IMPACT OF YOGA ON MENTAL WELL-BEING

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The present study sought to more rigourously explore outcomes of psychological well-being immediately following a psychotherapeutic yoga class. Specifically, the study hypothesized improvements in state anxiety and subjective well-being as well as an observable relationship between state and trait mindfulness following a yoga intervention, all while controlling for differences between yoga instructors, prior yoga experience, and participant endorsements of psychological symptoms. Previous yoga experience was not found to be a significant factor in any of the tested hypotheses. Findings revealed that psychotherapeutic yoga decreased anxiety and increased subjective well-being, even after controlling for therapist variability, prior yoga experience, and client diagnosis. Results also indicate differential impacts on decreased anxiety and increased subjective well-being by class instructor. This is the first study to examine outcomes of an ongoing yoga based-practices in the naturalistic setting of an outpatient counseling center while rigorously controlling for confounding factors (e.g. therapist variability). Methodological and statistical limitations are discussed in depth, and future directions to improve on this study and clarify the present findings are emphasized.

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CHAPTER I

OVERVIEW

A developing array of complementary and alternative medicine (CAM) interventions are gaining increasing support as supplements or amplifications to psychotherapeutic care (Duros & Crowley, 2014; Zitnay, 2006). One such group of interventions, yoga-based practices (YBPs) has been shown to promote improved psychological well-being (Jerath, Eddry, Bames, & Jerath, 2006; Simpkins & Simpkins, 2011). Although various yoga practices have existed for centuries as a self-proclaimed science-based system of healing (Khalsa, 2007; Saraswati, 2011), YBPs have only recently been increasingly integrated into Western models of healing and well-being.

Research on effectiveness of YBPs has evidenced positive changes in experiences of anxiety (Michalsen, et al., 2005; Valoriani, et al., 2014) and depression (Kinser, Bourguignon, Whaley, Hauenstein, & Taylor, 2013; Kirsten, 2001; Shapiro, Cook, Davydov, Ottaviani, Leuchter, & Abrams, 2007). Clinical practices are also increasingly incorporating elements of mindfulness in their philosophies and treatments (Hayes, Strosahl, & Wilson, 1999; Linehan, 1993; Kabat-Zinn, 1990; Brach, 2003; Fulton, 2005), reporting that mindfulness builds with practice and leads to positive mental health outcomes (Kiken, Garland, Bluth, Palsson, & Gaylord, 2015). Mindfulness is also another key element in hatha yoga that is embedded throughout any practice via the different elements, such as withdrawal of the senses in pratyahara, or in dhyana (meditation).

While empirical studies of the effectiveness of YBPs in addressing psychosocial distress have increased and demonstrated varying results (Jeter, Slutsky, Singh, & Khalsa, 2015; Büssing, Michalsen, Khalsa, Telles, & Sherman, 2012), no research to this point has examined outcomes of an ongoing YBP designed specifically to address symptoms of psychological

distress at an outpatient counseling center with consideration of potential confounding factors impacting outcomes. Therefore, the current cross-sectional pilot outcome study aimed to explore outcomes of psychological well-being immediately following a psychotherapeutic yoga class. Specifically, the study examined potential changes in anxiety, mindfulness, and subjective well-being, with attention to potential differences by participant experience, diagnoses, and class instructor.

CHAPTER II

REVIEW OF THE LITERATURE

Complementary and Alternative Interventions

Individual, couples, and group psychotherapies are growing in accessibility and variety with increasing empirical support within the United States. Psychotherapy and behavioral health are increasingly becoming integrated into primary care (Cramer, Haller, Lauche, Stechhan, Michalsen, & Dobos, 2014) and community settings (Durlak, Weissberg, Dymnicki, Taylor, & Schnellinger, 2011; Patel, Newstead, & Ferrer, 2012) Despite this growth, however, psychotherapy is still widely stigmatized and continues to remain inaccessible to many groups due to cost, lack of availability, stigma, or a combination of these (Larson & Corrigan, 2010). Additionally, a cross-cultural lens of psychology and psychotherapy indicates one size does not fit all, with regards to interventions for or even conceptualizations of mental health concerns (Kohrt, & Hruschka, 2010; Wessells, 2009). Complementary and alternative medicines (CAM), which are often based in Eastern healing practices and serve as a supplement and complement to Western medical interventions, are gaining empirical support in addressing the need for diverse and accessible treatment options (Duros & Crowley, 2014; Zitnay, 2006). Emergent research on CAM interventions shows promising implications that some CAM approaches may be as or more cost-effective compared to conventional medical interventions (Herman, Craig, & Caspi, 2005). One such category of interventions, yoga therapy, or yoga-based practices (YBPs), is rising in popularity and utility in addressing psychological distress, due to its focus on holistic health promotion and strong traditions of viewing humans as more than the experiences of our physical bodies. As well, yoga may be significantly more affordable for many people than

psychotherapy, and is something that individuals can practice on their own at home, or within a trusted community.

Introduction to Yoga

Yoga has been a practice and science for hundreds of years, spanning different cultures, religions and approaches. While the physical practices of yoga originated as a systemic method to prepare the body and mind for meditative exercises, a growing number of modern schools of practice have developed with goals varying from physical fitness to body purification and mood regulation (Saraswati, 2011).

Though there is evidence that many cultures have historically engaged in some form of physical and meditative practices (Saraswati, 2011), hatha yoga began to emerge as a practice around the 6th century, A.D. in India and the surrounding areas (Saraswati, 2011). Many different schools and practices of yoga have since evolved, with the majority of yoga practiced in the West based on hatha yoga. Within this loosely formed orientation, emphasis is placed on physical exercises, postures and movements, coordinated with breath work and mindfulness practices for the ultimate purpose of growing beyond the physical body. Outside of this ultimate and, across yoga practices nearly universal, goal of physical liberation, the aim of hatha yoga is balance. The integrated exercises that incorporate physical postures, breath practices, and meditation seek to balance and regulate the various bodily, mental, and energetic systems at play in the human experience.

As long as systemic methods have existed for yoga, practitioners have utilized them not only to attain enlightenment, but as a "science of health" (Khalsa, 2007; Saraswati, 2011). According to hatha yoga tradition, physical ailments are symptoms of more pervasive states of

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disharmony in the whole body system. The activities of hatha yoga aim to reinstate a harmonic balance throughout this system. Psychological change is philosophically and practically built in to hatha yoga (Saraswati, 2011). These changes, however, were originally seen as more of side effects on the spiritual journey, and yoga has only been introduced as a therapeutic intervention within the past century (Khalsa, 2007). Aside from being often seen as a therapy in its own right (Khalsa, 2007; Saraswati, 2011; Woodyard, 2011), elements of yoga practices are increasingly being used in therapeutic contexts to address experiences of anxiety, depression, and Posttraumatic Stress Disorder (PTSD; Brown, and Gerbarg, 2005; Khalsa, 2007). Framed as a holistic practice and intervention, the physical asanas (or, movement sequences) are proposed to aid in strength, balance, and flexibility, while breathing and meditative practices contribute to decreasing psychological distress and regulation of subtle bodily processes (e.g., blood pressure, heart rate, metabolism, etc.; Jerath, Eddry, Bames, & Jerath, 2006; Park & Han, 2017), which also contribute to psychological arousal states (Simpkins & Simpkins, 2011). The combination of mindfulness and physical challenges are often framed in yoga classes as simultaneously cultivating an ability to sit with and work through discomfort, aiding in psychological and physical flexibility.

As yoga-based practices (YBPs) for therapeutic work have increased in number and variety in recent years (e.g. Sciarrino, DeLucia, O'Brien, & McAdams, 2017; Staples, Hamilton, & Uddo, 2013), so has the research and theory on effectiveness of such programming and treatment; with one review noting research has tripled in the last 10 years alone (Jeter, Slutsky, Singh, & Khalsa, 2015). In this same review of 428 studies published between 1967 and 2013, Jeter, Slutsky, Singh, and Khalsa (2015) found a growing number of YBP research articles are based on randomized controlled trials and published in mainstream journals. This indicates, then,

that yoga research is becoming not only more prevalent, but more methodologically rigorous and visible in mainstream medical communities.

The majority of yoga research has taken place and been published within India, and results of these studies are not always readily accessible from the United States or other countries. Researchers seeking to investigate effects of YBPs often encounter limitations related to financial resources, availability of space, sufficient time for an intervention, and other necessary resources (Jeter, Slutsky, Singh, & Khalsa, 2015). The current body of literature reflects the vast array of yoga approaches and uses, thus generating issues with standardization in interventions and interpretations. Due to the lack of homogeneity across yoga studies, researchers have encountered difficulty succinctly summarizing research and utilizing meta analytic methods to empirically study effects (Büssing, Michalsen, Khalsa, Telles, & Sherman, 2012). This body of research has, however, yielded useful information indicating yoga-based practices could reasonably be used as effective complementary interventions for psychological distress.

