Yoga for Mental Health:
Evaluation of yoga interventions
for reducing depression and anxiety,
and improving well-being

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I, Michael de Manincor, declare that this thesis, submitted in fulfilment of the requirements of the award of PhD, at the National Institute of Complementary Medicine, in the School of Science and Health, Western Sydney University, is wholly my work unless otherwise referenced or acknowledged.

This document has not been submitted, either wholly or in part, to any other educational institution.

Signature:          Date:
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<tr>
<td>ACT</td>
<td>Acceptance-Commitment Therapy</td>
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<tr>
<td>AD</td>
<td>Antidepressant</td>
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<td>ADM</td>
<td>Antidepressant Medication</td>
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<td>AL</td>
<td>Allostatic Load</td>
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<td>ANS</td>
<td>Autonomic Nervous System</td>
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<td>BA</td>
<td>Behavioural Activation</td>
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<td>BDZ</td>
<td>Benzodiazepines</td>
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<td>BT</td>
<td>Behaviour Therapy</td>
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<td>CAM</td>
<td>Complementary and Alternative Medicine</td>
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<td>CBT</td>
<td>Cognitive Behaviour Therapy</td>
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<tr>
<td>CM</td>
<td>Complementary Medicine</td>
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<td>CMT</td>
<td>Compassionate Mind Training</td>
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<tr>
<td>CRH</td>
<td>Corticotropin-Releasing Hormone</td>
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<tr>
<td>CT</td>
<td>Cognitive Therapy</td>
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<tr>
<td>DSM</td>
<td>Diagnostic and Statistical Manual</td>
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<td>ECT</td>
<td>Electro-Convulsive Therapy</td>
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<td>EE</td>
<td>Energy Expenditure</td>
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<td>GABA</td>
<td>Gamma Amino-Butyric Acid</td>
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<td>GAD</td>
<td>Generalised Anxiety Disorder</td>
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<td>HPA</td>
<td>Hypothalamic-Pituitary-Adrenal</td>
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<tr>
<td>ICD</td>
<td>International Classification of Diseases</td>
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<tr>
<td>MAOI</td>
<td>Monoamine Oxidase Inhibitor</td>
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<tr>
<td>MBCT</td>
<td>Mindfulness-Based Cognitive Therapy</td>
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<tr>
<td>MBS</td>
<td>Mild Brain Stimulation</td>
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<tr>
<td>MBSR</td>
<td>Mindfulness-Bases Stress Reduction</td>
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<tr>
<td>MDD</td>
<td>Major Depressive Disorder</td>
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<tr>
<td>OCD</td>
<td>Obsessive-Compulsive Disorder</td>
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<tr>
<td>PAI</td>
<td>Positive Activity Intervention</td>
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<tr>
<td>PI</td>
<td>Positive Intervention</td>
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<tr>
<td>PMR</td>
<td>Progressive Muscle Relaxation</td>
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<tr>
<td>PNS</td>
<td>Parasympathetic Nervous System</td>
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<td>PPI</td>
<td>Positive Psychology Intervention</td>
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<td>PPT</td>
<td>Positive Psychotherapy</td>
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<tr>
<td>PTSD</td>
<td>Post-Traumatic Stress Disorder</td>
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<tr>
<td>Abbreviation</td>
<td>Description</td>
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<tr>
<td>QoL</td>
<td>Quality of Life</td>
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<tr>
<td>RCT</td>
<td>Randomised Controlled Trial</td>
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<tr>
<td>RT</td>
<td>Relaxation Training</td>
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<tr>
<td>rTMS</td>
<td>Repetitive Transcranial Magnetic Stimulation</td>
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<tr>
<td>SNRI</td>
<td>Serotonin Norepinephrine Reuptake Inhibitor</td>
</tr>
<tr>
<td>SNS</td>
<td>Sympathetic Nervous System</td>
</tr>
<tr>
<td>SSRI</td>
<td>Selective Serotonin Re-uptake Inhibitor</td>
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<tr>
<td>SWB</td>
<td>Subjective Well-Being</td>
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<tr>
<td>TAU</td>
<td>Treatment as Usual</td>
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<td>TCA</td>
<td>Tricyclic Antidepressants</td>
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<tr>
<td>tDCS</td>
<td>Transcranial Direct Current Stimulation</td>
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<tr>
<td>TMS</td>
<td>Transcranial Magnetic Stimulation</td>
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Abstract

Depression and anxiety are leading causes of disability worldwide and major contributors to the global burden of disease. Current treatments are primarily pharmaceutical and psychological. However, questions remain about the effectiveness of, and barriers to access to conventional treatments. There is increasing interest in complementary, mind-body, and lifestyle approaches, including yoga. Previous research suggests potential benefits of yoga in reducing depression and anxiety.

The aim of this thesis was to investigate the potential benefits of yoga in managing depression and anxiety, and evaluate associated improvements in mental health and well-being.

Current concepts of depression, anxiety and their comorbidity are reviewed, as are conventional approaches to management and treatment of the disorders. Positive psychology approaches to mental health, and the opportunity for development of non-conventional approaches to therapeutic interventions, including yoga as a form of mind-body mental health intervention are considered.

Prior research into the benefits of yoga for depression and anxiety has demonstrated potential benefits however, the results and interpretations must be treated with caution, due to methodological limitations and heterogeneity of interventions used.

In response to concerns of heterogeneity of yoga interventions used in prior research, a consensus-based yoga intervention was developed utilising a Delphi method study. From the results of the study, a consensus statement was produced on components of yoga practice that could be used in research evaluating yoga for reducing depression or anxiety and improving well-being.

Central to this thesis and testing of the hypotheses, was the conduct of a clinical trial to evaluate a yoga-intervention for reducing depression and anxiety, and increasing well-being.

The effectiveness of the consensus-based yoga intervention was evaluated in a randomised controlled trial (RCT), with an additional crossover trial design. A sample of 101 people with depression and/or anxiety participated in an RCT comparing a 6-week yoga
intervention with waitlist control. Both groups continued other treatments as usual. The control group was offered the yoga following the waitlist period. Participants were also assessed at 6-week follow-up. Primary outcome measures were the depression and anxiety sub-scales of the Depression Anxiety and Stress Scale (DASS21). Secondary outcome measures included the stress sub-scale of the DASS21, total DASS score, Kessler Psychological Distress Scale (K10), Short Form Health Survey (SF12), Scale of Positive and Negative Experience (SPANE), Flourishing Scale (FS), and Connor-Davidson Resilience Scale (CDRISC2).

Results of the RCT showed a statistically significant reduction of DASS depression scores in the yoga group relative to the waitlist group (AMD -4.30; 95% CI’s -7.70, -0.91; p=0.01; effect size -0.44). The reduction of DASS anxiety scores with yoga relative to waitlist was not statistically significant (AMD -1.91; 95% CI’s -4.58, 0.76; p=0.16). However, influential outlying data were observed in changes from pre to post anxiety scores (with Cook’s distance values > 0.04). After trimming of these data, group differences on anxiety scores were statistically significant (AMD -2.53; CI’s -4.71, -0.35; p=0.02; effect size -0.40). Statistically significant differences in favour of yoga were also found on secondary measures: total DASS (p=0.03), K10, SF12 mental health, SPANE, FS and resilience scores (p<0.01 for each). Differences in stress and SF12 physical health scores were not statistically significant. Benefits were maintained at 6-week follow-up.

The overall results of the clinical trial suggest that the yoga intervention in addition to regular care was effective in the reduction of symptoms of depression and anxiety when compared with regular care alone. The benefits remained statistically significant after correcting for changes in usual treatment, and were maintained at six-week follow-up. These results were demonstrated in the randomised controlled trial, as well as the single group crossover trial design.

In conclusion, yoga intervention plus regular care was effective in reducing depression compared with regular care alone, and continued to improve at follow-up. Further investigation is warranted for reduction of anxiety. Individualized yoga is recommended as an optional mental health intervention, and may beneficial in mental health care in the broader community.
SECTION 1 BACKGROUND AND THERAPEUTIC CONTEXT

Chapter 1 Introduction

Mental Health and Treatment of Mental Disorders

Mental health concerns are common. They are recognised worldwide as leading causes of disability and major contributors to the global burden of disease, and their prevalence appears to be increasing (WHO, 2014c). The World Health Organisation (WHO) reports that health systems have not adequately responded to the burden of mental disorders; and there is a large gap between the need for treatment and its provision all over the world (WHO, 2013).

The practice and teachings of Yoga\(^1\) have been in existence for millennia, originating from the Vedic tradition of the Himalayan Mountains. Many claims are made of a wide range of yoga’s health benefits, including mental health, and modern yoga has become popular throughout many parts of the world today. Whilst modern popular yoga is predominantly recognised by its physical postures, the classical system Yoga may be more fully understood as a practical psychology, or a breath-centered mind-body-lifestyle approach to mental health.

This thesis is an investigation of Yoga as a system of mental health, and an evaluation of a yoga-based intervention for reducing symptoms of depression and anxiety, and associated increases in well-being.

Mental health is defined by the World Health Organisation (WHO) as “a state of well-being in which every individual realises his or her own potential, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to her or his community” (WHO, 2014a). This positive dimension of mental health is reflected in WHO’s broader definition of health, contained in its constitution: “Health is a state of complete physical, mental and social well-being and not merely the absence of disease or infirmity” (WHO, 1946).

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\(^1\) “Yoga” (as a proper noun) is used to signify the classical system based in Patanjali’s Yoga Sutra, whereas “yoga” is used in the more generic popular use of the term.
Mental health disorders comprise a broad range of problems with different symptoms, and can be categorised using an extensive range of diagnoses (APA, 2013; WHO, 2015). However, they are generally characterised by some combination of abnormal thoughts, emotions, behaviour and relationships with others (WHO, 2014b).

Mental health care is generally associated with treatment of diagnosed disorders. However, WHO emphasises that “mental health is recognised as more than the absence of mental disorders, and is an integral part of health. Indeed, there is no health without mental health” (WHO, 2014c).

Depression and anxiety are common mental health concerns. They are leading causes of disability worldwide, and are major contributors to the global burden of disease (Costa e Silva, 1998; Kessler et al, 2009; Whiteford et al, 2013). Current global prevalence of diagnosed anxiety disorders in a given year is 11.6% (one in nine) (WHO, 2012; Baxter et al, 2013). Current global prevalence of diagnosed Major Depressive Disorder (MDD) in a given year averaged 4.7% (4.0% in low/middle income countries, and 5.1% in high-income countries) (Kessler et al, 2015). Many people also experience comorbidity of the disorders, symptoms that may be sub-syndromal, residual or undiagnosed (Epstein, R. et al, 2010; Gorman, 1996; Li et al, 2009; Menza et al, 2003), and may also go untreated (Jorm et al, 2013; Wang et al, 2007; Whiteford, 2008).

In 2011-12, it was estimated that three million people in Australia (13.6% of the adult population) had a mental and behavioural condition in the prior year, an increase from 11.2% in 2007-08, and 9.6% in 2001 (ABS, 2012). Mental and behavioural conditions continued to be more common amongst women than men (15.1% compared with 12.0% respectively) (ABS, 2012). The 12-month prevalence of diagnosed anxiety disorders is 3.8%, and affective (mood) disorders, including depression, is 9.7% (ABS, 2012). The Australian Psychological Society estimates one in five Australians will experience an episode of clinical depression in their lifetime (APS, 2015b).

Mental health concerns are also indicated by psychological distress (ABS, 2015; Kessler et al, 2002). Measures of psychological distress are often used by general medical practitioners in Australia, as part of patient assessment for referral for mental health services and treatment, especially for depression and anxiety disorders. In 2014-15, around one in
nine Australian adults (11.7% or 2.1 million people) experienced high or very high levels of psychological distress (measured on the Kessler Psychological Distress Scale, or K10), a slight increase from 2011-12 (10.8% or 1.8 million people) (ABS, 2015). More women than men experienced high or very high levels of psychological distress (13.5% and 9.9% respectively). Adults living in areas of most disadvantage across Australia were more than twice as likely to experience high or very high levels of psychological distress than adults living in areas of least disadvantage (17.7% compared with 7.3% respectively), continuing the pattern from 2011-12 (15.0% compared with 6.2% respectively). Between 2011-12 and 2014-15, rates of high or very high psychological distress remained stable across most age groups, with the exception of 18-24 year old women (up from 13.0% to 20.0% respectively). Women aged 18-24 years had the highest rate of any age-sex group in 2014-15. Around two-thirds of Australian adults (68.0% or 12.2 million people) experienced a low level of psychological distress.

Mental health may also be viewed on a continuum, conceived as a constellation of dimensions of subjective well-being. Such a continuum may range from languishing, to moderate, to flourishing, and can be used for distinguishing and predicting levels of functioning for individuals with and without a diagnosed mental disorder (Keyes, 2002b; Keyes, 2002a). Concepts such as this are well-established in the field of Positive Psychology, which, consistent with WHO definitions, posits that a more positive paradigm to conceptualisation, treatment, prevention, and promotion of population mental health is warranted (Keyes, 2002b; Seligman et al, 2005; Wood & Tarrier, 2010).

Current treatments and interventions for depression and anxiety include medical, psychological, complementary, mind-body, and lifestyle interventions, and combinations of these (Balon, 2004; Black Dog Institute, 2015c, 2015b, 2015a; Hollon & Ponniah, 2010; Hunot et al, 2007; Jorm et al, 2013; Kessler et al, 2001; Kotsirilos et al, 2011; Mead et al, 2009; Swinson et al, 2006; van der Watt et al, 2008). In Australia and other developed countries, medical & psychological treatments are the most common (Black Dog Institute, 2015b, 2015a; Jorm et al, 2013; Reavley et al, 2013). Medical treatments (described by the Black Dog Institute as “physical treatments”, Black Dog Institute, 2015a), include a range of
pharmaceutical medications and electroconvulsive therapy (ECT). Commonly used psychological treatments include Cognitive Behaviour Therapy (CBT), Interpersonal Therapy, and a 3rd wave of Mindfulness-based therapies, including Mindfulness-Based Cognitive Therapy (MBCT), and Acceptance-Commitment Therapy (ACT).

Whilst extensive research provides an evidence base of the effectiveness of these forms of interventions (Jorm et al., 2013; RANZCP, 2004; Swinson et al., 2006), questions remain about efficacy, side effects and risk of harm, placebo effects, cost effectiveness, individual choice, barriers and access to services, compliance, ethics and long term benefits (Andrews et al., 2000; Ankarberg & Falkenstrom, 2008; Biegler, 2010; Blumenthal, R. & Endicott, 1996/1997; Harris et al., 2015; Hasler, 2010; Wang et al., 2007). In particular, psycho-pharmaceutical medications are known to have a number of limitations, including adverse side-effects (Gartlehner et al., 2015; Hindmarch, 1998), and several reviews of the research found only small differences between antidepressant medications and active placebos, especially for mild/moderate depression (Arroll et al., 2009; Cuijpers et al., 2014b; Fournier et al., 2010; Hougaard, 2010; Moncrieff et al., 2004). Some people choose not to be medicated, and others remain depressed or anxious despite medications, often described as “treatment resistant” (Fava, M. & Davidson, 1996; Fava, M., 2003; Nierenberg et al., 2007).

Psychological treatments are generally free from side effects. However, some people choose not to seek psychotherapy because of perceived stigma, cultural issues, financial cost or service availability. Also, a number of barriers to the implementation of these interventions have been identified in Australia (Killackey et al., 2008). These include patient, practitioner, health system, social and other barriers (ABS, 2008; Andrews et al., 2000). Despite the availability of treatments, 40% of patients with depression or anxiety do not seek treatment, and of those who do, less than half receive beneficial or evidence-based treatments (Tiller, 2012; Harris et al., 2015). Problems associated with psycho-pharmaceutical medications and conventional psychological interventions are well-recognised as reasons for seeking complementary and alternative therapies (Astin, 1998; Biegler, 2010; Jorm et al., 2002; Killackey et al., 2008; Simon et al., 2004).

There is a general recognition that mental health services in Australia are in need of reform. The Australian Medical Association has identified concerns about funding and access to
effective evidence-based services, as well as the need for research, and has recommended that mental health services should be evidence-based and continuously improved as a result of sound research in the area of mental health service delivery, including community-based primary care mental health (AMA, 2011). “All Australians with a mental illness deserve to have ready access to quality mental health care, based on their particular needs. This requires a significant expansion of services, intervention and support for people with mental illness across the whole continuum of care.” (AMA, 2011, p1).

Such reform of mental health services includes opportunities for further development of evidence-based non-conventional treatments, interventions and services. There is increasing interest in the potential role of complementary medicine (CM), mind-body and lifestyle interventions, including yoga, for assisting people with mental health concerns (Annapoorna et al, 2011; Astin, 1998; Barnes et al, 2008; Cramer et al, 2013b; D'Silva et al, 2012; Jeter et al, 2015; Jorm et al, 2013; Kessler et al, 2001; Kotsirilos et al, 2011; Sarris et al, 2014; Uebelacker et al, 2010a; van der Watt et al, 2008; Weintraub, 2004). CM, mind-body and lifestyle interventions (also referred to as “Self-help and Alternate Therapies”, Black Dog Institute, 2015c) with an established evidence-base for treatment of depression and anxiety, include herbal medicines, acupuncture, exercise, relaxation training, controlled breathing and meditation-based interventions (Jorm et al, 2002; Jorm et al, 2004; Jorm et al, 2013; Reavley et al, 2013).

Yoga has also been identified as having a potential role as an intervention for mental health concerns such as depression and anxiety (Jeter et al, 2015; Jorm et al, 2013). Prior research, including several systematic reviews and meta-analyses, suggests potential benefits of yoga in reducing depression and anxiety (Annapoorna et al, 2011; Bonura & Pargman, 2009; Butler, L. et al, 2008; Cabral et al, 2011; Cramer et al, 2013b; Gothe et al, 2012; Kinser et al, 2013; Kirkwood et al, 2005; Pilkington et al, 2005; Shapiro et al, 2007; Smith, C. et al, 2007; Streeter et al, 2010; Uebelacker et al, 2010a; Uebelacker et al, 2010b; Woolery et al, 2004). However, variety in diagnoses, severity of symptoms, and types of interventions, as well as limitations of trial methodology, reporting, and risk of bias, suggest that the findings must be interpreted with caution (Cramer et al, 2013b; Cramer et al, 2015;
Uebelacker et al., 2010a). A common concern in the research reviews is the considerable heterogeneity, and lack of detail, rationale and consistency of approach in the types of yoga interventions between the various studies (Cramer et al., 2013b; Uebelacker et al., 2010a; Kirkwood et al., 2005).

Yoga is a wholistic multidimensional system of health and well-being that focuses on the mind and its functions, with multi-component mind-body practices, including i) physical postures and movement; ii) breathing exercises; iii) relaxation; and iv) mindfulness and meditation. Other aspects of yoga practice include cultivation of positive values, thoughts and attitudes, and lifestyle factors (de Manincor et al., 2015). Yoga may be taught individually or in group classes, and is often tailored to the needs and preferences of different individuals and groups (Desikachar TKV, 1995). The multidimensional and individualised nature of Yoga, renders it difficult to standardise interventions for randomised controlled trials, draw generalisable conclusions of the benefits of Yoga, or evaluate the effectiveness of the key components of interventions.

Despite these limitations, growing evidence suggests that further research into the effectiveness of yoga as an intervention to help people who suffer from mental health concerns such as depression and anxiety, including its cost-effectiveness, is warranted (Annapoorna et al., 2011; Butler, L. et al, 2008; Janakiramaiah et al., 2000; Shapiro et al, 2007; Sharma et al, 2005; Smith et al, 2007; Streeter et al, 2010; Uebelacker et al, 2010a; Uebelacker et al, 2010b; Woolery et al, 2004).

There are several reasons why yoga may be an attractive intervention for mental health (Uebelacker et al, 2010a). Yoga may be appealing to people who are concerned with the side effects of medications, or the stigma or narrow focus on treating “disorders” that defines much of current mental health treatment, and are instead attracted to a broader focus on living a healthier, happier and flourishing life. Yoga is seen as more participatory and includes a broader focus on mind-body or lifestyle interventions (Uebelacker et al, 2010b).

Secondly, yoga is increasingly more available in many locations, can also be done at home without need to attend group yoga classes, and may be more cost-effective compared to other types of mental health interventions. As a non-pharmaceutical form of
mind-body-lifestyle intervention, yoga could also be used as an adjunct to conventional treatments. A yoga practice can be modified for people with specific concerns, such as pregnant women, who are frequently reluctant to use medications (Shivakumar et al, 2011; Newham et al, 2014). Due to the low risk of adverse events associated with yoga (Cramer et al, 2013a), it can be recommended to people with physical or mental ailments, as long as it is appropriately adapted to their needs and abilities and performed under the guidance of an experienced and suitably trained yoga teacher (Cramer et al, 2013a). Finally, yoga may also have a range of other desirable effects in general health and well-being, including musculo-skeletal, diabetes, obesity and cardiovascular (Bernstein et al, 2014; Bodhe & Jankar, 2015; Boolani et al, 2013; Büssing et al, 2012b). Many yoga practitioners view yoga as a way to promote physical and mental health, rather than a treatment for a specific illness (Uebelacker et al, 2010a).

Whilst modern yoga is generally taught in group classes and according to particular styles, it may also be taught individually and tailored to the needs and preferences of different individuals and groups (Desikachar TKV, 1995). This latter approach is more consistent with classical teachings and practice of yoga, known as the viniyoga of yoga (Desikachar TKV, 1995; Desikachar TKV et al, 2001; Kraftsow, 1999; Mohan & Mohan, 2004), as well as recent recognition of the need for more personalised treatment approaches in mental health service settings (Beyond Blue, 2016a; Castle et al, 2012; Craske, 2012; Drake et al, 2009; Malthi et al, 2015). When yoga is used to assist people in treatment or recovery from injury, illness or disability, including mental health concerns, it is often referred to as yoga therapy (Annapoorna et al, 2011; Devi, 2014; Mohan & Mohan, 2004; Partlow-Lauttamus, 2014).

The aim of this thesis is to investigate yoga as an intervention for mental health, in the context of a broader understanding of psychology, mind-body medicine, and mental health care, with a particular focus on reducing depression and anxiety, and associated increases in well-being. In chapter 2, I will present a summary of current conceptualisations of depression and anxiety disorders, as well as an overview of the concepts of mental health and well-being. In chapter 3, I will describe current evidence-based treatments and interventions for depression and anxiety, and their comorbidity. These two chapters provide
the medical, psychological and neurophysiological therapeutic context, within which yoga may be understood and evaluated as an intervention for reducing depression and anxiety, and improving mental health and well-being. Chapter 4 describes and explores the system of yoga itself, its historical origins and modern developments, an understanding of yoga as an intervention for mental health care, a review of evidence of the effectiveness of yoga for reducing depression and anxiety (including a systematic review of randomised controlled trials), and finally, a presentation of plausible mechanisms of action of how yoga might work for reducing depression and anxiety, and improving mental health and well-being.

Section 2 describes the development of an individualised yoga intervention protocol, utilising a Delphi method study. The results of this study provided a consensus statement, which was used for the development of an intervention, and later implemented in our clinical trial. This approach was taken and included in this thesis, in response to concerns identified in reviews of prior research related to the development and heterogeneity of interventions used in clinical trials of yoga for depression and anxiety. Section 3 describes the methodology and results of a randomised controlled trial that was conducted to evaluate the effectiveness of the yoga intervention. Finally, section 4 provides a discussion of the results of the clinical trial, and recommendations for future research in yoga for mental health, and implementation in mental health care.

In the context of current conceptualisations and interventions for depression and anxiety disorders, and broader mental health care, this study adds to the existing literature by 1) developing an understanding of yoga as a multidimensional, multi-component, mind-body-lifestyle approach to mental health care; 2) developing a consensus-based yoga intervention protocol for reducing depression and anxiety, and increasing well-being; and 3) evaluating the effectiveness of the intervention in a clinical trial.
Chapter 2 Current Conceptualisations of Depression, Anxiety and Mental Health

This chapter begins by recognising that depression and anxiety are related. Although depression and anxiety are identified as diagnostically independent categories of mental disorders (APA, 2013), comorbidity of symptoms and diagnoses is well recognised and common (ABS, 2008; Aina & Susman, 2006; Altamura et al, 2004; Craske, 2012; Hunot et al, 2007; Keller & Hanks, 1995; Kendall, P et al, 1992; Kessler et al, 1994; Kessler et al, 2015; Malhi et al, 2015; Schatzberg, 2015; Tiller, 2012), and there have been longstanding questions of the theoretical and clinical significance of their comorbidity (Kendall, P et al, 1992; Sunderland et al, 2010; Zbozinek et al, 2012). Furthermore, it has been proposed that diagnostic conceptualisations of mental health disorders, such as depression and anxiety, within overall understandings of mental health have been lacking (Keyes, 2005; Seligman & Csikszentmihalyi, 2000; Wood & Tarrier, 2010). In this chapter, depression and anxiety will first be considered independently, followed by a consideration of their comorbidity. Finally, a context for understanding the disorders with broader notions of mental health and well-being will be presented.

