer does the boy’s basement elicit pleasant emotions. Instead, he begins to respond fearfully to the basement in the same way he responds to spiders. This explains how language and derived relational responding can expand relational frames via transformation of stimulus function. Relational frames can be similarly expanded and transformed through other verbal relations such as bigger than/smaller than and better than/worse than. Frames grow increasingly complex with further life experience (Blackledge, 2003).

A final aspect of RFT is that relational frames are arbitrarily applicable (Hayes, 2004). This means that derived relations are not necessarily demonstrated according to physical similarity, but according to social context and rules. A common example includes relating a dime with a nickel. Someone might say the dime is “bigger” than the nickel, and this would be socially understood due to the social-contextual value placed on both coins. Indeed, a dime is worth more than a nickel, but the nickel is physically larger.
Through derived relational responding, it makes sense socially that someone might say the dime is bigger. Therefore, these relational frames are arbitrarily applicable because they are not based on physical form, but they are not arbitrarily applied when social context is considered.

RFT can account for psychopathology due to the propensity of ever-expanding relational frames. Humans respond to internal stimuli, external stimuli, and language stimuli in ways that promote suffering (Barnes-Holmes, Barnes-Holmes, Hayes, & McHugh, 2004). Humans are able to respond similarly to various stimuli that are not formally related. Consider the thought “I am a failure” in a depressed person. Perhaps this thought started upon receiving results from a failed exam. Following from this event was aversive emotional responses and self-judgments. Through further life experience, “failure” may come to be related to various situations, people, and experiences, such that suffering persists across multiple contexts, demonstrating relational frame theory as a mechanism of action for which human suffering occurs.

**Processes of RFT.** The prominent techniques used in ACT are based on the processes that follow from RFT which promote human suffering, especially the ubiquity of pain, cognitive fusion, and experiential avoidance. Together, these make up what is called “psychological inflexibility” (Hayes, 2004).

The ubiquity of pain simply refers to the fact that pain is a part of human life and is unavoidable (Hayes, 2004). Pain serves some evolutionary function, as it alerts us to situations that are dangerous and may pose a threat to survival. However, through human language, pain has the potential to reach beyond just survival threats, notably with emotional forms of pain. Pain can be experienced by humans simply through a word, a
memory, or a situation. Therefore, pain persists across many aspects of a person’s life and is unavoidable.

When derived relations from expanded relational frames dominate over direct contingencies present in the environment, this is called cognitive fusion (Hayes, 2004). Cognitive fusion looks like a strict set of verbal rules, usually of an evaluative nature, that an individual holds. An example of this might be the aforementioned thought of being a failure. It may grow to the specific belief “If I don’t succeed 100% the first time, I am a failure.” When an individual is fused with this belief, they may experience it in multiple contexts and have trouble letting go of it.

The unwillingness to remain in contact with private experience and taking steps to alter the form, frequency, or intensity of private experience is known as experiential avoidance (Hayes, 2004). The very nature of RFT demonstrates why experiential avoidance is an action that perpetuates suffering. By trying to control an aversive internal event, the relational frame of that aversive event is only expanded. For example, imagine a person is experiencing a lot of shame. They try to change this by giving themselves the rule “don’t feel shameful.” By focusing on this rule, the person is focusing on the experience of shame itself. Therefore, experiential avoidance does the exact opposite of ridding oneself of aversive internal experience—it actually brings it back into focus and expands the experience.

**Specific ACT Techniques**

Several techniques are used in ACT in order to attempt to change the context in which one relates to their internal experience in order to reduce human suffering and promote effective actions regardless of painful experience. These are contact with the
present moment, creative hopelessness, control is the problem, cognitive defusion, values, acceptance, self-as-context, and committed action (Hayes, 2004).

**Contact with the present moment.** This technique is utilized throughout ACT sessions. Remaining with the present moment is thought to promote acceptance and committed action all in the service of values. The “hexaflex” in ACT, which consists of contact with the present moment, cognitive defusion, values, acceptance, self-as-context and committed action, is known as psychological flexibility and is the overall target for ACT (Hayes, 2004).

**Creative hopelessness.** When an ACT client first attends a therapy session, the therapist works with them to identify the actions they have already taken to try and reduce their suffering. The client may list several actions such as substance use, trying not to think about it, distraction attempts, social isolation, and more. These techniques are often discussed as possibly effective in the short-term, but not in the long-term. The therapist then asks the client to consider that perhaps there may not be a technique that will rid them of their pain. Clients are often stuck on the idea that they just haven’t found the right tool yet, and the therapist offers the idea that perhaps there is no tool. The shovel metaphor (Hayes, Masuda, & De Mey, 2003) is often used in this context. The therapist asks the client to imagine that they are dropped into a field, blindfolded, with a bag of tools. The client doesn’t know this, but the field is filled with holes. The client begins walking and falls into a large hole. The client opens the bag of tools and finds only shovels, of all different sizes and shapes. The client digs because this is the only action he or she can do with the tools given. However, digging does not get the client anywhere. If they are to find any way out of this hole, the client must put down the shovels.
Control is the problem. This is the next step in ACT that follows from creative hopelessness. Through this step, it is expected that clients begin to recognize the futility of attempts to control pain, in that by attempting not to have pain, they are only expanding their relational frame of pain. A common exercises used here is the “don’t think about chocolate cake (or insert any other delicious food)” metaphor (Hayes, 2004). A therapist may ask the client to try and not think about chocolate cake, while the therapist describes chocolate cake in detail. This exercise aims to help the client see how attempts to control thoughts and emotions simply expand and promote further relational framing and get them caught up in a rigged game they cannot win.

Self-as-context. This refers to changing the client’s perspective. They are encouraged to remain in the present moment and experience their thoughts and emotions as they occur. Self-as-context exercises emphasize the continuity of consciousness as the foundation of human experience (Hayes et al., 2003). A metaphor commonly used in self-as-context exercises is a chessboard. The chessboard is made up of pieces that represent both the “good” and “bad” experiences in life. Although the client may imagine themselves as either the player of the game or the pieces, they are asked to consider another part of the game that they could be, as the player and the pieces have a vested interest in the game’s outcome. The client can be viewed as the chessboard, in which life experiences are allowed to play out, but the client doesn’t have to live inside of the game.

Acceptance. In ACT, acceptance does not mean approving of what is happening. It means to “take what is offered” (Hayes, 2004). It involves nonjudgmental, fully-engaged experience in the present. It is purported that the accepting and willing client will allow exposure to all thoughts, feelings, and sensations as they are without attempts
to change them. Acceptance is the opposite of experiential avoidance in this sense. A common metaphor to promote acceptance is the tug of war with a monster exercise. The client is told that the monster represents their most aversive experiences (pain, depression, loneliness, anxiety, etc.). There is a large pit in the middle of the client and the monster, and they both have one end of the rope. Every time the client pulls, the monster pulls a little harder. The client begins to move closer and closer to the bottomless pit in the middle. This is to help the client realize that they cannot win this game. The only way out is to drop the rope, stop the struggle, and allow the monster to just be there.

**Values.** Values are important in ACT because they can help to guide the client’s behavior. Clients are asked to reflect on what’s important to them and what they want their life to stand for (Hayes, 2004). Behaviors are then assessed for workability in order to determine if the behavior is in the service of the client’s values, which sometimes means the behavior won’t always feel pleasant in the moment (e.g., attending a friend’s child’s birthday party may feel aversive, but it is in the service of supporting a friend, which is an identified value of the client). Clients are asked to assess their values in multiple life domains including work, family, personal growth, and spirituality. A common exercise for values clarification is asking the client to imagine their 80th birthday and what they’d most like their friends and family members to say about them.

**Committed action.** This is the ongoing final phase in ACT. The client starts small by identifying simple valued actions he or she can take, and then is encouraged to seek out larger patterns of effective behavior (Hayes, 2004). New psychological barriers may be encountered and the aim is for previously learned techniques like acceptance to be used to follow through with values in the face of barriers.
Cognitive defusion and mindfulness. These techniques are used to purportedly change the context in which clients relate to thoughts. Instead of trying to change the thoughts or painful experiences themselves, these techniques ostensibly work by decreasing the stimulus function power of the thoughts themselves (Hayes, 2004). A common example of cognitive defusion is the “milk, milk, milk” exercise. The client first begins by describing milk (milk is cold, white, creamy, etc.) to demonstrate the relational frames with milk. Then the client repeats the word “milk” aloud, over and over, quickly. Through this exercise, “milk” quickly loses its stimulus functions and becomes a simple sound. The context in which the client is relating to milk changes. The same exercise can be done with a clinically relevant word or phrase, like the aforementioned “failure.”

Mindfulness exercises are also used to change the context in which the client relates to painful experience. A common exercise is “leaves on a stream.” The client sits quietly and imagines their thoughts as they come up. When a thought is noticed, the client attaches it to a leaf and sends it down an imaginary stream. As distractions or judgments about the experience come in, the client is again instructed to attach those to a leaf and send it down the stream. This is thought to allow the client to get some space from their thoughts and look at them instead of through them.

Research Support for ACT

Öst (2008) reviewed a number of third-wave behavioral therapies, including ACT. His systematic review and meta-analysis for ACT included 13 studies. Using criteria from Chambless and Ollendick (2001), Öst concluded that ACT research methodology was especially poor and not as good as methodology used in cognitive studies, which is why he included only 13 studies. Statistical analyses revealed an overall moderate effect
size of $g = .68$ for ACT, which was not superior to effect sizes reported for cognitive treatments. He recommended that ACT RCTs use more stringent methodologies in the future.

Powers, Zum Vorde Sive Vording, and Emmelkamp (2009) reviewed 18 studies with random or consecutive allocation that included ACT compared to waitlist, placebos, treatment as usual, and established treatment. Inclusion criteria were not reported to be as stringent as Öst (2008). Results showed medium to large effect sizes for ACT over waitlist, placebos, and treatment as usual. ACT was not superior to established treatment such as cognitive behavior therapy. Specifically for the five included studies that had depression as an outcome measure, the researchers reported ACT was superior to waitlist control, equal to alternative cognitive treatments, and superior to alternative cognitive treatments.

Ruiz (2012) reviewed 16 studies that compared ACT to a cognitive treatment. Studies were in English or Spanish, reported outcome and meditational/moderational analyses, and included randomized and quasi-experimental designs. In 11 of the 16 studies, ACT was reportedly more effective than cognitive treatment with a small effect size. ACT also was significantly mediated/moderated by proposed theoretical processes from psychological flexibility (small effect size) whereas cognitive therapy results were not affected by the proposed processes such as reduction in automatic thoughts (this effect size did not even reach the criterion of small). This suggests that ACT is more theoretically sound in its theoretical application to practice. Studies included in this review that had depression as a primary outcome study were found to favor ACT over cognitive therapy in three studies, and cognitive therapy over ACT in one study. The
effect size for ACT over cognitive therapy was small and non-significant when analyzed in the meta-analysis.

An updated systematic review and meta-analysis by Öst (2014) included more ACT studies, as research in the ACT area increased over the past few years. Öst reiterated his previous conclusions in that ACT overall had a medium effect size of $g = 0.68$ that is not superior to established cognitive therapies. He again pointed to methodological weaknesses in ACT research, such as not using an active control group, not completing power analyses beforehand, and failing to blind assessors. Five of the included studies targeted depression. Two were found to be more effective than treatment as usual, one was not found to be more effective than treatment as usual, and two found ACT to be equally effective to cognitive therapy.

Also, the APA Presidential Task Force on Evidence-Based Practice (2006) identifies ACT as being well-established (strong research support) for chronic pain and probably efficacious (modest research support) for depression. The APA reports that these conclusions were also made using Chambless and Ollendick’s (2001) criteria for strong research designs to identify empirically supported treatments. Thus, ACT does qualify as an evidence-based therapy for depression according to APA.