Research on the psychological effects of YBPs is heavily based on an understanding of the possible physiological changes and the effect of those changes on psychological well-being. One model proposed by McCloskey, Hewitt, Henzel, & Eusebio (2009) indicates yoga and meditation are capable of fostering executive control by simultaneously activating and downregulating certain neurological and limbic processes. Through ethical principles and meditation experiences, practitioners learn to experience "not doing" (Simpkins & Simpkins, 2011), which is neurologically reflected as downregulation of stress-response processes. At the same time, yoga practitioners at any given moment in an asana, pranayama, or meditation may engage in focused attention on a physical or imagined object, word, or experience. This "doing"

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(Simpkins & Simpkins, 2011) is postulated to engage higher order executive functioning and regulation. The simultaneous, or rapidly shifting "not-doing" and "doing" within one practice may then foster development of greater executive control, to be used in other contexts (Simpkins & Simpkins, 2011).

A more recent, though very similar model additionally contributes to an understanding of how yoga may impact cognitive and emotional functioning and expression. Gard, Noggle, Park, Vago, and Wilson (2014) proposed a model of YBP effectiveness from a framework of self-regulation. In this model the authors propose YBPs, when incorporating breathing practices, ethical practices, physical postures and meditation, facilitate simultaneous and harmonized top-down and bottom-up regulation. By top-down, the authors suggest practices utilizing these four elements bring about a single-pointedness of mind by maintaining attentional focus on a body part, sensation, thought, or external object, and minimizing negative evaluations and ruminative patterns. As well, bottom-up regulation is supposedly engaged during physical and breath work practices that stimulate subtler and unconscious processes in the limbic and neurologic systems (Gard, Noggle, Park, Vago, & Wilson, 2014). This model proposes yoga integrates top-down and bottom-up regulation processes, again, for the promotion of overall health across contexts and domains of functioning. Specifically, one study found regulated breathing practices alone are capable of simultaneously increasing parasympathetic activation and general alertness, while simultaneously lowering heart rate and blood pressure (Jerath, Eddry, Bames, & Jerath, 2006). Additional research has focused on other aspects of cognitive impacts seen following YBPs. One such study (Gothe, Kramer, & McAuley, 2017) found improvements in attention and processing speed following an 8-week yoga intervention among older adults that emphasized breathing, posture, and meditative components.

Emotional Changes

Anxiety

The effects of YBPs on emotion regulation and expression have been examined with primary focus on stress/anxiety and depression. If indeed YBPs are capable of activating the parasympathetic nervous system and promoting down-regulation of stress responses, research should indicate decreases in stress and anxiety with yoga and meditation practice. Much of the current research has focused on decreasing symptoms of anxiety, such as in a study of women practicing Iyengar yoga twice weekly for 8 weeks (Michalsen, et al., 2005). These participants demonstrated significant decreases in anxiety levels, as well as significant improvements in overall well-being (Michalsen, et al., 2005). Research with participants diagnosed with Obsessive-Compulsive Disorder also demonstrated significant decreases in anxious distress following a 12-month yoga intervention (Shannahof-Khalsa & Beckett, 1996). Valoriani, et al. (2014) found significant reduction in self-reported distress among women seeking in-vitro fertilization treatments and exposed to a hatha yoga intervention as part of psychological support. West (2004) additionally demonstrated statistically significant reductions in cortisol levels indicative of stress in research participants engaged in a yoga intervention. Participants from this study also indicated a decrease in self-reported distress following the intervention (West, 2004). A more recent study found that psychiatric nurses who participated in a 6-week yoga nidra program (similar to progressive muscle relaxation) evidenced reduced stress levels and reduced muscle fatigue (Anderson, Mammen, Paul, Pletch, & Pulia, 2017).

Despite these promising findings, results on effectiveness of YBPs on reducing anxiety symptoms appear to indicate YBPs may not necessarily be more effective than other similar interventions. One study revealed although a yoga intervention significantly reduced symptoms

of anxiety in a sample of patients with cardiovascular disease, this was not significantly different from the effects of a Mindfulness-Based Stress Reduction intervention (Ospina, et al., 2007). A review of YBP effectiveness on mental health conditions also indicated that yoga seems to reduce self-reported perceived stress with similar effectiveness as dance and cognitive behavioral therapies (Büssing, Michalsen, Khalsa, Telles, & Sherman, 2012).

Depression

Decreased symptoms of depression following YBPs have also been demonstrated in various populations. Valoriani and colleagues (2014) found, in addition to decreased distress, decreased self-reports of depression after 3 months of hatha yoga intervention for a population of women undergoing in-vitro fertilization treatments. Research with women who have been diagnosed with Major Depressive Disorder (MDD) also found significant decreases in depressive symptoms, after an 8-week hatha yoga intervention (Kinser, Bourguignon, Whaley, Hauenstein, & Taylor, 2013). These changes were not, however, significantly different from outcomes of a comparison group who were exposed to a weekly lecture on health; though, rumination in the yoga group did significantly decrease beyond that of the comparison group (Kinser, Bourguignon, Whaley, Hauenstein, & Taylor, 2013). Another study (Chu, et al., 2017) demonstrated changes similar to the above-described models in both physiological and psychological outcomes. Chu and colleagues provided a 12-week yoga intervention to women diagnosed with depressive disorders as part of a randomized controlled trial. Results indicate not only did participants in the yoga group, as compared to the control group, demonstrate significant decreases in depressive symptoms, they also evidenced significant changes in heart rate variability, or as the authors note, "increasing parasympathetic tone" (Chu et al., 2017).

Mantra meditation may additionally lower depressive symptoms, though research has only been found to support this for mild and chronic depression, versus acute depression (Kirsten, 2001). Other research has indicated depressive symptoms may decrease, and remain stably lowered, even when only engaging in the relaxation and breathing portions of hatha yoga (savasana; Khumar, Kaur, & Kaur, 1993). Conversely, solely teaching depressed participants the asana postures, without the relaxation and stand-alone breathing portions, has also demonstrated lowered symptoms of depression (Shapiro, Cook, Davydov, Ottaviani, Leuchter, & Abrams, 2007).

Hatha yoga and other YBPs emphasize stable and elongated posture, whether sitting or standing. Students are often prompted to lengthen their spines during various asana postures and sit in upright positions when engaged in meditation. Upright and open physical posture has been associated with decreased symptoms of depression, particularly with regard to negative cognitive appraisals (Michalak, Mischnat, & Teismann, 2014) and increased subjective energy (Golec de Zavala, Lantos, & Bowden, 2017).

In addition to mixed results on effectiveness for anxiety, the effectiveness of YBPs on reducing depressive symptoms has also been varied in the existing body of literature (Büssing, Michalsen, Khalsa, Telles, & Sherman, 2012). One review of randomized clinical trials utilizing yoga-based practices to treat depression indicated although YBPs may be promising in complementing standard treatments, yoga intervention groups alone often did not significantly differ from active controls (Uebelacker, et al., 2010). Another, more recent, systematic review of studies using YBPs to address depression found similarly promising results that nevertheless fell short due to inconsistencies in interventions and reporting (Cramer, Anheyer, Laucher, & Dobos, 2017). Additionally, as indicated by the preceding literature, it is not yet clear what components

of YBPs are beneficial, or the most efficacious in treating specific disorders and promoting overall health.

Despite these challenges, researchers continue attempting to fill the many empirical gaps. Yoga interventions and breathing techniques have additionally been shown to aid in coping with chronic illnesses. Brazier, Mulkins and Verhoef (2006) found reports of increased general well-being and positive life changes in HIV/AIDS patients after learning breathing and meditative techniques, despite indicating increased stress on quantitative measures. Fibromyalgia patients endorsed increasingly fewer negative and increasingly more positive daily experiences over eight weeks of practicing yoga (Rudrud, 2012). These results, however, were solely based on qualitative reports. Another study, published recently, found that patients with obstructive pulmonary disease who practiced yoga breathing techniques for 12 weeks demonstrated significantly increased tolerance and capacity for exercise. (Kaminsky, et al., 2017). Other research has also indicated positive effects on behavior-regulation and treatment adherence for medical patients (Bock, et al., 2012). It seems clear then, that the variances in results have not deterred researchers, particularly as YBP research is increasing and those who implement YBPs are able to anecdotally report positive impacts.

Mindfulness

While many definitions of mindfulness exist, perhaps Kabat-Zinn (1995) expresses it most clearly for the present purposes: mindfulness is "the awareness that emerges through paying attention on purpose, in the present moment, and non-judgmentally to the unfolding of experience, moment to moment." The experiences attended to are both internal (affective, cognitive, sensory) and external (environmental, social; Kristeller, 2007). As mentioned

previously, mindfulness is typically considered a distinct, though closely related, concept from attention or attentional focus. In fact, attention has been identified as a key mechanism of mindfulness (Shapiro, Carlson, Astin, & Freedman, 2006). Though mindfulness is often thought of as rooted in the traditions of Buddhism, it is also preset in the practices of most major religions in forms such as meditation and prayer (Kristeller, 2007).