What is Depression?

The term depression is often used to describe various and sometimes overlapping experiences. To many people being depressed means feeling sad, 'blue', tearful, downhearted, detached or having a lowered mood. However, experiencing these feelings does not necessarily mean someone has depression. Such feelings are common, generally brief and do not generally have significant or lasting effects on normal functioning (APS, 2015b; RANZCP, 2004). However, whilst clinical depression is also common, it is considered more serious and treatable. Untreated, it can result in disability and even death (RANZCP, 2004).

There are several different ways that depression is conceptualised as a diagnosed mental health disorder or illness. According to the 10th edition of the World Health Organization’s (WHO) International Classification of Diseases (ICD-10), a “depressive episode” is a type of mood (affective) disorder. In a depressive episode, the person suffers from lowering of mood, reduction of energy, and decrease in activity. Capacity for enjoyment, interest, and concentration is reduced, and marked tiredness after even minimum effort is common.
Sleep is usually disturbed and appetite diminished. Self-esteem and self-confidence are usually reduced and, even in the mild form, some ideas of guilt or worthlessness are often present. The lowered mood varies little from day to day, is unresponsive to circumstances and may be accompanied by so-called "somatic" symptoms, such as loss of interest and pleasurable feelings, disturbed sleeping including oversleeping, marked psychomotor retardation, agitation, loss of appetite, weight loss or weight gain, loss of libido, and symptoms are generally worse in the morning.

A depressive episode may be specified as mild, moderate or severe, depending upon the number and severity of symptoms experienced (WHO, 2015). A mild depressive episode is characterised by two or three of the above symptoms, and whilst the person is usually distressed by these, will probably be able to continue with most activities. A moderate depressive episode is characterised by four or more of the above symptoms being present, and the person is likely to have great difficulty in continuing with ordinary activities. A severe depressive episode is characterised by an episode of depression in which several of the above symptoms are marked and distressing, typically loss of self-esteem and ideas of worthlessness or guilt. Suicidal thoughts and acts are common and a number of the "somatic" symptoms are usually present. This may also be referred to as "major depression".

"Recurrent depressive disorder" is a disorder characterised by repeated depressive episodes, with varying degrees of severity, and without any history of independent episodes of mood elevation and increased energy (mania). There may, however, be brief episodes of mild mood elevation and overactivity (hypomania) immediately after a depressive episode, sometimes precipitated by antidepressant treatment. The more severe forms of recurrent depressive disorder have much in common with older disorder conceptualisations such as manic-depressive depression, melancholia, vital depression and endogenous depression. The first episode may occur at any age from childhood to old age, the onset may be either acute or insidious, and the duration varies from a few weeks to many months. The risk that a patient with recurrent depressive disorder will have an episode of mania never disappears completely, regardless of the number of depressive episodes experienced. If such an episode does occur, the diagnosis is generally changed to bipolar affective disorder.
In Australia, the psychology and medical professions generally use the term ‘clinical depression’ to refer to a diagnosable mental disorder (APS, 2015b; RANZCP, 2004), rather than a depressive episode of varying severity (ICD-10). Similarly, the term Major Depressive Disorder (MDD) as defined by the fifth edition of the Diagnostic and Statistical Manual (DSM-5) (APA, 2013) is also used in Australia, the USA, and other developed countries.

The Australian Psychological Society (APS) describes clinical depression is an emotional, physical and cognitive (thinking) state that is intense and long-lasting and has significant negative effects on a person’s day-to-day life (APS, 2015b). It involves a depressed mood or loss of pleasure in activities, plus four other criteria (e.g., change in sleep, energy, concentration, appetite) over the same two week period. The American Psychiatric Association (APA) describes MDD is a medical illness that affects how you feel, think and behave, causing persistent feelings of sadness and loss of interest in previously enjoyed activities. Depression can lead to a variety of emotional and physical problems. It is seen as a chronic illness that usually requires long-term treatment, and many people with depression have concurrent physical and other mental health disorders (APA, 2014). Episodes of MDD are also classified according to severity: A mild episode is when there are few symptoms beyond the minimum required to make the diagnosis, with mild disability or the capacity to function normally, but with usual and substantial effort required. A moderate episode is when more than minimum criteria are met, and there is greater functional impairment. A severe episode is when most diagnostic criteria are present, there is marked interference with social and/or occupational functioning, producing clear-cut, observable disability (e.g. inability to work or to care for children). In the extreme, afflicted people may be totally unable to function socially or occupationally, or even to feed or clothe themselves or to maintain minimal personal hygiene. The nature of symptoms (e.g. suicidal ideation and behaviour) is also be considered in assessing severity (RANZCP, 2004).

It is sometimes viewed as important to distinguish depression from the sadness and grief that is often experienced during bereavement (APA, 2014). Although the grief associated with such loss is often intense and long lasting, such emotions are considered a natural response to the loss. Prior to DSM-5, clinicians using DSM-IV were advised to refrain from diagnosing major depression in individuals within the first two months following the death of
a loved one in what has been referred to as the “bereavement exclusion” (APA, 2014). However, the bereavement exclusion has been removed from DSM-5. This change from DSM-IV is replaced by notes in the criteria that caution clinicians to differentiate between normal grieving associated with a significant loss, and a diagnosis of a mental disorder. Removing the bereavement exclusion helps prevent major depression from being overlooked and facilitates the possibility of appropriate treatment, including therapy or other interventions. DSM-5 aims to provide an accurate diagnosis for people who need professional help and no diagnosis for those who do not.

Whilst symptom-based diagnostic approaches to describing depression are well-established, debate continues regarding the adequacy and validity of such descriptive approaches, and the need for a more aetiology-based classification system has been recommended (Kendler, 2002; Luyten et al, 2006).

In summary, “depression” may include a “depressive episode” of varying severity, a medical or psychological diagnosis of “major depressive disorder” or “clinical depression”, or, in the absence of a diagnosis, a person may experience symptoms of depression, with varying degrees of severity and duration.

What causes depression? Aetiology, risk factors, and pathogenesis

Many factors predispose a person to or precipitate depression, including genes, gender, childhood experience, previous trauma, social and cultural factors, physical and physiological factors (including substance abuse and physical health problems), and stress (RANZCP, 2004).

Heritability: Genetics and Familial Factors

Epidemiological family, twin, and adoption studies provide solid and consistent evidence that depression is primarily a familial disorder, related to both genetic factors and gene-environment interactions (Ebmeier et al, 2006; Hasler, 2010; Sullivan et al, 2000). However, whilst this indicates broad familial risk factors, there is no solid evidence for specific genes or specific gene-by-environment (epigenetic) interactions in the pathogenesis of depression. Genome-wide association studies have indicated that many genes with small effects are
involved in complex diseases, increasing the difficulty in identifying such genes (Donnelly, 2008). Psychiatry is also viewed as lacking in genetic-based diagnostic tests, such as those available for many physical illnesses (Wellcome Trust Consortium, 2007), and depression has been identified as both clinically and genetically heterogeneous (Camp & Cannon-Albright, 2005). Psychiatric conditions in general have turned out to be highly resistant to robust gene identification (Hamet & Tremblay, 2005; Hasler, 2010). The limited success of genetic studies of depression has been related to the use of current classification schemas including the ICD and the DSM. These diagnostic manuals are based on clusters of symptoms and characteristics of clinical course that do not necessarily describe homogenous disorders, but instead reflect common final pathways of different pathophysiological processes (Hasler et al., 2004). That is, diagnosed mental health disorders such as depression are more related to the common symptomatic outcomes, rather than being a homogenous disorder with any known common underlying genetic causes (Sullivan et al., 2000).

Stress and Stressful Life Events

Stress is recognised as a major contributing factor in depression, and has been strongly associated with depression in both retrospective and prospective research (Belmaker & Agam, 2008; Bogdan & Pizzagalli, 2006; Brown, G. & Harris, 1978, 1989; Cohen, S. et al., 2010; Hammen, 2005; Kinser & Lyon, 2014; Pizzagalli et al., 2007; van Praag et al., 2004). Stressful life events, including adverse events in childhood, and ongoing or recent stress due to serious illness, other lifetime trauma, low social support, marital problems and divorce, have been linked to depression onset (Brown, G. & Harris, 1978, 1989; Kendler et al., 1999; Kessler, 1997; Sullivan et al., 2000). Stress may also exacerbate depressive symptoms (Kinser et al., 2012).

The impact of a particular stressor varies across individuals. As a result, the likelihood for a depressive episode is hypothesised to increase when individuals perceive stress as uncontrollable, unpredictable, and severe, and deem coping resources as insufficient (Hammen, 2005; Pizzagalli et al., 2007). Perception of uncontrollability of stressors, in particular, has been found to have profound physiological, cognitive, and motivational consequences, and increase vulnerability to emotional disorders (Pizzagalli et al., 2007).
Stress sensitivity in depression appears to be partly gender-specific. Whilst men and women are, in general, equally sensitive to the depressogenic effects of stressful life events, their responses vary depending upon the type of stressor. Specifically, men are more likely to have depressive episodes following divorce, separation, and work difficulties, whereas women are more sensitive to events in their proximal social network, such as difficulty getting along with an individual, serious illness, or death (Kendler et al., 2001). These findings point to the importance of gender-sensitive psychosocial approaches in the prevention and treatment of depression (Hasler, 2010).

The relationship between genetic and environmental factors, including stress and stressful life events, and the perceived stress response, remains unclear. However, the chronic nature of depression for many people, especially the “kindling” effect whereby each episode of depression increases the probability of another recurrence, suggests long-term neurobiological consequences. Given that the environment influences gene expression (epigenetics) and those epigenetic changes could affect the individual’s perception of the surrounding environment, then there is unlikely to be a strict dichotomy between genes and environment in terms of depression. Rather, there is most likely a cyclic relationship in the neuroregulation of mood and stress responsivity, such that depression may occur because of life stress, and life stress may be a result of depression. The interplay between stressors and the individual’s ability to cope appears to be a key factor in depression (Kinser et al., 2012; Luyten et al., 2006).

**Pathophysiology - Neurobiology and Neurochemistry**

Along with potential predisposing geno-psychosocial factors, significant neurobiological factors are associated with depression, including molecular, structural and functional alterations in several areas of the brain (Maletic et al., 2007; Palazidou, 2012).

- **Stress Hormones and the HPA axis**

Studies over the last 40 years have demonstrated that hyperactivity of the hypothalamic-pituitary-adrenal (HPA) axis is one of the most consistent biological findings in major depression psychiatry (Ehlert et al., 2001; Pariante & Lightman, 2008). The HPA axis is the primary endocrine system affected by the stress response (Cohen, S. et al, 2010). When a
person experiences stress, corticotropin-releasing hormone (CRH) is released from the hypothalamus. This induces the secretion of pituitary corticotropin, which stimulates the adrenal gland to release cortisol into the plasma. Dysfunction of the HPA axis is a well-established, but not universal, finding in affective disorders, being apparent in 50% of depressed patients (Palazidou, 2012). Altered stress hormone secretion appeared to be most prominent in depressed subjects with a history of childhood trauma (Heim et al., 2008; Palazidou, 2012).

- **Monoamine Deficiencies**

Monoaminergic systems are involved in the regulation of a broad range of brain functions, including mood, attention, reward processing, sleep, appetite, and cognition (Hasler, 2010). The monoamine-deficiency theory posits that the underlying pathophysiological basis of depression is a depletion of the monoamine neurotransmitters serotonin, norepinephrine or dopamine in the central nervous system, and that antidepressant drugs restore these to normal (Belmaker & Agam, 2008; Hasler, 2010; Palazidou, 2012). Almost every compound that inhibits monoamine re-uptake, leading to an increased concentration of monoamines, has been shown to be a clinically effective antidepressant (Belmaker & Agam, 2008). Inhibiting the enzyme monoamine oxidase, which induces an increased availability of monoamines in presynaptic neurones, also has antidepressant effects. However, there is no explanation for the mechanism of serotonin loss in depressed patients, and studies of serotonin metabolites in plasma, urine and cerebrospinal fluid, as well as post-mortem research on the serotonergic system in depression, have yielded inconsistent results (Hasler, 2010). There is some evidence that an increased availability of the brain monoamine oxidase, which metabolizes serotonin, may cause serotonin deficiency (Meyer et al., 2006).

- **Gamma aminobutyric acid (GABA)**

Low levels of the neuroreceptor GABA, has also been found with mood disorders (Brambilla et al., 2003; Sanacora et al., 1999). Patients have shown clinical improvements when treated with serotonin selective reuptake inhibitors (SSRIs) (Sanacora et al., 2002), ECT (Sanacora et al., 2003) and yoga (Streeter et al., 2007).
Interoception and sense of “self” - Deficiencies and Dysfunctions

Interoception comprises sensing the physiological condition of the body, as well as the representation of the internal state within the context of ongoing activities, and is closely associated with motivated action to homeostatically regulate the internal state (Craig, 2002, 2003, 2007, 2009; Farb et al, 2013; Paulus & Stein, 2010). Interoception includes a range of sensations such as pain, temperature, itch, tickle, sensual touch, muscle tension, hunger, stomach discomfort, and intestinal tension, which together provide an integrated sense of the body’s physiological condition, and an associated feeling sense of oneself or “self” (Paulus & Stein, 2010).

The meaning and implications of the concept of a “self” has been a long-standing focus of study and debate in philosophy, psychology and psychiatry (Combs & Soper, 1957; Epstein, S., 1973, 2003; Wylie, 1968; Zion, 1965). More recently, neurology and neurosciences have begun to examine the psychological and biological basis for the existence of a “self” (Farb et al, 2013; Gusnard, 2005; Simmons et al, 2013; Simmons et al, 2016). Reflecting upon oneself relates to an individual’s self-concept and plays a crucial role in the maintenance of emotional and physical equilibrium (Simmons et al, 2013). Being aware of our internal state modulates approach and distancing behaviours which, in turn, help us maintain and regain homeostasis (i.e., regulation of internal body state) (Paulus & Stein, 2010). Recent neuropsychological and functional neuroimaging studies have established the role of the insula in interoceptive awareness (Avery et al, 2014; Simmons et al, 2013).

Depression and anxiety are both associated with an altered experience of the individual with respect to self, others and the future (Paulus & Stein, 2010). Altered self-related thought processing, e.g., reduced tendency to self-favouring, exaggerated negative self-image, low self-esteem, negative evaluative bias for self-relevant information, and negative view about the relationship between the self and the world are associated with depression and anxiety (Paulus & Stein, 2010).

Abnormal interoceptive activity has been found in people with depression and anxiety disorders, including decreased interoceptive activity amongst individuals with depression, and in contrast, increased levels in anxiety (Avery et al, 2014; Simmons et al, 2016). Causal
or correlated abnormalities in interoceptive functions, negative self-referent associations, and changes in insula activity associated with depression and anxiety, are unknown.

In summary, the aetiology and pathophysiology of depression are complex. The role and interaction of genetics, stress, neurobiology and neurochemistry, perceptual and sense of self and self-worth, and other potential factors remains unclear. Factors that may initiate depression and those that maintain the condition are likely to be very different. Genetic and stress vulnerabilities interplay to initiate a cascade of neurobiological alterations that disrupt a dynamic and complex system. Progressive effects of recurrent and chronic depression may then be potentiated by further structural and functional neurological abnormalities (Maletic, 2007).

**What is Anxiety?**

Anxiety is generally described as feelings of fear, worry or nervousness about something with an uncertain outcome. It reflects the thoughts and bodily reactions a person may have when he or she is presented with an event or situation that he or she cannot manage or undertake successfully (APS, 2015a). The event or situation that is perceived as threatening, may be in the present moment, triggered by a memory from a past experience, or something imagined in the future. When a person is experiencing anxiety their thoughts are actively assessing the situation, sometimes automatically and outside of conscious attention, and developing predictions of how well they will cope based on past experiences. It is sometimes seen as a normal part of everyday life (Swinson et al, 2006).

Although some anxiety is seen as a normal response to a threatening situation, when the anxiety level is too high a person may not come up with an effective way of managing the threatening or stressful situation (APS, 2015a).

Symptoms or feelings of anxiety include ongoing worry or thoughts that are distressing, and interfere with daily living; confusion; trembling; sweating; faintness or dizziness; difficulty sleeping; increased heart rate; difficulty breathing; upset stomach or nausea; restlessness; avoidance behaviour; and irritability (APS, 2015a).
Australia’s Beyond Blue distinguishes between anxious feelings and anxiety, and describe anxiety as “more than just feeling stressed or worried. While stress and anxious feelings are a common response to a situation where a person feels under pressure, the feelings usually pass once the stressful situation has passed, or ‘stressor’ is removed. Anxiety is when these anxious feelings don’t subside. Anxiety is when the feelings are ongoing, exist without any particular reason or cause, and are difficult to control. In order to be diagnosed with anxiety, the condition must have a disabling impact on the person’s life.” (Reavley et al, 2013)

Similarly, the distinction is more often made between anxiety and anxiety disorders. Anxiety disorders are defined as a group of mental disorders characterised by various combinations of key features - excessive anxiety, fear, worry, avoidance, and compulsive rituals, that are associated with impaired functioning or significant distress (Swinson et al, 2006). According to this definition, and similar to the distinction made between feelings of depression and a diagnostic disorder, the main distinction between anxious feelings and a disorder, is a generally matter of severity and duration (Boyce et al, 2015).

Prior to 1980, the APA Diagnostic and Statistical Manual (DSM & DSM-II), as well as psychiatry in general, referred to neurotic disorders and hysteria (Costa e Silva, 1998). DSM-III (1980) introduced a major revision of terminology, generally replacing terms like neurosis and hysteria, in favour of “anxiety disorders”. Similarly, in 1992, WHO’s ICD-10 classification system largely (but not completely) abandoned use of the term neurosis as a diagnostic classification, and included use of the term anxiety to classify a range of mental health disorders (Costa e Silva, 1998).

Specific types of anxiety disorders include generalised anxiety disorder (GAD), which is the most common, specific phobias including social phobia or social anxiety disorder, panic disorder, obsessive-compulsive disorder (OCD), and post-traumatic stress disorder (PTSD) (APS, 2015a; Reavley et al, 2013; Swinson et al, 2006).

The most common anxiety disorder presenting in primary care settings, and the most substantive focus of research has been related to GAD (Baxter et al, 2013; Gwynn et al, 2008; Newman et al, 2013). Other anxiety disorders have specific distinguishing features, such as phobias and PTSD. The main differences between GAD and general symptoms of
anxiety are severity and duration of the symptoms, and GAD is the most relevant
diagnostic category to general anxiety symptoms.

What causes anxiety? Aetiology, risk factors, and pathogenesis

It was mentioned at the beginning of this chapter that anxiety and depression are related,
highly comorbid, and there is considerable overlap of symptoms and risk factors that
characterise the disorders. It is important to note here that there is ongoing controversy
about whether anxiety and depression constitute a common underlying emotional
disorder, or distinct and separate disorders (Barlow et al., 2004; Blanco et al., 2014; Gorman,
1996; Newby et al., 2015; Roy-Byrne et al., 1994; Sunderland et al., 2010; Tiller, 2012; Watson,
2005).

There is no one cause of anxiety. Rather, there are a number of factors that may contribute
to the development of anxious thoughts, feelings and behaviour (APS, 2015a). The
aetiology of GAD involves psychological, social and biological factors. Interpretation of
experimental data is complicated by changes in diagnostic practice and the frequent
occurrence of comorbidity, particularly with major depression (NCCMH, 2011). Whilst it
remains unclear whether anxiety and depression share a common underlying aetiology,
many of the factors related to aetiology and pathogenesis certainly appear to be
common (Cohen, J. et al., 2014; Hettema et al., 2005; Sunderland et al., 2010). Similar to
depression, many factors predispose a person to anxiety, including genes, childhood
experience, previous or recent trauma, physical and physiological factors (including
substance abuse and physical health problems), and stress (Katzman et al., 2014; Reavley
et al., 2013).

Heritability: Genetics and Familial Factors

Reviews and meta-analysis of family and twin studies clearly indicate a genetic
component to anxiety disorders (Hettema et al., 2001; Schienle et al., 2011; Wray, 2015a).
Earlier reviews of the research suggested that although anxiety disorders comprise a heterogeneous group of disorders, the underlying genetic architecture is relatively simple (Hettema et al., 2001; Hettema et al., 2005). However, progress in identifying a genetic basis of anxiety disorders has been limited (McGrath et al., 2012; Wray, 2015b). Similar to depression and most major psychiatric disorders, anxiety disorders are generally considered complex genetic conditions, the aetiology of which involves the effects of multiple genetic and environmental risk factors that combine and interact throughout the lifespan to produce illness (Schienle et al., 2011). Some research suggests a common genetic origin for depression and anxiety disorders (Kendler et al., 2007). However, this remains unclear and further research is required. Significant changes in diagnostic criteria in recent decades also makes it difficult to interpret the findings of prior research.

Stress and Stressful Life Events

It is well established that stressful or traumatic childhood experience is associated with a range of adult psychological disorders (Kessler et al., 1997; Young et al., 1997). Adverse experience during childhood development induces a non-specific vulnerability to the effects of stress later in life. This may predispose individuals to developing a wide array of mental and physical disorders, including anxiety disorders, that are known to manifest or worsen in relation to acute or chronic life stress (Ehlert et al., 2001; Heim & Nemeroff, 2001; Hettema et al., 2005; Safren et al., 2002).

Similar to depression, the impact of a particular stressor varies across individuals. The likelihood of a particular anxiety disorder resulting from similar types of stressful experiences is unknown. Perception of the uncontrollability of stressors, in particular, has been found to increase vulnerability to emotional disorders (Pizzagalli et al., 2007). Stressful life events in adult life, including job stress or changing jobs; change in living arrangements; pregnancy and giving birth; family and relationship problems; stressful or traumatic events; experiencing verbal, sexual, physical or emotional abuse; death or loss of a loved one, can also trigger symptoms of anxiety (Reavley et al., 2013).
Physical Health Problems and Breathing

Research has also found high prevalence of anxiety and mood disorders associated with a range of physical health problems, particularly those associated with chronic breathing disorders (Di Marco et al, 2006; Katon et al, 2004; Kunik et al, 2005; Maurer et al, 2008; Roy-Byrne et al, 2008; Scott et al, 2007). Consideration of breathing dysfunction as a risk-factor for anxiety and mood disorders is relatively recent (Paulus, 2013). Whilst there have been few clinical studies, Paulus concludes

“The physiology and neurobiology of breathing is a rapidly progressing field that provides an experimental scaffold to study the biological basis of how the body and the brain interact. More importantly, the experimental tools available enable one to begin to delineate how specific emotions emerge as a consequence of the body-brain interaction. There are some intriguing initial findings of altered breathing perception, different breathing patterns, and changes in the neural signature related to breathing in individuals with high anxiety or anxiety disorders. However, much work needs to be done to better delineate the direction of the relationship between breathing and anxiety as well as to evaluate how brain systems respond to the modulation of breathing as a powerful intervention to attenuate levels of anxiety. A deeper understanding of anxiety and associated disorder can emerge from investigating the molecular characteristics of peripheral lung receptors to the influence of controlled breathing during mindfulness.” (Paulus, 2013, p 318)

Personality Factors and Cognitive Style

Some research suggests that people with certain personality traits are more likely to have anxiety. For example, children who are perfectionists, easily flustered, lack self-esteem or want to control everything, sometimes develop anxiety during childhood or as adults (Beyond Blue, 2016b; Hudson, 2015). Similarly, the Australian Psychological Society suggests that people who have a tendency to be shy, have low self-esteem, and a poor capacity to cope are more likely to experience high levels of anxiety (APS, 2015a). Evidence to support this view includes strong genetic correlations between GAD and trait neuroticism (Cuijpers et al, 2014a), and also that individuals with inhibited temperament, a tendency towards internalising problems, and conduct problems during childhood have been linked to the development of GAD later in life (Hudson, 2015; Moffitt et al, 2007). Questions remain
about whether such personality factors and cognitive styles are inherent in the individual or learnt (Kindt, 2014; Mineka & Zinbarg, 2006).