**Mechanisms of Action in ACT**

Forman, Herbert, Moitra, Yeomans and Geller (2007) explored the mechanisms of action for change in ACT and traditional cognitive therapy (CT). Non-traditional college students with moderate to severe anxiety or depression were randomly assigned to CT or ACT with minimal exclusion criteria in order to maximize exclusion criteria. Relevant empirically-supported outcome measures assessed depression, anxiety, quality
of life, general life functioning, and satisfaction with life. Mediatonal measures included the Kentucky Inventory of Mindfulness Skills (KIMS; Baer, Smith, & Allen, 2004) which measures four mindfulness domains: observing, describing, acting with awareness, and accepting without judging; and the Acceptance and Action Questionnaire-II (AAQ-II; Bond et al., 2011), which measures the extent to which an individual accepts and contacts aversive experiences in their life and takes action despite what they might feel. Improvements were seen across outcome measures for both groups, thus a main effect of time but not main effect of group; however, mediatonal processes differed between groups. It should be noted that a formal mediatonal analysis was not able to be conducted due to a lack of control/no-treatment group in the methodology and that mediatonal measures were assessed concurrently. Thus, repeated measures MANOVA was used to determine mediation. For ACT, changes in experiential avoidance and acceptance (measured from the AAQ-II), and acting with awareness (from the KIMS) mediated improvement on various outcome measures. For CT, treatment improvements were mediated via observing and describing experience, both domains that were assessed on the KIMS. Therefore, both ACT and CT conditions included mindfulness aspects of mediation for treatment change.

Zettle, Rains, and Hayes (2011) also analyzed ACT at the level of processes of change to distinguish between ACT processes unique from CT processes. The researchers randomly assigned college students with moderate to severe depression to CT or ACT for the purposes of comparison and mediatonal analysis. The Beck Depression Inventory-II (BDI-II) was used as the primary outcome measure, and mediatonal measures included the Automatic Thoughts Questionnaire (ATQ; Hollon & Kendall, 1980) and the
Dysfunctional Attitude Scale (DAS; Weissman, 1979). The ATQ measures the prevalence and frequency of negative thoughts closely related to depression that are in immediate awareness. The ATQ-B (Zettle & Hayes, 1986), a form of the ATQ that asks individuals to rate how much they believe each thought statement (e.g., “I hate myself”) on the ATQ, was also used. This problem with believability of depressive negative thoughts is targeted in ACT through cognitive defusion and mindfulness. Previous research has found such automatic thoughts to be negatively correlated with high dispositional mindfulness, such that the ability to detach from negative thoughts and observe them without judgment or believability was inversely related to the frequency with which individuals experience automatic thoughts (Frewen, Evans, Maraj, Dozois, & Partridge, 2008). The DAS is a measure of common, deep-seated attitudes related to depression, such as “I should be able to please everybody.” Outcomes revealed significant improvements in depression for both groups. However, ACT was more successful in decreasing the occurrence of depressogenic thoughts and their believability according to the ATQ and ATQ-B. Through a modified, bootstrapped Sobel mediational analysis, the researchers found that neither the original ATQ nor the DAS significantly mediated change in BDI-II results post-treatment for either CT or ACT, using pre-treatment BDI-II scores as a covariate. However, the ATQ-B successfully mediated follow-up BDI-II scores, thus suggesting that changes in believability of automatic negative thoughts via cognitive defusion and mindfulness were most responsible for improvements in depression.

Additional studies that found evidence for cognitive defusion and/or mindfulness as mechanisms of action in ACT include Zettle and Hayes (1986), Zettle and Rains
The relevance of these multiple studies lies in their support for cognitive defusion and mindfulness as mechanisms of action that account for therapeutic processes of change. As mindfulness is a technique used to foster cognitive defusion, then perhaps incorporating additional mindfulness practice into an ACT protocol could further improve treatment results.

**Mindfulness**

Baer (2003, p. 125) describes mindfulness as “the non-judgmental observation of the ongoing stream of internal and external stimuli as they arise,” which involves the process of “intentionally bringing one’s attention to the internal and external experiences occurring in the present moment.” The integration of mindfulness into psychotherapy has grown in recent years with the third-wave behavior therapies that incorporate mindfulness with acceptance (Hayes et al., 2003).

**Research Support for Mindfulness**

Mindfulness has been incorporated into several treatments for depression. In addition to its inclusion as a component of ACT, it is also a major component of Mindfulness-Based Stress Reduction (MBSR; Kabat-Zinn, 1982) and Mindfulness-Based Cognitive Therapy (MBCT; Segal, Williams, & Teasdale, 2002), which was actually created to help prevent depression relapse. Multiple systematic reviews and meta-analyses have demonstrated the effectiveness of mindfulness-based psychotherapy and mindfulness practice for many symptoms and difficulties including psychosis (Khoury, Lecomte, Gaudiano, & Paquin, 2013), psychological and physiological symptoms as a result of cancer (McAbee, Labbé, & Drayer, 2014), binge and emotional eating...
(Katterman, Kleinman, Hood, Nackers, & Corsica, 2014), and depression (Boteva, 2008; Grossman, Niemann, Schmidt, & Walach, 2004; McCarney, Schulz, & Grey, 2012).

**Mindfulness and Yoga**

Another form of treatment for depression that incorporates mindfulness, albeit an alternative form, is yoga. Most forms of yoga combine physical activity, breathing practice, and meditation (American Yoga Association, 2006). Yoga is considered a mind-body intervention which emphasizes focus and concentration on the interactions of the brain, body, and behavior (National Center for Complementary and Alternative Medicine, 2011), a description which corresponds well with the definition of mindfulness practice described by Baer (2003) above.

A systematic review and meta-analysis including 12 randomized-controlled trials of yoga for depression by Cramer, Lauche, Langhorst, and Dobos (2013) suggested moderate evidence for the short-term effectiveness of yoga for depression. Yet another broad systematic review by Mehta and Manoj (2010) suggested yoga as an effective complementary therapy for depression after demonstrating 17 of 18 studies significantly reducing depressive symptoms. Unfortunately, similar to Öst (2008, 2014) with ACT, both Cramer and colleagues and Mehta and Manoj list methodological weaknesses of included studies in their reviews, thus limiting the inferences that can be made from the reviews; however, both sets of researchers confidently conclude that yoga can at least be considered as an effective supplementary treatment to established treatment for depression to further relieve depression.
The Current Study

Due to the pervasiveness of depression across college campuses, there is a need for evidence-based treatment that will work to relieve depression in the college student population. Acceptance and Commitment Therapy is considered one of these evidence-based options (APA Presidential Task Force on Evidence-Based Practice, 2006). Included in the ACT treatment package is mindfulness, which is a component of several successful treatments for depression (e.g., MBSR, Kabat-Zinn, 1982; MBCT, Segal et al., 2002). Yoga is also a mindfulness-based activity that has been added to therapy protocols for depression and proved helpful in reducing depression (e.g., Cramer et al., 2013; Mehta & Manoj, 2010). As yoga is conceptually compatible with ACT, adding a yoga component to a brief ACT intervention for depression may be helpful in further reducing depression than using ACT alone. The APA currently identifies ACT for depression as “probably efficacious,” which is one step below “well-established” (APA Presidential Task Force on Evidence-Based Practice, 2006). The additional dose of mindfulness from yoga may help to bolster this skill and raise the effectiveness of ACT-based protocols. In addition, the use of yoga as an ancillary component is especially convenient in a college setting, as most students have free or low-cost access to student recreation centers that usually offer yoga classes as part of a fitness program. Thus, the accessibility of the additional yoga component in this treatment is relatively simple for a depressed college student.

The first goal of the present study was to conduct a study that compared ACT alone (ACT) to ACT plus a yoga component (ACT+Y) administered to college students with depressive symptoms to determine if adding a yoga component helps to reduce
depression more than ACT alone. Because ACT alone has demonstrated effectiveness in reducing symptoms of depression and yoga has demonstrated effectiveness as an ancillary treatment for depression, in addition to the fact that both ACT and yoga utilize mindfulness skills, it was hypothesized that all participants in both conditions would significantly improve depression scores (as measured by the Beck Depression Inventory-II) and mindfulness scores (as measured by the Mindfulness Attention Awareness Scale) over the course of treatment. It was also hypothesized that the additional exposure to mindfulness in the ACT+Y condition would further improve mindfulness and depression such that participants in the ACT+Y condition would have significantly better mindfulness and depression scores than those in the ACT condition. Of specific interest was at which time points during the course of repeated measures these outcome measures would differ between the two conditions. A secondary goal of the present study was to examine the effect of both ACT and ACT+Y on acceptance and quality of life. It was hypothesized that acceptance as measured by the Acceptance and Action Questionnaire-II and quality of life as measured by the World Health Organization Quality of Life–short form (WHOQOL-BREF) would improve for both conditions.
METHOD

Participants

Participants were students recruited from Western Michigan University (WMU) through publicly posted flyers and through announcements in psychology classrooms. Potential participants were excluded from the study if they presented in acute crisis, i.e., were experiencing suicidal plan or intent (responding higher than a “1” on the Beck Depression Inventory-II to item #9, which assesses for suicidal ideation, plan, and intent, in which they were to be assessed further for suicide risk and provided information for the crisis line, WMU Counseling Services, and the WMU Psychology Clinic), experienced recent medication changes that could potentially confound results, already practiced yoga regularly (at least twice per month), or had health or physical limitations that prevented their ability to practice yoga. Participants were included in the study if they completed measures indicating at least moderate depression (a score of 20 or higher, as measured by the Beck Depression Inventory-II) at the time of the pre-treatment assessment. Individuals reporting active medications were included only if they were stable on their medications for three months prior to beginning the study.

Measures

The information collected in this study included a demographic information and relevant background information questionnaire (see Appendix A), which was only collected during screening, and the measures described in detail below.
Beck Depression Inventory-II (BDI-II). The BDI-II (Beck, Steer, & Brown, 1996) is a 21-item self-report questionnaire with response scale values 0-3 for each item. The BDI-II assesses symptoms of depression, including cognitions such as hopeless thoughts and suicidal ideation, and also physical symptoms such as appetite change and fatigue. The BDI-II has demonstrated good internal consistency ($\alpha = .71$) and has been demonstrated to have good test-retest reliability ($r = .93$). Higher scores on the BDI-II indicate more severe depression. The BDI-II was administered at pre-treatment, session 1, session 3, session 5, one week post-treatment, and one-month follow-up assessment appointments.

Mindfulness Attention Awareness Scale (MAAS). The MAAS (Brown & Ryan, 2003) is a 15-item measure that assesses trait mindfulness. Items describe specific non-mindful experiences are rated on a 6-point Likert scale ranging from 1 (almost always) to 6 (almost never). The MAAS has demonstrated good reliability ($\alpha = .82$) and has been demonstrated to have good test-retest reliability ($r = .81$). Higher scores on the MAAS represent higher levels of trait mindfulness. The MAAS was administered at pre-treatment, session 1, session 3, session 5, one week post-treatment, and one-month follow-up assessment appointments.

Acceptance and Action Questionnaire–II (AAQ–II). The AAQ-II (Bond et al., 2011) is a 7-item self-report questionnaire. Response options range from 1 (never true) to 7 (always true). The AAQ-II measures acceptance, experiential avoidance, and psychological inflexibility. The AAQ-II has demonstrated good internal consistency ($\alpha = .84$). The AAQ-II has been demonstrated to have good test-retest reliability at 3 months ($r = .81$) and 12 months ($r = .79$). Higher scores on the AAQ-II indicate greater
psychological inflexibility. The AAQ-II was administered at pre-treatment, session 1, session 3, session 5, one week post-treatment, and one-month follow-up assessment appointments.

**World Health Organization Quality of Life – short form (WHOQOL-BREF).**

The WHOQOL-BREF (The WHOQOL Group, 1998) is an abbreviated form of the original 100-item WHOQOL, a measure used to assess quality of life. It consists of 26 Likert-scaled items and is scored across four different domains of quality of life (psychological health, physiological health, social relationships, environmental health), as well as one overall domain. The WHOQOL-BREF domains correlate well with the original WHOQOL, with correlation coefficients at .89 or above. Psychometrics are good without ceiling or floor effects, with test-retest reliability ranging from \( r = .66 \) to \( r = .87 \) across the domains, and internal consistency coefficients ranging from \( \alpha = .81 \) to \( \alpha = .90 \). Higher scores on each of the domains indicate stronger quality of life within that domain. The WHOQOL-BREF was administered at pre-treatment, session 1, session 3, session 5, one week post-treatment, and one-month follow-up assessment appointments.