Clinical practices are increasingly incorporating elements of mindfulness in their philosophies and treatments, such as in acceptance and commitment therapy (Hayes, Strosahl, & Wilson, 1999), dialectical behavior therapy (Linehan, 1993), and mindfulness-based stress reduction work (Kabat-Zinn, 1990), among others (Brach, 2003; Fulton, 2005). Research has also indicated that exposure to mindfulness activities can aggregate to an increased ability to tap mindfulness in any given present moment (Kiken, Garland, Bluth, Palsson, & Gaylord, 2015). It is also another key element in hatha yoga that is embedded throughout any practice via the different elements, such as withdrawal of the senses in pratyahara, or in dhyana (meditation). As well, mindfulness has been emphasized in YBPs, the effectiveness of which has been evaluated in various ways, though most commonly as a component of meditation.

After engaging in mindful meditation, participants have reported increased self-compassion and psychological well-being, and decreased problems with emotion regulation (Sauer-Zavala, Walsh, Eisenlohr-Moul, & Lykins, 2012). Kristeller (2007) proposed mindful meditation may offer a multi-modal means of addressing stress management via cognitive, physical, emotional, behavioral, relational and spiritual elements and outcomes. Research has produced demonstrable effects of mindfulness-based activities on all of these proposed elements (Semple, Lee, & Miller., 2006; Kabat-Zinn, Lipworth, & Burney, 1985; Teasdale, et al., 2000; Kristeller & Hallett, 1999; Weissbecker, et al., 2002; and Shapiro, Schwartz, & Boumer, 1998;

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respectively), though each element is usually examined separately. While research has examined the effects of mindful yoga practices in general, due to the defuse presence of mindful elements throughout many hatha classes and YBPs, it can be difficult to parse effects. What is clear, however, is mindfulness can have wide-ranging positive effects on overall well-being (Kabat-Zinn, Lipworth, & Burney, 1985).

The Current Study

Due to the increasing empirical support for YBPs as influential in mental health outcomes, many agencies such as counseling centers, prisons, rehabilitation programs, and veteran care centers have been incorporating YBPs into their care models. One such agency, the Lifeologie Institute counseling centers in the Dallas/Fort Worth metroplex, has gone so far as to start a teacher training program and provide psychotherapeutically directed yoga classes for clients seeking services for mental health concerns such as anxious and depressive disorders. Classes are offered on an individual or group basis, and clients are free to attend regularly or only once. All instructors in the Lifeologie Institute School of Psychotherapeutic Yoga (LISPY) have been trained in yoga therapy and plan their classes with certain elements in mind in order to address symptoms of anxiety and depression, as well as aid clients in more actively pursuing meaningful lives. The LISPY instructors are trained using not only the most up-to-date research in yoga therapies, but particularly in the model of Viniyoga (Kraftsow, 1999). This model of yoga emphasizes mindful attention to breath, physical movements, and emotional states throughout the practice. The majority of yoga poses are dynamic, rather than static, meaning as the practitioner inhales as they move to a more open expression of the pose and then exhale as they move to a more closed expression. Classes for students primarily exhibiting symptoms of

anxiety may start with a higher activity level to physiologically match psychological arousal, and gradually downregulate to decrease hyperarousal and teach students self-regulation. Contrary, classes designed primarily for students with depressive symptoms match lower arousal levels, slowly building throughout. With these dynamic postures, instructors encourage students to practice breath regulation, while noticing the effects, by increasing inhale and exhale time ratios. While the instructors and students have been anecdotally reporting positive outcomes of LISPY classes, the student researcher has been unable to identify documentation of any study of an ongoing psychotherapeutically oriented yoga program.

The current study therefore sought to evaluate psychological outcomes of this yoga program designed to address symptoms of anxiety and depression. The outcome study aimed to establish whether interventions have immediate outcomes on participants, to assess the feasibility of engaging in future longitudinal research. The primary research question explored in this study was whether a specially designed psychotherapeutic yoga program affects indices of psychological well-being. The study also examined potential differential effects of individual versus group yoga sessions, as well as any potential observable differences in outcomes by instructor, prior yoga experience, and psychiatric diagnoses. Specifically, the following hypotheses were proposed:

1. Participants will report decreased symptoms of anxiety following yoga.

2. Participants will report increased subjective well-being following yoga.

3. Trait mindfulness will predict state mindfulness following yoga.

CHAPTER III

METHODS

Participants

Participants were recruited from clients seeking psychotherapy services at two of the four Lifeologie Institute counseling offices in the Dallas/Fort Worth area. In addition to psychotherapy, the Lifeologie Institute has developed a psychotherapeutic yoga program, based on Viniyoga (Kraftsow, 1999), to aid clients in decreasing symptoms of anxiety and depression and "re-engage with life." Participants were required to be current clients at a Lifeologie Institute location, and able to speak, read, and write English. All eligible participants were required to be adults over the age of 18, and willing to take at least one psychotherapeutic yoga class in either a group or individual setting. Prior to conducting the study, a priori power analysis indicated a sample size of 45 would be needed to detect a moderate effect size ($d = .5$) with good power ($\alpha = .95$). Ultimately, exactly 45 participants were recruited.

The total sample consisted of 45 participants, with the typical participant being female ($n = 43$, 95.6%), white ($n = 41$, 91.1%) and with annual household income over \$150,000 ($n = 18$, 40%). See Table 1 for full descriptive statistics and frequencies. Mean age was 45 ($SD = 11.6$) and the majority of participants ($n = 24$, 53.3%) completed measures before and after participating in a group psychotherapeutic yoga session, rather than an individual session, with half of these ($n = 12$, 26.7% of sample) doing so as part of the LISPY Psychotherapeutic Yoga training program. These participants can be characterized as "wounded healers" as LISPY anecdotally reports the majority of students in this program engage in training for personal, rather than professional, gain and their data appear consistent with the remainder of the sample with regard to meeting criteria for depression and anxiety.

Table 1

Sample Characteristics and Demographics

Outcome	*N* (%)
*PDSQ Depression	12 (26.7%)
*PDSQ PTSD	4.6 (10.2%)
*PDSQ Eating Disorder	8.8 (19.5%)
*PDSQ Obsessive-Compulsive Disorder	0 (0.0%)
*PDSQ Panic Disorder	2 (4.4%)
*PDSQ Psychosis	0 (0.0%)
*PDSQ Agoraphobia	2 (4.4%)
*PDSQ Social Phobia	11 (24.4%)
*PDSQ Alcohol Use Disorder	7 (15.5%)
*PDSQ Drug Use Disorder	1 (2.2%)
*PDSQ Generalized Anxiety Disorder	20 (44.4%)
*PDSQ Somatization Disorder	0 (0.0%)
*PDSQ Hypochondriasis	1 (2.2%)
Frequencies	*N* (%)
Race	
White	41 (91.1%)
Black or African American	1 (2.2%)
Biracial	2 (4.4%)
Other	1 (2.2%)
Income	
$5,000-9,999	1 (2.2%)
$10,000 – 19,999	1 (2.2%)
$20,000 – 29,999	4 (8.9%)
$30,000 – 39,999	2 (4.4%)
$40,000 – 49,999	1 (2.2%)
$50,000 – 74,999	7 (15.6%)
$75,000 – 99,999	8 (17.8%)
$100,000 – 150,000	3 (6.7%)
Over $150,000	18 (40.0%)
Previous Yoga Experience	39 (86.7%)
< 1 month	3 (6.7%)
3-6 months	7 (16.3%)
6 months – 1 year	4 (9.3%)
> 1 year	7 (16.3%)
> 5 years	10 (23.3%)
> 10 years	14 (32.6%)
Individual Session	15 (33.3%)
Group Session	24 (53.3%)
LISPY Training	12 (26.7%)
Instructor	
1	7(15.6%)
2	27 (60%)
3	1 (2.2%)
4	10 (22.2%)

Note: PDSQ: Psychiatric Diagnostic Screening Questionnaire diagnostic subscales; *using pooled data.

The most frequently endorsed psychological disorder, as determined by responses on the Psychiatric Diagnostic Screening Questionnaire (PDSQ) was generalized anxiety disorder ($n = 20$, 44.4%), and the second disorder most frequently endorsed with clinically significant elevation was major depressive disorder ($n = 12$, 26.7%), supporting the aim of the psychotherapeutic yoga intervention to target individuals with anxiety and depression. Additionally, 30 of the 45 participants (67%) reported practicing yoga at least once weekly.

Measures

State-Trait Anxiety Inventory (STAI)

The STAI (Spielberger, 1983) is a measure of in-the-moment (state) and characteristic (trait) anxiety and consists of two 20-item self-report measures. Each item is rated along a 4-point Likert scale ranging from *not at all* to *very much* for the state measure, and *almost never* to *almost always* on the trait measure, with higher scores indicating greater levels of anxiety (Spielberger, 1983). This measure has been validated in a wide range of populations and language translations (Grös, Antony, Simms, & McCabe, 2007), and demonstrates excellent psychometric properties (average αs > .89, and average r for Trait scale > .88; Barnes, Harp, & Jung, 2002). Internal consistency of items on the STAI State scale for the current study was low, at α = 0.55, and very good for the Trait scale at α = .96. Previous research indicates it is expected for state anxiety reliability coefficients to vary by sample (Barnes, Harp, & Jung, 2002) however, the internal consistency for the present study is below typically acceptable conventions and results are therefore interpreted with caution.