Substance Abuse

Beyond Blue also suggest that heavy or long-term use of substances such as alcohol, cannabis, amphetamines or sedatives can also cause people to develop anxiety, particularly as the effects of the substance wear off. People with anxiety may also find themselves using more of the substance to cope with withdrawal related anxiety, which can lead to feeling worse (Reavley et al, 2013). Notwithstanding comorbidity, preliminary evidence on the potential temporal association between substance dependence and anxiety has suggested the “need to maintain a reasonable level of suspicion for anxiety disorders in individuals with substance use disorders” (Goodwin & Stein, 2013). Further research is needed to investigate more precise neurochemical mechanisms, and questions related to associations between specific substance use disorders and specific anxiety disorders.

Pathophysiology - Neurobiology and Neurochemistry

GAD has been labeled the basic disorder in psychopathology, due to findings that its fundamental characteristics may reflect central processes of all emotional disorders (Barlow, 1988, quoted in Newman et al, 2013). This proposition is central to ongoing controversy related to the high prevalence of comorbidity of mental health conditions, and ambiguity of common diagnostic criteria shared across different disorders, particularly depression and anxiety. Whether or not these characteristics of GAD are fundamental or simply shared with other disorders, remains unclear.

Evidence indicates that early life stress induces long-lived hyper(re)activity of the HPA axis and corticotropin-releasing factor (CRF) systems, as well as functional and structural alterations in other neurotransmitter systems, resulting in increased stress responsiveness (Heim & Nemeroff, 2001; Saveanu & Nemeroff, 2012), which is known to be common in most mental health disorders.

Characteristics of pathophysiology in anxiety disorders have been identified as being common with mood disorders, and described previously for depression. Much of the
related research has focused on depression, or anxiety and depression, but there is a striking lack of research into the biology of GAD (Schienle et al., 2011). This may be due to changes and ambiguity in diagnostic criteria. Common factors of pathophysiology identified in both depression and anxiety include dysregulation of the HPA axis, GABA modulation, and monoamine deficiencies, and abnormalities in interoceptive functions (Ehlert et al., 2001; Gorman, 1996; Heim & Nemeroff, 2001; Möhler, 2012; Nuss, 2015; Paulus, 2013; Paulus & Stein, 2010; Schienle et al., 2011).

In summary, conceptualisations of anxiety have changed significantly in recent decades, from prior diagnostic terms such as neuroticism and hysteria. Distinctions between anxious feelings, anxiety, and the variety of anxiety disorders remain unclear. Like depression, the aetiology and pathophysiology of anxiety disorders are complex. Genetics, stressful events and trauma, physical health problems - particularly those related to dysfunctional breathing, personality factors, cognitive style, and substance abuse, all seem to play a role in disruptions in a variety of neurochemical mechanisms. Conditions of anxiety also appear to share factors of both symptoms and aetiology of depression. Whilst distinct diagnostic categories have been developed, distinctions in underlying mechanisms between the two remain unclear.

**Comorbidity of depression and anxiety**

This chapter began by recognising that depression, anxiety and well-being are related. Although depression and anxiety are identified as diagnostically independent categories of mental disorders (DSM-5, APA, 2013), comorbidity of symptoms and diagnoses is well recognised and common (ABS, 2008; Altamura et al., 2004; Craske, 2012; Hunot et al., 2007; Keller & Hanks, 1995; Kendall, P et al., 1992; Kessler et al., 1994; Kessler et al., 2015; Schatzberg, 2015; Tiller, 2012). There have been longstanding questions of the theoretical and clinical significance of their comorbidity (Blanco et al., 2014; Gorman, 1996; Kendall, P et al., 1992;), which remains an important issue for treatment choice and outcomes (ABS, 2008; Altamura et al., 2004). Issues related to the comorbidity of depression and anxiety are now considered.
Epidemiological studies have consistently identified high prevalence of comorbidity between depressive and anxiety disorders, including MDD and GAD. Rates of comorbidity vary across different studies, depending on diagnostic criteria for both depressive and anxiety disorders, as well as comparisons of comorbidity of lifetime, 12-month and current diagnoses. Estimates from the 1990s in the USA suggested between 33 and 85% of people with MDD have a comorbid anxiety disorder, and up to 90% of people with anxiety disorders have a comorbid depressive disorder (Gorman, 1996). More recently in Australia, 39% of people diagnosed with GAD, also met criteria for a depressive disorder (Hunt et al, 2002), and the 2007 Australian National Survey of Mental Health and Wellbeing found over 30% of people with any anxiety disorder also had a diagnosed affective disorder (McEvoy et al, 2011). In a recent study of data across 10 different countries from the WHO World Mental Health Surveys, 52% of respondents with 12-month MDD also had one or more lifetime anxiety disorder, and 42% had a 12-month comorbid anxiety disorder (Kessler et al, 2015).

Multiple models have been proposed to explain these high rates of comorbidity (see Brown, T. et al, 2001; Blanco et al, 2014; Cohen, J. et al, 2014; Gorman, 1996; Klein, 2004; Schienle et al, 2011; Sunderland et al, 2010). Amongst the competing models and supportive evidence, a significant controversy has emerged related to the considerable overlap of symptoms and diagnostic criteria amongst depression and anxiety disorders (Barlow et al, 2004; Brown, T. et al, 2001; Persons et al, 2003; Watson, 2005; Zbozinek et al, 2012). As described above, there is strong evidence indicating that similar aetiological and maintenance processes underlie both depressive and anxious psychopathology. Anxiety and depressive disorders share many similar genetic, familial, and environmental risk factors. These disorders also share similar cognitive-affective, interpersonal, and behavioural maintaining factors, with the similarities superseding differences between the disorders (Newby et al, 2015). The primary distinguishing feature in symptom presentation between the disorder categories can be summarised as anhedonia in depression, and excessive worry in anxiety (Zbozinek et al, 2012).

Whilst some researchers conclude that evidence continues to support the view that MDD and GAD are “different nosological entities, with distinct latent structures” (Blanco et al,
and can be thought of as two distinct diagnostic entities that frequently co-occur because of a shared underlying trait (Ionescu et al., 2013; Sunderland et al., 2010), there have been longstanding and numerous proponents of the view that the two disorders represent something more like a spectrum or mixed anxiety-depression disorder, and “anxious depression” as sub-type of depressive disorders (Barlow et al., 2004; Fawcett & Kravitz, 1983; Gorman, 1996; Roy-Byrne et al., 1994; Sloan & Kring, 2010). Indeed, this proposition was considered in the review of DSM-IV, for inclusion in the DSM V (Kupfer et al., 2002; Regier et al., 2009; Watson, 2005), and whilst it was not included at that time, it remains an ongoing question (Blanco et al., 2014; Goldberg, D. & Fawcett, 2012).

**Mental Health and Well-being**

Diagnostic conceptualisations of depression, anxiety and their comorbidity have been developed in the fields of psychiatry and psychology for nearly 200 years. However, the concept of mental health remained undefined, unmeasured, and unrecognized, at least at the level of governments and non-governmental organizations, until relatively recently (Keyes, 2007). In 1999, a report of the US Surgeon General conceived mental health as “a state of successful performance of mental function, resulting in productive activities, fulfilling relationships with people, and the ability to adapt to change and to cope with adversity” (U.S. Department of Health and Human Services, 1999, p. 4). In 2004, the World Health Organization (WHO) published a historic first report on mental health promotion, conceptualising mental health as not merely the absence of mental illness but the presence of “a state of well-being in which the individual realizes his or her own abilities, can cope with the normal stresses of life, can work productively and fruitfully, and is able to make a contribution to his or her community” (WHO, 2004, p. 12).

These definitions affirm prior conceptualisations of mental health that come from behavioural and social sciences, where mental health was viewed as not merely the absence of mental illness but the presence of something positive (e.g., Jahoda, 1958; Maslow, 1970). It can also be seen that social and psychological scientists have been studying positive aspects of mental health, such as subjective well-being (SWB), and quality...
of life (QoL) for about 50 years (Diener, 1984; Grant et al, 1995; Keyes, 2006; Keyes et al, 2012).

In the past two decades, a new approach to understanding mental health and well-being has emerged, known as Positive Psychology (Seligman & Csikszentmihalyi, 2000). Positive Psychology is a broad field that encapsulates and builds on extensive prior research on positive aspects of mental health, including positive emotions, SWB, QoL, and shifts the focus from treatment of what is clinically wrong, to the promotion of well-being and the creation of a satisfying life filled with meaning, pleasure, engagement, positive relationships and accomplishment (Black Dog Institute, 2014a). Positive Psychology proposes alternatives to the diagnosis and treatment of mental disorders used in conventional psychology and psychiatry, and suggests that this conventional approach is often unhelpful (Keyes, 2002b; Keyes, 2005; Seligman & Csikszentmihalyi, 2000; Seligman et al, 2005; Seligman, 2011; Wood & Joseph, 2010; Wood & Tarrier, 2010). Mental health is viewed on a continuum, conceived as a constellation of dimensions of SWB, which includes building positive emotion, engagement, and meaning (Duckworth et al, 2005). Such a continuum may range from languishing (which is viewed as analogous to depression), to moderate and flourishing (also described as being in a state of “Flow”, Csikszentmihalyi, 1991), and can be used for distinguishing and predicting levels of functioning for individuals with and without a diagnosed mental disorder (Keyes, 2002b; Keyes, 2002a; Keyes & Haidt, 2002; Seligman, 2011; Wood & Joseph, 2010).

Keyes, Seligman and others have proposed that an understanding and “treatment” of mental disorders, such as depression and anxiety, are more effectively related to the cultivation of positive emotion, happiness and well-being, with growing evidence to support these reconceptualisations (Diener et al, 1999; Fredrickson, 2000; Gargiulo & Stokes, 2009; Keyes, 2002a; Keyes, 2005; Keyes, 2007; Lyubomirsky et al, 2005a; Lyubomirsky et al, 2005b; Seligman et al, 2005; Seligman, 2011; Sin et al, 2011). By looking at scores of SWB amongst people with diagnosed depressive disorders, an Australian study has shown that people with clinical depression exhibit a lower SWB than the normative range, and that positive levels of SWB were found in people who have recovered from depression and in
people who have no psychopathology (Gargiulo & Stokes, 2009). Further studies have shown this negative correlation between depressive symptoms and SWB or measures of happiness to be between $r = -0.2$ and $-0.5$ (Duckworth et al, 2005; Keyes, 2002a; Keyes, 2006; Keyes et al, 2012). Whilst this is not a particularly strong correlation, it warrants consideration and further exploration.

The Positive Psychology movement has also attracted considerable criticism (Wood & Tarrier, 2010). These criticisms are largely related to the movement rather than the importance or viability of research into positive functioning, or efficacy of interventions. The main criticisms include an overstating of the innovative novelty of the approach. The call for an increased focus on positive topics in psychology and mental health care have been in existence throughout the decades since the 1950s (Tennen & Affleck, 2003), found in the approaches of humanistic, existential, and psychodynamic psychology, and including the work of Gordon Allport in the mid-50s, Carl Rogers in the 60s, Rollo May and Eric Fromm in the 70s and 80s. Indeed, it has been noted that even the term “positive psychology” had been coined some decades earlier by Abraham Maslow (Wood & Tarrier, 2010). Whilst considerable research had been conducted into the benefits of cultivating positive aspects of mental health, little research had been done on benefits for mental health conditions such as depression and anxiety.

A second criticism has been that the movement of Positive Psychology has, to some extent, alienated itself from mainstream psychiatry, clinical psychology and mental health care. In so doing, it appears to have created a division in the research related to evidence-based interventions for mental health, and failed to integrate an understanding of the positive and negative aspects of mental health, by focusing solely on the positive (Bohart, 2002; Provencher & Keyes, 2011; Wood & Tarrier, 2010). Positive Psychology may be seen as the “other side of the coin”, focusing on that which has been overlooked or neglected in mainstream mental health care for decades. However, there has been a strong call for a more integrated approach of both positive and negative aspects of mental health in mental health care and research (Johnson & Wood, 2015; Joseph & Wood, 2010; Linley, 2006; Provencher & Keyes, 2011; Wood & Johnson, 2016; Wood & Tarrier, 2010).
Whilst the need for a change of approach in the mental health sector seems necessary and urgent, and these newer conceptualisations appear to be sensible and plausible, the need for an evidence-based approach for development of positive psychology interventions for mental disorders is required. The relationship between conceptualisations of mental disorders in conventional psychiatry and clinical psychology, and these emerging conceptualisations of mental health and SWB, require further exploration, research and evidence, and perhaps a more integrated approach (Provencher & Keyes, 2011).

Summary

The aetiology and pathophysiology of depression, anxiety, and their comorbidity are complex. Whilst contributing factors have been identified, the role and interaction of genetics, stress, trauma, neurological mechanisms, personality factors, cognitive style, sense of self and self-worth, and other factors related to both and each disorder, remain unclear. These conditions include varying medical or psychological diagnostic models, high rates of comorbidity, common symptoms, and may have common underlying psycho-neurological mechanisms. Those common mechanisms can be affected in different ways by a variety of factors. In the absence of a diagnosis, a person may experience symptoms of depression or anxiety, or both, with varying degrees of severity and duration. Factors that may initiate the conditions and those that maintain them are likely to be very different (Maletic et al, 2007).

Chapter 3 will explore current treatment and intervention approaches, including conventional, complementary and mind-body-lifestyle approaches, as well as a brief discussion of the potential benefits of yoga. Further exploration of yoga as a mental health intervention will be presented in Chapter 4, including a summary of evidence of efficacy and plausible mechanisms of action.

The call for a more integrated approach to understanding and managing mental health concerns, including depression and anxiety, is an important aspect of this thesis.
Consideration will be given to the benefits of yoga for both reduction of the symptoms and negative experiences of mental health disorders (depression, anxiety, and psychological distress), and associated increases in the positive aspects of mental health (such as positive emotions, flourishing and resilience). An evaluation of the effectiveness of yoga for mental health will be the main focus and latter sections of the thesis.
Chapter 3 Treatments and Interventions for Depression, Anxiety and their Comorbidity

Use of the term “treatment” in health services generally refers to medical care for an injury or illness (Oxford Dictionary Online, 2016). Despite this Oxford Dictionary definition, “treatment” of mental health conditions is not necessarily medical, and may be viewed in a number of different ways. Firstly, as a mental “illness”, depression or anxiety may be “treated” like any other diagnosed medical illness or condition. This includes the use of medical interventions for reduction of the number of symptoms that define its diagnostic categorisation, as well as reduced severity, duration, and frequency of symptoms or episodes, and relapse prevention. The focus and language are often related to the treatment of the condition, such as “treatment of depression or anxiety”. Treatment may also include helping a person to live well, despite ongoing presence of symptoms.

Treatment may also be considered from the point of view of consumers or carers. The language of consumers is often different to medical professionals (Zeng & Tse, 2006), and phrases related to treatment might include “assisting a person” (who suffers with a condition), rather than “treating an illness or disorder”. Whilst terms such as “treatment” and “intervention” are often used synonymously, the term “intervention” generally refers to something behavioural or actions taken (Oxford Dictionary Online, 2016), which may or may not be medical, and “intervention” may be preferred to “treatment” as it may have less associated stigma (Archer et al, 2012). Conceptualisations and treatment of mental illness, and associated stigma, are highly contextualised in time, place, culture, community, and ethics (Byrne, 2000; Robertson, 2015), and cannot be presumed to be medical in nature.

Further consideration may also be needed of the therapeutic framework, paradigm or philosophical approach from which various treatments or interventions come. For example, terms such as allopathic, naturopathic, conventional, medical, traditional, complementary, alternative, integrative, or wholistic are often used to describe different approaches, and use of these terms can be emotive and value laden for practitioners, patients, consumers, and policy makers (Barrett et al, 2003; Gordon, 1990; Jarvis, 2000). There may also be considerable overlap across these various approaches, and treatments or interventions are common amongst them, or have been incorporated from one to
another. As well as evaluation of the efficacy of various treatments and interventions, the context, approach or framework they are provided in, may also need to be considered.

**Evidence-based treatments and interventions for depression**

In Australia and other developed countries, the most common treatments for depression are medical and psychological (Beyond Blue, 2016a; Black Dog Institute, 2015b, 2015a; Jorm et al, 2013; Malhi et al, 2015). Generally, in Australia, medical treatments and interventions require administration, delivery and/or management by a medical doctor, and psychological treatments and interventions by a qualified psychologist.

**Medical Treatments**

Medical treatments of depression (also described as “Physical Treatments”, Black Dog Institute, 2015a) are primarily pharmacological and ECT. Newer physical-medical treatments being trialled include Transcranial Direct Current Stimulation (tDCS), and Transcranial Magnetic Stimulation (TMS).

a. **Pharmacological**

A range of pharmaceutical medications have been used to treat depression for several decades. These include selective serotonin re-uptake inhibitors (SSRIs), serotonin norepinephrine reuptake inhibitors (SNRIs), tricyclic antidepressants (TCAs) and monoamine oxidase inhibitors (MAOIs). The relative efficacy of these medications is well-established in the medical research literature. Generally, different classes of antidepressants have resulted in similar effect sizes, although it has been claimed that there are some small, but meaningful differences between specific types of antidepressants with regard to efficacy and/or tolerability (Cipriani et al, 2009; Fava, M. et al, 1997).

Antidepressant medications (ADM’s) are recommended in medical clinical practice guidelines in Australia, USA and other developed countries, as an option for first-line of treatment for all levels of severity of depression (Gelenberg et al, 2010; Malhi et al, 2015; NICE, 2009). They are particularly recommended for moderate to severe depression (Jorm et al, 2013), and sometimes depend on the particular type of depression (Black Dog Institute, 2012c). However, adherence rates remain low (Burton et al, 2012; van Geffen et
al, 2009), and concerns about side effects and possible dependency are well known (Archer et al, 2012; Gartlehner et al, 2015; van Schaik et al, 2004).

Increasing evidence also raises questions about the true drug effect of ADM’s with mild or moderate depression (Ankarberg & Falkenstrom, 2008; Fournier et al, 2010; Gelenberg et al, 2008; Moncrieff et al, 2004). Evidence suggests that the placebo response rate in clinical trials of ADM’s is substantial, and appears to have increased in recent decades (Ankarberg & Falkenstrom, 2008; Hougaard, 2010; Kirsch, 2005; McQueen et al, 2013; Walsh et al, 2002; Wampold et al, 2005). No substantial differences were found between ADM’s and placebo for people with mild to moderate depression, suggesting a differential efficacy of antidepressants compared to placebo varying as a function of initial symptom severity (Fournier et al, 2010; Vöhringer & Ghaemi, 2011). Furthermore, placebo response rates vary as a function of the expectancy produced by the treatment, with known brand names, administration via injection, larger pill sizes, and higher “doses” producing increased effects (Gaudiano & Epstein-Lubow, 2007; Kirsch, 2005; Walsh et al, 2002).

Another review of the evidence concludes (controversially) that “Available evidence supports a psychological model of therapeutic action when it comes to antidepressant medication, and there is not much support for the pharmaceutical model” (Ankarberg & Falkenstrom, 2008, p336). They further add that there is an absence of evidence for a pharmacological action of antidepressant medications, and propose a psychological model (largely placebo) of therapeutic action is more acceptable until further evidence is available (Ankarberg & Falkenstrom, 2008).

Overall, despite their frequency of use, the efficacy and tolerability of ADM’s compared to placebo and other treatments is questionable for people with mild to moderate depression.

b. Electro-Convulsive Therapy

For people with severe or difficult-to-treat depression who have not adequately responded to medication and psychotherapy, practice guidelines typically recommend the use of electroconvulsive therapy (ECT) (Beyond Blue, 2016c; Black Dog Institute, 2012a; Gelenberg et al, 2010; Jorm et al, 2013; Malhi et al, 2015). It is the most widely used non-
pharmacological medical treatment for depression, and remains the most effective treatment for difficult-to-treat depression (Greenberg & Kellner, 2005; Fitzgerald, 2012). Its use is particularly indicated when a rapid antidepressant response is required, where psychotic features or catatonia are indicated, or there is a risk of death from suicide or being nutritionally compromised through refusal to eat or drink. Other considerations include the presence of co-occurring general medical conditions that preclude the use of antidepressant medications, pregnancy or postnatal, a prior history of positive response to ECT, and patient preference (Gelenberg et al., 2010).

In ECT, electrical currents are passed though the brain to cause a seizure. The treatment is given under a general anesthetic, along with muscle relaxants, and usually given as a series of ECT treatments over the course of several weeks. While there are some side-effects, including confusion and memory loss, ECT is a considered a relatively safe procedure (Black Dog Institute, 2015a). Questions remain about optimal administration of the procedure, and it use is associated with substantial community stigma (Fitzgerald, 2012).

New non-pharmacological medical treatments

C. Transcranial Direct Current Stimulation

Brain activity can also be changed with the application of a very low-voltage electrical current, termed transcranial direct current stimulation (tDCS), also called Mild Brain Stimulation (MBS). This technique was first proposed in the 1950s, but there has been a resurgence of interest in the past 10 years. The efficacy of this approach has been assessed in a series of small randomised controlled trials, and the results have recently been summarised in a meta-analysis (Kalu et al., 2012). A positive antidepressant effect was noted across this limited sample. Although no large studies have yet been published, the safety profile of tDCS appears promising. The procedure is generally painless and does not require an anesthetic or sedation. However, it can cause local irritation or headaches, but these effects appear to be predominantly transient (Brunoni et al, 2011). tDCS shows promise as an antidepressant treatment, and although it remains in early stages of development, it is currently offered free of charge to suitable patients at Sydney’s Black
Dog Institute (Black Dog Institute, 2012b). Its potential applicability is wide, as tDCS machines can be produced at very low cost, offering the possibility of it being made available in less affluent countries (Fitzgerald, 2012).

d. **Repetitive Transcranial Magnetic Stimulation**

Repetitive transcranial magnetic stimulation (rTMS) is a technique that has been researched since the mid-1990s, and now being increasingly used in clinical practice in many countries. rTMS is a treatment method that utilises a pulsed magnetic field to stimulate and potentially alter brain activity. Repeated cortical stimulation with TMS pulses can either increase or decrease local brain activity depending on the frequency of stimulation (Malhi et al, 2015).

The majority of clinical trials conducted evaluating the use of rTMS in depression have been conducted in patients who have failed to respond to one or more antidepressant medication strategies. rTMS treatment appears to be effective whether it is applied as a mono-therapy or in conjunction with antidepressant medication (Slotema et al, 2010). The findings from studies supporting the use of rTMS treatment have led to its approval and use in many countries including USA (Gelenberg et al, 2010), and it is increasingly being used in clinical practice in Australia.

Whilst rTMS is generally well tolerated, known side effects include headaches and scalp discomfort at the site of stimulation (Loo et al, 2008; Rossi et al, 2009). There is also a potential risk of seizure induction with rTMS treatment although with suitably selected patients this risk appears extremely low (Rossi et al, 2009). People with metal implants from neurosurgery or pacemakers may be unsuitable for rTMS due to risks of interference from the high power magnetic field (Malhi et al, 2015).

**Psychological Treatments**

a. **Cognitive Behavioural Therapy**

Cognitive behavioural therapy (CBT) was first formalised in the late 1970s (Beck et al, 1979), and is now one of the most well-known psychological treatments for depression. CBT may be considered as a category or group of associated psychotherapies (Mansell, 2008),
based on the main premise that depressive symptoms arise from dysfunctional beliefs, thought processes and behaviours. Such thought processes and behaviours are often unconscious and/or automatic. Identifying and challenging negative automatic thoughts, which often includes behavioural components or exercises, and replacing them with more functional beliefs, is the main focus of treatments and interventions.

Extensive research is available on the effectiveness of CBT for depression (Butler, A. et al, 2006; DeRubeis et al, 2005; Ebmeier et al, 2006), including reviews, meta-analyses, and reviews of meta-analyses that compare CBT to antidepressant medications, other forms of psychotherapy, and placebo or waitlist controls, for the treatment of depression. In a review of meta-analyses, Butler and colleagues concluded that CBT is highly effective for adult depression, compared to no-treatment, waitlist, or placebo controls, and somewhat superior to antidepressant medications (Butler, A. et al, 2006). They also concluded that there was significant evidence for the long-term effectiveness of the treatment, and vastly superior long-term persistence of effects compared to antidepressant medications (Butler, A. et al, 2006). In another meta-analytic review, Tolin concluded that CBT outperforms psychodynamic and other forms of psychotherapy, though not interpersonal or supportive therapies (Tolin, 2010). Based on the strength of accumulated evidence, CBT is often recommended as the first-line psychological therapy approach for depression, especially for mild or moderate severity (Gelenberg et al, 2010; Malhi et al, 2015; NICE, 2009; Tolin, 2010).