**Procedure**

All data collection took place in the Behavioral Medicine Research Lab at Western Michigan. Recruitment began in January 2015 and treatment protocols began as soon as one week after participants were screened and accepted for the study. Interested participants met with research assistants not involved in the treatment components of the study to complete self-report screening assessment measures. Research assistants first gained informed consent from interested participants. Then, interested participants underwent an initial assessment screening process consisting of the self-report
assessments and background information measures previously described. Eligibility was assessed based on initial assessment measures and questionnaires, and eligible participants were assigned a treatment condition by the dissertation researcher. If the potential participant did not qualify, the research assistant provided contact information for University Counseling Services, WMU Psychology Clinic, and the 24-hour crisis line (1-800-273-TALK). Participants who did qualify were randomly assigned a condition (ACT or ACT+Y) by the dissertation researcher using a random number generator. Participants were assigned an individual therapist for the study based on their availability and therapists’ availability.

Research assistants independent from treatment aspects facilitated self-report assessments at initial screening, session 1, session 3, session 5, and one week and one month follow-up. At each assessment point, participants completed the BDI-II, MAAS, AAQ-II, and WHOQOL-BREF. Participants were informed that research assistants and therapists would not be aware of treatment condition in order help conceal treatment condition and prevent divulgement of any information that could jeopardize blinding for the research assistants during testing sessions, or the therapists during therapy sessions (e.g., those in the ACT+Y condition were told their therapist and assessment research assistant would not be aware of their involvement in yoga throughout the study). The yoga instructor was also blinded to research participant status. The yoga classes were open to all university students, and the fact that some students were part of the research study was not revealed. For ACT+Y participants, yoga passes were picked up outside of the student recreation center immediately prior to each yoga class from the dissertation researcher or other independent research assistant (separate from other aspects of the
study) in order to track attendance. Throughout either treatment condition, participants tracked their weekly exercise activity levels via a log and handed the log into their therapist at each session, beginning with session 2. This log included type of activity (e.g., running, biking, weight-lifting), intensity, and duration (see Appendix B). Average intensity and total duration for each participant was calculated at the end of the study. Following completion of treatment, one week follow-up assessments occurred within 7-10 days following the last session or attended yoga class, and one month follow-up assessment sessions occurred 4-6 weeks following treatment completion.

**Delivery of Intervention Personnel**

**Therapists.** Graduate students enrolled in Western Michigan’s Clinical Psychology doctoral program who completed at least one year of internal practicum in a community psychology clinic served as therapists in delivering the ACT protocol. The therapists had supervised experience by a licensed psychologist in ACT-based therapy and were assigned to participants based on schedule availability to provide the ACT intervention. Therapists were blinded to participant condition.

**Yoga instructor.** A registered 200-hour National Yoga Alliance yoga instructor delivered yoga protocols to participants in the ACT+Y condition via a scheduled class at the WMU Student Recreation Center. She led classes in both Yoga Meditation and Vinyasa Flow Yoga (see Appendix C for further explanation). The yoga instructor was blinded to participant status.
Treatments

Acceptance and Commitment Therapy (ACT) for the present study included major techniques offered by Hayes et al. (1999). Therapists followed a six-session ACT protocol, with each session lasting approximately 50-60 minutes.

Therapy session outlines. The first session included an introduction to ACT as well as a discussion of attempts to control, reduce, or alter aversive experience associated with depression and introduction of creative hopelessness. Mindfulness was also introduced and practiced throughout each session. Values clarification was assigned for homework. During the second session, control is the problem and acceptance concepts were introduced through metaphors, and initial valued goal setting was introduced to continue throughout the treatment. The third session included a review of control is the problem and introduction to willingness to experience. The fourth session consisted of cognitive defusion exercises. During the fifth session, self-as-context and observation of the self was discussed. The sixth and final session involved a review of progress and re-assessment of values-directed behavior, as well as planning for future barriers. Each session included a mindfulness exercise, and following the first session, values-directed goal setting as well. In addition, participants were encouraged to practice skills relevant to the topic discussed during that session, including defusion, acceptance, values examination, and self-as-context exercises. Sessions were audio-recorded and coded by two research assistants to ensure treatment integrity and adherence to the ACT protocol.

ACT condition. The ACT condition consisted of the protocol described above without any additions. It served as the control condition in the present study.
**ACT plus yoga (ACT+Y) condition.** The ACT+Y condition included the ACT protocol described above, in addition to one weekly session of yoga at Western Michigan University’s Student Recreation Center for the six-week duration of the ACT protocol. Participants attended yoga class weekly. Each class lasted approximately 60 minutes each and contained four overarching components: mindful awareness via deep breathing, connection of body, breath, and movement, mindful body scan, and brief relaxation via stillness (e.g., “svasana,” also called “corpse pose”). All components involved mindfulness practice. Poses during flow series may have varied each session, but general outlines were used to plan and implement each class. Poses and movements were offered at various fitness intensity levels to accommodate participants of all physical fitness levels. Participants were encouraged both by the yoga instructor and via introductory email by the dissertation researcher to try poses but to respect personal physical limits and reduce to a lower intensity level as needed.

**Treatment Adherence**

Both therapy sessions and yoga classes were observed in order to be certain that the delivery of the interventions adhered to the protocols. One-third of yoga classes were attended by independent observers not involved in other aspects of the study. All therapy sessions were audio recorded, and one-fourth were randomly selected for coding by two observers. Protocol checklists were utilized for both yoga and therapy sessions to ensure treatment integrity and adherence to the yoga protocol. Kappa values for agreement of adherence to protocol were calculated for therapy sessions at the end of the study.
Participation Compensation

Any individual that participated in assessment or intervention components of the study was eligible to receive extra credit in current WMU psychology courses, if approved by the instructor. Confirmation of participation was provided to instructors via a slip of paper signed off on by a research assistant denoting the amount of time the participant had devoted to the research project, which could have been as little as 30 minutes for an initial screening assessment during which they were excluded, or as much as 15 hours for a participant completing all treatment and assessment components within ACT+Y. It was up to the course instructor to determine how to award extra credit, but most instructors awarded points based on length of time devoted to the study.

Human Subjects Protection

The current study was approved by Western Michigan University’s Human Subjects Institutional Review Board (HSIRB) in January 2015 (see Appendix D). Students from WMU aged 18 and older were eligible for participation. Following email or phone contact with the dissertation researcher, potential participants interested in the study were scheduled at their convenience to come in for an initial assessment which began with reading through the informed consent document in a private room. All individuals at this stage signed the informed consent and agreed to proceed with the initial assessment.
RESULTS

Design Analysis and Plan

Analyses were intended to be carried out using an intent-to-treat modality in order to include data collected on all participants that were assessed, accepted, and randomized to a condition. Power analyses using G*Power (Faul, Erdfelder, Lang, & Buchner, 2007) indicated that the study required 18 participants in each condition for a total of 36 participants for an 80% chance to detect a treatment difference at the $\alpha = .05$ level. However, the study resulted in a smaller sample size ($N = 24$) than expected and included attrition of 11 randomized participants before completion of treatment components.

Unfortunately, ANCOVA cannot be carried out with missing data, thus cases are either deleted from analyses or must be addressed with a statistical technique for missing data imputation. While useful in raising power, especially for small samples, these techniques can introduce significant error and bias into the statistical model and results as they develop values for missing data based on earlier values for cases affected by attrition. For repeated measures ANCOVA, options to address missing data include maximum likelihood estimation (MLE) and multiple imputation. In a simulated study, Cheema (2014) found that for ANOVA, listwise deletion (deleting cases with missing data from analyses) performed as good as MLE, and power was not significantly affected. Multiple imputation did not perform well. Given the strong degree of bias and error that could be introduced to the current study’s small sample size by estimating values for one-third of the participants (11 of 35), it was determined that only cases with full data (thus, those
who completed the study) would be included in analyses. Therefore, an intent-to-treat analysis was not used in final analyses.

**Treatment Randomization, Attrition, and Attendance**

As illustrated by Figure 1, 53 interested participants attended the initial screening session. Of these, 35 met criteria for the study and agreed to enroll. Reasons for exclusion included BDI-II score below moderate depression level and recent medication changes. Three accepted participants dropped out before the first therapy session, and 8 more dropped out sometime between the first and fourth therapy session, leaving 24 participants that fully completed all treatment and assessment components of the study, including follow-up data (12 in each condition). There were no participants that withdrew past session three. The primary reason for choosing not to enroll in the study after acceptance or dropping out of the study after beginning was time constraints due to personal or academic reasons. One participant also shared that he had experienced sufficient benefit from two sessions and no longer wished to continue. Another participant had broken an ankle in sports practice and chose to withdraw from ACT+Y. Other participants simply stopped attending sessions and responding to researchers’ attempts to reach them.

Of the participants that completed the ACT+Y intervention, the mean number of yoga classes attended was 4.92 ($SD = .76$). Because this class was offered only one time per week and could not be rescheduled conveniently like therapy sessions, yoga was sometimes missed for an entire week due to illness, academic priorities, car trouble, or class cancellation due to weather. Participants were allowed and encouraged to make up missed yoga classes and were considered “completers” for the intervention if they
Figure 1. Participant flow diagram.

attended at least 4 of 6 yoga classes. Every participant randomized to ACT+Y who completed all 6 therapy sessions also completed at least 4 yoga sessions. Participants considered as completers were compared to non-completers on background and demographic information, as well as pre-intervention variables using $t$-tests and chi-
square tests. No significant differences were found between completers and non-completers on any preliminary variables.

**Adverse Events**

No adverse effects were reported as a result of the interventions. As noted, one participant reported breaking an ankle during a sports practice and chose to drop out of the ACT+Y condition after the first therapy session, although this participant was offered the opportunity to delay the progression of his intervention. Another participant reported a new family stressor that demanded more personal time, which impeded the ability to remain in the study. These were not functions of the interventions and thus not categorized as adverse events. No acute crises or injuries directly related to experimental procedures were reported by study participants.

**Treatment Follow-Up**

The dissertation researcher took a strong role throughout the study to maintain contact with each participant for the purpose of monitoring adverse effects, addressing attrition, and encouraging follow-up. Participants were encouraged to contact the dissertation researcher if they had questions or concerns. The contact that was initiated by participants was in the context of scheduling issues or desire to withdraw from the study. The dissertation researcher also sent reminder emails for initial assessments and first therapy sessions, as well as reminder emails for each yoga session in the ACT+Y group. Therapists sent emails or called participants at their discretion to remind them of subsequent therapy sessions. Emails and/or phone calls were implemented by both the dissertation researcher and assessment research assistants to schedule and remind participants of follow-up assessments. Notably, participants that remained in the study
past session 3 completed all necessary treatment components for analysis, including follow-up assessments.

**Treatment Adherence**

Interobserver agreement was assessed by sampling one quarter of each therapist’s completed sessions for adherence to the protocol. Two independent observers listened to audio recordings of sessions and completed adherence checklists. Cohen’s kappa was run for each set of therapists’ recordings to determine if there was agreement between two observers’ judgements on whether or not therapists adhered to the protocol. Level of agreement was very good, ranging from $k = .88$ to $k = 1.00$, $p < .001$ for each set. Therapists were very adherent to the protocol, with a deviation observed only on one occasion.