Subjective Exercise Experience Scale (SEES)

The SEES (McAuley & Courneya, 1994) is a 12-item self-report measure for use following exercise interventions to assess participants along three factors of well-being: Psychological Distress, Positive Well-being, and Fatigue. Each factor subscale contains 4 items which are rated along a 7-point Likert scale from 1, *not at all,* to 7, *very much so.* Participants are instructed to rate how they feel at the moment, according to descriptors such as *Great, Exhausted,* and *Strong.* The SEES has been used in another study evaluating well-being outcomes following a progressive muscle relaxation intervention (Vancampfort, et al., 2011), and demonstrated adequate internal consistency with Cronbach's alphas of 0.78 (Psychological Stress Scale), 0.92 (Positive Well-Being Scale), and 0.70 (Fatigue Scale). For the current study, the SEES items demonstrated good internal consistency of $\alpha = 0.86$ (Positive Well-Being), $\alpha = 0.76$ (Psychological Distress) and $\alpha = 0.95$ (Fatigue).

The Mindfulness Attention Awareness Scale (MAAS)

The MAAS (Brown & Ryan, 2003) is a 15-item self-report measure of mindfulness in the present moment. Items are rated on a 6-point Likert scale, ranging from *almost always* (1) to *almost never* (6) and high total scores indicating greater mindfulness. Examples of items include "*I snack without being aware that I'm eating*" and "*I find it difficult to stay focused on what's happening in the present.*" This measure exhibits good psychometric properties, with good internal consistency of $\alpha = .87$ in a general population (Brown & Ryan, 2003). The MAAS demonstrated good internal consistency in the current sample ($\alpha = 0.93$).

Psychiatric Diagnostic Screening Questionnaire (PDSQ).

The PDSQ (Zimmerman & Mattia, 2001) is a 125-item self-report screener for DSM-IV Axis I disorders that are commonly seen in outpatient clinics. Participants are asked to indicate whether they experienced listed symptoms over the preceding two weeks or across the past 6 months. Items include "Over the past two weeks did you get sudden attacks of intense anxiety or fear that came on from out of the blue, for no reason?" and "During the past 6 months did you regularly avoid any situations because you were afraid they'd cause you to have an anxiety attack?" The measure yields 13 subscales (major depressive disorder [MDD], bulimia, post-traumatic stress disorder [PTSD], panic disorder, agoraphobia, social phobia, generalized anxiety disorder, obsessive-compulsive disorder, alcohol abuse/dependence, drug abuse/dependence, somatization, hypochondriasis, and psychosis), which have all demonstrated excellent internal consistency and test-retest reliability (Zimmerman & Mattia, 2001). Internal consistency varied among scales for the current sample as follows: Depression $\alpha = 0.86$, PTSD $\alpha = 0.87$, Bulimia/Binge Eating Disorder $\alpha = 0.89$, Obsessive/Compulsive Disorder $\alpha = 0.34$, Panic Disorder $\alpha = 0.78$, Psychosis $\alpha = 0.54$, Agoraphobia $\alpha = 0.74$, Social Phobia $\alpha = 0.85$, Alcohol Abuse/Dependence $\alpha = 0.81$, Drug Abuse/Dependence $\alpha = 0.66$, Generalized Anxiety Disorder $\alpha = 0.93$, Somatization $\alpha = 0.72$, Hypochondriasis $\alpha = 0.79$.

Subjective Well-Being Measure (SWB)

The SWB (Callahan, Swift, & Hynan, 2006) is a four-item measure of a participants' subjective appraisal of personal well-being, in the moment, and was based on the Howard, Lueger, Maling, and Martinovich's (1993) subjective well-being items. Participants answered the following questions on a 4-point Likert scale: "Currently, how upset have you been feeling?

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Currently, how energetic have you been feeling? Currently, how do you feel that you are getting along emotionally? and Currently, how satisfied have you been feeling with your life?" The measure has previously demonstrated adequate internal reliability of .71 and test-retest reliability of .63 (Callahan, Swift, & Hynan, 2006). For the present study, the SWB demonstrated good internal reliability ($\alpha = 0.85$).

Toronto Mindfulness Scale (TMS)

The TMS (Lau, et al., 2006) is a 13-item self-report measure of state mindfulness, yielding scores on three scales: Curiosity Score, Decentering Score, and the overall score, with higher scores indicating greater state mindfulness. Participants respond to questions about a preceding activity with 0 (*Not at all*), 1 (*A little*), 2 (*Moderately*), 3 (*Quite a bit*), or 4 (*Very much*). This measure has also previously demonstrated good psychometric properties, with Chronbach's alpha for the Decentering subscale ranging 0.85-0.87 and 0.86-0.91 for the Curiosity subscale (Park, Reilly-Spong, & Gross, 2013). The TMS demonstrated very good internal consistency for the Curiosity subscale ($\alpha = 0.92$) and fair consistency for the Decentering subscale ($\alpha = 0.70$) and good consistency for the total scale ($\alpha = 0.88$) with the current sample.

<center>Procedures</center>

As previously described, participants were recruited from two of the four Lifeologie counseling offices in Dallas, and Fort Worth. Flyers were placed in lobby areas, and clinicians were asked to notify their clients of the research participation opportunity. All interested and eligible Lifeologie clients were asked to attend at least one LISPY individual or group yoga class. Participation in either individual or group classes is typically determined jointly by the

<center>20</center>

client and clinician, and these naturalistic procedures were followed for the current study.

Students in the LISPY psychotherapeutic yoga training program were also invited to participate

in the study during their first required attendance of a psychotherapeutic yoga session, done in a

group setting. Participants were asked to arrive approximately 15-30 minutes prior to their

scheduled class, and to stay approximately 15 minutes following their class, to complete

measures. Upon arrival, each participant was provided an envelope containing two informed

consent forms and all measures (one to retain and one to return), with a participant number pre-

written on the outside of each envelope. All yoga therapists participating in the present study

completed training in ethically conducting human subjects research, and were trained in

administration of the present study measures.

All yoga therapists were licensed master-level counselors who had completed training

through the Lifeologie Institute School of Psychotherapeutic Yoga (LISPY). All therapists were

female and between the ages 26 and 55. In broad terms, the therapists in this study mirrored the

typical participant (white, female, mid-life, middle to upper socioeconomic standing, with many

years of yoga experience). More specificity in description is not being provided to guard against

identification of individual therapists. While no class follows an exact prescription, all follow

general guidelines, principles, and orientations in designing each class. Elements included in

each class consist of regulated breathing (which includes extending time ratios between inhales

and exhales, with exhales lasting longer), stretching, balancing, dynamic poses (meaning there is

movement in the pose, typically done with the in- and out-breath), and verbal prompts for

mindfulness or momentary attention to emotional or physical states.

All participants were provided informed consent by their yoga therapist, who also

instructed them in completing all demographics and baseline measures (STAI, PDSQ, MAAS,

SEES, and SWB) prior to the yoga class. Following the class, participants were instructed to complete the post-yoga measures (SWB, SEES, STAI-state, and TMS) and to seal all documents in the provided envelope. All envelopes were kept at the Lifeologie offices in a locked, confidential space, from where they were regularly retrieved by the student researcher and a peer in the same research lab once the student researcher no longer resided in the same geographic area (near completion of the data collection phase). Consent forms were stored separately from data, and all de-identified data was electronically entered on a secure server.

CHAPTER IV

RESULTS

Data Cleaning

All measures were completed in the presence of a psychotherapeutic yoga clinician

trained in research ethics and study procedures for the purpose of this study. Not all measures

were checked for completion prior to submission, however, resulting in missing data. No item

contained 10% or more missing data, and the overall sample (45 participants) had 1.50% missing

data. Based on box plots and Tukey interquartile ranges, no significant outliers were identified in

the dataset. Due to the small sample size and potential impact on power of missing data, the

statistical procedure of Multiple Imputation (MI; Rezvan, Lee, & Simpson, 2015) was used.

First, data was examined for patterns of missingness, and data were found to be missing

completely at random (Little's MCAR test: Chi Square = 0.00, $df = 4260$, $p = 1.00$). Next, the

missing data were imputed using the *mice* package in R which uses the predicted means method.

All proposed analyses for hypotheses were supported by MI, however upon analyses it was

found the number of covariates combined with initial imputation methods produced exorbitant

data, leading to alterations in modeling, below. Additionally, the inclusion of class type (group

versus individual) as an additional covariate would have reduced degrees of freedom and the

decision was made to examine these differences in a descriptive sense to characterize the sample

only.