CBT emerged from the narrower focus in Behaviourism and Behavioural Therapy (BT) in recognition of the significance of thoughts and beliefs in depression and mental health, and has overshadowed approaches that are more behavioural in nature. However, evidence supporting the significance of the behavioural components in CBT, as well as purely behavioural approaches, in the treatment of depression, has continued to emerge. A component analysis trial of CBT found that behavioural components alone might work just as well as CBT (Jacobson, N. et al, 1996), and if there is an optimum combination of behavioural and cognitive techniques within CBT, it is unknown (Jacobson, N. et al, 1996).

These findings revitalised interest in purely behavioural treatments for depression and the development of a more fully realised behavioural intervention based on a contextual
behavioural activation approach (Jacobson, N. et al, 2001). A meta-analysis of 17 randomised controlled trials demonstrated equivalence between CBT and BT in terms of depression recovery rates, symptom levels and participant dropout, and superior outcomes to control, supportive counselling and brief psychotherapy (Ekers et al, 2008). In line with a ‘parsimony hypothesis’ proposed by Jacobson and colleagues (Jacobson, N. et al, 1996), the researchers question the utility of adding ‘complex’ cognitive techniques to simpler behavioural interventions to improve clinical outcomes, and comment on the significance of behavioural interventions that may require shorter training of less-qualified practitioners (Ekers et al, 2008).

Similarly, in a meta-(re)analysis of data from a prior meta-analysis, Wampold and colleagues found that cognitive therapy (CT) and behavioural approaches to the treatment of depression were equally effective (Wampold et al, 2002). These researchers also compared CT to ‘other therapies’, after distinguishing between ‘bona fide’ and ‘non-bona fide’ control interventions. Bona fide interventions were determined by i) being offered by suitably trained therapists; ii) who developed a relationship with patients based on face-to-face meetings, and gave individualised - rather than standardised treatment; and iii) treatment intervention contained a number of defined psychologically valid components (Wampold et al, 2002). In apparent contrast to Tolin (2010), their results indicated that CT and bona fide ‘other therapies’ were equally effective in treatment of depression. They concluded that “all bona fide psychotherapies for depression were uniformly efficacious, a result consistent with that for psychotherapies in general” (Wampold et al, 2002, p 163). This conclusion is consistent with the more recent findings of a Cochrane review of behavioural therapies versus other psychological therapies for depression (Shinohara et al, 2013).

b. “Third Wave” Cognitive Behavioural Therapies

In recent decades, a new wave of Cognitive Behavioural Therapies has emerged, known as the “third wave of CBT” (Hayes, 2004; Hofmann et al, 2010a). Similar to proponents of the Behavioural Therapy approach, proponents of third wave CBT have suggested that rational challenging of thoughts (a principal feature of CBT interventions) is less important than was believed (Longmore & Worrell, 2007; Vøllestad et al, 2012), and have sought new
strategies by which therapeutic change can be achieved (Segal et al., 2002). Approaches include Acceptance and Commitment Therapy (ACT) (Hayes, 2004), Compassionate Mind Training (CMT) (Gilbert, 2005), Metacognitive Therapy (MCT) (Wells, 2009), Mindfulness-Based Cognitive Therapy (MBCT) (Teasdale et al., 1995; Segal et al., 2002), and an expanded model of Behavioural Activation (BA) (Martell et al., 2001).

Studies of the efficacy of these approaches as treatments or interventions for treating depression or reducing relapse are numerous, and several reviews and meta-analyses have been conducted. A Cochrane review compared ‘third wave’ cognitive and behavioural therapies versus treatment as usual (TAU) for depression (Churchill et al., 2013). TAU included any appropriate or usual medical care during the course of the study, including no treatment, waitlist TAU, or psychological placebo control group. Three studies were eligible for inclusion in the review. Results indicated a significant difference in depression levels in favour of third wave CBT compared with TAU conditions (Churchill et al., 2013). Similarly, in a separate Cochrane review, 3rd wave cognitive and behavioural therapies were compared with other psychological therapies for depression (Hunot et al., 2013). Third wave CBT approaches eligible for inclusion were ACT, CMT, MCT, and MBCT. The key criterion for categorising a CBT approach as third wave was that the intervention focused on modifying the function or processes of thoughts and thinking, rather than on modifying their content. The control comparison consisted of all other types of psychological therapies, categorised as psychodynamic, behavioural, humanistic, integrative and cognitive-behavioural approaches. Again, only three studies were eligible for inclusion in the review. Results indicated that there was no significant difference between third wave CBT and other psychological therapies in clinical response or reduction of depression, and no evidence of any difference of efficacy and acceptability between individual third wave CBT approaches compared with all other psychological therapies. Similarly, results showed no evidence of any difference in terms of efficacy and acceptability between third wave CBT and any other individual psychological therapy approach. In both reviews by Churchill, Hunot and colleagues, the authors commented that despite the large number of studies published using MBCT, there was a lack of studies using this approach included in the reviews. This is likely to be explained by the use of this
approach as a relapse prevention intervention for people in remission, hence beyond the scope of the reviews (Churchill et al., 2013; Hunot et al., 2013).

The evidence indicates that third wave CBT approaches were more effective in the treatment of depression compared to no treatment, usual care (TAU), or psychological placebo, and equally effective as other forms of psychological therapies.

In summary, there is no evidence for a better rationale of any particular psychotherapy, since several approaches with different underlying assumptions seem to be equally efficacious (Ebmeier et al., 2006), and there is strong evidence to conclude that all bona fide psychological interventions are equally effective (Shinohara et al., 2013), more effective than no treatment, usual care (TAU), or psychological placebo for the treatment of depression, and superior to antidepressant medications for the treatment of mild to moderate depression (Cuijpers et al., 2013b).

There is significant and growing evidence to suggest that the main factor of efficacy common to all psychotherapeutic approaches, and even the strength of the placebo in pharmacological approaches, is the strength of the therapeutic relationship or alliance between practitioner and patient or consumer (Ankarberg & Falkenstrom, 2008; Castonguay et al., 1996; Hougaard, 2010; Lambert, 2013; Shinohara et al., 2013).

c. Positive Psychology Interventions

As discussed in chapter 2, Positive Psychology is a broad field that encapsulates and builds on extensive prior research on positive aspects of mental health, including positive emotions, Subjective Well-being (SWB), Quality of Life (QoL), and shifts the focus from what is clinically wrong, to the promotion of well-being and the creation of a satisfying life filled with meaning, pleasure, engagement, positive relationships and accomplishment (Black Dog Institute, 2014a).

Based on these principles of positivity, and extensive prior research, a diverse range of Positive Psychology Interventions (PPIs) or Positive Activity Interventions (PAIs), and Positive Psychotherapy (PPT), have been developed and investigated. Examples of positive interventions (PIs) include expressing gratitude, kindness and compassion, cultivating optimism, investing in and nurturing social connections and relationships, savouring the
present moment, practice of mindfulness and other forms of meditation, self-care for mind and body, yoga, visualising your best possible self, and identifying and using character strengths.

Studies have consistently shown efficacy of a range of these intervention for improving positive emotions, SWB and QoL (Bolier et al., 2013; Caunt et al., 2012; Fredrickson, 2000; Fredrickson, 2008; Grant et al., 1995; Layous et al., 2012; Linley & Joseph, 2004; Magyar-Moe, 2009; Malathi et al., 2000; Rashid, 2009; Seligman et al., 2005; Seligman et al., 2006; Sheldon & Lyubomirsky, 2006; Sharma, R. et al., 2008).

In 2005, Duckworth and colleagues undertook a review of studies that evaluated the efficacy of PIs. They found that PI’s showed beneficial effects on relieving depressive symptoms as well as increasing happiness (Duckworth et al., 2005). However, they found that studies up to that time almost entirely included non-clinical participants. The authors conclude that one way to relieve depression may be through directly building positive emotion, engagement, and meaning (Duckworth et al., 2005), a view that is supported in the development of Positive Psychotherapy (Seligman et al., 2006), Well-being Therapy (Fava, G. et al., 2005), Quality of Life Therapy (Grant et al., 1995), and more recently, Positive Clinical Psychology (Wood & Tarrier, 2010; Wood & Johnson, 2016). PI’s may be particularly useful for addressing a paucity of positive affect, engagement, and life meaning that characterise depression (Seligman et al., 2006; Sin & Lyubomirsky, 2009).

In the past several years, further studies of the efficacy of PI’s for reducing depression, and several reviews and meta-analyses have been conducted (Bolier et al., 2013; Layous et al., 2011; Sin & Lyubomirsky, 2009). A meta-analysis of 51 studies conducted by Sin & Lyubomirsky (2009) included PI’s and measures of depression, with an aggregated total of 4,266 individuals. The results showed that positive psychology interventions significantly enhances well-being (mean unweighted effect size, \( r = 0.29; \) 95% CI 0.21, 0.37), and decrease depressive symptoms (mean unweighted effect size, \( r = 0.31; \) 95% CI 0.17, 0.43) (Sin & Lyubomirsky, 2009). They also found that several factors were found to impact the effectiveness of the PIs, including participant moderators: i) depression status - depressed individuals benefited more from PIs than non-depressed individuals; ii) self-selection - individuals who elected to participate in a PI, perhaps highly motivated and expecting
that the intervention would make them less depressed or happier, were more likely to experience greater gains; and iii) age of participants - benefits increased with age.

Methodological moderators also had an impact on the effectiveness of interventions, including i) intervention format - interventions with individuals were more effective than those done with groups, which were also more effective than self-administered interventions; and ii) duration of the interventions - longer interventions (more than 7 weeks) produced greater gains in WB, but was not significant for reductions in depression.

Accordingly, Sin & Lyubomirsky encourage clinicians to incorporate PI’s into their clinical work with clients who are depressed, relatively older, and highly motivated to improve (Sin & Lyubomirsky, 2009; Shapiro et al., 2007; Sin & Lyubomirsky, 2009). They also suggest that clinicians deliver PI’s as individual (versus group) therapy, and for relatively longer periods of time. Whilst these results are promising of the efficacy of PIs for reducing depression, a limitation of this review and meta-analysis is that not all studies necessarily included subjects with depressive disorders or elevated symptoms, and results cannot be generalised as evidence for efficacy of interventions for people with a depressive disorder. A subsequent review and meta-analysis of 39 studies generally confirmed each of these findings (Bolier et al., 2013).

Complementary, Integrative, Mind-Body, and Lifestyle Medicine Approaches

There is increasing interest in the potential role of complementary medicine (CM), mind-body, and lifestyle interventions, including yoga, for assisting people with mental health concerns (Annapoorna et al., 2011; Astin, 1998; D'Silva et al., 2012; Jorm et al., 2013; Kessler et al., 2001; Kotsirilos et al., 2011; Luberto et al., 2013; Martinsen & Raglin, 2007; Qureshi & Al-Bedah, 2013; Sarris et al., 2014; Uebelacker et al., 2010a; van der Watt et al., 2008; Weintraub, 2004).

CM refers to a group of diverse medical and health care systems, practices, interventions and products that are not presently considered to be part of conventional or mainstream medicine. Complementary treatments, therapies and interventions are usually used conjunctively with conventional or mainstream medicine. "Integrative" medicine generally makes use of all therapies appropriate to the needs of individual patients (Gelenberg et al,
“Alternative” medicine is also a term often used, and included as “Complementary and Alternative Medicine” (CAM). Alternative therapies are generally used in place of conventional or mainstream medicine. However, the US National Center for Complementary and Integrative Health (NCCIH) (formerly known as the National Centre for Complementary and Alternative Medicine, NCCAM), at the National Institutes of Health (NIH), now refers to “Complementary and Integrative Health” rather than CAM, and suggests that “true alternative medicine is uncommon. Most people who use non-mainstream approaches use them along with conventional treatments” (NCCIH, 2016b), and the term “Alternative” has been seen as unhelpful (Zollman & Vickers, 1999).

Australia’s National Institute of Complementary Medicine (NICM) uses a (modified) definition of CM from the Cochrane Collaboration (cited from Zollman & Vickers, 1999)

“Complementary medicine (CM) is a broad domain of healing resources that encompasses all health systems, modalities, and practices and their accompanying theories and beliefs, other than those intrinsic to the politically dominant health system of a particular society or culture in a given historical period. CM includes all such practices and ideas self-defined by their users as preventing or treating illness or promoting health and well-being.” (NICM, 2016)

NICM uses the term complementary medicine synonymously with the terms “complementary therapies” and “complementary and alternative medicine” found in other texts, according to the definition used by the Cochrane Collaboration, and recognises that boundaries within CM, and between the CM domain and that of the dominant system are not always sharp or fixed (NICM, 2016).

For example, mind-body medicine and interventions, and lifestyle medicine and interventions, may be seen as part of conventional and mainstream, or complementary and alternative medicine. NICM describes mind-body medicine as “a variety of techniques designed to enhance the mind’s capacity to affect bodily function and symptoms. These include meditation and therapies that use creative outlets such as art, music, or dance” (NICM, 2016), and distinguishes it from “Manipulative and Body-based Practices” that are based on tactile therapies and structured exercise regimes. Manipulation may be performed as a part of other therapies or whole medical systems, including chiropractic...
medicine, osteopathic medicine, massage and naturopathic medicine. Structured exercise regimes include yoga, tai chi and specific exercise programs aimed at restoring health and enhancing well being (NICM, 2016). Similarly in the US, NCCIH refers to mind and body practices as a large and diverse group of techniques that are administered or taught to others by a trained practitioner or teacher. Examples include acupuncture, massage therapy, meditation, relaxation techniques, spinal manipulation, and yoga (NCCIH, 2016a).

What is considered complementary or alternative is constantly changing, as the evidence base grows for particular approaches or techniques, and they become adopted into mainstream medicine (Luberto et al, 2013).

Lifestyle medicine has been defined as “the application of environmental, behavioural, medical and motivational principles to the management of lifestyle-related health problems in a clinical setting.” (Egger et al, 2008) The discipline involves the therapeutic use of lifestyle interventions predominantly in the management of chronic disease (Egger et al, 2009). This is a useful but somewhat narrow definition. Whilst Lifestyle medicine may be seen as the use of lifestyle interventions in a medical context, lifestyle interventions may also be offered in a context that is not necessarily medical, such as community rather than clinical settings, and may also been seen as treatments within CM.

Categorisation of different treatments and interventions is not necessarily consistent between major mental health organisations. CM, mind-body, and lifestyle interventions are sometimes referred to as “Self-help and Alternate Therapies” (Black Dog Institute, 2015c). Some treatments and interventions are considered “self-help” if they can be done without the assistance of another person, such as yoga or mindfulness meditation (Morgan & Jorm, 2008). However, it is reasonable to suggest that an effective yoga or meditation intervention for treatment of depression may require instruction or guidance from a suitably qualified teacher. The same could be said of many other interventions, including components of CBT, or MBCT, which are categorised as psychological interventions, rather than alternative or self-help. In the case of yoga, it is not the yoga that enables the categorisation, but the context in which it is taught and practiced. It seems that
placement of various interventions within these categories, particularly those described as self-help, is ambiguous. Evaluation of effectiveness of various approaches and interventions, and qualifications required for delivery, may be more useful than these ambiguous categorisations.

As well as considering particular complementary or alternative treatments and interventions for depression, consideration and analysis must also be given to the paradigm or framework of these approaches (Barrett et al., 2003; Bell et al., 2002; Deng et al., 2010; Kienle et al., 2011; Zollman & Vickers, 1999). One study found that CAM users and practitioners considered themes of holism, empowerment, and access as characteristic of CAM, and saw these in contrast to conventional medicine (Barrett et al., 2003).

“Wholistic” medicine warrants mention here. Wholistic medicine may be described as an approach to the whole person in his or her total environment, with a variety of therapeutic and healing promoting strategies, which recognises the uniqueness of each patient, the centrality of the therapeutic partnership, the primacy of self-care, and regards the spiritual dimension as a vital enlargement of the biopsychosocial model (Gordon, 1990). However, a more wholistic approach may also been seen as an important emergent characteristic in modern medicine, especially in the field of integrative medicine and healthcare (Deng et al., 2010), and as CAM and lifestyle interventions become a more integral part of modern medicine (Kienle et al., 2011).

Currently, distinctions in concepts, treatment and intervention approaches in mainstream medicine, integrative, lifestyle, wholistic, complementary, and alternative medicine, psychology, mind-body and lifestyle interventions, are unclear and constantly changing.

However, amidst these various approaches and definitions, many individuals with depression attempt to alleviate symptoms through the use of CM, mind-body and lifestyle interventions (Barnes et al., 2008; Deligiannidis & Freeman, 2010; Gordon, 1990; Gelenberg et al., 2010; Kessler et al., 2001; Parslow & Jorm, 2004; Pilkington et al., 2006). CM, mind-body and lifestyle interventions with an established or promising evidence-base for treatment of depression include herbal medicines - particularly St John’s wort, acupuncture, exercise, relaxation training, controlled breathing, meditation, and yoga (Black Dog Institute, 2014b; Carpenter, 2011; Gartlehner et al., 2015; Gelenberg et al., 2010; Jorm et al., 2002; Jorm et al,

Mind-Body and Lifestyle Interventions

i) Exercise

Physical activity has previously been defined as any bodily movement produced by skeletal muscles that results in energy expenditure. Exercise was considered a subset of physical activity that is planned, structured, and repetitive, with the objective of maintenance or improvement of physical fitness. And, physical fitness was defined by a set of attributes that are related to either health or skill development (Caspersen et al, 1985; Haskell et al, 1985). These definitions might be useful in preliminary identification or categorization of activities used in various health interventions. However, the other factors related to exercise and health outcomes are required.

Dose and adherence are important factors in any form of treatment intervention. Dose of exercise or physical activity includes type, frequency, duration, intensity and total energy expenditure (EE). EE or calorie consumption is considered central to health outcomes in general, including mental health (Barbour et al, 2007; Gebel et al, 2015; Norton, K. et al, 2010; Warburton et al, 2006). However, definitions and terminology used for prescribing and promoting exercise, as well as descriptors of intensity and associated measures of energy consumption, vary considerably, making it difficult to draw meaningful conclusions about relative benefits of varying types, dose and intensity of exercise (Norton, K. et al, 2010; Warburton et al, 2006).

There has been extensive clinical research, numerous systematic reviews (including Cochrane Reviews), and meta-analyses of exercise for depression (Barbour et al, 2007; Blumenthal, J. et al, 1999; Brosse et al, 2002; Cooney et al, 2013; DiLorenzo et al, 1999; Herring et al, 2012; Krogh et al, 2011; Larun et al, 2006; Lawlor & Hopker, 2001; Martinsen, 2008; Mead et al, 2009; Rethorst et al, 2009; Rimer et al, 2012; Salmon, 2001; Stathopoulos et al, 2006; Taylor et al, 1985; Yeung, 1996).

The most recent Cochrane review (Cooney et al, 2013) is an updated version of an earlier review from the same authors (Rimer et al, 2012), which produced similar results to their
earlier review. Thirty-five trials (1356 participants) comparing exercise with no treatment or a control intervention were included in the review. The pooled SMD for the primary outcome of depression at the end of treatment was -0.62 (95% CI -0.81 to -0.42), indicating a moderate clinical effect, which may be as effective as psychological or pharmacological treatments. Seven of the trials (n = 189) specifically compared exercise with psychological therapy, and found no significant difference (SMD -0.03, 95% CI -0.32 to 0.26). Four trials (n = 300) compared exercise with pharmacological treatment and found no significant difference (SMD -0.11, 95% CI -0.34 to 0.12). However, because of the risk of bias in many of the trials, the direct effect of exercise may only be small.

The authors were uncertain of what type of exercise might be most effective. Most exercise interventions for depression have included some form of aerobic exercise (e.g. swimming, walking, jogging, and cycling). However, benefits have also been found with non-aerobic exercise, including resistance and weight training (Barbour et al., 2007); Qi-gong (Gaitan-Sierra & Hyland, 2014), stretching (Krogh et al., 2012), and yoga, though it’s aerobic function is ambiguous (Berger & Owen, 1992; Bonura & Pargman, 2009).

Mixed results have also been found relating to dose and intensity of exercise (Barbour et al., 2007; Bartholomew et al., 2005; Trivedi et al., 2006; Trivedi et al., 2011). A study by Dunn et al. (2005) specifically explored questions related to exercise dose and EE for reducing depression. Results showed that benefits of more intense exercise were mediated by frequency, and that the determining factor for reduction and remission of symptoms is total energy expenditure, rather than exercise intensity (Dunn et al., 2005). More recently, Callaghan et al. (2011) found that participant preferred intensity of exercise, coupled with motivational education and support, is likely to improve health and quality of life of women living with depression and improve their exercise adherence rates. They suggested that the key to the improvements is ‘mentored’ exercise, which included group motivational support and a low effort walking plan. Exercise tailored to preferred rather than prescribed exertion levels was considered most beneficial (Callaghan et al., 2011). The review by Cooney et al. (2013) also explored the influence of intensity and also found mixed results. Large effect sizes were found for both vigorous intensity (SMD - 0.77, 95% CI -1.30 to -0.24) and light/moderate intensity (SMD -0.83, 95% CI -1.32 to -0.34). They concluded that the
evidence regarding optimum dose (duration, frequency and intensity) of an exercise programme required for benefit was unclear.

Other questions related to intensity and dose of exercise for people with depression may also need to be considered. Increased intensity or dose, may lead to fatigue (especially with depression) or increased anxiety (Barbour et al, 2007).

There was little data on whether any benefits persist after exercise has stopped. There was also some variation between studies with respect to attendance rates for exercise as an intervention, suggesting that there may be factors that influence adherence and acceptability of exercise among participants (Cooney et al, 2013). Overall, the authors conclude that “exercise might have a moderate sized effect on depression, but because of the risks of bias in many of the trials, the effect of exercise may only be small. The evidence also suggests that exercise may be as effective as psychological or pharmacological treatments, but the number of trials reporting these comparisons and the number of participants randomised, were both small.” (Cooney et al, 2013, p35)

The findings of this review are consistent with, though somewhat more cautious than, findings of earlier reviews. Rethorst and colleagues (2009) conclude that the results of their meta-analysis of RCT’s with a cumulative sample of 3000 participants provide conclusive evidence in support of recommending exercise for the alleviation of depressive symptoms. Mead et al (2009) found that exercise improved symptoms of depression, but were unsure of exactly how effective it is, nor the most effective types of exercise (Mead et al, 2009).

Based on established evidence, exercise is often recommended as a treatment intervention for depression, especially given the range of additional health benefits associated with exercise (Beyond Blue, 2016a; Black Dog Institute, 2015c; Gebel et al, 2015; Jorm et al, 2013; Warburton et al, 2006). Australia’s Beyond Blue recommends that “There is good evidence that exercise is helpful for depression in adults. As it is not yet known which kind of exercise is best, people should choose a form they like, so that they will stick with it.” (Jorm et al, 2013) Australian psychiatric clinical practice guidelines acknowledge that exercise is established as an effective treatment strategy for depression (Malhi et al, 2015). Similarly, but with less conviction, USA clinical practice guidelines state: “If a patient with mild depression wishes to try exercise alone for several weeks as a first intervention, there is
little to argue against it, provided the patient is sufficiently monitored for an abrupt worsening of mood or adverse physical effects. The dose of exercise and adherence to an exercise regimen may be particularly important to monitor in the assessment of whether an exercise intervention is useful for MDD. If mood fails to improve after a few weeks with exercise alone, medication or psychotherapy should be recommended. For patients with depression of any severity and no medical contraindication to exercise, physical activity is a reasonable addition to a treatment plan for major depressive disorder. The optimal regimen is one the patient prefers and will adhere to” (Gelenberg et al, 2010).

Despite substantial evidence of efficacy, and clinical practice recommendations, mental health professionals are often reluctant to prescribe exercise and other lifestyle changes to depressed patients, due to frequent lack of motivation and concerns of adherence (Jacka & Berk, 2012; Nahas & Sheikh, 2011). This reluctance may also be due to the requirement for increased monitoring of depressive symptoms and associated risks of non-adherence or lack of improvement (Gelenberg et al, 2010; Nahas & Sheikh, 2011).