Adherence to the yoga protocol was assessed by a research assistant completing protocol checklists after attending one third of the yoga classes attended by study participants. From the eight yoga classes attended by observers, 100% of the protocol was observed to be followed, suggesting the yoga intervention was delivered consistently as planned. Unfortunately, due to blinding, it was not possible for existing research assistants and therapists to attend yoga classes, thus research assistants separate from all other aspects of the study were needed to attend these classes. Due to limited availability, it was not possible for two observers to attend on the same date, thus kappa values could not be calculated.
Demographics and Preliminary Statistics

Twenty-four participants (12 in each condition) fully completed all intervention and assessment components and were included in analyses. First, demographic and history data were analyzed for group differences. Independent *t*-tests revealed no significant differences between groups for age or pre-intervention physical activity level (*p* > .025, to account for the multiple *t*-tests). Pearson chi-square tests for categorical variables indicated no significant differences between groups for reported gender, relationship status, race, class standing, income, type of residence, previous yoga experience, medication status, previous therapy experience, and psychiatric diagnosis (*p* > .05). Mean age for all participants was 20.17 years (*SD* = 1.9). The majority of the sample was female (75%) and Caucasian (79.2%), with the remainder of the sample identifying as African American (8.3%), Middle Eastern (8.3%), and Asian American (4.2%). Previous exposure to yoga was reported in 45.8% of the sample, and 41.7% reported previous psychological treatment for reasons including adjustment, depression, anxiety, and self-esteem. Within the sample, 33.3% reported a previous psychological diagnosis (including anxiety, ADHD, depression, and OCD), and 20.8% reported to be stable on medications at the time of the initial screening assessment. Please see Table 1 for a summary breakdown of demographic and background variables. Table 2 specifically includes pre-intervention physical activity levels. The differences observed between aerobic minutes per week can be accounted for by a track athlete who exercised extensively every day, affecting both mean and standard deviation.
Table 1

**Participant Demographic Characteristics**

<table>
<thead>
<tr>
<th>Demographic Information</th>
<th>Number/Total Number of Participants (N=24)</th>
<th>Mean or Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (mean)</td>
<td>8</td>
<td>20 years (range 18-25)</td>
</tr>
<tr>
<td>Sex (% female)</td>
<td>18</td>
<td>75%</td>
</tr>
<tr>
<td>Relationship (% single)</td>
<td>10</td>
<td>42%</td>
</tr>
<tr>
<td>Race (% Caucasian)</td>
<td>19</td>
<td>79%</td>
</tr>
<tr>
<td>Education (% freshmen)</td>
<td>9</td>
<td>38%</td>
</tr>
<tr>
<td>Income (% ≤ $15,000)</td>
<td>19</td>
<td>79%</td>
</tr>
<tr>
<td>Residence (% dorms)</td>
<td>11</td>
<td>46%</td>
</tr>
<tr>
<td>Previous yoga (% no)</td>
<td>13</td>
<td>54%</td>
</tr>
<tr>
<td>Current medication (% no)</td>
<td>19</td>
<td>79%</td>
</tr>
<tr>
<td>Previous therapy (% no)</td>
<td>14</td>
<td>58%</td>
</tr>
<tr>
<td>Psych diagnosis (% no)</td>
<td>16</td>
<td>67%</td>
</tr>
</tbody>
</table>

Table 2

**t-test Pre-treatment Exercise Variables by Condition**

<table>
<thead>
<tr>
<th></th>
<th><strong>ACT</strong></th>
<th></th>
<th></th>
<th><strong>ACT+Y</strong></th>
<th></th>
<th></th>
<th>t</th>
<th>df</th>
<th>p</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>M</td>
<td>SD</td>
<td>M</td>
<td>SD</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Aerobic sessions per week</td>
<td>3.60</td>
<td>2.21</td>
<td></td>
<td>2.17</td>
<td>1.75</td>
<td>-0.67</td>
<td>22</td>
<td>.51</td>
<td></td>
</tr>
<tr>
<td>Aerobic minutes per week</td>
<td>39.88</td>
<td>102.30</td>
<td></td>
<td>69.10</td>
<td>82.64</td>
<td>-0.75</td>
<td>22</td>
<td>.46</td>
<td></td>
</tr>
<tr>
<td>Strength sessions per week</td>
<td>1.67</td>
<td>2.20</td>
<td></td>
<td>1.17</td>
<td>1.59</td>
<td>0.64</td>
<td>22</td>
<td>.53</td>
<td></td>
</tr>
<tr>
<td>Strength minutes per week</td>
<td>19.17</td>
<td>27.21</td>
<td></td>
<td>19.58</td>
<td>23.98</td>
<td>0.04</td>
<td>22</td>
<td>.97</td>
<td></td>
</tr>
</tbody>
</table>

*Note.* n = 12 for both conditions. ACT = Acceptance and Commitment Therapy condition. ACT+Y = Acceptance and Commitment Therapy + Yoga condition.
Reliability Analyses

Reliability of the outcome measure scales was assessed at the initial assessment for participants included in the study. Internal consistency was compared for results in the current study to previous published psychometrics. The majority of Cronbach’s alpha coefficients for measures in the current study reflected high internal consistency, congruent with previous published research: BDI-II $\alpha = .85$, MAAS $\alpha = .77$, AAQ-II $\alpha = .70$. Some scales on the WHOQOL-BREF had low reliability; however, this is not uncommon for short scales with less than 10 items. Indeed, the WHOQOL-BREF subscales contain 2 to 8 items. Because Cronbach’s alpha is often not suitable for such scales, Briggs and Cheek (1986) recommend reporting mean inter-item correlation for shorter scales with an optional range of .2 to .4. Mean inter-item correlations for WHOQOL-BREF subscales were satisfactory: Overall QOL $r = .35$, Physical Health QOL $r = .25$, Psychological QOL $r = .31$, Social Relationships QOL $r = .27$, and Environment QOL $r = .23$.

Assumption Checking

Prior to examining ANCOVA output, data inspection and assumption testing for outliers, normality, and homogeneity of covariance and variance was assessed. First, pre-intervention scores on all outcome variables were compared between the two groups using ANOVA and revealed no significant differences ($p > .05$). Recall that there are four outcome measures, one of which (WHOQOL-BREF) has five subscales; thus, there are technically eight measures. Also recall that these measures were administered at six different time points, therefore creating 48 variables to inspect for normality, outliers, and homogeneity of variance. Both visual inspection via boxplots and studentized residuals
were utilized to check for outliers in the outcome variables examined by treatment group. Several outliers were found consistent with these methods. Data entry was double checked for errors and outliers were found to be genuine data points. Options were considered for handling these outliers, including case deletion and variable transformation. Deletion of these cases would result in significant reduction of the already small sample size by eliminating several more cases. Type of transformation of variables (e.g., logarithmic, square root) depends upon the presenting distributions. Upon inspection, data distribution across variables was inconsistent and not appropriate for a blanketed transformation function. In addition, Tabachnick and Fidell (2007) caution against transformation of variables when the scales are widely used in research, as is the case for the BDI-II and WHOQOL-BREF, which will make for interpretation of transformed variables challenging. Furthermore, researchers Orr, Sackett, and DuBois (1991) posit that legitimate outliers are likely representative of the population as a whole and therefore can be retained in analyses. Given the small sample size of this study in particular, the presence of these few outliers is not exceptional, and a larger sample size may have helped to round out the sample. Considering this also with the inconsistent data distribution across variables, outliers were decidedly retained in analyses.

Normality of variables was assessed using Shapiro-Wilk’s test of normality, and multiple variables of the 48 used in analyses were found to violate the normality assumption at the \( p < .05 \). In examining graphical depictions of data, it was determined that distribution patterns of non-normally distributed variables were not consistent in the data set, nor were they consistent within the same measure across time points. Therefore, it was again not possible to transform data consistently to account for non-normality. Any
transformation would lead to adjustment in interpretation, which would be difficult with
the small sample size observed in this study. Given that ANCOVA is fairly robust to
violations of normality and normality is not a critical assumption (Cohen, Cohen, West,
& Aiken, 2003), original data was retained without transformation for analyses.

Scatterplots were constructed to check the ANCOVA assumption of a linear
relationship between the dependent variable (repeated measures of the outcome variables)
and the covariate (initial assessment of the outcome variables). These scatterplots
revealed distributions that followed general linear patterns with no curvilinear trends,
confirming the linear relationship assumption had not been violated.

Homogeneity of regression slopes, or the assumption that the relationship
between the covariate and dependent variable is the same for both groups, was assessed
by running an ANOVA and assessing if there was a statistically significant interaction
between treatment group and the covariates (initial assessment measures). Analysis
revealed no significant interactions (each analysis \( p > .05 \)), suggesting the assumption of
homogeneity of regression slopes was not violated. This also supports the earlier
conclusion gained from inspection of scatterplots.

Sphericity, or homogeneity of variance, was assessed through Mauchly’s Test of
Sphericity. This analysis was run alongside each ANCOVA and is addressed and
adjusted for as needed in outcome descriptions below.

**ANCOVA**

Mixed between-within subjects analysis of covariance (ANCOVA) was utilized to
determine statistically significant differences between conditions (ACT or ACT+Y) on
depression, mindfulness, acceptance, and quality of life differences (using the BDI-II,
MAAS, AAQ-II, and WHOQOL-BREF subscale scores, respectively) across time points while controlling for pre-treatment scores and using them as a covariate. The use of separate ANCOVAs rather than MANCOVA was utilized in order to be more sensitive to true group differences given the study’s small sample size. Analyses included within-subjects factor (time) and a between-subjects factor (condition, ACT or ACT+Y). The covariate of initial assessment measures is also considered a between-subject factor.

Table 3 displays means and SDs for each measure at each time point by group. Figure 2 (BDI-II), Figure 3 (MAAS), Figure 4 (AAQ-II), Figure 5 (Overall QOL), Figure 6 (Physical Health QOL), Figure 7 (Psychological QOL), Figure 8 (Social Relationships QOL), and Figure 9 (Environmental QOL) will assist in visual interpretation of the reported statistical results below.
Table 3

*Means and Standard Deviations of Measures across Sessions by Group*

<table>
<thead>
<tr>
<th></th>
<th>BDI-II</th>
<th>MAAS</th>
<th>AAQ-II</th>
<th>Overall QOL</th>
<th>Physical Health QOL</th>
<th>Psychological QOL</th>
<th>Social QOL</th>
<th>Environment QOL</th>
</tr>
</thead>
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<tr>
<td>Pre-Treatment</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<tr>
<td>ACT</td>
<td>30.67 (10.71)</td>
<td>3.11 (.49)</td>
<td>34.25 (5.36)</td>
<td>11.33 (3.23)</td>
<td>12.95 (1.94)</td>
<td>10.44 (2.45)</td>
<td>10.78 (2.69)</td>
<td>13.67 (2.57)</td>
</tr>
<tr>
<td>ACT+Y</td>
<td>30.08 (7.67)</td>
<td>2.98 (.81)</td>
<td>33.75 (8.26)</td>
<td>12.17 (3.13)</td>
<td>13.71 (2.29)</td>
<td>11.17 (2.50)</td>
<td>11.78 (3.76)</td>
<td>14.08 (2.69)</td>
</tr>
<tr>
<td>Session 1</td>
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<td></td>
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<tr>
<td>ACT</td>
<td>28.67 (9.15)</td>
<td>3.09 (0.82)</td>
<td>32.75 (8.37)</td>
<td>11.67 (3.70)</td>
<td>13.10 (2.10)</td>
<td>10.89 (2.73)</td>
<td>12.00 (3.50)</td>
<td>14.13 (2.63)</td>
</tr>
<tr>
<td>ACT+Y</td>
<td>27.25 (7.86)</td>
<td>3.07 (0.93)</td>
<td>32.17 (7.87)</td>
<td>12.67 (2.31)</td>
<td>13.71 (2.71)</td>
<td>11.72 (2.97)</td>
<td>12.56 (3.34)</td>
<td>14.88 (2.59)</td>
</tr>
<tr>
<td>Session 3</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT</td>
<td>22.75 (10.23)</td>
<td>3.39 (0.85)</td>
<td>30.75 (9.30)</td>
<td>12.17 (3.56)</td>
<td>13.10 (2.09)</td>
<td>11.56 (2.75)</td>
<td>11.89 (4.16)</td>
<td>14.38 (2.78)</td>
</tr>
<tr>
<td>ACT+Y</td>
<td>22.42 (9.41)</td>
<td>3.52 (1.00)</td>
<td>27.67 (9.99)</td>
<td>13.83 (3.01)</td>
<td>14.33 (1.91)</td>
<td>12.06 (2.61)</td>
<td>12.78 (2.87)</td>
<td>15.38 (2.29)</td>
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<td>Session 5</td>
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<tr>
<td>ACT</td>
<td>20.75 (9.77)</td>
<td>3.52 (0.89)</td>
<td>29.00 (7.79)</td>
<td>12.67 (2.99)</td>
<td>13.71 (1.86)</td>
<td>11.56 (2.56)</td>
<td>12.00 (3.98)</td>
<td>14.38 (2.78)</td>
</tr>
<tr>
<td>ACT+Y</td>
<td>15.67 (8.19)</td>
<td>3.79 (0.81)</td>
<td>25.67 (7.64)</td>
<td>14.83 (2.48)</td>
<td>15.38 (1.76)</td>
<td>13.06 (2.02)</td>
<td>14.89 (3.00)</td>
<td>15.42 (2.79)</td>
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<tr>
<td>1 Week Post</td>
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<tr>
<td>ACT</td>
<td>14.16 (8.71)</td>
<td>4.11 (0.97)</td>
<td>23.17 (8.70)</td>
<td>14.67 (3.23)</td>
<td>15.05 (2.11)</td>
<td>13.28 (2.40)</td>
<td>13.00 (4.66)</td>
<td>15.25 (2.10)</td>
</tr>
<tr>
<td>ACT+Y</td>
<td>12.25 (6.59)</td>
<td>4.10 (0.73)</td>
<td>20.92 (7.32)</td>
<td>16.17 (2.48)</td>
<td>15.76 (1.91)</td>
<td>14.17 (2.28)</td>
<td>14.56 (4.16)</td>
<td>16.13 (2.54)</td>
</tr>
<tr>
<td>1 Month Post</td>
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<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT</td>
<td>13.00 (8.43)</td>
<td>4.19 (0.99)</td>
<td>22.83 (9.23)</td>
<td>14.67 (2.74)</td>
<td>15.43 (2.12)</td>
<td>13.67 (2.69)</td>
<td>12.89 (4.27)</td>
<td>15.00 (2.88)</td>
</tr>
<tr>
<td>ACT+Y</td>
<td>10.58 (4.36)</td>
<td>4.20 (0.70)</td>
<td>21.33 (7.14)</td>
<td>16.67 (1.78)</td>
<td>15.95 (1.80)</td>
<td>14.39 (1.41)</td>
<td>15.44 (2.24)</td>
<td>16.42 (2.08)</td>
</tr>
</tbody>
</table>