Scales were reverse-coded as needed to total all scales and subscales for analyses in the

same direction (higher scores indicate greater distress for the PDSQ, STAI, Fatigue and

Psychological Distress scales of the SEES; and greater mindfulness or well-being for the MAAS,

TMS, SEES positive well-being scale and SWB). Additionally, a new variable was computed to

indicate the difference in total scores before and after yoga, consistent with the planned paired samples approach. PDSQ scores were coded for individual diagnoses, and a total score was generated to denote the symptom count of each participant based on their responses. See Table 2 for means and standard deviations for each scale before and after the intervention

Table 2

Means and Standard Deviations for Pre- and Post-Yoga Measures

Outcome	*M*	*SD*
STAI-S Pre	44.78	5.17
STAI-S Post	47.19	5.24
MAAS	53.62	14.56
TMS	35.47	9.17
SEES		
Psychological Well-Being -Pre	17.80	5.02
Psychological Well-Being – Post	22.82	5.51
Psychological Distress – Pre	8.39	4.42
Psychological Distress – Post	5.14	2.25
Fatigue – Pre	15.29	7.12
Fatigue – Post	10.3	5.40
SWB – Pre	13.52	3.07
SWB – Post	15.49	2.16

Finally, participants were divided into groups based on the duration of their yoga practice prior to the present study. Linear mixed-effects regression was used to account for the presence of the

covariates Instructor, PDSQ Total score, and Yoga Duration. Total PDSQ scores were used instead of each individual PDSQ diagnosis to maintain enough degrees of freedom to perform the analyses. Random effects were structured by individual. Residuals were examined for all models and no deviance from homoskedasticity was found; assumptions were therefore supported. Model selection was performed using Likelihood Ratio Tests of each of the covariates against the fullest models.

Analyses for Hypothesis 1

To address the first hypothesis, a paired *t*-test was performed to determine if there was a difference in anxiety scores before yoga and after yoga. Prior to analysis, covariates were examined, as described above, and no covariates were found to have a significant impact on explaining the variance of the model ($p = 0.22$). The paired *t*-test was found to be significant ($t = -2.78$, $p = .01$) and the estimate of the difference was found to be -2.56 points after yoga (95% CI: -4.42 - -0.70). The first hypothesis, that there is a significant reduction in anxiety scores post-yoga, was therefore supported.

Analyses for Hypothesis 2

The second hypothesis, that participants would report increased subjective well-being following yoga, was evaluated using four linear mixed model regressions run in R using the response variables of mean subjective well-being score difference, mean SEES psychological wellbeing score difference, mean SEES psychological distress score difference, and mean SEES fatigue score difference. Model selection was performed using a Likelihood Ratio test as before.

Subjective Well-Being

For subjective well-being (as measured by SWB), Instructor was found to significantly reduce variation in the model ($p < 0.001$) and was therefore retained in the final model. PDSQ Total Score was not found to significantly reduce variation in the model ($p = 0.32$) and was therefore dropped from the final model. Yoga duration was not found to significantly reduce variation in the model ($p = 0.13$) and was therefore dropped from the final model. Model for SWB:

$$Y_{ij} = B_0 + B_1 T_2 + B_2 T_3 + B_3 T_4 + b_j + \epsilon_{ij}$$

Where:

- Y_{ij} is the mean difference in scores post- and pre-yoga;
- B_0 is the baseline difference for someone who has been practicing for 1-3 months, does not have PDSQ present, and was taught by Instructor 1;
- B_1 is the change in mean difference when the teacher is Instructor 2;
- T_2 is 1 if the teacher was Instructor 2 and 0 otherwise;
- B_2 is the change in mean difference when the teacher is Instructor 3;
- T_3 is 1 if the teacher is Instructor 4 and 0 otherwise;
- B_3 is the change in mean difference when the teacher is Instructor 4;
- T_4 is 1 if the teacher is Instructor 4 and 0 otherwise;
- b_j is the random effect of participant;
- ϵ_{ij} is the random error term for the ith response and the jth participant.

For subjective well-being, the estimate of the intercept and its 95% confidence interval bounds were not found to contain 0 (Table 2). Therefore, the null hypothesis can be rejected at a significance level of $p = 0.05$; there is statistical evidence that subjective wellbeing was increased after yoga when accounting for instructor, as measured by the SWB. The mean difference in post-yoga – pre-yoga wellbeing score was -3.00 points (95% CI: 1.75 – 4.25). The

estimate and 95% confidence of mean wellbeing score difference also did not contain 0 for any

covariates. Therefore, each instructor appeared to have a significant impact on outcomes.

Table 3

Estimates of Mean Difference in Self-Reported Wellbeing with 95% Confidence Intervals

	lower	est.	upper
fixed			
(Intercept)	1.75	3.00	4.25
Instructor 2	-4.44	-3.04	-1.63
Instructor 3	-7.54	-4.00	-0.46
Instructor 4	-4.46	-2.75	-1.04
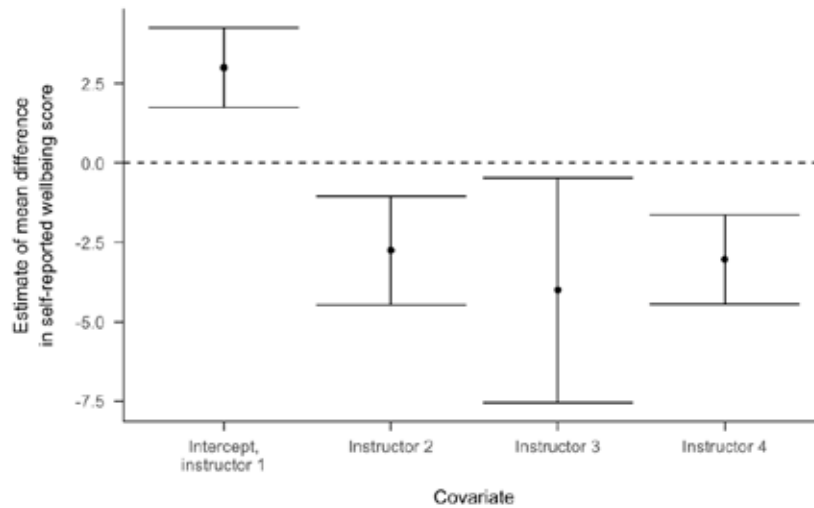
Figure 1. Confidence intervals and estimates of mean difference in subjective well-being scores (post-yoga minus pre-yoga)

Psychological Well-Being Scale of the SEES

For Psychological Wellbeing (PWB) score on the SEES, Instructor was found to

significantly reduce variation in the model ($p = 0.04$) and was therefore retained in the final

model. PDSQ Total Score was also found to significantly reduce variation in the model ($p = 0.01$) and was therefore retained in the final model. Yoga duration was not found to significantly

reduce variation in the model ($p = 0.28$) and was therefore dropped from the final model.

PWB model:

$$Y_{ij} = B_0 + B_1T_2 + B_2T_3 + B_3T_4 + B_4PDSQ + b_j + \epsilon_{ij}$$

Where:

- Y_{ij} is the mean difference in scores post- and pre-yoga;
- B_0 is the baseline difference for someone who has been practicing for 1-3 months, does not have PDSQ present, and was taught by Instructor 1;
- B_1 is the change in mean difference when the teacher is Instructor 2;
- T_2 is 1 if the teacher was Instructor 2 and 0 otherwise;
- B_2 is the change in mean difference when the teacher is Instructor 3;
- T_3 is 1 if the teacher is Instructor 3 and 0 otherwise;
- B_3 is the change in mean difference when the teacher is Instructor 4;
- T_4 is 1 if the teacher is Instructor 4 and 0 otherwise;
- B_4 is the change in mean difference for every one unit increase in PDSQ score;
- $PDSQ$ the subject's PDSQ score;
- b_j is the random effect of participant;
- ϵ_{ij} is the random error term for the ith response and the jth participant.

For psychological wellbeing score difference on the Subjective Exercise Experience Scale, the estimate of the intercept and its 95% confidence interval bounds were not found to contain 0 (Table 3). Therefore, the null hypothesis can be rejected at a significance level of $p = 0.05$; there is significant statistical evidence that psychological wellbeing (as measured by the PWB scale of the SEES) was changed after yoga after accounting for instructor and PDSQ score. The difference in post - pre yoga PWB scores was found to be 5.54 points (95% CI: 1.37 - 9.71, Figure 1). Additionally, for every 1 unit increase in PDSQ score, a change in difference of 0.096 points was observed (95% CI: 0.017 - 0.174).