In summary, evidence of benefit of physical activity or exercise for reducing depression is well-established. Questions related to type, intensity, duration, and energy expenditure required for benefit, remain unclear. Evidence-based recommendations for exercise and physical activity often include the importance of tailoring the intervention to individual preferences and abilities (Blake, 2012; Gelenberg et al, 2010; Stathopoulou et al, 2006; Trivedi et al, 2006).

ii) Relaxation Training

Relaxation training (RT) has been defined as any technique, process or activity that helps a person to relax, to voluntarily let go of tension and attain a state of increased calmness (Jorm et al, 2002). The “Relaxation Response” is a well-known term popularised by Herbert Benson in the 1970s (Benson et al, 1974; Benson & Klipper, 1976), and there has been significant interest in a range of health benefits resulting from relaxation (NCCIH, 2014a). There are numerous techniques for inducing relaxation, which can be learned from a professional or done as self-help, including freely available or purchased recorded versions. The most common modern approaches come from variations of progressive muscle
relaxation (PMR), originally developed by medical physician Edmund Jacobson in the 1920s (reprinted: Jacobson, E., 1987). Other techniques include autogenic training (Schultz & Luthe, 1965), biofeedback, relaxation imagery, and practices derived from meditation and yoga techniques.

Several research reviews have generally concluded that relaxation techniques are better than no treatment in reducing symptoms of depression, but are not as beneficial as psychological therapies such as CBT (Fung & White, 2012; Jorm et al, 2013; NCCIH, 2014b). The authors of a Cochrane review of clinical trials concluded more specifically that relaxation training was more effective at reducing self-rated depressive symptoms than waitlist or no or minimal treatment (5 studies, 136 participants; Jorm et al, 2008). Clinician-rated depressive symptoms were less clear because of significant heterogeneity. However, relaxation training was not as effective as psychological (mainly cognitive-behaviour) treatment in reducing self-rated depressive symptoms. These differences were found both at the end of treatment (9 studies, 286 participants) and at follow-up several months later (6 studies, 192 participants). Results from clinician-rated depressive symptoms were partially supportive, with non-response/remission post intervention favouring psychological treatment (3 studies, 104 participants), but no significant difference in clinician-rated depression scores post intervention (3 studies, 72 participants). There were inconsistent effects found when comparing relaxation training to medication (2 studies, 115 participants). The comparisons with medication did not lead to clear conclusions because of inconsistencies between the post-test and follow-up data. There were too little data to draw any conclusions about relaxation in comparison with other complementary and lifestyle treatments (Jorm et al, 2008).

Despite its popular use over many decades, and evidence of its moderate effectiveness, relaxation training is not included in current psychiatric clinical practice guidelines in Australia (Malhi et al, 2015) or USA (Gelenberg et al, 2010) as a treatment for depression.

iii) Breathing Exercises

Controlled breathing or deep breathing exercises have been reported as the most commonly used mind-body therapy by adults with medical conditions in the US (Bertischa
et al., 2009), and the second most commonly used of all complementary health approaches (second only after all natural dietary supplements combined) (Clarke, T. et al., 2015). However, the frequency of using breathing exercises for treatment of depression is not reported.

Breathing exercises are commonly used as a component of psychological treatments, including CBT, MBCT and other 3rd wave cognitive approaches, mind-body and self-help practices, yoga, tai chi, qi gong, relaxation training, and mindfulness and other forms of meditation (Morgan & Jorm, 2008). Each of these have been studied in clinical research, and included in various reviews (Cramer et al., 2013b; D'Silva et al., 2012; Hofmann et al., 2010b; Jorm et al., 2008; Jorm et al., 2013; Morgan & Jorm, 2008). However, there has been very little factorial research on the contribution of breathing exercises in these approaches, nor the use of breathing exercises as a stand alone practice or intervention for reducing depression. Clinical research that has focused on breathing exercises as a primary intervention, are mostly yoga breathing exercises, and will be discussed in chapter 5. Breathing exercises are not included in clinical practice guidelines or other guides to what works for depression.

iv) Meditation

Meditative practices derive from traditions in both Eastern and Western cultures, many dating back centuries, and there are many definitions, approaches, and techniques that may be included under the term. Of particular interest here, is that meditation is an integral part of the system of yoga (discussed in chapter 4), even though the term “yoga and meditation” is popular, due to modern yoga’s association with being primarily a physical practice, suggesting that meditation is somehow separate from or additional to yoga.

Different meditation interventions, such as mindfulness, are often included in a different treatment category to meditation itself. For example, mindfulness has been included under psychological treatments, whereas meditation is included as a complementary, alternative, or self-help treatments (Black Dog Institute, 2012c; Jorm et al., 2013), even though mindfulness itself is a form of meditation (Ludwig & Kabat-Zinn, 2008), and was formerly known as mindfulness meditation (Ivanovski & Malhi, 2007; Kabat-Zinn, 1995).
Perhaps it can be considered psychological, complementary, and self-help, and again highlights the ambiguity and changing nature of such categorical distinctions, discussed previously.

Some approaches to meditation have been the focus of clinical and therapeutic application for a range of different health conditions and disorders (Arias et al., 2006; Ludwig & Kabat-Zinn, 2008; Ospina et al., 2007; Shannahoff-Khalsa et al., 1999). There has been extensive research and numerous reviews on the efficacy of meditation for reducing depression, where meditation was one component in multi-component interventions, such as Mindfulness Based Stress Reduction (MBSR), Mindfulness-Based Cognitive Therapy (MBCT) and other yoga interventions (Arias et al., 2006; Bogart, 1991; Saeed et al., 2010). However, similar to breathing exercises, there has only been a small number of clinical studies that have focussed on meditation as a stand alone intervention for reducing depression, and reviews have concluded that there was insufficient evidence to draw strong conclusions (Arias et al., 2006; Pilkington et al., 2006). In particular, Morgan and Jorm concluded: “For non-clinically depressed individuals, the evidence for meditation is inconsistent, with some trials showing benefit and others not. There is no evidence on the effects of meditation on depressive disorders.” (Morgan & Jorm, 2008, p 11)

Meditation and mindfulness as part of the yoga approach will be explored further in chapter 4.

v) Yoga

Yoga has been identified as having a potential role as an intervention for mental health concerns such as depression and anxiety (Jorm et al., 2013). Prior research, including several systematic reviews and meta-analyses, including Cochrane reviews, suggests potential benefits of yoga in reducing depression and anxiety, and further research is recommended (Annapoorna et al., 2011; Black Dog Institute, 2015c; Bonura & Pargman, 2009; Butler, L. et al., 2008; Cramer et al., 2013b; Gothe et al., 2012; Jorm et al., 2013; Kinser et al., 2013; Kirkwood et al., 2005; Pilkington et al., 2005; Shapiro et al., 2007; Smith, C. et al., 2007; Streeter et al., 2010; Uebelacker et al., 2010a; Uebelacker et al., 2010b; Woolery et al., 2004). It is important to recognise that there is considerable overlap between yoga and other
treatment interventions that have been presented. Yoga includes exercise and physical activity, relaxation training, breathing exercises, mindfulness and a range of approaches to meditation, diet, lifestyle, cultivation of positive values, meaning and purpose, and the importance of changing behavioural and cognitive patterns. The case and evidence for yoga as a mental health intervention are presented in chapters 4 and 5.

Evidence-based treatments and interventions for anxiety

Similar to treatment of depressive disorders, the predominant and recommended treatments for anxiety disorders in Australia and other developed countries, are medical & psychological (Boyce et al, 2015; Katzman et al, 2014; Lim et al, 2015; NCCMH, 2011; Swinson et al, 2006). The predominant medical treatment for anxiety disorders is pharmacological, and the predominant psychological treatments are Behaviour Therapy (BT), Cognitive Therapy (CT) and Cognitive Behaviour Therapy (CBT). Complementary and lifestyle interventions for reduction of anxiety are also popular. However, despite this popularity, the high prevalence of anxiety, and considerable CAM research for depressive disorders, there is a surprising lack of research that considers complementary medicine and lifestyle interventions for anxiety disorders (Ravindran & da Silva, 2013).

Medical-pharmacological treatments

Early medications for anxiety disorders included tricyclic antidepressants (TCAs) and benzodiazepines (BDZs). These were rigorously studied and shown to have an acceptable risk:benefit ratio (Koen & Stein, 2011). Evidence showed that BDZs in particular, tend to work very fast in reducing anxiety symptoms, and are effective in the immediate or short-term for reducing symptoms of a number of anxiety disorders. However, long-term use can cause addiction, may impair cognition and memory, and have a range of short-term side effects such as sleepiness, dizziness and headache. Anxiety disorders are often experienced for a longer period than the recommended duration of BDZs use, and symptom recurrence is common once the treatment is stopped unless an alternative treatment is provided (Reavley et al, 2013).
Subsequent work with agents that targeted particular molecular systems, such as the selective serotonin re-uptake inhibitors (SSRIs) and the serotonin and noradrenaline re-uptake inhibitors (SNRIs), has led to a shift away from the use of BDZs, and the development of range of this class of antidepressants (ADs). SSRIs and SNRIs have become the most recommended and prescribed pharmacological treatment for anxiety disorders (Baldwin et al., 2011; Koen & Stein, 2011; Lieberman, 2003). However, a review and meta-analysis of efficacy and tolerability of BDZs versus newer ADs as treatments in anxiety disorders has concluded that this “change in the prescribing pattern favouring newer ADs over BDZs in the treatment of anxiety disorders has occurred without supporting evidence.” (Offidani et al., 2013). Their results showed that BDZs compared to ADs, showed comparable or greater improvements, fewer treatment withdrawals, and fewer adverse events in treatment of GAD and panic disorder, and that the role and usefulness of BDZs need to be reappraised (Offidani et al., 2013).

Whilst ADs are often recommended in clinical practice guidelines as a first line of pharmacological treatment for anxiety disorders (Baldwin et al., 2011; Koen & Stein, 2011), it is important to note that recently revised British clinical practice guidelines for GAD, recommend low-intensity psychological interventions as the first line of intervention. If a person presents with GAD indicated by marked functional impairment, or a level of functional impairment that has not improved after low-intensity psychological interventions, then either individual high-intensity psychological intervention or drug treatment is recommended, according to personal choice (NICE, 2011). SSRIs and SNRIs are often recommended as a first-line pharmacological intervention, but not a first-line intervention.

Evidence indicates that most antidepressant medications are effective in the treatment of most types of anxiety (Reavley et al., 2013). This has raised ongoing debate related the comorbidity and overlap of diagnostic criteria between depression and anxiety disorders, which will be discussed further in the next section of this chapter.
Psychological treatments

Recent years have seen a significant increase in the number of studies examining the effects of psychotherapies for anxiety disorder in adults, particularly GAD. A recent meta-analysis by Cuijpers and colleagues integrates this new evidence with the older literature through a quantitative meta-analysis (Cuijpers et al., 2014a). A total of 41 RCT’s (with 2132 patients meeting diagnostic criteria for GAD) were included in the meta-analysis. Most studies (n=35) examined the effects of cognitive behaviour therapy (CBT). Remaining studies examined the effects of relaxation, biofeedback, behaviour therapy (BT), and supportive, psychodynamic or other form of psychotherapy. The results showed that psychological treatments (in general, and CBT in particular) are effective in reducing anxiety when compared with waitlist control groups. CBT was also compared with other types of psychotherapy, relaxation, behaviour therapy, and pharmacotherapy. However, due to the small number of studies in each comparison, they found insufficient evidence to form meaningful conclusions. They also conclude that their results are consistent with the view that psychotherapy is the treatment of choice for GAD (Cuijpers et al., 2014a; Tyrer & Baldwin, 2006). This is also generally consistent with recommendations in the British clinical practice guidelines, that psychotherapy be used as the first-line of intervention for GAD, unless a person presents with marked functional impairment, or a level of functional impairment that has not improved after low-intensity psychological interventions (NICE, 2011).

Numerous studies and meta-analyses have also shown the effectiveness of CBT compared to placebo or waitlist controls for the treatment of anxiety disorders (Hofmann & Smits, 2008; Olatunji et al., 2010; Otte, 2011). However, similar to research in the treatment of depression, whilst numerous studies have shown the effectiveness of CBT as a treatment for anxiety disorders, there is little evidence to conclude that CBT is more effective than other forms of psychotherapy or psychological interventions.

Interestingly, and despite the lack of evidence of superiority of efficacy, CBT is the only form of psychological intervention recommended for treatment of GAD by the Australian Psychological Society (APS, 2013; Kangas, 2014). Relaxation is also recommended.
However, relaxation is also considered to be a form of complementary, mind-body, or lifestyle intervention, and does not require qualifications as a psychologist.

“Third Wave” Cognitive Behavioural Therapies

Similar to depression, the inclusion of mindfulness meditation and acceptance based cognitive therapies has become popular for treatment of anxiety disorders (Ando et al, 2009; Davis & Hayes, 2011; Desrosiers et al, 2013; Lang, 2013; Singh-Manoux et al, 2008; Schreiner & Malcolm, 2008). These constitute a group of interventions with a shared emphasis on strategies that alter an individual’s relationship to his or her internal experience, rather than strategies that aim to directly alter the content of these experiences (Vøllestad et al, 2012).

A growing number of clinical trials on the effectiveness of these approaches have been conducted, and several systematic reviews and meta-analyses have been published (Evans et al, 2008; Hofmann et al, 2010b; Miller, J. et al, 1995; Victorson et al, 2014; Vøllestad et al, 2012; Kim et al, 2009). Each of these studies has found that mindfulness and acceptance based interventions are associated with robust and substantial reductions in symptoms of anxiety and comorbid depressive symptoms. More research is needed to determine the efficacy of these approaches relative to current treatments of choice, and to clarify the contribution of processes of mindfulness and acceptance to observed outcome.

Positive Psychology Interventions

Cultivation of positive emotions and well-being are the main focus of Positive Psychology. Various Positive Interventions (PI’s) developed to cultivate positive emanations and well-being were presented in the previous section on treatments and interventions for reducing depression. It has been suggested that PI’s may be particularly useful for addressing a paucity of positive affect, engagement, and life meaning that characterise depression (Seligman et al, 2006; Sin & Lyubomirsky, 2009). More recently, questions related to the suitability and effectiveness of PI’s for reducing anxiety have been raised. For example, Watkins and Pereira explore the question: “Can positive emotions and positive activities counteract the effects of fear and anxiety?” (Watkins & Pereira, 2016; p 205). They present
an overview of “How positive activities might contract dysfunctional mechanisms in anxiety disorders”, including counteracting dysfunctional worldview, and self-preoccupation, and enhancing coping mechanisms. They propose that it is clinically useful to target specific cognitive dysfunctions with specific PI’s (Watkins & Pereira, 2016; p213). However, whilst the propositions seem plausible, they also recognise that very little research has been conducted to provide evidence of the effectiveness of PI’s for anxiety disorders, and most of their exploration draws on reduction of anxiety in a transdiagnostic approach.

**Complementary, integrative, mind-body, and lifestyle medicine approaches**

Complementary, integrative, mind-body, and lifestyle interventions are also popular for reduction of anxiety. A survey of 2,055 participants in the United States found that CAM therapies were used more than conventional therapies by people with self-defined anxiety and depression (Kessler et al, 2001). However, an Australian community survey of 7484 participants, found that 6.3% of participants used only prescription medications to treat depression or anxiety, 2.3% used only CAMs, while a further 0.6% reported using both types of treatments (Parslow & Jorm, 2004). The proportion of people using various approaches specifically for either depression or anxiety is unclear.

However, despite this popularity, the high prevalence of anxiety, and considerable CAM research for depressive disorders, there a surprising lack of research that considers Complementary Medicine and Lifestyle interventions for anxiety disorders. A recent review of CAM therapies as add-on to pharmacotherapy for mood and anxiety disorders concluded that “While several CAM therapies show some evidence of benefit as augmentation in depressive disorders, such evidence is largely lacking in anxiety disorders.” (Ravindran & da Silva, 2013). An earlier research review had concluded that the treatments with the best evidence of effectiveness for reducing anxiety included exercise and relaxation training, and that there is more limited evidence to support the effectiveness of acupuncture, music, autogenic training, meditation, and alcohol avoidance (Jorm et al, 2004). Further research has been undertaken in the past decade. There is considerable evidence for the benefits of acupuncture (Pilkington et al, 2007; van der Watt et al, 2008), yoga (Bonura & Pargman, 2009; Chugh-Gupta et al, 2013; Kirkwood
et al., 2005), relaxation training (Manzoni et al., 2008), and meditation techniques such as mindfulness (Chen et al., 2012; Davis & Hayes, 2011; Grossman et al., 2004; Hofmann et al., 2010b; Krisanaprakornkit et al., 2006).

The benefits of components of some of these CM and Lifestyle interventions may be understated, as they are often included as components in some of the main stream “gold-star” interventions. For example, breathing exercises, meditation and mindfulness are also included as components of psychological interventions, such as MBSR, and relaxation training is also part of CBT. Again, there is considerable overlap of treatments used in mainstream medicine, psychology, complementary and lifestyle interventions (Kessler et al., 2001). Surprisingly, Beyond Blue do not currently include a “good quality evidence rating” for any complementary or lifestyle intervention for anxiety (Reavley et al., 2013).

**Evidence-based treatments and interventions for comorbid anxiety and depression**

Notwithstanding diagnostic dilemmas related to comorbidity, consideration must be given to treatment approaches for comorbidity. The disorder-specific approach has dominated the way in which depressive and anxiety disorders have been conceptualised and researched, and has shaped the way treatments and interventions have been developed and evaluated. While this approach to treatment has demonstrable efficacy, there is a paucity of data for evidence-based treatment of anxiety and depression comorbidity (Tiller, 2012), and substantial discrepancies between the disorder-specific treatment approach with the emerging understanding of depressive and anxiety disorders (Newby et al., 2015).

Efficacious treatments developed for each of these disorders share common features. It was presented earlier in the chapter that most antidepressant medications are effective in the treatment of most types of anxiety (Pollack, 2005; Reavley et al., 2013), and evidence suggests that SSRIs are the most effective, with similar benefits for both conditions (Garber & Weersing, 2010; Krishnan, 2003). The primary psychological intervention for both anxiety and depression is CBT, with interventions that contain similar elements, such as problem solving, cognitive restructuring, relaxation training, pleasant activity scheduling, and behavioural activation. Across all these techniques, the CBT approach has a core focus on
the interplay between thoughts, feelings, and behaviours, and teaching adaptive responses to stress and coping with negative emotionality (Garber & Weersing, 2010). Specific intervention protocols are tailored to differing diagnoses. Also, exercise and relaxation training have both been shown to be efficacious in the reduction of both depression and anxiety (Jorm et al, 2013; Reavley et al, 2013).

In 1992, Kendall and colleagues recommended

“Treating comorbidity of anxiety and depression calls for flexible application of interventions developed for both disorders. The degree to which interventions simultaneously address depression and anxiety depends on the nature of the intervention, the symptom constellation, and his or her developmental level. More circumscribed anxiety, as is seen in phobias, may enable the therapist to initially turn attention to treating the depression; once the depression is somewhat reduced and a sense of skill and mastery have been gained, the therapist may begin to treat the anxious component of the distress. When anxiety is more pervasive and disruptive, the therapist will need to address symptoms associated with both disorders from the outset.” (Kendall, P et al, 1992, p 878)

A meta-analysis of the effects of psychological therapies for depression amongst children and adolescents, compared the effect sizes (ES) for measures of depression with those for anxiety symptoms across ten studies that had assessed both. Results showed that depression treatments produced a significant reduction in anxiety symptoms (ES = 0.39), that was only marginally lower than that found for depressive symptoms (ES = 0.57). The authors concluded that anxiety treatments reduce depressive symptoms, and treatments for depression beneficially affect anxiety (Weisz et al, 2006).

However, a later review of studies that included disorder specific treatments for depression or anxiety, when comorbidity of the other is present showed that results are mixed (Garber & Weersing, 2010). Interventions targeting one disorder do not necessarily successfully reduce the other comorbid condition, even if similar treatments are effective for each condition on its own.

There was also contention with the predominant cognitive and behavioural approaches of the 1990s and early 2000s. Whilst CBT had good evidence of efficacy, there were many people who did not respond, and reasons for their lack of response were unknown (Barlow
et al., 2004). Another problem was that too many different manualized treatments were being developed for each specific condition or diagnosed disorder. Clinicians were required to use separate handbooks, workbooks, and protocols for each disorder. Not only was this costly, but it also took significant amounts of training to become adequately familiar with each of the distinct protocols. Finally, because the protocols were complex, dissemination of treatment to providers was seen as an obstacle. In summary, whilst extensive research provided good evidence of the efficacy of the interventions, they were often unlikely to be used by non-researcher clinicians, and not effective for many people (Barlow et al., 2004; Newby et al., 2015).

Driven by these concerns, there has been growing consensus that a novel approach is needed in the way we classify, formulate, treat, and prevent depression and anxiety disorders (Barlow et al., 2004; Kring & Sloan, 2009; Newby et al., 2015). Barlow and colleagues developed a unified theory and treatment approach to emotional disorders (Barlow et al., 2004; Barlow et al., 2010; Wilamowska et al., 2010). Arguments for their approach included i) emerging theory and research that emphasized the commonalities of emotional disorders rather than their differences, including developments in understanding of epidemiology and aetiology of comorbidity (already discussed); ii) the non-specificity of treatment response to psychological treatments in comorbid conditions; and iii) better facilitation of dissemination and training that focused on a single set of therapeutic principles rather than diverse and complex protocols. Their approach focused on developments in understanding and addressing the underlying commonalities and comorbidity found amongst a range of emotional and psychological disorders, particularly mood and anxiety disorders (Barlow et al., 2004), and emphasised the core cognitive biases and avoidance of negative emotions common to both anxiety and depression (Ehrenreich et al., 2009).

The emergence of this approach has led to the development of “transdiagnostic” treatment interventions, which have been defined as “those that apply the same underlying treatment principles across mental disorders, without tailoring the protocol to specific diagnoses.” (McEvoy et al., 2009). The transdiagnostic approach focuses on identifying the common and core maladaptive temperamental, psychological, cognitive,
emotional, interpersonal and behavioural processes that underpin a broad array of
diagnostic presentations, and targeting these factors in treatment (Newby et al, 2015). The
approach is viewed as operating outside the traditional diagnostic boundaries of DSM or
ICD, and is compatible with the Research Domain Criteria (RDoC) put forth by the U.S.
National Institute for Mental Health as an alternative to DSM or ICD, with a focus on the
underlying mechanisms (e.g., cognition, negative affect, arousal) that cut across multiple
disorders and mixed diagnostic groups (Cuthbert, 2014; McEvoy et al, 2009; Newby et al,
2015).

Transdiagnostic psychological treatments have been hailed as a promising new approach
to overcome some of the pitfalls of disorder-specific treatments for mood and anxiety
disorders (Craske, 2012). In theory, transdiagnostic treatments should enable practitioners
to conceptualise the common maintaining processes across presenting issues, and deliver
evidence-based treatment interventions within the one protocol, increasing the efficiency
and efficacy of treatment, reducing the need for multiple manuals, and increasing the
ease of implementation (Newby et al, 2015).

Whilst this approach sounds reasonable and promising, it remains uncertain how
efficacious transdiagnostic treatments are in reducing symptoms of anxiety and
depression, and in improving quality of life. In 2009, McEvoy and colleagues (McEvoy et al,
2009) conducted a review of the efficacy of unified or transdiagnostic protocols for anxiety
and mood disorders. They concluded that whilst the evaluation of such treatments is in its
infancy, with the evidence base consisting of a limited number of randomised controlled
trials using wait-list controls rather than diagnosis-specific interventions, along with
uncontrolled treatment trials, accumulating evidence suggests that unified approaches
may be an effective, efficient, and practical treatment modality that could be more easily
disseminated than the multitude of diagnosis-specific approaches (McEvoy et al, 2009).
The evidence suggests that unified treatments are associated with symptom improvement,
 generally perform better than wait-list controls, are associated with improvements in
comorbid disorders, and may compare well to diagnosis-specific treatments. Unified
protocols are also associated with high client satisfaction, therapeutic alliance, group
cohesion, and positive treatment expectations. However, these conclusions are tempered
by the small number of studies and methodological limitations (McEvoy et al., 2009). More research is clearly needed to establish whether there are specific advantages to a transdiagnostic perspective on treatment. Research into unified treatments also can answer important questions about the common and distinct factors maintaining emotional disorders, which will help inform and extend existing theoretical models (McEvoy et al., 2009).

Similarly, in more a recent review and meta-analysis, Newby and colleagues (2015) identified studies with a range of transdiagnostic interventions (primarily including CBT and mindfulness-based approaches), differing diagnostic combinations and symptom profiles (e.g., multiple anxiety disorders or anxiety and depression), utilising various delivery formats (e.g., individual, group, and internet-delivered interventions). This is the first study to review a comprehensive and broad range of transdiagnostic interventions, across various diagnostic disorders and delivery formats. They conclude that their results

“Provide evidence in support of the efficacy of transdiagnostic treatments in reducing depression and anxiety, and improving quality of life. The quality of RCTs was low overall, and heterogeneity was high. Further high quality RCTs are now needed to explore the sources of this heterogeneity to identify the most effective treatment components and designs, and to understand how transdiagnostic treatments work.” (Newby et al., 2015, p.108)

Other complementary, mind-body and lifestyle interventions that have shown good outcomes for reducing both depression and anxiety, and their comorbid presentation, such as exercise, relaxation training, mindfulness meditation, and positive psychology interventions, may also be conceptualised as “transdiagnostic”, as they address the same underlying treatment principles across disorders, and are not designed as diagnosis-specific treatments. There is no research on these types of interventions within the transdiagnostic framework.