*Note. ACT = Acceptance and Commitment Therapy condition. ACT+Y = Acceptance and Commitment Therapy + Yoga condition. BDI-II = Beck Depression Inventory-II. MAAS = Mindfulness Attention and Awareness Scale. AAQ-II = Acceptance and Action Questionnaire-2. QOL = Quality of Life, subscales from the World Health Organization Quality of Life.*
Figure 2. Repeated measures graph for BDI-II, by group.

Figure 3. Repeated measures graph for MAAS, by group.
Figure 4. Repeated measures graph for AAQ-II, by group.

Figure 5. Repeated measures graph for Overall QOL, by group.
Figure 6. Repeated Measures graph for Physical Health QOL, by group.

Figure 7. Repeated Measures graph for Psychological QOL, by group.
**Figure 8.** Repeated Measures graph for Social Relationships QOL, by group.

**Figure 9.** Repeated Measures graph for Environmental QOL, by group.
Interaction Effects

The interaction effects of condition (ACT or ACT+Y) on dependent variables depression, mindfulness, acceptance, and quality of life subscales over time after controlling for initial assessment (pre-treatment) scores were not significant across all analyses. See Table 4 for a summary of reported statistics of interaction effects. For BDI-II, MAAS, Overall QOL, Physical Health QOL, and Social QOL, the assumption of sphericity was violated. This means variances of the differences between levels of the within-subjects factor time were found to be unequal for these variables, according to Mauchly’s test of sphericity (BDI-II: $\chi^2(9) = 21.77, p = .01$; MAAS: $\chi^2(9) = 19.43, p = .02$; Overall QOL: $\chi^2(9) = 21.64, p = .01$; Physical Health QOL: $\chi^2(9) = 19.79, p = .02$; and Social QOL: $\chi^2(9) = 20.81, p = .01$). Epsilon ($\varepsilon$) was 0.69, 0.67, and 0.64, 0.67, 0.62 for BDI-II, MAAS, Overall QOL, Physical Health QOL, and Social QOL, respectively, as calculated according to Greenhouse and Geisser (1959), and was used to correct the interaction effects to reduce type 1 error rates. Although it was possible to use multivariate Wilks’ Lambda statistics to report interaction effects to avoid issues of sphericity, results of these tests were compared for each ANCOVA and found to be similarly non-significant. Thus, the more conservative Greenhouse-Geisser statistics are reported. Sample effect size was observed through analyses as partial eta squared ($\eta^2$).
Table 4

*Mixed Between-Within Subjects Analysis of Covariance Interaction Effects Summary*

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>P</th>
<th>Partial η²</th>
</tr>
</thead>
<tbody>
<tr>
<td>BDI-II</td>
<td>81.92</td>
<td>2.77</td>
<td>29.59</td>
<td>.69</td>
<td>.55</td>
<td>.03</td>
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<tr>
<td>MAAS</td>
<td>.44</td>
<td>2.68</td>
<td>.166</td>
<td>.48</td>
<td>.67</td>
<td>.02</td>
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<tr>
<td>AAQ-II</td>
<td>31.25</td>
<td>4.00</td>
<td>7.81</td>
<td>.39</td>
<td>.82</td>
<td>.02</td>
</tr>
<tr>
<td>Overall QOL</td>
<td>7.15</td>
<td>2.56</td>
<td>2.79</td>
<td>.53</td>
<td>.63</td>
<td>.03</td>
</tr>
<tr>
<td>Physical Health QOL</td>
<td>5.78</td>
<td>2.69</td>
<td>2.15</td>
<td>.94</td>
<td>.42</td>
<td>.04</td>
</tr>
<tr>
<td>Psych Health QOL</td>
<td>3.72</td>
<td>4.00</td>
<td>.93</td>
<td>.59</td>
<td>.67</td>
<td>.03</td>
</tr>
<tr>
<td>Social QOL</td>
<td>33.22</td>
<td>2.48</td>
<td>13.42</td>
<td>2.38</td>
<td>.09</td>
<td>.20</td>
</tr>
<tr>
<td>Environment QOL</td>
<td>2.03</td>
<td>4.00</td>
<td>.51</td>
<td>.42</td>
<td>.79</td>
<td>.02</td>
</tr>
</tbody>
</table>

Note. Statistics for BDI-II, MAAS, Overall QOL, Physical Health QOL, and Social QOL reported using Greenhouse-Geisser adjustment due to violations of sphericity. Computed using alpha = .05.

**Covariate Effects**

The covariate of initial assessment score was assessed for each outcome measure as a main effect to determine if the outcome measure score varied as a function of the initial assessment score. These analyses revealed significant covariate effects for all outcome measures collapsed across both conditions, such that scores on the BDI-II, MAAS, AAQ-II, and all WHOQOL-BREF subscales across time points were significantly related to their initial assessment score. See Table 5 for a summary of reported statistics for covariate analyses.
Table 5

*Mixed Between-Within Subjects Analysis of Covariance Covariate Effects Summary*

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Sum of Squares</th>
<th>df Between</th>
<th>df Within</th>
<th>F</th>
<th>p</th>
<th>Partial $\eta^2$</th>
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<tbody>
<tr>
<td>BDI-II</td>
<td>2074.47</td>
<td>1</td>
<td>21</td>
<td>17.88</td>
<td>&gt;.001*</td>
<td>.46</td>
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<tr>
<td>MAAS</td>
<td>37.50</td>
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<td>21</td>
<td>32.04</td>
<td>&gt;.001*</td>
<td>.60</td>
</tr>
<tr>
<td>AAQ-II</td>
<td>2359.67</td>
<td>1</td>
<td>21</td>
<td>14.02</td>
<td>&gt;.001*</td>
<td>.40</td>
</tr>
<tr>
<td>Overall QOL</td>
<td>172.84</td>
<td>1</td>
<td>21</td>
<td>8.28</td>
<td>.009*</td>
<td>.28</td>
</tr>
<tr>
<td>Physical Health QOL</td>
<td>147.45</td>
<td>1</td>
<td>21</td>
<td>18.57</td>
<td>&gt;.001*</td>
<td>.47</td>
</tr>
<tr>
<td>Psych Health QOL</td>
<td>310.66</td>
<td>1</td>
<td>21</td>
<td>30.44</td>
<td>&gt;.001*</td>
<td>.59</td>
</tr>
<tr>
<td>Social QOL</td>
<td>512.13</td>
<td>1</td>
<td>21</td>
<td>16.40</td>
<td>.001*</td>
<td>.43</td>
</tr>
<tr>
<td>Environment QOL</td>
<td>320.33</td>
<td>1</td>
<td>21</td>
<td>19.26</td>
<td>&gt;.001*</td>
<td>.48</td>
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</tbody>
</table>

*Note. Computed using alpha = .05.*

*Denotes statistical significance.

**Main Effects**

The between-subjects effects of condition (ACT vs. ACT+Y) on dependent variables depression, mindfulness, acceptance, and quality of life areas over time after controlling for initial assessment (pre-treatment) scores were not significant across all analyses. Please see Table 6 for a summary of reported statistics for main effect of condition.
The within-subjects effect of time on dependent variables depression, mindfulness, acceptance, and quality of life areas across conditions after controlling for initial assessment (pre-treatment) scores was analyzed for the outcome measures. There was a significant main effect of time while controlling for initial assessment score on mindfulness (MAAS; $F(2.68, 67.20) = 7.07, p = .001$, partial $\eta^2 = .25$), overall quality of life (Overall QOL; $F(2.56, 53.75) = 4.99, p = .01$, partial $\eta^2 = .19$), physical health quality of life (Physical Health QOL; $F(2.69, 56.53) = 5.49, p = .003$, partial $\eta^2 = .21$), psychological quality of life (Psych QOL; $F(4.00, 84) = 7.00, p > .001$, partial $\eta^2 = .25$), and social relationships quality of life (Social QOL; $F(2.48, 51.99) = 4.23, p = .01$, partial $\eta^2 = .17$). Non-significant main effects of time were found for depression, acceptance, and environment quality of life. Please see Table 7 for a summary of time main effects.
Similar to the interaction effects of condition*time, Greenhouse-Geisser statistics were compared to Wilks’ Lambda for the main effect of time and found to determine the same statistical conclusions, thus Greenhouse-Geisser statistics were reported for consistency.

Sample effect size was observed through analyses as partial eta squared.

Table 7

**Mixed Between-Within Subjects Analysis of Covariance Time Main Effects Summary**

<table>
<thead>
<tr>
<th>Dependent Variable</th>
<th>Sum of Squares</th>
<th>df</th>
<th>Mean Square</th>
<th>F</th>
<th>P</th>
<th>Partial ( \eta^2 )</th>
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<td>.06</td>
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<tr>
<td>MAAS</td>
<td>6.46</td>
<td>2.68</td>
<td>2.41</td>
<td>7.07</td>
<td>&gt;.01*</td>
<td>.25</td>
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<tr>
<td>AAQ-II</td>
<td>10.66</td>
<td>4.00</td>
<td>2.67</td>
<td>.13</td>
<td>.97</td>
<td>.01</td>
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<tr>
<td>Overall QOL</td>
<td>66.92</td>
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<td>26.15</td>
<td>4.99</td>
<td>.01*</td>
<td>.19</td>
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<td>Physical Health QOL</td>
<td>33.83</td>
<td>2.69</td>
<td>12.57</td>
<td>5.49</td>
<td>&gt;.01*</td>
<td>.21</td>
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<tr>
<td>Psych Health QOL</td>
<td>44.05</td>
<td>4.00</td>
<td>11.01</td>
<td>7.00</td>
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<td>.25</td>
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<tr>
<td>Social QOL</td>
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<td>23.79</td>
<td>4.23</td>
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<td>.17</td>
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<tr>
<td>Environment QOL</td>
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<td>4.00</td>
<td>2.96</td>
<td>2.45</td>
<td>.05</td>
<td>.11</td>
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</table>

*Note.* Statistics for BDI-II, MAAS, Overall QOL, Physical Health QOL, and Social QOL reported using Greenhouse-Geisser adjustment due to violations of sphericity. Computed using alpha = .05. *Denotes statistical significance.