Table 4

Estimates of Mean Difference in Psychological Well-Being Scores, Subjective Exercise Experience Scale, with 95% Confidence Intervals

	lower	est.	upper
fixed			
(Intercept)	1.37	5.54	9.71
Instructor 2	-5.78	-2.10	1.57
Instructor 3	-15.55	-7.27	1.02
Instructor 4	-8.15	-3.97	0.20
PDSQ_TOTAL	0.02	0.10	0.17
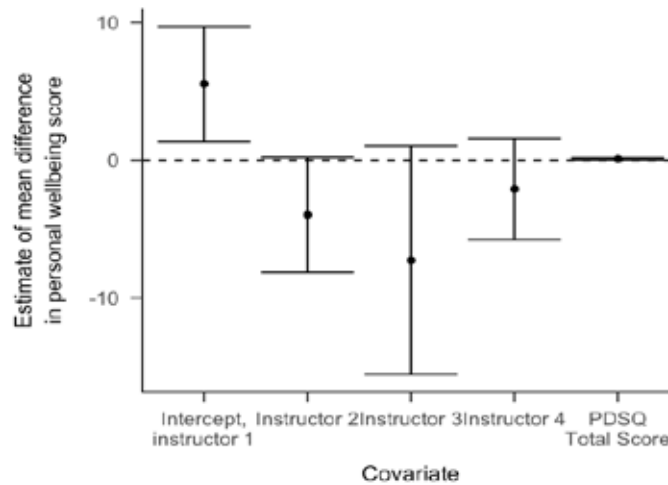
Figure 2. Confidence intervals and estimates of mean difference in psychological wellbeing scores (post-yoga minus pre-yoga)

Psychological Distress Scale of the SEES

For Psychological Distress (PD), Instructor was found to significantly reduce variation in the model ($p = 0.01$) and was therefore retained in the final model. PDSQ Total Score was again found to significantly reduce variation in the model ($p = 0.03$) and was therefore retained in the final model. However, yoga duration was not found to significantly reduce variation in the model ($p = 0.28$) and was therefore dropped from the final model.

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PD model:

$$Y_{ij} = B_0 + B_1 T_2 + B_2 T_3 + B_3 T_4 + B_4 PDSQ + b_j + \epsilon_{ij}$$

Where:

- Y_{ij} is the mean difference in scores post- and pre-yoga;
- B_0 is the baseline difference for someone who has been practicing for 1-3 months, does not have PDSQ present, and was taught by Instructor 1;
- B_1 is the change in mean difference when the teacher is Instructor 2;
- T_2 is 1 if the teacher was Instructor 2 and 0 otherwise;
- B_2 is the change in mean difference when the teacher is Instructor 3;
- T_3 is 1 if the teacher is Instructor 3 and 0 otherwise;
- B_3 is the change in mean difference when the teacher is Instructor 4;
- T_4 is 1 if the teacher is Instructor 4 and 0 otherwise;
- B_4 is the change in mean difference for every one unit increase in PDSQ score;
- $PDSQ$ the subject's PDSQ score;
- b_j is the random effect of participant;
- ϵ_{ij} is the random error term for the ith response and the jth participant.

For psychological distress score difference on the Subjective Exercise Experience Scale, the estimate of the intercept and its 95% confidence interval bounds were found to contain 0 (Table 4). Therefore, the null hypothesis was unable to be rejected at a significance level of $p = 0.05$; there is no significant statistical evidence that psychological distress score difference was changed after yoga after accounting for instructor and PDSQ score. For every 1 unit increase in PDSQ score, a change in difference of -0.082 points was observed (95% CI: -0.162 - -0.002, Figure 2).

Table 5

Estimates of Mean Difference in Psychological Distress Scores, Subjective Exercise Experience Scale, with 95% Confidence Intervals

	lower	est.	upper
fixed			
(Intercept)	-7.41	-3.19	1.02
Instructor 2	-2.37	1.35	5.06
Instructor 3	-15.98	-7.61	0.77
Instructor 4	-0.78	3.44	7.67
PDSQ_TOTAL	-0.16	-0.08	0.00*

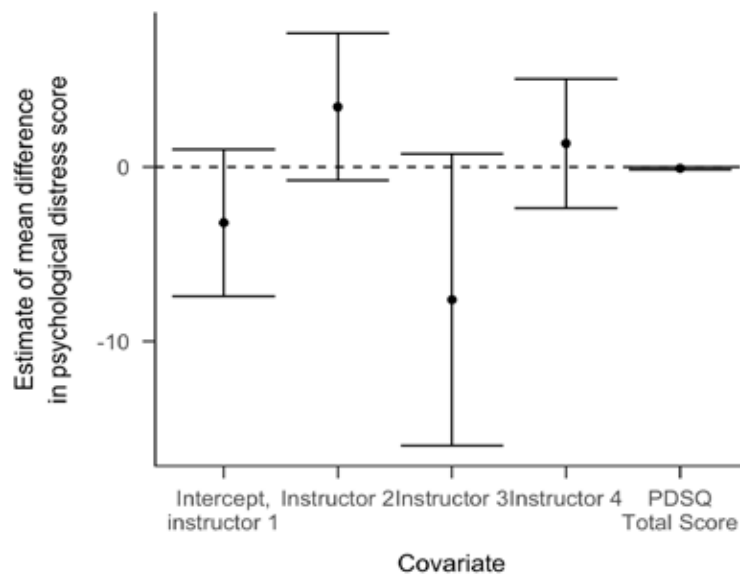*Note*: *exact estimate is 0.002

Figure 3. Confidence intervals and estimates of mean difference in psychological distress scores (post-yoga minus pre-yoga)

Fatigue Scale of the SEES

For Fatigue (FAT), Instructor was found to significantly reduce variation in the model ($p < 0.0001$) and was therefore retained in the final model. PDSQ Total Score was not found to

significantly reduce variation in the model ($p = 0.15$) and was therefore dropped from the final

model. Yoga duration was not found to significantly reduce variation in the model ($p = 0.34$) and

was therefore dropped from the final model.

FAT model:

$$Y_{ij} = B_0 + B_1 T_2 + B_2 T_3 + B_3 T_4 + b_j + \epsilon_{ij}$$

Where:

- Y_{ij} is the mean difference in scores post- and pre-yoga;
- B_0 is the baseline difference for someone who has been practicing for 1-3 months, does not have PDSQ present, and was taught by Instructor 1;
- B_1 is the change in mean difference when the teacher is Instructor 2;
- T_2 is 1 if the teacher was Instructor 2 and 0 otherwise;
- B_2 is the change in mean difference when the teacher is Instructor 3;
- T_3 is 1 if the teacher is Instructor 3 and 0 otherwise;
- B_3 is the change in mean difference when the teacher is Instructor 4;
- T_4 is 1 if the teacher is Instructor 4 and 0 otherwise;
- b_j is the random effect of participant;
- ϵ_{ij} is the random error term for the ith response and the jth participant.

For fatigue score difference on the Subjective Exercise Experience Scale, the estimate of the

intercept and its 95% confidence interval bounds were not found to contain 0 (Table 4).

Therefore, the null hypothesis is rejected at a significance level of $p = 0.05$ and it is concluded

that there is significant statistical evidence that fatigue score difference was changed after yoga

when accounting for instructor. The difference in post- pre-yoga FAT scores was found to be

-11.50 points (95% CI: -17.59 - -5.42, figure 4). Additionally, covariates were found to have

significant impacts on fatigue scores. When the instructor was Instructor 2, fatigue scores

increased by 7.54 points (95% CI: 2.18 - 12.91). With Instructor 3, fatigue scores increased by

14.53 points (95% CI: 2.43 - 26.62) and with Instructor 4, fatigue scores increased by 13.65

points (95% CI: 7.55 - 19.75).

Table 6

Estimates of Mean Difference in Fatigue Scores, Subjective Exercise Experience Scale, with 95%
Confidence Intervals

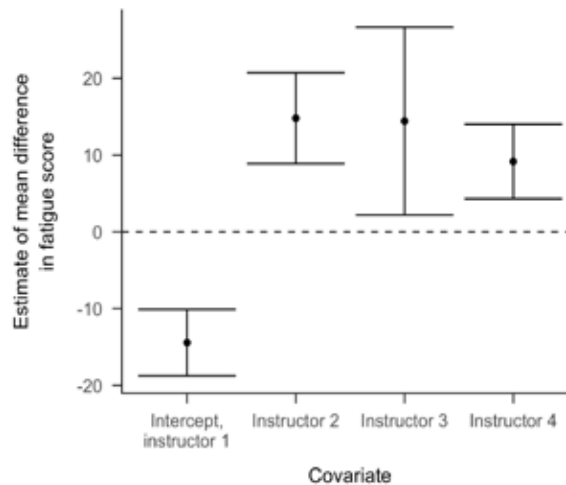|	lower	est.	upper
fixed			
(Intercept)	-17.59	-11.50	-5.42
Instructor 2	2.18	7.55	12.91
Instructor 3	2.43	14.53	26.62
Instructor 4	7.55	13.65	19.75

Figure 4. Confidence intervals and estimates of mean difference in fatigue scores (post-yoga
minus pre-yoga).

Analyses for Hypothesis 3

The third hypothesis, trait mindfulness will predict state mindfulness, was also examined

using a linear mixed model regression analysis in R using the response variable of mean state

mindfulness score, the explanatory variable of trait mindfulness score, and the explanatory

covariate Instructor. As before, model selection was performed using a Likelihood Ratio Test.

Instructor was found to significantly reduce variation in the model ($p = 0.01$) and was therefore

retained in the final model. Neither PDSQ Total Score ($p = 0.06$) nor yoga duration was found to

significantly reduce variation in the model ($p = 0.50$); both were therefore dropped from the final

model.