Summary
This chapter has included presentation of current evidence-based approaches to treatment and interventions for depression, anxiety and their comorbidity, as well as transdiagnostic approaches. These include a range of medical, psychological,
complementary and mind-body-lifestyle interventions, including yoga. Numerous factors
related to effectiveness of different treatment and intervention approaches, suggests that
the conditions may have common underlying psycho-neurological mechanisms, and that
those common mechanisms can be affected in different ways by a variety of factors.

Whilst a clearer understanding of each of these factors and how they may be related is
required, current conceptualisations and evidence support the development of a range of
different evidence-based treatment approaches, a better understanding of what works
best for different people, and individually tailored interventions (Hasler, 2010). Australia’s
Beyond Blue suggest that “there is no one proven way that people recover from mental
health conditions such as depression or anxiety. However, there is a range of effective
evidence-based treatments, and there are also many helpful things that people can do for
themselves. The important thing is finding the right treatment approach for the individual’s
needs (Beyond Blue, 2016a). Similarly, Ebmeier and colleagues conclude that mental
health conditions such as depression and anxiety require a large choice of treatments”
and “all effective treatments …. have to be welcomed.” (Ebmeier et al, 2006).

Further research is recommended for the identification of reliable predictors of therapeutic
outcomes, such as use of neuroimaging, neuroendocrine tests and genotyping. This could
potentially allow for the development of personalised medicine that has the potential to
individually tailor interventions, and to open up new pathways in the evaluation of novel
therapeutic approaches (Hasler, 2010).

The previous two chapters have focused on current conceptualisations of depression and
anxiety disorders, a broader framework of mental health and well-being, and a range of
conventional, complimentary and mind-body-lifestyle interventions for reducing depression
and anxiety, and improving well-being. Yoga has been identified as having a potential role
as an intervention for mental health concerns such as depression and anxiety. The
following chapter will explore yoga as a mental health intervention in greater detail, and
the remaining chapters of the thesis will focus on evaluation of the effectiveness of yoga
for mental health.
Chapter 4  Yoga as a Mental Health Intervention

4.1 The System of Yoga

i) Ancient Origins and Source Teachings

Yoga originally comes from the ancient Indian Vedic tradition. It emerged as a one of the major philosophical systems (or darśanas) of the Vedic tradition, over 2000 years ago, and developed as a comprehensive mind-body healthcare system, particularly for individuals seeking higher states of mental health, mind functioning or conscious awareness. The emergent system was originally compiled, synthesised and promulgated by the Indian sage Patanjali, in a classical teaching known as the Yoga Sutra (circa 200 BCE). Whilst there are numerous classical texts and teachings on Yoga, Patanjali’s Yoga Sutra is generally accepted as the most authoritative treatise and concise summary of the classical system of Yoga (Bryant, 2009; Desikachar TKV, 1995; Feuerstein, 1998). Well-accepted translations and interpretations from the original Sanskrit, include a comprehensive psychology, with descriptions of the nature and functions of the mind, mental processes, thoughts and cognition, notions of mental health, problems associated with the mind’s functions (or “mental disorders”), and a range of strategies, solutions and interventions to improve one’s mental functioning, health and well-being (Bryant, 2009; Desikachar TKV, 1995; Feuerstein, 2013).

The system of Yoga is based on a wholistic and multidimensional model of the person, that places the mind and everything that affects its functions, at the centre of health and well-being. Yoga offers practitioners a foundation for developing and maintaining good physical and mental health. When Yoga is used to assist people in treatment or recovery from injury, illness or disability, it is often referred to as cikitsa, or yoga therapy (Annapoorna et al, 2011; Devi, 2014; Mohan & Mohan, 2004; Partlow-Lauttamus, 2014). This includes therapeutic applications for mental disorders, including depression and anxiety.

Patanjali’s classical system includes the well-known model of the “eight-limbs of Yoga”. These eight limbs include cultivation of social and personal values (yama and niyama); physical postures and movement (asana); conscious breathing exercises (pranayama); internal sensory awareness or interoception (pratyahara); and three stages of “meditation” - concentration, meditation, and absorption (dharana, dhyanam, and samadhi). The
model of the eight limbs is presented as a comprehensive and multidimensional approach for reducing mental health problems associated with the human condition (kleśa and duḥkha), and establishing a foundation for optimal human experience of happiness and well-being. Many concepts found in these ancient teachings evolved from an evidence-base of introspection and the accumulated shared experience of the ancient yogis.

The system of Yoga includes multi-component mind-body-lifestyle practices, which may be identified in four main categories of yoga practices: i) physical postures and movement; ii) breathing exercises; iii) relaxation; and iv) mindfulness and meditation (Balasubramaniam et al., 2013; de Manincor et al., 2015). Other aspects of yoga practice include cultivation of positive values, thoughts and attitudes, and behavioural and lifestyle factors. Each of these also include many different components, approaches and techniques, each of which may be practiced in many different ways.

Traditionally, Yoga was generally practiced individually, where students were guided by a teacher in the development of a suitable individualised or personal Yoga practice (Desikachar TKV, 1995). This is an underlying principle found in the classical system of Patanjali known as viniyoga, and refers to the appropriate and specific application of the various aspects of Yoga for the different needs, abilities, goals and circumstances of different people (Desikachar TKV et al., 2001; Kraftsow, 1999). Practical application of the classical system of Yoga is based on tailoring the benefits gained from the development of a suitable individualised or personal yoga practice, which may also change and develop over time.

Whilst the regular practice of each or many of the various components of Yoga, tailored to the needs of the individual, might bring a variety of different benefits, the primary purpose of the classical system of Yoga is for the development of mental health.

ii) Historical Developments and Yoga Traditions

Throughout history, particular ideas, concepts and practices of this classical system have been further developed by different groups of practitioners at different times. When such developments gather significant interest and followers, often over periods of several hundreds of years they are recognised as historical “traditions” of Yoga. These include
Hatha Yoga, Raja Yoga, Bhakti Yoga, Mantra Yoga, and Karma Yoga (Feuerstein, 1998). Hatha Yoga is an example of particular interest and relevance, which emerged from the 9th century, and remained popular in India into the 17th century (Feuerstein, 1998). The central foci of this approach are the physical postures (asana) and breathing exercises (pranayama), which were developed with a view to cultivate physical and mental health, and preparation for further development of the mental capabilities through meditation (Swatmarama, circa 15th century).

Historical traditions generally built on and remained consistent with the classical foundations of Patanjali’s system, with each tradition having a different emphasis on particular aspects of the classical system (Feuerstein, 1998).

iii) Modern Popular Yoga and Yoga Postures

From its ancient Indian origins and various historical developments, Yoga and various adaptations of it have become increasingly popular in recent decades throughout many parts of the world. This popularity is seen in the development of a range of different modern “styles” of yoga, almost exclusively taught in group classes of varying sizes, and new styles or brands of yoga continue to emerge. These modern styles are often said to be based on the tradition of Hatha Yoga (Pilkington et al, 2005; Singleton, 2010; Uebelacker et al, 2010a). Whilst these modern styles of yoga often refer to Patanjali’s model of the eight-limbs, they generally place considerable emphasis on the more physical aspects of yoga postures, and often to the exclusion of all other aspects of Yoga (Feuerstein, 2003Singleton & Byrne, 2008; Singleton, 2010). However, these physical postures are just one aspect of the system of classical Yoga, and the tradition of Hatha Yoga, and are more correctly referred to as the practice of yoga-asana, rather than Yoga.

Within this modern popular focus on physical yoga postures, there is considerable heterogeneity across different approaches, styles and brands. This includes very gentle forms, as well as those that are more vigorous, intense and challenging, and some that are purely a form of exercise and stretching, devoid of any connection or underpinning of the classical teachings. Other practices that are sometimes included in modern popular yoga, include relaxation and breathing techniques, visualisations, mantras, and various
techniques of meditation, including mindfulness, as well as teachings related to values, lifestyle and spirituality.

With the vast array of teachings, practices, approaches and styles today, it is difficult (if at all possible) to ascertain authenticity and adherence to the original classical system. Despite emerging and ongoing debates of authenticity, popularity continues to grow, and some benefit can be assumed by that growing popularity. In relation to mental health, anecdotal claims are often made that the physical postures of yoga have emotional and mental health benefits, and there is some preliminary evidence to support this (Penman et al, 2012; Uebelacker et al, 2010a).

iv) Conscious Regulation of Breathing

Based in the classical system of Patanjali, and central to the tradition of Hatha Yoga, techniques that involve conscious regulation of breathing patterns (pranayama) have been an important aspect of Yoga practice throughout history. Whilst such techniques continue to be taught and practiced today, they do not appear to be as popular and widely taught in modern yoga classes. Despite this, many practitioners report significant benefits of such techniques, particularly in the area of mental health and well-being, and there is some preliminary evidence to support this (Janakiramaiah et al, 2000; Rohini et al, 2000).

v) Meditation in Yoga - Mindfulness in Particular

The model of the eight-limbs, and the classical system of Yoga in general, include a significant focus on meditation, which may be described as developing the ability of the mind (or mind-body) to concentrate and fully immerse oneself in the experience of the moment, or object of attention, without distraction (Desikachar TKV, 1995). It includes the process of changing the usual patterns and dysfunctional tendencies of the distracted and habitual mind, and increases the person’s ability to more fully experience the joy of life. This may seen as analogous to the state of “Flow”, which Mihaly Csikszentmihalyi (1991) describes as “the psychology of optimal experience” and “the process of total involvement with life” (p xi). Similar to Yoga, characteristics of “flow” experiences include concentration and merging of action and awareness. “People who learn to control inner
experience will be able to determine the quality of their lives, which is as close as any of us can come to being happy” (Csikszentmihalyi, 1991, p2).

As discussed earlier, there has been increasing attention in psychological literature on meditation in general, and particular techniques such as “mindfulness”, as therapeutic interventions for those suffering from psychological and emotional difficulties, such as anxiety, depression and stress (Ando et al, 2009; Butler, L. et al, 2008; Davis & Hayes, 2011; Manocha et al, 2011; Vøllestad et al, 2012). Meditation and yoga are often seen as separate (or different, but related) approaches, largely due to the focus on the physical aspects in modern popular yoga. The phrase “Yoga and meditation” is commonly used, yet phrases such as “Yoga and asana” or “Yoga and pranayama” are almost never used.

Meditation is an integral aspect of Yoga, and there are aspects of yogic meditation, and yoga practices in general, that are virtually identical to, and from the same origins as, popularized practices such as mindfulness (Bayley-Veloso & Salmon, 2015; Salmon et al, 2009).

Mindfulness is a modern term used to describe a general form of meditative practice, which comes from both Buddhist and Yogic traditions (Hofmann et al, 2010b; Kabat-Zinn, 1990; Kabat-Zinn, 2003b), and is a central notion within the classical Yoga of Patanjali. Mindfulness is commonly defined as the state of being attentive to and aware of what is taking place in the present (Brown, K. & Ryan, 2003). Mindfulness is also thought of as moment-to-moment, non-judgmental awareness, cultivated by paying attention to the present moment, and as non-reactively and non-judgmentally as possible (Kabat-Zinn, 1995). Yoga practices may also be seen as a mindfulness practices (Kabat-Zinn, 2003a).

Techniques utilised in mindfulness training programmes, such as Mindfulness Based Stress Reduction (MBSR), include yoga practices such as breath awareness, body scans, and mindful movements in yoga postures (Kabat-Zinn, 1982; Kabat-Zinn, 1990; Kabat-Zinn, 2003a; Kabat-Zinn, 2003b).

Whilst mindfulness has been investigated independently as an intervention for mental health (Ando et al, 2009; Baer, 2003; Davis & Hayes, 2011; Lang, 2013), and as a component of other approaches such as MBCT and MBSR (Evans et al, 2008; Teasdale et
It has largely been overlooked or separated from the research framework and evidence base related to Yoga.

**Cultivation of Positive Values**

The system of Yoga includes cultivation of positive values. Patanjali’s Yoga Sutra refers to a number of social and personal values that are seen as the foundation of the model of the eight-limbs. The social values are referred to as *yamas*, and include cultivating i) non-violence, or acting with kindness (*ahimsa*); ii) truthfulness (*satya*); iii) not stealing (*asteya*); iv) chastity - integrity in intimate or sexual relationships, or using one’s sexual energy with integrity (*brahmacharya*) (some translations refer to this as celibacy rather than chastity); and v) non-possessiveness or not being greedy (*aparigraha*). Personal values are referred to as the *niyamas*, and include cultivation of i) personal hygiene and cleanliness on body & mind (*śauca*); gratitude and contentment with what we have and our situation in life (*santoṣa*); self-discipline (*tapas*); self-reflection or self-study (*svadhyaya*); surrender or acceptance of that which is greater than our individual nature or beyond our control; also described as spirituality (with or without adherence to the practitioners particular religious affiliations) and surrender to or connection with the eternal unchanging nature of existence or the divine (*iśvarapranidhana*). Other positive values presented in the Yoga Sutras include friendliness (*maitri*), compassion (*karuna*), appreciation and acknowledgement of what others accomplish (*mudita*), and equanimity in the face of the wrongdoing of others (*upekṣa*). These values are not presented as objective moral imperatives. Rather, cultivation of such values is for the purpose of the individual’s mental health, or a peaceful and joyous mind (*citta prasadanam*), especially in times of difficulty and negativity (*duḥkha* and *daurmāsasya*).

Many of these values are the same as those promoted in Positive Psychology Interventions for the promotion of mental health and well-being, discussed previously in Chapter 3.

**Yoga as an individualised multidimensional whole-systems approach**

The classical system of Yoga presents a range of different practices and techniques that might assist different people in different ways. Rather than viewing Yoga as a singular uni-
dimensional practice or a standardised form of intervention, Yoga may be better understood within a whole-systems approach (Desikachar et al., 2005; Verhoef et al., 2005), with a range of different practices, techniques and therapeutic interventions, that work in combination with each other, in different ways for different people. As a whole-systems approach, Yoga includes a framework of the multidimensional nature of the individual person; the multidimensional nature of illness and suffering, with the fundamental basis of suffering being related to the nature and workings of the mind; and multidimensional solutions and strategies for overcoming suffering and illness, or improved quality of life. Included in this classical system, and consistent with the whole-systems approach, is the importance of an individualised rather than standardised or generic intervention approaches.

Yoga, Mental Health, Positive Psychology, and Well-Being

In the established framework of psychiatry and clinical psychology, much attention has been given to the categorisation and diagnosis of mental disorders, including depression and anxiety, and corresponding approaches to treatment for each specific disorder, including pharmacological, psychological, and behavioural. The field of Positive Psychology has recently emerged with a focus on optimising mental health through cultivation of positive aspects of mental health, including positive emotions and various dimensions of well-being. These include a range interventions and “intentional activities” such as cultivation and expression of gratitude, compassion, kindness, and forgiveness; avoidance of over-thinking and social comparison; increasing “flow” experiences; cultivating the ability to “savour” moments of joy; practicing religion and spirituality; and caring for body and mind, including physical exercise, yoga postures, and meditation (Lyubomirsky, 2007). Preliminary evidence supports the importance of tailoring such interventions and activities to the strengths and lifestyle of the individual (Lyubomirsky, 2007; Seligman, 2002; Sin & Lyubomirsky, 2009).

Many of these concepts and intentional activities of Positive Psychology are similar to those described in the classical system of Patanjali’s Yoga. However, previous research on the mental health benefits of yoga, often seems to overlook these factors in designing the yoga intervention (Riley, D., 2004; Uebelacker et al., 2010a; Weintraub, 2004).
Consistent with conceptualisations in Positive Psychology, this thesis places a focus on both the reduction of symptoms of depression and anxiety, and parallel increases in subjective well-being, and includes exploration of aspects of classical Yoga teachings, such as the cultivation and expression of values such as gratitude and compassion, increases in experiences of the present moment, and cultivating the capacity for savouring moments of joy, many of which are similar to the intentional activities described in Positive Psychology. Emphasis is placed on assisting the individual person, rather than treating the illness, utilising a range of different aspects of yoga teachings and practices, with an emphasis on tailoring the yoga practice to the needs, abilities and interests of each individual, in a cost effective manner.

4.2 Yoga as a Mental Health Intervention

There are several factors and types of evidence that potentially support the notion of Yoga for mental health care.

Firstly, the theoretical and historical proposition of the teachings and practice of Yoga as a mental health care system, which was discussed in the previous section.

Secondly, indirect, inferred or related evidence of efficacy of interventions that may be viewed as being the same or similar to yoga interventions, but not necessarily called yoga, or with evidence established from outside the Yoga system or framework. Examples include i) exercise, ii) relaxation, iii) breathing exercises, iv) mindfulness and other forms of meditation, and v) cultivation of values and positive aspects of mental health.

Finally, direct evidence of efficacy, established from prior research. A general review of the literature, followed by a systematic literature review of randomised controlled trials will be presented later in this chapter.

Related evidence

i) Exercise

According to the definitions of exercise and physical activity presented previously (Caspersen et al, 1985), the practice of yoga postures can be considered a type of physical activity or exercise as they generally include planned, structured and repetitive
bodily movements produced by skeletal muscles, that result in energy expenditure, and are related to attributes of health and skill development.

Evidence of the benefits of physical activity or exercise for reducing depression and anxiety is well established in clinical research, and was presented in Chapter 2. Definitions, terminology, dose, acceptability, and types of exercise that derive benefits, vary considerably in the research literature. Heterogeneity includes levels of intensity, duration, frequency, and total energy expenditure, as well as different types of physical activities (Cooney et al, 2013; Dunn et al, 2002; Dunn et al, 2005; Mead et al, 2009; Pate et al, 1995).

It is plausible to deduce that the known efficacy of exercise and physical activity, also provides supportive evidence to the practice of yoga postures as a type physical activity and mental health intervention. Characteristics, such as particular types and approaches of yoga postures, as well as frequency, duration, intensity and energy expenditure are unknown and require further consideration (Cowen & Adams, 2005).

As well as supportive evidence from physical activity in general, a growing number of studies have assessed yoga as a type of exercise intervention (Berger & Owen, 1992; Bonura & Pargman, 2009; Chen et al, 2006; Cowen & Adams, 2005; Hagins et al, 2007; Ross & Thomas, 2010; Sherman, S., 2016; Streeter et al, 2010; Uebelacker et al, 2010b). However, the practice of yoga postures as a physical activity often includes integration of breath awareness and mindfulness. So, it is difficult to know if it is the exercise component, breath awareness, mindfulness, other factors associated with the yoga, or combinations of these that derive benefit. A review of the evidence directly related to yoga as a mental health intervention will be presented in chapter 5.

ii) Relaxation Training

Relaxation techniques are commonly used in modern yoga classes. Many different approaches are used, often incorporating a composite of components such as breath awareness, progressive muscle relaxation, affirmations, visualisation and imagery. Relaxation techniques in yoga are sometimes referred to as Yoga Nidra (Swami Saraswati, 1984), though this term is somewhat ambiguous, and is also used to refer to meditation (Miller, R., 2005). Regardless, yoga relaxation techniques are consistent with the definition
provided in chapter 2: any technique, process or activity that helps a person to relax, to voluntarily let go of tension and attain a state of increased calmness (Jorm et al, 2002).

Evidence of moderate benefits for reducing depression and anxiety has been well established in clinical research, and was presented in Chapter 2. Whilst most of the relaxation techniques used were not necessarily referred to as being a yoga relaxation practice, the evidence supports this component of yoga as a mental health intervention. Further consideration of the components included in yoga relaxation is required.

iii) Breathing Exercises
Breath awareness and breathing exercises are integral to several aspects of yoga practice. Yoga postures are ideally done with breath awareness and in coordination with breath movements, pranayama includes specific yoga breathing techniques, relaxation and meditation techniques often use the breath as a means to relax and focus the mind.

Apart from yoga, surprising little research has been done on the use of breathing techniques for reducing depression or anxiety, despite the fact that controlled breathing or deep breathing exercises have been reported as the most commonly used mind-body therapy by adults with medical conditions in the US (Bertischa et al, 2009), and the second most commonly used of all complementary health approaches (second only after all natural dietary supplements combined) (Clarke, T. et al, 2015). Also, that breathing exercises are commonly used as a component of psychological treatments, including CBT, MBCT and other 3rd wave cognitive approaches, mind-body and self-help practices, yoga, tai chi, qi gong, relaxation training, and mindfulness and other forms of meditation (Morgan & Jorm, 2008). Each of these have been studied in clinical research, and included in various reviews (Cramer et al, 2013b; D'Silva et al, 2012; Hofmann et al, 2010b; Jorm et al, 2008; Jorm et al, 2013; Morgan & Jorm, 2008). However, there has been very little research on the use of breathing exercises as a stand alone mental health intervention.

Clinical research that has focused on breathing exercises as a primary intervention, are mostly yoga breathing exercises, and will be presented in chapter 5.

iv) Mindfulness, Meditation and Yoga
Whilst yoga postures are the most popular and identifiable component of modern yoga, mindfulness and meditation are an important, if not essential, part of the system of Yoga. Evidence of the efficacy of mindfulness meditation, yoga as a form of mindfulness practice, and mindfulness components in other psychotherapeutic interventions such as MBCT and MBSR, is well established, and was presented in chapter 2. Some of the research literature refers to mindfulness in association with yoga or yoga as a mindfulness enhancing practice (Brisbon & Lowery, 2011; Büssing et al., 2012a), and some does not. Regardless, the broader evidence of efficacy of mindfulness practices provides related evidence of the efficacy of Yoga as a mental health intervention.

v) Cultivation of Positive Values

The system of Yoga includes cultivation of positive values, described earlier in this chapter. There is strong evidence from the emerging field of Positive Psychology to confirm the efficacy of cultivation of positive values for lasting increases in well-being, particularly for people with mild to moderate depressive symptoms, presented previously in chapter 3. Whilst the research was not directly referring to Yoga, the evidence supports the efficacy of this component of Yoga teachings and practices as a mental health intervention.

One study has examined the relationship between well-being and yoga. Comparing groups with no yoga experience and those with varying years of experience, they showed a correlation between years of yoga practice and i) levels of gratitude ($r = 0.25; p = 0.005$, 2-tailed test), and ii) levels of meaning ($r = 0.21; p = 0.01$, 2-tailed test) (Ivtzan & Papantoniou, 2014). Whilst this is only one study, it provides further evidence of the association between yoga and well-being, and further investigation of potential causation is warranted.

General literature review of Yoga as a therapeutic intervention for mental health

In recent years, there has been a proliferation of popular books, magazine and journal articles, webpages and news stories, that acclaim the mental health benefits of yoga (Bennett, 2002; Broad, 2012; Forbes, 2011; Harvard Medical School, 2009; Liebler & Moss, 2009; Weintraub, 2004). More specifically, several bibliometric analyses have shown a
significant increase in clinical research publications related to yoga as a mental health intervention (Cramer et al, 2014; Jeter et al, 2015; Khalsa, 2004).

In 2004, Khalsa reviewed clinical trial publications appearing in research journals, which reported on interventions incorporating yoga or yoga based techniques for the treatment of medical or psychiatric conditions, or their associated symptoms. Studies that were meditation specific (including yoga-meditation and mindfulness) with no other component of yoga postures or breathing techniques were excluded, as these had been extensively reported elsewhere (Baer, 2003; Murphy et al, 1997; Perez-De-Albeniz & Holmes, 2000). A total of 181 publications were identified, including uncontrolled trials (48%), randomised controlled trials (40%), and non-randomised controlled trials (12%). To reduce risk of potential publication bias, yoga-speciality journals and non-yoga research journals were analyzed separately, as well as country where the study was conducted. A total of 96 trials (53%) were published in India, and a total of 34 (19%) were published in specialty yoga journals. Khalsa found a total of 58 published reports on trials for psychiatric conditions, with 23 (40%) of these in non-yoga journals. The number of these from India is not reported. Khalsa also notes that there was considerable heterogeneity in the types of yoga included in the literature, ranging from individual breathing or postural techniques, to complete yoga lifestyle interventions involving dietary and psycho-spiritual components.