**Additional Analyses**

Considering the lack of significant main effects of time despite trends depicted in graphs, repeated measures ANOVA was run without the pre-treatment covariates to determine if significance could be reached. No change in conclusions resulted for the interaction of condition*time or the main effect of condition, so these results will not be displayed as the results of the ANCOVAs previously reported are sufficient for these
purposes. However, removal of the covariate resulted in significant main effects of time across conditions for all outcome measures, as outlined in Table 8.

Table 8

*Analysis of Variance Time Main Effects Summary*

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<tr>
<th>Dependent Variable</th>
<th>Sum of Squares</th>
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<th>Mean Square</th>
<th>F</th>
<th>P</th>
<th>Partial η²</th>
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<td>1869.12</td>
<td>28.54</td>
<td>&gt;.001*</td>
<td>.57</td>
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<td>20.54</td>
<td>2.41</td>
<td>8.51</td>
<td>20.56</td>
<td>&gt;.001*</td>
<td>.48</td>
</tr>
<tr>
<td>AAQ-II</td>
<td>1988.08</td>
<td>2.77</td>
<td>717.10</td>
<td>24.12</td>
<td>&gt;.001*</td>
<td>.52</td>
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<td>Overall QOL</td>
<td>221.00</td>
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<td>91.33</td>
<td>16.01</td>
<td>&gt;.001*</td>
<td>.42</td>
</tr>
<tr>
<td>Physical Health QOL</td>
<td>96.99</td>
<td>2.60</td>
<td>37.37</td>
<td>14.21</td>
<td>&gt;.001*</td>
<td>.39</td>
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<tr>
<td>Psych Health QOL</td>
<td>136.46</td>
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<td>34.12</td>
<td>19.83</td>
<td>&gt;.001*</td>
<td>.47</td>
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<td>28.31</td>
<td>4.73</td>
<td>.010*</td>
<td>.18</td>
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<tr>
<td>Environment QOL</td>
<td>27.89</td>
<td>4.00</td>
<td>6.97</td>
<td>5.66</td>
<td>&gt;.001*</td>
<td>.21</td>
</tr>
</tbody>
</table>

Note. Greenhouse-Geisser adjustment due to violations of sphericity were necessary for all variables except for Psych Health QOL and Environment QOL and reported accordingly. Statistics computed using alpha = .05. *Denotes statistical significance.

Finally, reliable change criterion analyses were performed as an alternative assessment to determine if the change in scores for each participant from pre-treatment to one-month follow-up were greater than would be expected according to random variation. The formula to calculate the reliable change index includes the change in measurement score divided by the standard error of the difference of the measure (Jacobson & Truax, 1991). This statistic is calculated by including the reliability of the measure, which was reported earlier for each outcome variable. As previously discussed, given the small number of items in each subscale on the WHOQOL-BREF and thus
challenges in determining an appropriate reliability statistic, reliable change was not calculated for these subscale variables. Reliable change criterion analyses were calculated for BDI-II, MAAS, and AAQ-II within both conditions from pre-intervention to 1 month follow-up. The reliable change criterion can be interpreted similarly to a confidence interval set around a change score of zero. When a participant’s change score falls outside of the confidence interval, which is determined by the standard error of change multiplied by 1.96 (critical value for one standard deviation), the score is said to be reliably changed—improved or declined, depending on the direction of change. A summary of results can be found in Table 9.

Table 9

**Reliable Change Criterion Analysis Summary**

<table>
<thead>
<tr>
<th></th>
<th>ACT (n=12)</th>
<th></th>
<th>ACT+Y (n=12)</th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Reliable</td>
<td>Uncertain</td>
<td>Reliable</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Deterioration</td>
<td>Change</td>
<td>Improvement</td>
<td></td>
</tr>
<tr>
<td></td>
<td>n</td>
<td>%</td>
<td>n</td>
<td>%</td>
</tr>
<tr>
<td>BDI-II</td>
<td>0</td>
<td>0</td>
<td>2</td>
<td>8</td>
</tr>
<tr>
<td>MAAS</td>
<td>0</td>
<td>0</td>
<td>5</td>
<td>21</td>
</tr>
<tr>
<td>AAQ-II</td>
<td>0</td>
<td>0</td>
<td>6</td>
<td>25</td>
</tr>
</tbody>
</table>

*Note. N of total sample = 24 and % represents percentage of total sample. Reliable change criterion calculated from pre-treatment initial assessment to one month follow-up. Reliable deterioration represents those whose scores declined beyond the reliable change criterion, uncertain change represents those whose change scores fall within the confidence interval determined by the reliable change criterion, and reliable improvement represents those whose change improved beyond the reliable change criterion.*

**Follow-up Questionnaire Comparisons**

Follow-up questionnaires were administered at approximately one week and one month post-intervention (see Appendices E and F). These questionnaires assessed for
potential interfering variables that may have entered into the treatment period, such as changes to medication status, yoga exposure other than that prescribed in the ACT+Y condition, and changes in exercise habits. Yoga class participation for ACT+Y participants was screened out in interpretation of reported increase of physical activity on the questionnaires, such that those in ACT+Y reporting an increase in physical activity were reporting this increase independent of the study’s yoga classes. The questionnaires also assessed for changes in valued life domains including social relationships and work/academic activities both during the intervention and in the one month follow-up period. If any change took place, participants were asked to report if the change was consistent with their personal values. From these questionnaires, total number of valued changes was calculated for each participant and compared using an independent t-test. There was no significant difference in the overall number of reported valued changes per participant during the intervention for ACT \( (M = .92, SD = .97) \) and ACT+Y \( (M = .83, SD = .83) \); \( t(22) = .222, p = .83 \). Similarly, there was no significant difference in the number of reported valued changes during the one month follow-up period for ACT \( (M = .92, SD = .90) \) and ACT+Y \( (M = 1.3, SD = .98) \), \( t(22) = -1.08, p = .29 \). Chi-square analyses were also completed in order to determine if the proportion of participants reporting valued changes within specific domains was different between the two conditions. One significant result was found at one week follow-up for “altered a social relationship,” \( \chi^2(1, N = 24) = 6.17, p = .01 \), with more participants in ACT compared to ACT+Y reporting a valued change in this category. Table 10 displays a compilation of number of participants reporting valued changes in each category during intervention and follow-up phases, organized by group, with chi-square statistics.
Table 10

*Number of Participants Reporting Valued Changes in Relevant Domains During Intervention and Follow-up Period, with Chi-Square p-values*

<table>
<thead>
<tr>
<th></th>
<th>During Intervention</th>
<th>During Follow-Up</th>
</tr>
</thead>
<tbody>
<tr>
<td>Began medication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>ACT+Y</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>( p )</td>
<td>0.31</td>
<td>1.0</td>
</tr>
<tr>
<td>Changed medication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ACT+Y</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>( p )</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Stopped medication</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>ACT+Y</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>( p )</td>
<td>1.0</td>
<td>1.0</td>
</tr>
<tr>
<td>Began additional yoga</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>ACT+Y</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>( p )</td>
<td>0.31</td>
<td>1.0</td>
</tr>
<tr>
<td>Began additional therapy</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT</td>
<td>1</td>
<td>0</td>
</tr>
<tr>
<td>ACT+Y</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>( p )</td>
<td>1.0</td>
<td>0.31</td>
</tr>
<tr>
<td>Changed exercise habits</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>ACT+Y</td>
<td>5</td>
<td>3</td>
</tr>
<tr>
<td>( p )</td>
<td>0.18</td>
<td>0.42</td>
</tr>
<tr>
<td>Altered a relationship</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT</td>
<td>7</td>
<td>5</td>
</tr>
<tr>
<td>ACT+Y</td>
<td>2</td>
<td>5</td>
</tr>
<tr>
<td>( p )</td>
<td>0.01*</td>
<td>1.0</td>
</tr>
<tr>
<td>Changed work/academics</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ACT</td>
<td>3</td>
<td>5</td>
</tr>
<tr>
<td>ACT+Y</td>
<td>1</td>
<td>4</td>
</tr>
<tr>
<td>( p )</td>
<td>0.27</td>
<td>0.65</td>
</tr>
</tbody>
</table>

*Significant at the .05 level.
Questionnaires allowed for participants to write in details of the reported changes they made during the intervention and follow-up period. Medications added included St. John’s Wort, stomach medicine (unknown name), and amino acids. Participants who began additional therapies specified these to be career counseling and speech therapy during the intervention period, and psychotherapy for depression during the follow-up period. All changes in exercise habits were reported to be increases. Reported relationship changes included ending romantic partnerships or friendships based on values, beginning new relationships, spending more time with parents, bonding with a coach, and talking through conflict with a significant other rather than arguing. Work and academic changes included reducing hours at a job, finding a new job, studying more, and asking for help from instructors.
DISCUSSION

Summary of Hypotheses

The present study was designed to determine if the addition of a yoga component on a brief ACT protocol for depression would significantly improve results on depression, mindfulness, acceptance, and quality of life when compared to the ACT protocol alone. The aim was to determine if the opportunity to practice mindfulness in another context (yoga) improved the effects of ACT in depressed college students. This was addressed through the use of repeated measures while including the effects of pre-treatment scores in the analyses as a covariate, which typically affect the degree of improvement in treatment. The following hypotheses were examined:

1. All participants would improve depression and mindfulness scores over time as a result of either intervention condition, while controlling for pre-treatment scores.

2. Participants in the ACT+Y condition would further improve on depression and mindfulness scores such that statistically significant differences are obtained between groups over time, while controlling for pre-treatment scores. Of specific interest was at which time point(s) throughout the interventions the two conditions would differ.

3. All participants would improve acceptance and quality of life scores over time as a result of either intervention condition, while controlling for pre-treatment scores.
The first hypothesis was partially supported. The main effect of time was found to be significant for mindfulness (MAAS), but not for depression (BDI-II). These results suggest that participants in either condition significantly improved mindfulness skills over time throughout the intervention. Statistically significant improvement was not demonstrated for BDI-II scores, suggesting that participants across both groups did not significantly improve depression when controlling for pre-treatment scores. However, graphical depiction of BDI-II scores shows clear trending decrease in depression across both groups. The decreases appear clinically significant, with mean scores beginning in the severe range (\(M = 30.38\) at pre-treatment across both groups) and reducing to the minimal range (\(M = 11.79\) at one month follow-up across both groups). This clinically significant trend is in line with previous research and RCTs demonstrating the effectiveness of ACT interventions for depression (Forman et al., 2007; Powers et al., 2009; Ruiz, 2012). Potential explanations to account for lack of statistical significance for main effect of time for BDI-II are the small sample size, small effect size (partial \(\eta^2 = .06\)), inclusion of the covariate, which accounted for a large portion of the variance of depression in the sample (partial \(\eta^2 = .46\)), and floor effects due to restricted range from inclusion criteria of BDI-II score of at least moderate depression level, and non-normal distributions. Although the analyses are robust to violations of normality, these other issues may have affected the ability to detect a true main effect, limiting conclusions to discussion of trends. However, in re-running the same analysis without the co-variate, the main effect of time on the depression outcome variable did indeed reach statistical significance, suggesting the covariate of initial assessment score played a significant role in determining degree of improvement over time, collapsed across both interventions.
The second hypothesis was not supported by analyses. There were no significant interactions of condition by time while controlling for pretreatment scores, meaning that improvement of depression and mindfulness scores over time did not depend on condition. These interaction analyses were expanded to all other outcome variables and consistent lack of statistical significance was found for each, suggesting condition did not differentially affect any outcome variables over the course of treatment. Again, small sample size, small effect size, outliers, non-normality, and inclusion of the covariate pre-treatment scores may have affected the ability to detect any differences among condition that may exist. Alternatively, it may simply be the case that condition did not have any bearing on difference in treatment outcome throughout the course of the intervention, and that the ACT treatment components in both conditions, placebo effect of being involved in treatment, and regression towards the mean may account for some of the uniform improvement. Similarly, it may be concluded that the addition of yoga may not add anything to the effectiveness of a brief ACT treatment for depression as it replicates an already existing component of ACT (mindfulness) rather than adding in a unique treatment component.