Model for question 3:

$$Y_{ij} = B_0 + B_1 MAAS + B_2 T_2 + B_3 T_3 + B_4 T_4 + b_j + \epsilon_{ij}$$

Where:

- Y_i is the mean state mindfulness score following yoga;
- B_0 is the baseline mean trait mindfulness score for someone who has been practicing for 1-3 months, does not have PDSQ present, and was taught by Instructor 1;
- B_1 is the change in mean state mindfulness score for every 1 unit increase in mean trait mindfulness score;
- $MAAS$ is the mean trait mindfulness score;
- B_2 is the change in mean state mindfulness score when the teacher is Instructor 2;
- T_{two} is 1 if the teacher was Instructor 2 and 0 otherwise;
- B_3 is the change in mean state mindfulness when the teacher is Instructor 3;
- T_{three} is 1 if the teacher is Instructor 3 and 0 otherwise;
- B_4 is the change in mean state mindfulness when the teacher is Instructor 4;
- T_{four} is 1 if the teacher is Instructor 4 and 0 otherwise;
- b_j is the random effect of participant;
- ϵ_i is the random error term for the ith response and the jth participant.

The estimate for the slope trait mindfulness total and its 95% confidence interval were

found to contain 0 (Table 6). Therefore, the null hypothesis cannot be rejected and there is no

statistical evidence for a relationship between trait mindfulness and state mindfulness after yoga

when accounting for covariates in the present study. Notably, instructor 2 was found to have a

-10.82 point change in mean state mindfulness score (95% CI = -18.66 - 02.98) while Instructor

4 was found to have a -14.99 point change in mean state mindfulness score (95% CI = -24.06 -

05.93, figure 4).

Table 7

Estimates of State Mindfulness After Yoga in Response to Trait Mindfulness Scores, with 95%
Confidence Intervals

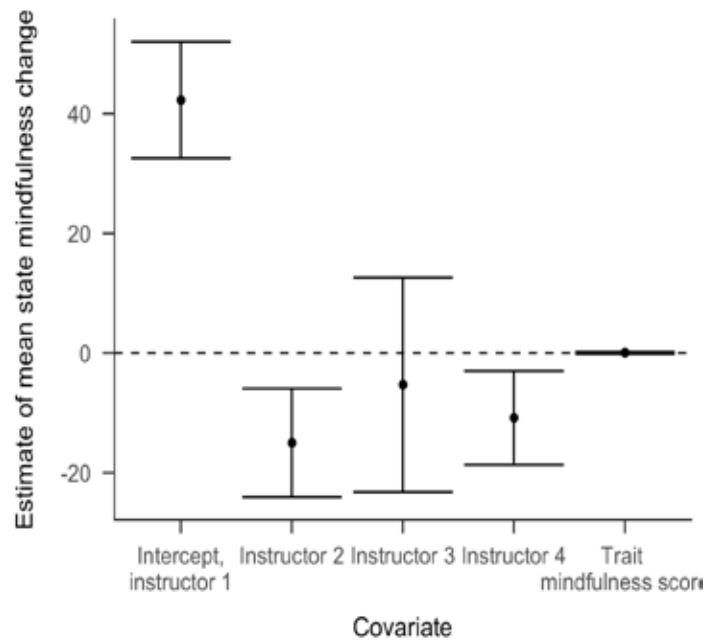|	lower	est.	upper
(Intercept)	32.56	42.29	52.02
Trait Mindfulness	-0.12	0.06	0.24
Instructor 2	-18.66	-10.82	-2.98
Instructor 3	-23.21	-5.29	12.63
Instructor 4	-24.06	-14.99	-5.93

Figure 5. Confidence intervals and estimates of state mindfulness in response to trait
mindfulness scores.

CHAPTER V

DISCUSSION

This cross-sectional study sought to evaluate the impact of a psychotherapeutic yoga program designed for clients with diagnoses of anxiety and/or depression. Specifically, the study hypothesized improvements in state anxiety and subjective well-being following a yoga intervention, as well as an observable relationship between state and trait mindfulness, all while controlling for differences between yoga instructors, prior yoga experience, and participant endorsements of psychological symptoms. Previous yoga experience, as measured by the duration of prior experience practicing yoga, was not found to be a significant factor in any of the tested hypotheses, despite the typical participant actually reporting practicing yoga at least once weekly. This may be indicative that the novel approach of the yoga intervention, or any other factors such as the therapy-focused setting, was impactful regardless of how much time a person has spent practicing yoga previously. This assumption based on the present findings is contrary to previous studies indicating more experienced practitioners tend to evidence greater benefits than novice practitioners of yoga (Brisbon & Lowrey, 2011; Kiecolt-Glaser, et al., 2010; Yoshihara, Hiramoto, Sudo, & Kudo, 2011)

The first hypothesis was supported, as a statistically significant decrease in anxiety was observed. This finding is interpreted cautiously, however, due to the low internal consistency of the STAI State scale in the present sample. This was the only analysis in which class instructor and psychological symptoms were not impactful, meaning regardless of instructor or severity of psychological symptoms, students reported experiencing a positive impact of the yoga intervention on symptoms of anxiety. This may be due in part, again, to the context. Specifically, because all participants are ongoing therapy clients at the outpatient counselling center, they may

be primed to expect changes and help when walking into the building. Regardless, results are comparable to previous literature indicating YBPs do have a positive impact on experienced anxiety (Anderson, Mammen, Paul, Pletch, & Pulia, 2017; Michalsen, et al., 2005; Shannahof-Khalsa & Beckett, 1996). Contrarily, whereas previous research has demonstrated decreased anxiety in longitudinal studies with repeated interventions and measures (Li & Goldsmith, 2012), the present study evidenced immediate impacts of this YBP on self-reported state anxiety.

The second hypothesis, that subjective well-being would increase following the intervention, was fairly nuanced due to the two measures of subjective well-being (one focused primarily on the mental state, and the other, SEES, focused on exercise-related outcomes) one of which (SEES) contained three subscales. When looking at results from the Subjective Well-Being measure, it appears participants did experience an increase in self-reported well-being following the yoga intervention. Additionally, instructors contributed to part of the variance in means, indicating that not only did the intervention have an effect, but the instructors themselves fostered change. This finding makes sense in light of the fact that instructors are specifically trained to prompt students for self-awareness. What is interesting, is that questions are designed to prompt students to, in the moment, retrospectively evaluate subjective experiences (e.g. *"how do you feel that you are getting along emotionally"*). This may mean then, that with a psychotherapeutic yoga intervention participants were able to make positive changes in their perspective of their own well-being.

The Subjective Exercise Experience Scale is comprised of three subscales meant to capture impacts of exercise and physical activity on well-being (McAuley & Courneya, 1994). In the present analyses the first subscale, Psychological Well-Being, includes items such as feeling "positive" and "terrific." Results demonstrate that instructors and psychological symptoms

(PDSQ Total score) significantly contributed to a statistically significant increase in psychological well-being following the yoga intervention. Results additionally indicate that participants with more psychological symptoms were likely to have a greater increase in well-being. While instructor factors contributed to the overall change, it is interesting that participants with more severe psychopathology would reap the most benefit on this domain. Though it remains salient to consider the impact of context, it is possible that these participants had more to gain by engaging in the intervention. Future research may consider comparing effects of a yoga-based intervention to a behavioral activation intervention to further parse effects.

Similarly, participants with higher psychological symptom counts appeared to have a, statistically non-significant, trend towards lowering psychological distress following the intervention. Although results indicate the change was non-significant, it appears Instructor and psychological symptom count also contributed to any small changes in lowering distress. Items on this scale include *"discouraged"* and *"miserable"*. While the intervention may have promoted positive changes in participants, it may not have been powerful enough to substantially reduce psychological suffering. It is also worth considering the physically and psychologically challenging nature of nearly any yoga intervention, but particularly one designed to address symptoms of depression and anxiety. Previous research indicates individuals, particularly those diagnosed with mood disorders, find it easier to ruminate on negative content and sensations than on positive (Nolen-Hoeksema, Wisco, & Lyubormirsky, 2008; Zetsche, D'Avanzato, & Joormann, 2012).

The final subscale of the SEES, Fatigue, yielded the finding that participants experienced a significant increase in fatigue following the yoga intervention. Additionally, each instructor evidenced unique degrees of impact on fatigue, indicating some instructors may foster more

physical and/or psychological challenge in their psychotherapeutic yoga sessions. For example, Instructor 3 and Instructor 4 appear to have facilitated a substantial amount of fatigue in their participants. Items in the Fatigue subscale include *"exhausted"* and *"drained."* It is important to note participants may be responding to items in relation to psychological or physiological states. For participants who may have responded with reference to their present physical state, the increase in fatigue makes sense as the yoga interventions do require physical activity. Participants responding to psychological states may also have been challenged during the psychotherapeutic intervention, and more data is therefore needed to parse out the potential differences. In line with this finding, however, is previous research connecting physiological exertion with reduction in anxiety (Asmundson, et al., 2013), which was also demonstrated in the present study. Hypothesis 2, therefore, was overall supported, as statistically significant improvements in psychological and subjective well-being were observed.