More recently, a review by Jeter and colleagues (Jeter et al, 2015) found a three-fold increase in the number of publications in the past decade. Overall, they identified 486 clinical trials in the period from 1967 to 2013, including the same 181 trials identified in the 2004 study (Khalsa, 2004), with similar distribution of publications by study design, region, and journal type. 37% of trials were uncontrolled, 45% were randomised controlled trials, and 18% were non-randomised controlled trials, with most publications (53%) continuing to emerge from India. Approximately 50% of publications, including RCT’s were published in traditional non-yoga or CAM research journals, suggesting that the mainstream medical literature is continuing to explore the plausibility of yoga as a therapeutic intervention.

Yoga for mental health disorders comprised the highest ranking number of publications (a total of 89 studies, or 18%). Mental health disorders included anxiety, depression, post-
traumatic stress disorder, schizophrenia, and addiction, among other psychopathologic disorders.

Cramer and colleagues conducted a more specific bibliometric analysis of randomised controlled trials (RCT’s) with yoga as a treatment intervention (Cramer et al., 2014). They identified a total of 312 RCT’s published between 1975 and 2014 (compared to approximately 218 RCTs included in the Jeter review), from 23 different countries. Eighty-four RCTs (26.9%) were conducted with healthy participants, and a further 23 RCTs (7.4%) included participants from the general population, or subpopulations such as students or employees, without any specified medical conditions as inclusion criteria. Other trials enrolled patients with one of 63 varied medical conditions; the most common being breast cancer (17 RCTs, 5.4%), depression (14 RCTs, 4.5%), asthma (14 RCTs, 4.5%) and type 2 diabetes mellitus (13 RCTs, 4.2%). Similar to other reviews, the largest number of studies were conducted India (46.4%). There appears to be an increase in RCTs done in developed countries, other than India, though the previous reviews did not specifically report on details of RCT’s done in particular countries. In total, 42 articles (13.5%) were published in yoga specialty journals, 58 articles (18.6%) in journals specialized on complementary therapies or integrative medicine, and 193 (61.9%) in other journals including major general medical journals.

Whilst these bibliometric analyses do not aim to gauge yoga’s effectiveness as an intervention, they provide an indication of the level of investigation provided by the number of trials being conducted, particularly RCTs. The volume of research evidence has continuously increased in the past decade, especially in recent years. More specifically, the highest number of clinical trials have been for mental health. Fourteen RCTs of yoga for depression were identified, and these did not include studies on yoga-meditation or mindfulness. Interestingly, there were no RCT’s for anxiety included. Further review of the quality of evidence and efficacy of yoga as a mental health intervention is required, and is presented in the following Section 4.3.
4.3 Systematic Review of Randomised Controlled Trials of Yoga for Depression and Anxiety

A systematic review of randomised controlled clinical trials (RCTs) was conducted on the effectiveness of yoga for reducing depression and/or anxiety compared with a control group. The review identifies, describes and assesses prior clinical research from RCTs that include any type of yoga-based intervention as a treatment for reducing symptoms of depression or anxiety, amongst participants with a diagnosis or measured elevated symptoms of anxiety or depression. Identifying general and particular characteristics of trials, and a summary of outcome efficacy are included in the review.

Search strategy

A comprehensive and exhaustive search of the electronic databases and literature was carried out including search databases Cochrane Register of Controlled Trials (CCTR), Cochrane Database of Systematic Reviews (CDSR), MEDLINE, PubMed, CINAHL Plus, EMBASE, and PsychINFO, using keywords (yoga OR meditation OR mindfulness) AND (depression OR anxiety) AND randomised controlled trial (RCT). Reference lists of identified original articles or reviews were searched manually. Searches were conducted in January-February, 2015.

Inclusion Criteria for Clinical Trials

Studies were deemed eligible for inclusion in the review if they were: 1) published since 1990; 2) text in English; 3) a randomised controlled clinical trial (RCT), including pilot studies; 4) one of the intervention arms involved an identifiable predominantly yoga-based intervention, including yoga-based meditation, yoga-based mindfulness or MBSR; 5) inclusion criteria for the trial required participants to have a diagnosis of anxiety or depression, or measured elevated symptoms of anxiety or depression on a standardised validated scale.

Prior reviews have noted that few clinical trials of yoga as a treatment for depression or anxiety were conducted prior to 1990, and such early trials were generally of a poor quality. Consequently, this search has focused on the 25 years of research evidence since 1990.
Studies that included a form of mindfulness or meditation as the intervention are included in this review only if the intervention is identified by the study authors as a form of yoga-based meditation or mindfulness. In particular, the MBSR programme is a standardised intervention which includes predominantly yoga-based practices, including yoga postures and mindfulness (Bayley-Veloso & Salmon, 2015; Kabat-Zinn, 1982; Kabat-Zinn, 1990; Kabat-Zinn et al, 1992; Kabat-Zinn, 2003b; Kabat-Zinn, 2003a; Kabat-Zinn, 2013; Salmon et al, 2009). More recently, Yoga is also becoming recognised in the context of Mindfulness Based Cognitive Therapy (Y-MBCT; Pradhan, 2015; Pradhan & Pinninti, 2016). However, whilst some study authors acknowledge MBSR as yoga-based, others do not. Studies where the MBSR was not acknowledged by the authors as a yoga-based intervention have been excluded, even though MBSR may be seen by others as a yoga-based intervention.

Searches were conducted by research assistants and university library staff. Abstracts of each article identified in the search were extracted and reviewed by the same research assistants, and articles were excluded or kept for potential inclusion in accordance with eligibility criteria. The full-text of articles for potential inclusion were sought and further evaluated by the primary researcher, to assess eligibility for the current review. Data on study and participant characteristics, selection criteria (including diagnosis or validated measure of depression or anxiety symptoms), randomisation, data collection instrument, data management (& data entry), interventions, control comparisons, outcome measures, and results from eligible articles, were reviewed and summarised. Statistical significance of results and effect sizes were included in the review, if included in original study publication.

Critical Appraisal and Risk of Bias of Individual Studies

Critical appraisal of studies was conducted by assessing risk of bias, using the risk of bias tool developed by the Cochrane Collaboration (Higgins & Green, 2011). This tool assesses risk of bias on the following 5 domains: selection bias, performance bias, attrition bias, reporting bias, and detection bias, using 12 criteria across the 5 domains. Studies that met at least seven of the 12 criteria were rated as having low risk of bias, and studies that met fewer than seven criteria were rated as having high risk of bias.

Previous systematic reviews on the same topic area were also searched and included in the review.
Results

Initial database searches identified 505 records, with 3 additional records from references provided in prior reviews. Following inspection of each abstract, 460 records were excluded in accordance with eligibility criteria. The full-text articles of the remaining 48 records were sought and further evaluated to assess eligibility for the current review. Of these, a further 24 were excluded based on the eligibility criteria. A summary of excluded studies is presented in Table 3 (p 98). 24 RCTs are included in the final review. Figure 1 summarises the results at each step of the search methodology.

Figure 1. Flowchart of results of literature search

1) Randomised Controlled Trials

The current review found twenty-four randomised controlled trials (RCTs) that met the inclusion criteria, including sixteen RCTs with measures for anxiety, twenty-one with measures for depression, and twelve RCTs not included in previous reviews. Thirteen of the twenty-four trials included measures for both anxiety and depression. Studies identified in the current review are summarised in Table 4.1.
Table 4.1
Randomised controlled trials of yoga interventions, with depression and/or anxiety outcome measures (N = 24)
Including 16 RCTs with anxiety as an outcome measure, 21 RCTs with depression as an outcome measure, and 12 RCTs not included in prior reviews.

<table>
<thead>
<tr>
<th>Study</th>
<th>Sample</th>
<th>Outcome Measures</th>
<th>Yoga Intervention</th>
<th>Control group(s)</th>
<th>Results on anxiety or depression outcomes (based on statistical significance)</th>
<th>Included in prior reviews</th>
</tr>
</thead>
<tbody>
<tr>
<td>Arch et al (2013)</td>
<td>n = 105 War veterans, outpatients with a DSM-IV anxiety disorder</td>
<td>Anxiety: * CSR * CSR AA * PSWQ Depression: * CSR * BD-II</td>
<td>Yoga-based MBSR</td>
<td>CBGT</td>
<td>Both groups led to significant reduction in CSR (p&lt;0.01), with no significant difference between groups. * Reduction in BDI scores for MBSR group (p&lt;0.01), for CBT group (p=0.09). However, no significant difference between groups. * Mixed results on anxiety scores, MBSR showed greater reductions on PSWQ (p&lt;0.05). No sig. difference on MASQ-AA</td>
<td>N/A - recency</td>
</tr>
<tr>
<td>Broota &amp; Sanghvi (1994)</td>
<td>n = 30 Students with history of exam anxiety, &amp; scored “high” on STAS</td>
<td>Anxiety: * ACL * STAS</td>
<td>BRT</td>
<td>Jacobson's Progressive relaxation</td>
<td>Mean pre &amp; post changes for BRT (yoga) group were greater than Jacobson relaxation (p&lt;0.05) and no treatment groups (p&lt;0.01)</td>
<td>Kirkwood et al (2005) da Silva et al (2009)</td>
</tr>
<tr>
<td>Buttner et al (2015)</td>
<td>n = 57 Women with postpartum depression (DSM-IV SCID; HDRS &gt; 12)</td>
<td>Anxiety &amp; Depression: * IDAS * clinician ratings Depression: * HRSD</td>
<td>Gentle sequence of postures, suitable for postpartum 16 x 1 hr classes, once per week, for 8 weeks + 30-min DVD-led home practice, once each week, over the 8 weeks</td>
<td>Waitlist</td>
<td>Significant decrease in depressive symptoms in both groups (p&lt;0.01). * Yoga group experienced greater rate of change in improvement of depression and anxiety (p&lt;0.01) * Large effect size (in rates of change) favouring yoga relative to the control group on depression (HDRS) (ES=1.06), and social anxiety (IDAS) (ES=1.03). * Differences between groups on post-intervention measures not reported.</td>
<td>N/A - recency</td>
</tr>
<tr>
<td>Study</td>
<td>Sample Size</td>
<td>Diagnosis</td>
<td>Anxiety</td>
<td>Depression</td>
<td>Other</td>
<td>Interventions</td>
</tr>
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<tr>
<td>Field et al (2012)</td>
<td>n = 92</td>
<td>DSM-IV pre-natal depression</td>
<td>STAI</td>
<td>CES-D</td>
<td></td>
<td>Yoga postures (described in publication) • Social support group</td>
</tr>
<tr>
<td>Field et al (2013)</td>
<td>n = 84</td>
<td>DSM-IV pre-natal depression</td>
<td>STAI</td>
<td>CES-D</td>
<td></td>
<td>Yoga postures (described in publication) • 1 x 20 min group session per wk, for 12 wks</td>
</tr>
<tr>
<td>Hoge et al (2013)</td>
<td>n = 93</td>
<td>Diagnosed with GAD (DSM-IV)</td>
<td>BAI</td>
<td>HAM-A</td>
<td>CGI-S</td>
<td>Yoga postures (described in publication) • 1 x 20 min group session per wk, for 12 wks</td>
</tr>
<tr>
<td>Janakiramaiah et al (2000)</td>
<td>n = 45</td>
<td>DSM-IV diagnosis of depression, with HRSD &gt; 17</td>
<td>BDI</td>
<td>HAM-D</td>
<td></td>
<td>Electroconvulsive therapy (ECT) • SKY</td>
</tr>
<tr>
<td>Jazaieri et al (2012)</td>
<td>n = 56</td>
<td>Adults diagnosed with SAD (DSM-IV)</td>
<td>LSAS</td>
<td>BDI-II</td>
<td>PSS</td>
<td>Yoga-based MBSR • Yoga-based MBSR • Aerobic exercise • No treatment</td>
</tr>
<tr>
<td>Kearney et al (2013)</td>
<td>n = 47</td>
<td>War veterans with PTSD</td>
<td>PHQ-9</td>
<td>PCL-C</td>
<td>HRQOL</td>
<td>Yoga-based MBSR • Yoga-based MBSR • TAU</td>
</tr>
<tr>
<td>Khumar et al (1993)</td>
<td>n = 50</td>
<td>“Severe” depression, measured by ADT &amp; ZDSRC Cut-off scores not given</td>
<td>ZDSSRS</td>
<td>Interview</td>
<td></td>
<td>Relaxation group showed greater reduction on depression scores and higher number of remissions, than controls (p=0.01).</td>
</tr>
<tr>
<td>Study</td>
<td>n</td>
<td>Diagnosis/Design</td>
<td>Measures</td>
<td>Intervention</td>
<td>Findings</td>
<td>Notes</td>
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<tr>
<td>Kinsel et al (2013)</td>
<td>27</td>
<td>Females diagnosed with MDD, MINI</td>
<td>Anxiety: STAI, Depression: PHQ-9, PSS-1</td>
<td>Gentle hatha yoga, 1 x 75 min session per wk, for 8 wks, with daily home practice</td>
<td>No differences between groups in reduction of depression or anxiety. Yoga group had greater decrease in rumination scores over time compared to the control group.</td>
<td>N/A - recency</td>
</tr>
<tr>
<td>Koszycki et al (2007)</td>
<td>53</td>
<td>DSM-IV SAD (MINI)</td>
<td>Anxiety: LSAS, SIAS, SPS, Depression: BDI-Other</td>
<td>Yoga-based MBSR, CBGT</td>
<td>Both groups showed significant reductions in depression and anxiety scores (p&lt;0.05), with no significant difference between groups.</td>
<td>N/A - MBSR</td>
</tr>
<tr>
<td>Kozasa et al (2008)</td>
<td>22</td>
<td>DSM-IV diagnosed anxiety disorders (SCID)</td>
<td>Anxiety: STAI-Depression: BDI</td>
<td>Waitlist</td>
<td>At 1 month: Significant decreases in depression and anxiety scores (state and trait) in yoga group compared with controls (p&lt;0.05 for each). Also, significant differences in increase in subjective well-being (p=0.04)</td>
<td>Cabral et al (2009)</td>
</tr>
<tr>
<td>Lovretsky et al (2013)</td>
<td>49</td>
<td>Care-givers, with mild-moderate depression, HRSD 5 to 17</td>
<td>Depression: HRSD, Other: SF-36</td>
<td>Listening to relaxing instrumental music</td>
<td>Difference in favour of Yoga meditation was not statistically significant (p=0.06, ES=-0.51)</td>
<td>Cramer et al (2013)</td>
</tr>
<tr>
<td>Lo et al (2013)</td>
<td>82</td>
<td>Adults with depressive symptoms (BDI-II &gt; 15) and anxiety symptoms (HADS-A &gt; 8)</td>
<td>Anxiety: HADS, Depression: BDI-Other: BNSWBI</td>
<td>Waitlist</td>
<td>C-MT group had significant decreases in depression and anxiety compared to controls (p&lt;0.01 for each; depression ES=1.11; anxiety ES=1.10)</td>
<td>N/A - recency</td>
</tr>
<tr>
<td>Mitchell et al (2014)</td>
<td>38</td>
<td>Women war veterans and civilians, with PTSD and mild-moderate depression, HRSD between 5 - 17</td>
<td>Anxiety: STAI, Depression: CES-D, Other: PCL, PC-PTSD, PSS-I</td>
<td>Assessment group meetings - weekly meetings to complete questionnaires</td>
<td>No significant difference in changes in PTSD symptoms, depression or anxiety between groups</td>
<td>N/A - recency</td>
</tr>
<tr>
<td>Rohini et al (2000)</td>
<td>30</td>
<td>Outpatients with DSM-IV diagnosis of major depression</td>
<td>Anxiety: BAI, Depression: BDI</td>
<td>SKY, Duration of each session unknown, Done individually at home</td>
<td>Both groups showed significant reductions scores of depression and anxiety (p&lt;0.03), No difference between groups</td>
<td>Pilkinson et al (2005)</td>
</tr>
<tr>
<td>Shaikh &amp; Kumar (2013)</td>
<td>30</td>
<td>Students with elevated anxiety scores (HAM-A)</td>
<td>Anxiety: HAM-A</td>
<td>Relaxation exercises</td>
<td>Both groups showed significant reductions in anxiety (p&lt;0.001), No significant difference between groups</td>
<td>N/A - recency</td>
</tr>
<tr>
<td>Study</td>
<td>Patients</td>
<td>Intervention</td>
<td>Measures</td>
<td>Findings</td>
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<tr>
<td>Sharma et al (2005)</td>
<td>n = 30 Outpatients with DSM-IV diagnosis of depression</td>
<td>Anxiety: HAM-A, Remission rates (HAM-D &lt; 7) Depression: HAM-D</td>
<td>SYM + antidepressant 30 min group session, 3 times/week, 8 weeks</td>
<td>Antidepressant alone  Reductions in depression &amp; anxiety symptom scores in both groups (p&lt;0.001) SYM group had greater % reductions in both scores (p&lt;0.01) SYM had higher number of remissions</td>
<td></td>
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<tr>
<td>van der Kolk et al (2014)</td>
<td>n = 64 Women with DSM-IV diagnosed PTSD</td>
<td>Depression: BDI-II Other: CAPS, DES</td>
<td>Trauma-informed hatha yoga 1 hr classes, weekly, for 10 wks Supportive women’s health education group</td>
<td>Both groups showed significant decreases on depression scores (p&lt;0.01; ES: yoga=-1.07; control =-0.66), but differences between groups not significant</td>
<td></td>
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<tr>
<td>Whiddon &amp; Bazini (2011)</td>
<td>n = 26 Adults with mild to severe depression (BDI-II)</td>
<td>Depression: BDI-II</td>
<td>Hatha yoga 1.5 hr classes, 3 times per week, for 8 weeks</td>
<td>Yoga group had significantly lower depression scores at post-test than controls (p&lt;0.03)</td>
<td></td>
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</tr>
<tr>
<td>Woolery et al (2004)</td>
<td>n = 28 Adults with mild depression, indicated by BDI score of 10 to 12</td>
<td>Anxiety: STAI, Depression: BDI Other: POMS, SOL</td>
<td>Iyengar style 1 hr group classes, 2 times/wk, 5 wks Not encouraged to practice at home</td>
<td>Yoga group showed greater reduction in scores of depression and anxiety than waitlist control group (p&lt;0.01)</td>
<td></td>
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</tr>
</tbody>
</table>

### Measures
- ACL = Anxiety Symptom Check List
- BAI = Beck Anxiety Inventory
- BDI (or BDI-II) = Beck Depression Inventory
- BMWSBI = Body-Mind-Spirit Well-Being Inventory
- CAPS = Clinician Administered PTSD Scale
- CDAS = Cornell Dysthymia Scale
- CES-D = Center for Epidemiological Studies Depression Scale
- CGI-I = Clinical Global Impression of Improvement
- CGI-S = Clinical Global Impression of Severity
- CSR = Clinical Severity Ratings (or Diagnostic Severity of Principal Diagnosis/Disorder)
- DES = Dissociative Experiences Scale
- HADS = Hospital Anxiety Depression Scale
- HRQOL = Health Related Quality of Life
- HRSD (or HAM-D) = Hamilton Rating Scale for Depression
- HRSQ = Hamilton Rating Scale for Anxiety
- IDAS = Inventory of Depression and Anxiety Symptoms
- LSAS = Liebowitz Social Anxiety Scale
- MASQ-AA = Mood and Anxiety Symptom Questionnaire - Anxious Arousal subscale
- PCL = PTSD Checklist
- PC-PTSD = Primary Care Screening - PTSD
- PHQ-9 = Patient Health Questionnaire
- POMS = Profile of Mood States
- PSS-10 = Perceived Stress Scale
- PSS-I = PTSD Symptom Scale-Interview
- PSI - WAIS = Penn State Worry Questionnaire
- RRQ = Ruminative Response Scale
- SIAS = Social Interaction Anxiety Scale
- SF-36 = Short Form Health Survey
- SPQ = Social Phobia Scale
- STA = State Trait Anxiety Inventory
- STAS = Spielberger Test Anxiety Scale
- TLEQ = Trauma Life Events Questionnaire
- ZDSRS = Zung Depression Self Rating Scale

### Yoga and Control Interventions Used
- BRT = Broota’s relaxation technique, including 4 exercises adapted from yoga + autosuggestion
- CBT = Cognitive-behavioral therapy
- C-MT = Compassion Mindfulness Therapy, includes body scans, mindful yoga, and sitting compassion meditation
- Hatha yoga is a multi-component intervention, which generally includes postures, breathing exercises, relaxation & meditation
- Inner Resources = mixed yoga techniques, including postures, breathing and relaxation, with emphasis on meditation
- Iyengar style: mostly postures and relaxation
- MBRR = Mindfulness Based Stress Reduction, includes group classes with body scan, breathing exercises, mindful yoga postures and movement, and sitting meditation; usually 2.5hr/week for 8 weeks + one-day meditation retreat, & homework 30-45 mins/day
- SKY = Sudarshan Kriya Yoga: includes 3 breathing techniques & a lying relaxation
- SYM = Sahaj Yoga Meditation
- IAU = Treatment as Usual
Characteristics of the twenty-four RCTs included in the review:

a) Study and Participant Characteristics

Fifteen studies were conducted in North America (USA) (Arch et al, 2013; Butler, L. et al, 2008; Buttnet et al, 2015; Field et al, 2012; Field et al, 2013; Hoge et al, 2013; Jazaieri et al, 2012; Kearney et al, 2013; Kinser et al, 2013; Koszycki et al, 2007; Lavretsky et al, 2013; Mitchell et al, 2014; van der Kolk et al, 2014; Whiddon & Bazini, 2011; Woolery et al, 2004). Seven studies were conducted in India (Broota & Dhir, 1990; Broota & Sanghivi, 1994; Janakiramaiah et al, 2000; Khumar S. et al, 1993; Rohini et al, 2000; Shaikh & Kumar, 2013; Sharma, V. et al, 2005), five of which were included by Cramer and colleagues, with one study published since their review (Shaikh & Kumar, 2013). One study was conducted in each of Brazil (Kozasa et al, 2008) and Hong Kong (Lo et al, 2013).


Spielberger Test Anxiety Scale (STAS) (Broota & Sanghivi, 1994), or rated by a clinician using a symptom checklist (Broota & Dhir, 1990).

Sample size in each study ranged from 22 to 93 participants (median 46.5). All participants were adults, with mean ages ranging between 19.5 and 60.5 years (median 39.2 years). Between 20 and 100% (median 74%) of participants in each study were female.

b) Intervention Characteristics

Fourteen RCTs used multi-component yoga interventions, including a combination of yoga postures, plus breathing techniques, relaxation, or meditation/mindfulness, or MBSR (Arch et al, 2013; Broota & Dhir, 1990; Broota & Sanghivi, 1994; Butler, L. et al, 2008; Hoge et al, 2013; Jazaieri et al, 2012; Kearney et al, 2013; Kinser et al, 2013; Koszycki et al, 2007; Lo et al, 2013; Mitchell et al, 2014; Shaikh & Kumar, 2013; van der Kolk et al, 2014; Whiddon & Bazini, 2011). This is a significant increase in frequency of use of multi-component yoga interventions, from the three studies reported by Cramer and colleagues (Cramer et al, 2013b). Four studies used yoga postures only; one of those using the iyengar method (Woolery et al, 2004), and the other three described postures that were said to be suitable for pre- or postnatal (Buttner et al, 2015; Field et al, 2012; Field et al, 2013). The remaining six did not use a physical component of yoga postures at all, and each included a particular form of relaxation, breathing or meditation practice: Kirtan Kriya\(^1\) (Lavretsky et al, 2013), Sahaja yoga meditation\(^2\) (Sharma, V. et al, 2005), Siddha Samadhi yoga (SSY)\(^3\) (Kozasa et al, 2008), Sudarshan Kriya Yoga (SKY)\(^4\) (Janakiramaiah et al, 2000; Rohini et al, 2000), and shavasana yoga\(^5\) (Khumar S. et al, 1993).

Eight of the RCTs used interventions that were conducted in group classes (Field et al, 2012; Field et al, 2013; Mitchell et al, 2014; Shaikh & Kumar, 2013; Sharma, V. et al, 2005; van der Kolk et al, 2014; Whiddon & Bazini, 2011; Woolery et al, 2004). Seven used interventions that

\(^1\) Kirtan Kriya is a repetitive chanting meditation with breathing and silent meditation, from the Kundalini Yoga practice (Newberg et al, 2010).