The third hypothesis was partially supported. Several quality of life subscales demonstrated statistically significant improvement over time across both conditions while controlling for pre-treatment scores, including overall quality of life (Overall QOL), physical health quality of life (Physical Health QOL), psychological quality of life (Psychological QOL), and social relationships quality of life (Social QOL). These statistical benefits were not observed for acceptance (AAQ-II) or environmental quality of life (Environment QOL). However, similar to BDI-II scores, graphical depictions of
these measures, especially AAQ-II, show improvement over time, which may be clinically significant. Similar to BDI-II, when ANOVA was run without the pre-treatment score covariates for all other measures, each measure was found to have a statistically significant main effect of time, suggesting pre-treatment scores largely accounted for change in these measures over time.

**Analysis Considerations**

As discussed, repeated measures ANOVA was run without the pre-treatment covariate to explore group differences independent of pre-treatment covariate. Significant main effects of time were found for all outcome measures with ANOVA. According to the repeated measures ANOVA, participants significantly improved over time on depression, mindfulness, acceptance, and quality of life domains (overall quality of life, physical health, psychological, social relationships, and environmental) when collapsed across both conditions. However, as outlined, the original data analysis plan incorporated the initial assessment scores within these domains as covariates. Considering the data from ANCOVA and ANOVA, it is reasonable to conclude that the inclusion of the pre-treatment scores as covariates reduced the ability of ANCOVA to detect main effects of time, due to the significant variance accounted for by the pre-treatment assessment scores. Eliminating the covariate with repeated measures ANOVA did not have any bearing on the statistical significance of the interaction of condition*time or main effect of condition for any outcome variables, despite slightly improving some of the p-values. Therefore, the discussions above of these effects along with their graphical displays previously discussed remain relevant. Pre-intervention covariates were included in the original analyses because they control for where participants were measuring on an
outcome variable at the start of the study, which has bearing on the degree to which they may improve during the intervention. The covariate thus gives a better picture of whether changes in scores are due to the intervention or due to the incoming levels of these outcome variables, but, as found in the present study, can also make for less statistically significant results.

Trends

Graphical depictions show trends in which all outcome measures appear to improve over time for both groups. Environment QOL improved in generally the same pattern and at the same degree for both groups, which supports the lack of main effect for condition and interaction effects of condition*time. Generally, this points to the idea that the addition of yoga does not add to the effectiveness of ACT for this domain. Graphical depictions for other measures generally show ACT+Y improving slightly better over time in the domains of depression, mindfulness, acceptance, overall quality of life, physical health quality of life, psychological quality of life, and social quality of life. However, these did not reach statistical significance and the trends are slight. Further study with a larger sample size may help to determine if these trends would strengthen into true effects.

In addition, one particular variable showed trending toward significance of an interaction of condition*time, which can be seen on the graph for Social QOL, or the quality of social relationships reported in one’s life. Considering the small sample size, it could be posited that the test statistic was also trending towards significance, Social QOL; $F(2.48, 51.99) = 2.38, p = .09$, partial $\eta^2 = .20$. From an inspection of the means in Table 2 and trends in Figure 8, participants started with similar ratings of Social QOL and
diverged clearly at the session 5 assessment with participants in the ACT+Y condition reporting a higher Social QOL than the ACT condition. The ACT condition appears to only very slightly improve over time on this measure (from $M = 12$ to $M = 12.89$), whereas the ACT+Y condition improves by a few points (from $M = 12.56$ to $M = 15.44$). This is actually somewhat in contrast to follow-up questionnaire data, where a significant difference was found in valued changes in social relationships reported between conditions, with 7 ACT participants reporting changes compared to 2 ACT+Y participants (see Table 8). Taken together, the interaction trend and results from the follow-up questionnaire suggest that Social QOL may have been a clinically significant outcome for both groups in some capacity within the present study.

These conflicting data warrant further exploration and theory. It could be that Social QOL simply improved in the ACT+Y group without stark changes in relationships (e.g., began or ended relationships) to be reported on the follow-up questionnaire, and this is simply a chance effect. ACT researchers do posit that ACT interventions help to pursue valued action rather than action based on feelings, and this can lead to improved social relationships (Dahl, Stewart, Martell, & Kaplan, 2014). However, it remains unclear how the addition of yoga in the ACT+Y group may have led to the trending improvement in Social QOL at the session 5 assessment for Social QOL.

The only study-designed difference between the two groups at the session 5 assessment point where divergence in Social QOL scores is seen is attendance of yoga classes for ACT+Y. Thus, a possibility for these trends is the group aspect of the yoga treatment component. While therapy ACT intervention as administered one-on-one with a therapist, yoga occurred in a group setting. This scheduled time in a group setting may
have affected Social QOL for ACT+Y participants. Following from this hypothesis, a simple search with the terms “yoga” and “social” was run in PsycInfo to reveal previous research in this realm. Limited relevant results were returned, but the few of interest indicated that yoga promotes social well-being and generally has a positive effect on social relationships, as reported through case study anecdotal evidence (Trigg, 2014) and survey data of long-time yoga practitioners (Ross, Friedmann, Bevans, & Thomas, 2013) through recent psychology dissertations. Another study from 1987 found that a yoga intervention for geriatric individuals in a community mental health center led to significant improvements in areas of well-being, including number social interactions (Allen & Steinkohl, 1987). Of probably greatest relevance returned from this literature search was a study by Rakhshani, Maharana, Raghuram, Nagendra, and Venkatram (2010). These researchers utilized the WHOQOL-100 (the full version of the WHOQOL-BREF, which was utilized in the present study) to measure quality of life domains and implemented a yoga intervention compared to a general stretching intervention for pregnant women. The researchers found significant improvement in the yoga group compared to the control group in the areas of Physical Health QOL, Psychological QOL, Environmental QOL, and Social QOL. An additional instrument, the Fundamental Interpersonal Relationships Orientation (FIRO-B; Schutz, 1958) demonstrated better results in the yoga group in the areas of expressed inclusion and wanted control (Rakhshani et al., 2010). Hence, there is existing research, albeit limited, to support the effects of yoga on social well-being.
Limitations

Sample size was a significant limitation to the current study and may have also contributed to additional limitations, including outliers and non-normal data. The inability to detect statistical significant from these tests was overwhelming and may be attributed back to the small sample size and small effect sizes. In fact, partial eta squared for each outcome variable for main effect of time was observed to be very small to small-medium, with the smaller effect sizes failing to reach significance. It is possible that with a larger sample size and thus larger effect sizes, statistically significant changes in all outcome measures over time would be observed.

Another explanation for lack of statistical significance despite some clear changes over time in both groups according to graphs include the effects of the pre-treatment score covariates and their strong influence on the models. Main effects of pre-treatment score covariates were significant for each outcome measure analysis, indicating that pre-treatment scores strongly influenced outcome variable scores over time across conditions. Partial eta squared indicated medium to large effect sizes for these analyses, suggesting that pre-treatment scores accounted for large percentages of the variance in each of the outcome measures. By using pre-treatment scores as a covariate, this large degree of variance is entered into the analysis and, while correctly increasing the specificity and accuracy of other tests in the analysis, reduces the other effects. In re-running the analyses as ANOVA without covariates, all main effects for time were found significant which was an improvement from ANCOVA, illustrating the strong variance component in the model for each covariate. Again, a larger sample size may help to determine if the
covariate of pre-treatment scores holds the same influence in a fuller study with more power.

Another limitation included the restricted range from BDI-II scores, which led to a floor effect in data gathering. Many interested individuals were excluded from the study as they did not meet criteria for moderate depression at the initial assessment (BDI-II score of 20 or larger). This was decidedly an exclusion criteria in order to see a sufficient amount of improvement in scores as a result of the interventions. However, this led to a bunching of scores near the inclusion cutoff score of 20 for the BDI-II. A reduction in variance of scores as a result of this reduces the sensitivity of the statistical analyses utilized in this study to detect significant effects. Correction formulas are available and recommended for correlational analyses (e.g., Wiberg & Sundström, 2009) but not found for ANCOVA.

Additionally, the fact that participants’ weekly therapy schedules were not consistent is a limitation. Some participants had a regular therapy time and consistently attended, and others were inconsistent in their attendance which led to rescheduling at various times. This sometimes led to two weeks or more in between therapy sessions, which disrupted the integrity of the treatment. This course of irregularity, while not ideal for experimental control, does more closely mimic a real-world setting; however, it may partially contribute to the challenges in drawing treatment effects regarding the integrity of implementing the ACT treatment component.

Finally, the degree of yoga exposure in the study may not have been enough to see a clear treatment effect. Although participants in ACT+Y were still included in the analyses if they attended at least 4 of the 6 yoga classes (and, in fact, all participants that
did not drop out of the study prematurely did attend at least 4 classes), this may not have been sufficient to significantly improve outcomes over the ACT group. Even those who attended the full 6 classes may have received greater benefit and outcomes with further yoga (and thus mindfulness) practice. While this research was designed to be more of an effectiveness study rather than efficacy, perhaps with a larger sample size we could better determine if a once weekly, regularly attended meditation mindfulness yoga class is of benefit to depressed college students.

**Implications and Future Directions**

Even with the limitations in the present study and the lack of evidence for yoga adding to the value of ACT, the results and trends observed could be considered to be a testament to the clinical effectiveness of an ACT intervention for depression. However, the limitations in this study do not help to address the issues in ACT RCTs outlined by Öst (2014), namely a need for stringent methodology and active control groups for comparison to ACT. Further studies with greater experimental control are needed to supplement the existing literature on ACT as a treatment for depression. Specifically in relation to the present study, a replication with a larger sample size may help to better address sample data issues (e.g., outliers, non-normality, etc.) and incorporating more stringent scheduling of therapy and yoga sessions may help to increase experimental control. Alternatively, the current research may simply suggest that yoga does not add to the effectiveness of ACT for depression. As the current study involved a strong mindfulness component within the ACT intervention, the yoga intervention may simply have replicated this component of ACT in a redundant manner rather than enhancing the treatment package. Future ACT research may be better served to focus on factors that
differentiate ACT treatment responders from failures. Along these same research lines, it would be beneficial to examine which treatment components, if any, can be added to ACT to improve the ratio of responders to ACT and to magnify the amount and strength of that response to treatment.

Another consideration for further study and replication of the current study involving a larger N relates to the slight trends observed in measures (besides environmental quality of life) showing outcomes in ACT+Y slightly better over time than ACT. If these effects were clearer in a larger sample size, it would be important to determine a mechanism of action accounting for the difference. It may be posited that the addition of yoga, which resulted in an extra hour per week of treatment for the ACT+Y group, served to further improve outcome measures due to a dose-response relationship of therapeutic activities.

Given the theories of ACT interventions to promote valued behavior in relationships and therefore improve relationships (Dahl et al., 2014), further research on the effects of ACT and social relationships is warranted to support this theory. Considering also the studies outlined describing positive effects of yoga on social relationships (Allen & Steinkohl, 1987; Rakhshani et al., 2010; Ross et al., 2013; Trigg, 2014), along with the trends in Social QOL from the present research, the area of yoga and social well-being appears to be an under-researched realm that may reveal positive, clinically and statistically significant treatment effects. However, future research must be careful to avoid common methodological issues cited in the current meta-analyses for both yoga (Cramer et al., 2013) and ACT (Öst, 2014). Considering the social effects observed in the present study, it may also be of value to consider replicating the study
with a modification of the ACT intervention in a group setting rather than individually as
the present study did, in order to observe the differential effects on social well-being.
With this replication, it might also be considered to add in a component to the ACT
control group (e.g., educational component) for the same time-length as the yoga class.
This would account for the extra hour of treatment incorporated in the ACT+Y group in
order to more fairly compare the conditions and avoid conclusions based on treatment
dosage effects.