Hypothesis 3 examined the nature of the relationship between trait and state mindfulness. Although Instructors were found to be significant covariates in the overall model, there was no significant relationship observed and the hypothesis was therefore not supported. Previous research has indicated potential relationships between an individual's trait mindfulness and their mindfulness at any given moment (Kiken, Garland, Bluth, Palsson, & Gaylord, 2015). The present lack of significant findings may be related to the lack of evaluating baseline state mindfulness prior to the yoga intervention, as participants with differing levels of trait mindfulness may have been in a different state upon entering the intervention environment. A recently published study comparing state and trait mindfulness, however, similarly found a lack of strong relationships between measured state and trait mindfulness following an intervention, and evidenced relationships may be highly nuanced with need for consideration of different *types*

of trait mindfulness and stated mindfulness (e.g. body awareness versus mental/cognitive awareness; Bravo, Pearson, Wilson, & Witkiewitz, 2018).

Overall, results from the present study indicate that the Lifeologies Institute Psychotherapeutic Yoga program intervention has an immediate impact on reducing anxiety and increasing subjective well-being. Additionally, the present study found results varied by instructor and instructors themselves accounted for varying portions of the observed changes. This is highly novel in the YBP body of literature, as previous literature supports the present findings with regard to anxiety and subjective well-being, but while these studies often suggest impact may vary by instructor, this is the first study to the researcher's knowledge that demonstrates such an impact.

No previous study found in the extant literature has examined potential covariates as done in the present study. The current findings suggest, even with impacts of low power and small sample size, that it is important to consider potential effect differences by who is leading the intervention and participant histories of psychopathology. Yoga instructors likely have unique styles and approaches and may place emphasis on different experiences depending on personal values, perspectives, and training. Despite the current instructors included in this study having identical training and uniform broad structure for each class/session, individual differences still emerged and appear to be important to control for when studying YBP effectiveness and outcomes. The advanced statistical modeling and consideration of covariates should, however, be considered in future development and evaluations of YBPs.

Results also further highlight the difficulty of standardizing and studying a "real-world" community-based intervention. This should not discourage practitioners and researchers from pursuing YBP interventions and research, but rather embolden them to control for as much

variance as possible to contribute to objectively powerful outcomes in addition to already reported subjectively powerful outcomes. As a further consideration, the limited demographic characteristics of the small sample should be considered when making generalizations about the findings reported herein.

Limitations

This was an initial inquiry into an ongoing intervention program, which meant staff were mostly inexperienced in research procedures prior to their training for this specific study. Relatedly, participants were not accustomed to completing self-report measures related to their behavioral health treatment were likely impactful. Given more time or ability to employ trained researchers, there may have been less missing data (although examination of missing data did not indicate this to be a cause of concern for hypothesis testing) and the sample size may have been increased. Demographic variables make generalizability to larger populations difficulty, but not unlikely as a recent systematic review of YBP research indicates the typical demographic of study participants closely align with that of the present sample (Park, Braun, & Siegel, 2015). Participants in this and other YBP studies generally represent economically and racially advantaged communities who may have had more opportunities to engage in yoga prior to the study or to access other treatment options. Anecdotally, this demographic often has more access to yoga classes due to the often high cost of yoga studios, location, and undeniable lack of representation of diverse practitioners in advertisements, schools and studios for yoga across the USA. This study further reinforces these demographic characteristics of yoga practitioners as it was based on a convenience sample similar to other YBP research publications (Park, Braun, & Siegel, 2015).

Additionally, while some research has demonstrated bidirectional relationships between state and trait mindfulness (Kiken, Garland, Bluth, Palsson, & Gaylord, 2015), it was an assumption of this study design that participants would experience states of mindfulness during and following the yoga intervention, as demonstrated by changes in subjective well-being and state anxiety. In future studies state mindfulness should be assessed both before and after the intervention to evaluate actual, rather than assumed, changes. Demographic characteristics of the present study indicate the majority of participants with previous yoga experience had 10 of more years of experience. Although duration of previous yoga practice was not found to be a statistically significant covariate in the present study, the majority of participants had been practicing yoga for at least one year. Changes may therefore be less evident in participants with greater previous exposure to the general model of yoga, regardless of differing class structures or foci. It is also important to consider potential measurement errors related to low internal consistency coefficients for the STAI State scale as well as some scales on the PDSQ.

Future Directions

For the purposes of informing the ongoing Psychotherapeutic Yoga Program at the Lifeologies Institute, it appears worth considering the differential impacts of different instructor style and personality, as well as "readiness" for psychotherapeutic yoga treatment in clients. Present results should not discourage the counseling center from continuing to use and develop their intervention, as anecdotal reports from staff indicate clients do indeed experience positive impacts from the programming. The present study contained many limitations, as described above, and true effects may have gone undetected as a result (i.e., Type II error).

Further, efforts to obtain larger sample sizes to increase power and demographic variability are strongly encouraged. There may be substantial value in evaluating a similar intervention design with diverse samples, particularly those with less yoga experience who are not already benefiting from their yoga training (e.g., such as inner-city school children as is done in programs such as the local Yoga-N-Da-Hood, college campuses, and/or community centers) to gain a more robust demographic and clinical constellation. These factors should also include information pertaining to participant health indicators (e.g. ability and disability status) to help parse findings, particularly pertaining to fatigue. Future research is encouraged to adapt the rigor of the current investigation, a key strength of this work that advances the field of inquiry in this area, and utilize robust and advanced statistical modelling to fully capture effects of related variables.

APPENDIX

UNT IRB APPROVAL

University of North Texas Institutional Review Board

Informed Consent Form

Before agreeing to participate in this research study, it is important that you read and understand the following explanation of the purpose, benefits and risks of the study and how it will be conducted.

Title of Study: Impact of Yoga on Mental Well-being

Student Investigator: Monica M. Gerber University of North Texas (UNT) Department of Psychology. **Supervising Investigator:** Jennifer Callahan, PhD ABPP; Professor, Department of Psychology; University of North Texas (UNT)

Purpose of the Study: You are being asked to participate in a research study investigating whether psychotherapeutic yoga fosters psychological well-being in treatment-seeking individuals with anxious and depressive symptoms. The study will also examine potential differential effects of individual versus group yoga sessions, as well as any potential observable differences in outcomes by instructor.

Study Procedures: You will be asked to complete measures of well-being prior to taking a yoga class at Lifeologies. Following the class, you will be asked to complete additional measures. Each participant is expected to take 15-20 minutes to complete the study questionnaires prior to and following the yoga intervention. Each yoga session is approximately 60 minutes. The total participation time is estimated to range from 90-100 minutes. You will be asked questions about your previous experience with yoga and mental health care, as well as symptoms related to depression, anxious disorders, mindfulness, and well-being.

Foreseeable Risks: There may be slight risk of physical strain, if postures and exercises are not carried out as instructed or with proper support. This risk, however, is not foreseeably great, as the program has been designed to be adaptive and therapeutic rather than physically strenuous. If, after leaving the Lifeologies office, you feel distressed by questions you answered as part of the current research study, mental health crisis intervention is available for Dallas county at 866260-8000 (Northstar) or for Tarrant County 800-866-2465 (Tarrant County MHMR). If you need immediate assistance.

Benefits to the Subjects or Others: By participating in this study, you may be contributing to our understanding of the effects of yoga on the body and mind. You may also experience a decrease in anxious or depressive symptoms following the yoga class, and an increase in mindfulness and perceived well-being.

Compensation for Participants: You will be entered in a drawing to win one of three $50 gift cards to a major retailer: Nordstrom.

Procedures for Maintaining Confidentiality of Research Records: After you finish the measures, we ask that you place all documents in the provided envelop and seal prior to returning to the staff member. All sealed envelopes will be transported to the research team's office on a weekly basis. To protect the participant identities, signed consent forms will be kept separately from the coded data gathered from the measures and assessments. All data will be kept secured in a locked area in the Supervising Investigator's office on the UNT campus for auditing purposes. The confidentiality of your individual information will be maintained in any publications or presentations regarding this study.

All demographic information and answers to questions regarding history of mental health care or current experience of symptoms will be kept and analyzed separately from any identifying data. This information will be used for analytic purposes only, to best understand the make-up of the current sample and the impact of the present yoga intervention on mental health.

Questions about the Study: If you have any questions about the study, you may contact the Supervising Investigator, Dr. Jennifer Callahan at USA telephone number +1-940-369-8229 or by email at Jennifer.Callahan@unt.edu.

Review for the Protection of Participants: This research study has been reviewed and approved by the UNT Institutional Review Board (IRB). The UNT IRB can be contacted at (940) 565-4643 with any questions regarding the rights of research subjects.

Research Participants' Rights:

Your signature below indicates that you have read or have had read to you all of the above and that you confirm all of the following:

- The researcher has explained the study to you and answered all of your questions. You have been told the possible benefits and the potential risks and/or discomforts of the study.
- You understand that you do not have to take part in this study, and your refusal to participate or your decision to withdraw will involve no penalty or loss of rights or benefits. The study personnel may choose to stop your participation at any time.
- You further understand you may choose to discontinue participation at any time, though information provided prior to that point may be used by the researchers.

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