In considering implications for the current study, it is also important to look to
recent related research and background research not identified at the outset of the project.
A related intervention to yoga that has been studied for depression is the implementation
of vigorous physical activity. Several studies have shown evidence of aerobic exercise
leading improvements in mental health for clinical and psychiatric populations (e.g.,
Babyak et al., 2000; Dunn, Trivedi, Kampert, Clark, & Chambliss, 2005; Trivedi et al.,
2011). From the background literature in the present study, it is also clear that mediation
and mindfulness interventions have been utilized to address depression with favorable
results (as with MBSR, Kabat-Zinn, 1982; and MBCT, Segal et al., 2002). Researchers
Alderman, Olson, Brush, and Shors (2016) used a new technique called mental and
physical (MAP) training to combine both meditation and physical exercise and observed
the effects on depression in a sample diagnosed with major depressive disorder (MDD).
_sessions were twice a week and included 30 minutes of meditation followed by 30
minutes of aerobic exercise. Results revealed this group improved significantly on
depressive symptoms and reported less ruminative thoughts compared to an active
control involving a cognitive task, suggesting that the combination of these techniques
may be a favorable intervention for depression. While yoga in the present study was not considered rigorous physical activity and was designed to be more meditative, the study by Alderman and colleagues warrants further research to determine if other forms of yoga that are more physically demanding (e.g., vinyasa yoga, hot yoga, power yoga) while still including the mindfulness meditation component that is generally included in all forms of yoga may help to improve depression. Perhaps the co-occurrence of mindfulness and vigorous physical activity together could produce similar effective results on depressive symptoms.
REFERENCES


Skinnerian account of human language and cognition (pp. 3-20). New York: Kluwer Academic.


Appendix A

Demographic and Background Questionnaire
Demographic and Background Questionnaire

1. What is your age? _____ years

2. Gender
   01 Male
   02 Female
   03 Transgender

3. What is your relationship status?
   01 Single and not in a dating relationship
   02 Single and currently dating/in a relationship
   03 Engaged
   04 Living with a romantic or sexual partner
   05 Married
   06 Separated/Divorced
   07 Widowed

4. What best describes your race/ethnicity?
   01 Asian/Pacific Islander
   02 African American
   03 Hispanic/Latino
   04 Native American/Alaska Native
   05 Caucasian
   06 Multiracial
   07 Other: ____________

5. What is your class standing upon entering this semester?
   01 Freshman
   02 Sophomore
   03 Junior
   04 Senior
   05 Graduate Student/Graduate Special
   06 Non-degree seeking student

6. What is your current yearly income?
   01 $15,000 or less
   02 $15,001 – $25,000
   03 $25,001 – $35,000
   04 $35,001 – $50,000
   05 over $50,000

7. Where do you currently reside?
   01 House
   02 Apartment
   03 Duplex
   04 Residence Hall (dormitory)
   05 Fraternity or Sorority House
   06 Other: __________________
8. Have you ever practiced yoga?
   01 yes
   02 no

9. Do you currently practice yoga?
   01 yes
   02 no
   IF YES, how many times per month, on average?
   _______________________________________

10. Do you have any limitations (e.g., health condition, broken bone) that would prevent you from practicing yoga?
    01 yes
    02 no

11. Are you currently taking medications?
    01 yes
    02 no
    IF YES, please list below. IF NO, please skip to question #13.
    _______________________________________________________
    _______________________________________________________
    _______________________________________________________
    _______________________________________________________
    _______________________________________________________
    _______________________________________________________

12. Have any of these medications been newly added or changed in dosage/administration within the last three months?
    01 yes
    02 no
    IF YES, please explain below:
    _______________________________________________________
    _______________________________________________________
    _______________________________________________________

13. On average, how many times per week do you engage in aerobic activity (walking, running, elliptical, biking, rowing, swimming, boxing, etc.)? _____
    How many minutes is each session, on average? _____
    (ignore if you do not engage in aerobic activity)

14. On average, how many times per week do you engage in strength or resistance-training activity (weight-lifting, plyometrics, circuit training, Pilates, etc.)? _____
    How many minutes is each session on average? _____
    (ignore if you do not engage in strength or resistance-training activity)
15. Are you currently receiving therapy or counseling for emotional or psychological difficulties?
   01 yes
   02 no

16. Have you previously received therapy or counseling for emotional or psychological difficulties?
   01 yes
   02 no
   IF YES, please indicate the primary problem(s):
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________

17. To your knowledge, have you ever been diagnosed with a psychological disorder, such as a mood disorder, anxiety disorder, or personality disorder?
   01 yes
   02 no
   IF YES, which disorder(s)?
   ___________________________________________________________________
   ___________________________________________________________________
   ___________________________________________________________________
   IF YES, please indicate who diagnosed you (primary care doctor, therapist, psychologist, friend, self, etc.)
   ___________________________________________________________________
Appendix B

Physical Activity Log
Physical Activity Log

Please list your planned physical activity for the week, or activity that you specifically set aside for exercise. This doesn’t include activity that is naturally built into your day like walking to and from your car. An example is below.

Day: **Monday**

Activity: **walking**

Duration: **35 minutes**

Perceived intensity:  

Day: ____________________

Activity: _______________________

Duration: _______________________

Perceived intensity: ___mild ___moderate ___intense

Week: ________________________ (mm/dd/yy - mm/dd/yy)

Day: ____________________

Activity: _______________________

Duration: _______________________

Perceived intensity: ___mild ___moderate ___intense

Day: ____________________

Activity: _______________________

Duration: _______________________

Perceived intensity: ___mild ___moderate ___intense

Day: ____________________

Activity: _______________________

Duration: _______________________

Perceived intensity: ___mild ___moderate ___intense

Day: ____________________
<table>
<thead>
<tr>
<th>Day</th>
<th>Activity</th>
<th>Duration</th>
<th>Perceived intensity</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>______________________</td>
<td>______________________</td>
<td>__mild      __moderate      __intense</td>
</tr>
<tr>
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<td>______________________</td>
<td>__mild      __moderate      __intense</td>
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<td>__mild      __moderate      __intense</td>
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<td></td>
<td>______________________</td>
<td>______________________</td>
<td>__mild      __moderate      __intense</td>
</tr>
</tbody>
</table>
Appendix C

Yoga Class Outlines
**YOGA MEDITATION**

AROMOTHERAPY / CENTERING / MEDITATION/ MANTRA or concentration on a purpose of relaxation

PRANAYAMA – Breath work, mindful connection of breath and mind

WARM-UP

SLOW FLOW PRACTICE – ASANA (POSES) – STRENGTH – BALANCE –

MOVING MEDITATION

FLOOR WORK – VARIOUS ASANAS (POSES) – STRENGTH – FLEXIBILITY

GUIDED MEDITATION / YOGA NIDRA

SAVASANA / FINAL RELAXATION

**VINYASA FLOW YOGA**

(MOVEMENT LINKED WITH BREATH)

CENTERING / MANTRA / PRANAYAMA

WARM-UP

SUN SALUTATIONS

STANDING ASANAS (POSES) – STRENGTH / FLEXIBILITY

STANDING BALANCE

FLOOR ASANAS (POSES) – STRENGTH / FLEXIBILITY

SAVASANA – FINAL RELAXATION / MEDITATION
Appendix D

Human Subjects Institutional Review Board Approval Letter
Date: January 7, 2015

To: Wayne Fuqua, Principal Investigator
    Jeralee Briggs, Student Investigator for dissertation
    Student Investigators: Alissa Conway, Jamie Hirsh
    Julie Huston, David Lawrence

From: Amy Naugle, Ph.D., Chair

Re: HSIRB Project Number 14-12-04

This letter will serve as confirmation that your research project titled “Yoga as an Ancillary Treatment to Acceptance and Commitment Therapy for Depression” has been approved under the full category of review by the Human Subjects Institutional Review Board. The conditions and duration of this approval are specified in the Policies of Western Michigan University. You may now begin to implement the research as described in the application.

Please note: This research may only be conducted exactly in the form it was approved. You must seek specific board approval for any changes in this project (e.g., you must request a post approval change to enroll subjects beyond the number stated in your application under “Number of subjects you want to complete the study”). Failure to obtain approval for changes will result in a protocol deviation. In addition, if there are any unanticipated adverse reactions or unanticipated events associated with the conduct of this research, you should immediately suspend the project and contact the Chair of the HSIRB for consultation.

Reapproval of the project is required if it extends beyond the termination date stated below.

The Board wishes you success in the pursuit of your research goals.

Approval Termination: December 16, 2015
Appendix E

One Week Follow-Up Questionnaire
One Week Follow-Up Questionnaire for Yoga as an Ancillary Treatment to Acceptance and Commitment Therapy for Depression

Please complete the following questions. Your responses are confidential.

During the time you were an active participant in the study, from your first therapy session or yoga class to your last, please check if the following occurred:

1. Began new medication(s) __Yes__ __No__
   If so, please list medication(s) and purpose ____________________________
   Please indicate when you began ____________________________

2. Changed current medication(s) dose or administration method __Yes__ __No__
   (e.g., began taking a medication in the morning instead of evening, or increased or decreased dose of medication)
   If so, please describe _____________________________________________
   Please indicate when this change took place __________________________

3. Stopped taking a medication __Yes__ __No__
   If so, please indicate name of medication _____________________________
   Please indicate when you stopped ____________________________

4. Began attending yoga classes other the yoga class included in this study __Yes__ __No__
   If so, please indicate how often ____________________________
   Please indicate when you began ____________________________
   Also, please identify where these classes took place ______________________

5. Began attending therapy or counseling outside of this study __Yes__ __No__
   If so, please describe for which difficulties __________________________
   Please indicate when you began ____________________________
   Also, please identify location or agency ____________________________

6. Changed my exercise habits (excluding yoga classes for the study) __Yes__ __No__
   If so, please describe _____________________________________________

7. Altered a major social relationship in your life __Yes__ __No__
   (e.g., began, ended, or changed the status of a relationship with a friend, family member, or romantic partner)
   If so, please describe _____________________________________________
   ____________________________________________

8. Experienced a major change in your work or academic activities __Yes__ __No__
   If so, please describe ____________________________________________
   ____________________________________________

**If you answered yes to any of the above, please list which change(s) were consistent with your personal values. You can simply list the question number(s):______________________________________________

Any questions, please contact Jeralee Briggs, graduate student investigator for dissertation at jeralee.m.briggs@wmich.edu
Appendix F

One Month Follow-Up Questionnaire
One Month Follow-Up Questionnaire for Yoga as an Ancillary Treatment to Acceptance and Commitment Therapy for Depression

Please complete the following questions. Your responses are confidential.

During the 1-month follow-up period, from your very last therapy session or yoga class to today, please indicate whether or not the following occurred:

1. Began new medication(s)  
   Yes  No
   If so, please list medication(s) and purpose
   Please indicate when you began

2. Changed current medication(s) dose or administration method  
   Yes  No
   (e.g., began taking a medication in the morning instead of evening, or increased or decreased dose of medication)
   If so, please describe
   Please indicate when this change took place

3. Stopped taking medication(s)  
   Yes  No
   If so, please list medication(s)
   Please indicate when you stopped

4. Attended yoga classes  
   Yes  No
   If so, please indicate how often
   Please indicate when you began
   Also, please identify where these classes took place

5. Attended therapy or counseling  
   Yes  No
   If so, please describe for which difficulties
   Please indicate when you began
   Also, please identify location or agency

6. Changed my exercise habits  
   Yes  No
   If so, please describe

7. Altered a major social relationship in your life  
   Yes  No
   (e.g., began, ended, or changed the status of a relationship with a friend, family member, or romantic partner)
   If so, please describe

8. Experienced a major change in your work or academic activities  
   Yes  No
   If so, please describe

**If you answered yes to any of the above, please list which change(s) were consistent with your personal values. You can simply list the question number(s):**

Any questions, please contact Jeralee Briggs, graduate student investigator for dissertation at jeralee.m.briggs@wnich.edu