\(^2\) Sahaja yoga meditation is a form of meditation from Kundalini Yoga, described as “a technique to arouse the latent potential of man by a [unique] simple meditative process” (Sharma, V. et al, 2005)

\(^3\) SSY includes breathing techniques with a focus on ujayi (sound/feeling of breath in the throat), and specific breathing ratio of inhale/hold/exhale/hold equal to counts of 3/2/5/2, plus a seated meditation of observing flow of spontaneous thoughts and use of a prescribed mantra (Kozasa et al, 2008)

\(^4\) SKY includes slow deep breathing followed by vigorous breathing, and a cyclical breathing pattern of slow, moderate and fast breathing (Janakiramaiah et al, 2000)

\(^5\) Shavasana yoga is described by the researchers as a lying down relaxation position, that include progressive muscle relaxation, slow rhythmic diaphragmatic breathing, with a short holding of the breath after inhalation and after exhalation (Khumar S. et al, 1993).

“Dosage” (frequency and duration) of yoga interventions ranged considerably, from twice per day over 3 consecutive days, to one session per week for twelve weeks. The length of programmes ranged from 3 days to 12 weeks (median 8 weeks), with each practice session ranging from 12 minutes to 150 minutes (median 60 minutes). Frequency of practice sessions ranged from daily to 1 session per week, with a number of studies including a combination 1 group session per week, plus daily home practice.


c) Control comparisons

A variety of control comparisons were used across the studies, and some trials included more than one control group. Twelve RCTs compared yoga to no specific treatment, including no treatment or treatment as usual (TAU) waitlist (Buttner et al, 2015; Field et al, 2012; Jazaieri et al, 2012; Kearney et al, 2013; Khumar S. et al, 1993; Kozasa et al, 2008; Lo et al, 2013; Whidden & Bazini, 2011; Woolery et al, 2004), or a control group that was not further specified (Broota & Dhir, 1990; Broota & Sanghivi, 1994; Butler, L. et al, 2008). Six
studies compared yoga to a relaxation intervention (Broota & Dhir, 1990; Broota & Sanghivi, 1994; Lavretsky et al, 2013; Rohini et al, 2000; Shaikh & Kumar, 2013; Sharma, V. et al, 2005). Two trials compared yoga to group CBT (Arch et al, 2013; Koszycki et al, 2007). One trial each compared yoga to a conventional antidepressant (Sharma, V. et al, 2005), both pharmacological treatment and electroconvulsive therapy (Janakiramaiah et al, 2000), aerobic exercise including stretching and running (Jazaieri et al, 2012), massage (Field et al, 2012), or some type of group activity: stress management education (Hoge et al, 2013), health education videos (Kinser et al, 2013), supportive health education (van der Kolk et al, 2014), group psycho-education with hypnosis (Butler, L. et al, 2008), unsupervised social support groups (Field et al, 2013), group meetings (Mitchell et al, 2014). Control interventions were conducted by a mixture of licensed massage therapists, psychiatrists, clinical psychologists, yoga teachers, or unspecified.

d) Outcome measures

Outcome measures for depression included the Beck Depression Inventory (BDI or BDI-II) (10 studies), Hamilton Rating Scale for Depression (HRSD or HAM-D) (5 studies), Cornell Dysthymia Rating Scale (CDRS) (1 study), the Center for Epidemiological Studies Depression Scale (CES-D) (3 studies), Inventory of Depression and Anxiety Symptoms (IDAS) (1 study), Patient Health Questionnaire (PHQ-9) (2 studies), Profile of Mood States (POMS) (1 study), Ruminative Response Scale (RRS) (1 study), Zung Depression Self Rating Scale (ZDSRS) (1 study), unvalidated symptom checklist (1 study) or remission rates (1 study).

Outcome measures for anxiety included the Anxiety Symptom Checklist (ACL) (1 study), Beck Anxiety Inventory (BAI) (2 studies), Hamilton Ratings Scale for Anxiety (HRSA or HAM-A) (3 studies), Hospital Anxiety Scale (HADS) (1 study), Inventory of Depression and Anxiety Symptoms (IDAS) (1 study), Liebowitz Social Anxiety Scale (LSAS) (2 studies), Mood and Anxiety Symptom Questionnaire - Anxious Arousal sub-scale (MASQ-AA) (1 study), Penn State Worry Questionnaire (PSWQ) (1 study), Social Interaction Anxiety Scale (SIAS) (2 studies), Social Phobia Scale (SPS) (1 study), Spielberger Test Anxiety Scale (STAS) (1 study), or State Trait Anxiety Inventory (STAI) (6 studies).
Quality of Evidence (Risk of Bias) of Individual Studies

Table 4.2 summaries details of risk of bias of individual studies included on the review. Twelve RCTs had low risk of bias (adequate on 7 or more of the 12 risk of bias criteria: Arch et al, 2013; Buttner et al, 2015; Field et al, 2013; Janakiramaiah et al, 2000; Jazaieri et al, 2012; Kearney et al, 2013; Koszycki et al, 2007; Lo et al, 2013; Mitchell et al, 2014; Rohini et al, 2000; Shaikh & Kumar, 2013; van der Kolk et al, 2014). Twelve RCTs had high risk of bias (less than 7 of the 12 criteria: Broota & Dhir, 1990; Broota & Sanghivi, 1994; Butler, L. et al, 2008; Field et al, 2012; Hoge et al, 2013; Khumar S. et al, 1993; Kinser et al, 2013; Kozasa et al, 2008; Lavretsky et al, 2013; Sharma, V. et al, 2005; Whiddon & Bazini, 2011; Woolery et al, 2004). This is a noticeable increase in RCT’s with low risk of bias than the three RCT’s reported previous by Cramer et al (2013). The main reason for this increase is the number of well-designed studies with good reporting that have been conducted in the three years since Cramer et al (2013) conducted their review.

Amongst the studies with higher risk of bias, risk of selection bias generally was high as only three RCTs reported adequate random sequence generation (Butler, L. et al, 2008; Kinser et al, 2013; Lavretsky et al, 2013), and no RCT reported adequate allocation concealment. No RCT reported blinding of participants or intervention providers (which is understandable given that the nature of the interventions are difficult to blind to participants and providers), and only two RCTs reported adequate blinding of outcome assessors (Butler, L. et al, 2008; Hoge et al, 2013). Risk of attrition bias was high as only two of these RCTs reported using an intention-to-treat analysis (Hoge et al, 2013; Khumar S. et al, 1993), and only two reported on and described dropout rates (Khumar S. et al, 1993; Lavretsky et al, 2013).
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<th>Author (year)</th>
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<th>Adequate allocation concealment</th>
<th>Similar baseline characteristics</th>
<th>Adequate participant blinding</th>
<th>Adequate intervention blinding</th>
<th>Similar or no co-interventions</th>
<th>Acceptable compliance</th>
<th>Acceptable &amp; described drop-out rate</th>
<th>Inclusion of an intention-to-treat analysis</th>
<th>No selective outcome reporting</th>
<th>Adequate outcome assessment</th>
<th>Similar timing of outcome assessment</th>
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* Higher scores indicate lower risk of bias.
Summary of outcomes

Depression

Twenty-one of the twenty-four RCTs included an outcome measure for depression (Arch et al., 2013; Broota & Dhir, 1990; Butler, L. et al., 2008; Buttner et al., 2015; Field et al., 2012; Field et al., 2013; Janakiramaiah et al., 2000; Jazaieri et al., 2012; Kearney et al., 2013; Khumar S. et al., 1993; Kinser et al., 2013; Koszycki et al., 2007; Kozasa et al., 2008; Lavretsky et al., 2013; Lo et al., 2013; Mitchell et al., 2014; Rohini et al., 2000; Sharma, V. et al., 2005; van der Kolk et al., 2014; Whiddon & Bazini, 2011; Woolery et al., 2004). Ten of these twenty-one RCTs compared a yoga intervention to no treatment or waitlist controls, and all ten RCTs reported significant group difference in reduction of depression in favour of yoga (Broota & Dhir, 1990; Buttner et al., 2015; Field et al., 2012; Jazaieri et al., 2012; Khumar S. et al., 1993; Kozasa et al., 2008; Lavretsky et al., 2013; Lo et al., 2013; Whiddon & Bazini, 2011; Woolery et al., 2004). The types of yoga interventions included in these studies were yoga relaxation techniques (Broota & Dhir, 1990; Khumar S. et al., 1993), gentle sequences of postures (suitable for pregnancy and postpartum; Buttner et al., 2015; Field et al., 2012), yoga-based MBSR (Jazaieri et al., 2012), breathing techniques and mantra meditation (Kozasa et al., 2008), compassion-mindfulness therapy (includes body scans, mindful yoga, and seated compassion meditation; Lo et al., 2013), general hatha yoga (multi-component yoga intervention, including a combination of yoga postures, breathing techniques, relaxation, and meditation) (Whiddon & Bazini, 2011), and a focus on postures only (Iyengar yoga) (Woolery et al., 2004).

Twelve of the twenty-one RCTs included comparison of the yoga intervention with an active control. Ten of these studies reported statistically significant reductions in depression in both groups, although no significant difference between groups. Three of these studies reported on calculation of sample size with sufficient statistical power as non-inferiority trials (Arch et al., 2013; Field et al., 2012; Field et al., 2013). Non-inferiority trials test whether a new experimental treatment, in this case yoga, is not unacceptably less efficacious than (not inferior to) an active control treatment already in use. Active control comparisons included either group CBT (Arch et al., 2013; Koszycki et al., 2007), relaxation (Broota & Dhir, 1990), group therapy with hypnosis (Butler, L. et al., 2008), massage (Field et al., 2012), social support groups (Field et al., 2013), partial Sudarshan Kriya Yoga (SKY) technique (compared
to full SKY; Rohini et al, 2000), aerobic exercise (Jazaieri et al, 2012), health education group (Kinser et al, 2013; van der Kolk et al, 2014), or pharmacological treatment (Janakiramaiah et al, 2000). Janakiramaiah et al (2000) also reported significant group differences favoring electroconvulsive therapy (ECT) over yoga. In addition, one study reported yoga plus pharmacological treatment was significantly better than pharmacological treatment alone in reduction of depression scores, as well as higher remission rates (Sharma, V. et al, 2005), and another study also showed higher remission resulting from the yoga intervention compared to psycho-education group (Butler, L. et al, 2008).

Two RCTs reported no significant change in depression resulting from the yoga intervention (Kearney et al, 2013; Mitchell et al, 2014). Participants in both these studies were war veterans diagnosed with PTSD.

In summary, the results suggest that several types of yoga interventions were more effective than no treatment or wait-period (without yoga) in reduction of depressive symptoms. Single RCTs which reported sufficient sample size and statistical power for non-inferiority comparison, also suggest that yoga-based MBSR was equally as effective as group CBT, and suitable gentle yoga-postures for pregnancy and postpartum was equally as effective as either massage or social support group in reduction of depressive symptoms. Yoga plus pharmacological treatment was shown to be more effective than pharmacological treatment alone, and a multi-component yoga (including postures, breathing and relaxation, with emphasis on meditation) was more effective than a psycho-education group.

Anxiety

Sixteen of the twenty-four RCTs included an outcome measure for anxiety (Arch et al, 2013; Broota & Sanghivi, 1994; Buttner et al, 2015; Field et al, 2012; Field et al, 2013; Hoge et al, 2013; Jazaieri et al, 2012; Kinser et al, 2013; Koszycki et al, 2007; Kozasa et al, 2008; Lo et al, 2013; Mitchell et al, 2014; Rohini et al, 2000; Shaikh & Kumar, 2013; Sharma, V. et al, 2005; Woolery et al, 2004). Seven of these sixteen trials compared a yoga intervention to no treatment or waitlist controls, and all seven reported a significant group difference in reduction of anxiety favouring the yoga (Broota & Sanghivi, 1994; Buttner et al, 2015; Field
et al., 2012; Jazaieri et al., 2012; Kozasa et al., 2008; Lo et al., 2013; Woolery et al., 2004). The types of yoga interventions included in these studies were yoga relaxation techniques (Broota & Sanghivi, 1994), gentle sequences of postures, suitable for pregnancy and postpartum (Buttnier et al., 2015; Field et al., 2012), yoga-based MBSR (Jazaieri et al., 2012), breathing techniques and mantra meditation (Kozasa et al., 2008), compassion-mindfulness therapy (includes body scans, mindful yoga, and sitting compassion meditation (Lo et al., 2013), and a focus on postures only (Iyengar yoga) (Woolery et al., 2004).

Eleven of the sixteen trials included comparison of the yoga intervention with an active control. Seven of these found significant reductions in anxiety measures in both groups, but no significant between-group differences. Active control comparisons included group CBT (Arch et al., 2013; Koszycki et al., 2007), massage (Field et al., 2012), social support groups (Field et al., 2013), partial SKY technique (compared to full SKY; Rohini et al., 2000), aerobic exercise (Jazaieri et al., 2012), health education group (Kinser et al., 2013), or relaxation exercises (Shaikh & Kumar, 2013). Three of these studies reported on calculation of sample size with sufficient statistical power as non-inferiority trials (Arch et al., 2013; Field et al., 2012; Field et al., 2013). One further study that compared a yoga relaxation technique to another form of relaxation (Jacobsen’s) as a control, reported the yoga to be more effective in reduction of anxiety scores (Broota & Sanghivi, 1994), and another study found yoga plus pharmacological treatment was significantly better than pharmacological treatment alone, in reduction of anxiety scores and higher remission rates (Sharma, V. et al., 2005).

One further study showed mixed results, where there was no difference between yoga and a stress management education programme on reductions of one of the anxiety scales (HAM-A), but the yoga preformed better than the education programme on another anxiety scale (BAI) (Hoge et al., 2013).

One of the sixteen studies reported no significant change in anxiety resulting from the yoga intervention (Mitchell et al., 2014). Again, participants in this study were war veterans diagnosed with PTSD.

In summary, the results indicate that several types of yoga interventions were more effective than no treatment or wait-period (without yoga) in reduction of symptoms of anxiety. Single RCTs which reported sufficient sample size and statistical power for non-
inferiority comparison, suggested that yoga-based MBSR was equally as effective as group CBT, and suitable gentle yoga-postures for pregnancy and postpartum were equally as effective as either massage or social support group. Yoga relaxation was also reported to be more effective than Jacobson’s progressive muscle relaxation, yoga plus pharmacological treatment was more effective than pharmacological treatment alone.

**Comorbidity (of both depression and anxiety)**

Whilst none of the studies specified inclusion of participants with comorbid depression and anxiety diagnoses, thirteen of the twenty-four RCTs included outcome measures for both depression and anxiety. Five of these thirteen studies compared yoga to no treatment or waitlist control, and all five showed benefit for reduction in symptoms of both depression and anxiety (Buttner et al., 2015; Jazaieri et al., 2012; Kozasa et al., 2008; Lo et al., 2013; Woolery et al., 2004).

Eight of the thirteen RCTs compared yoga with active controls (Arch et al., 2013; Field et al., 2012; Field et al., 2013; Jazaieri et al., 2012; Kinser et al., 2013; Koszycki et al., 2007; Rohini et al., 2000; Sharma, V. et al., 2005). All eight trials found significant reductions in both depression and anxiety measures in both groups, but no significant between-group differences. Again, three of these studies reported on calculation of sample size with sufficient statistical power as non-inferiority trials (Arch et al., 2013; Field et al., 2012; Field et al., 2013). Details of the types of yoga interventions showing benefits, and types of control comparisons, as described above, separately for depression and anxiety.

One of the thirteen RCTs also looked at differential or moderator effects of comorbid depression and anxiety (published separately in Arch & Ayers, 2013). This study compared effects a 10-week intervention of CBGT and adapted yoga-based MBSR for war veterans with a primary diagnosed anxiety disorder. The main outcome measure was clinical severity rating (CSR) of the primary anxiety disorder. Results indicated that both CBGT and adapted MBSR led to significant reductions in anxiety severity, with no significant difference between the groups. They also found that baseline severity of depression or anxiety differentially moderated treatment outcomes in CBGT compared to adapted MBSR. Anxiety disorder patients with significant depression symptoms or unipolar mood disorders, appeared to
have better outcomes following adapted MBSR than CBGT. On the other hand, anxiety
disorder patients without significant mood disorder symptoms appear to have better
outcomes following CBGT. Given the frequent co-occurrence of anxiety and mood
disorders, these findings may have clinical relevance and warrant further investigation to
ascertain whether people with different presenting diagnostic or symptom profiles may
respond differently to yoga-based interventions.
2) Prior Systematic Reviews & Meta Analyses

Twenty-eight reviews or meta-analyses of yoga for depression or anxiety were identified. Of these, four reviews were summaries of other systematic reviews (Büssing et al., 2012b; Ernst & Lee, 2010; McCall et al., 2013; Saeed et al., 2010), seven included a review of yoga interventions for a broad range of health conditions, including depression or anxiety, but neither depression or anxiety was the focus of the review (Arias et al., 2006; Chugh-Gupta et al., 2013; Field, 2011; Grossman et al., 2004; Lin, K.-Y. et al., 2011; Ospina et al., 2007; Telles et al., 2012), another eight studies reviewed evidence for a number of different mind-body interventions for mental health, of which yoga was one of the modalities included, but not a primary form of intervention (Chen et al., 2012; D'Silva et al., 2012; Hofmann et al., 2010b; Krisanaprakornkit et al., 2006; Marc et al., 2011; Morgan & Jorm, 2008; Ravindran & da Silva, 2013; Tsang et al., 2008). One further review included studies with both healthy participants and those with a range of medical conditions, and reviewed reductions in anxiety as a secondary outcome. Diagnosis or elevated symptoms of anxiety were not required for eligibility (Sharma, M. & Haider, 2013).

Eight reviews with a primary focus on review of RCTs of yoga (including yoga meditation and mindfulness) as an intervention for mental health conditions, including depression and anxiety, were identified and included in this review. Four of these were systematic reviews (Balasubramaniam et al., 2013; Cramer et al., 2013b; Kirkwood et al., 2005; Pilkington et al., 2005), one of which included a meta-analysis (Cramer et al., 2013b). Two were critical literature reviews (da Silva et al., 2009; Uebelacker et al., 2010a). One review included a meta-analysis only (Cabral et al., 2011), and one review examined evidence of selected trials (Louie, 2014). Four reviews were conducted for depression (Balasubramaniam et al., 2013; Louie, 2014; Pilkington et al., 2005; Uebelacker et al., 2010a), one for anxiety (Kirkwood et al., 2005), and three included both depression and anxiety (Cabral et al., 2011; Cramer et al., 2013b; da Silva et al., 2009). A summary of these reviews is presented in Table 4.3.
Table 4.3  Reviews and meta analyses of RCTs of yoga for reducing depression and anxiety

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<td>Balsubramaniam et al (2013)</td>
<td>Psychiatric diagnosis of MDD, or reported symptoms</td>
<td>Any form of yoga</td>
<td>4 (4 RCTs)</td>
<td>Assessment of available literature suggests Grade B evidence supports potential acute benefit of yoga for depression.</td>
</tr>
<tr>
<td>Louie (2014)</td>
<td>Unspecified “depression”</td>
<td>Specific emphasis on yoga postures</td>
<td>6 (4 RCTs)</td>
<td>Included narrative review of each trial. Geographical and cultural diversity, wide age range of samples, representations of subpopulations at high risk for depression, and moderate to very good attendance, all suggest yoga’s broad appeal, adaptability, and utility. Positive outcomes of interventions suggest yoga’s effectiveness.</td>
</tr>
<tr>
<td>Pilling et al (2005)</td>
<td>Unspecified: “depression or a depressive disorder”</td>
<td>Any, excluding meditation only, and those involving multi-component interventions (e.g. MBSR)</td>
<td>5 (5 RCTs)</td>
<td>Narrative review: Overall, indications are of potentially beneficial effects of yoga interventions on depressive disorders. However, variation in the interventions and severity of depression reported, together with a lack of details of trial methodology, suggest the findings must be interpreted with caution.</td>
</tr>
<tr>
<td>Uebelacker et al (2010)</td>
<td>Diagnosed depressive disorder, or elevated symptoms</td>
<td>Any form of yoga</td>
<td>8 (7 RCTs)</td>
<td>Included narrative review, summary and results (effect sizes) of each trial (where sufficient data was available). Concluded that these studies provide some encouragement that yoga may be helpful for depression, but are in no way definitive, and that further research is needed in order to make any type of definitive conclusions about efficacy of yoga for depression.</td>
</tr>
<tr>
<td><strong>Anxiety</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Kirkwood et al (2003)</td>
<td>Psychiatric diagnosis, validated measure, or reported symptoms</td>
<td>Any, excluding any with yoga meditation only</td>
<td>8 (5 RCTs)</td>
<td>Included narrative review, summary and results (effect sizes) of each trial (where sufficient data was available). Concluded that results suggest positive findings for yoga in reducing a variety of anxiety conditions. However, many methodological inadequacies were found. Further well conducted research is necessary.</td>
</tr>
<tr>
<td><strong>Both depression and anxiety</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cabral et al (2011)</td>
<td>Psychiatric diagnosis, or reported symptoms</td>
<td>Any form of yoga</td>
<td>9 (9 RCTs)</td>
<td>Study data pooled for MA. Yoga as therapy is an effective adjunct treatment for psychiatric disorders (particularly depression and anxiety), with a pooled mean effect size of −3.25 (95% CI −5.36 to −1.14; p = .002).</td>
</tr>
<tr>
<td>Cramer et al (2013)</td>
<td>Diagnosed depressive disorder [DSM-IV, ICD-10, or other], or validated psychometric measure Primary outcome: Depression Secondary outcome: Anxiety</td>
<td>Any, excluding MBSR</td>
<td>12 in review, 9 in MA (12 RCTs)</td>
<td>Depression: MA revealed moderate evidence for short-term effects of yoga compared to usual care (SMD = −0.69; 95% CI −0.99 to −0.39; p &lt; .001). Anxiety: No evidence for short-term effects on anxiety was found comparing yoga to usual care (SMD = −0.03; 95% CI −0.44 to 0.44; p = .99). Limited evidence for short-term effects of yoga compared to relaxation on anxiety (SMD = −0.79; 95% CI −1.3, −0.26; p &lt; 0.01).</td>
</tr>
<tr>
<td>da Silva et al (2009)</td>
<td>Diagnosed depressive disorder, or reported symptoms, Anxiety is ambiguous, including test anxiety</td>
<td>Any form of yoga</td>
<td>Depressio n 16 (9 RCTs)</td>
<td>Depression: yoga showed benefit (as mono-therapy or adjunct to medication) in mild to moderate depression, and as mono-therapy in severe depression. Anxiety: yoga (as mono-therapy or adjunct to medication) may benefit anxiety conditions.</td>
</tr>
</tbody>
</table>

1. Assessment according to the Research and Development/University of California at Los Angeles (RAND/UCLA) Appropriateness Method (Fitch et al., 2000)
2. Grade B = sparse high grade (Level 1 or 2) data, or a substantial amount of low grade (level 3 or 4) data, and/or clinical consensus.
Systematic Reviews of yoga for reducing depression.

Seven systematic reviews that included a review of randomised controlled trials (RCTs) for the effectiveness of yoga for reducing depression were identified (Balasubramaniam et al., 2013; Cabral et al., 2011; Cramer et al., 2013b; da Silva et al., 2009; Louie, 2014; Pilkington et al., 2005; Uebelacker et al., 2010a). Amongst these reviews, a total of nineteen separate studies were included, with each review having its own set of selection criteria.

The review by Cramer and colleagues (Cramer et al., 2013b) is perhaps the most comprehensive review to date of the evidence of yoga for depression. The review included a qualitative analysis in a systematic review of twelve RCTs, and a quantitative meta-analysis of nine RCTs (with a pooled sample of 452 participants). Nine of the twelve RCTs included in the review were included in previous reviews (Broota & Dhir, 1990; Butler, L. et al., 2008; Janakiramaiah et al., 2000; Khumar S. et al., 1993; Rohini et al., 2000; Shahidi et al., 2011; Sharma, V. et al., 2005; Veale et al., 1992; Woolery et al., 2004), with an additional three RCTs not included in previous reviews (Field et al., 2012; Field et al., 2013; Lavretsky et al., 2013). The review provides details from included RCTs related to i) study and participant characteristics; ii) intervention characteristics; iii) control comparisons; and iv) outcome measures. Each of these have been included in the current review.

In their summary of overall effects, Cramer et al. (2013b) report that single RCTs found no significant short-term group differences when comparing yoga to active treatments such as group therapy (Butler, L. et al., 2008), social support groups (Field et al., 2013), massage (Field et al., 2012), or pharmacological treatment (Janakiramaiah et al., 2000).

Cramer and colleagues also report that their meta-analyses indicate “moderate evidence for short-term effects of yoga compared to usual care on severity of depression (SMD = −0.69; 95% CI −0.99 to −0.39; P < 0.001; heterogeneity: I² = 86%; χ² = 28.81; P < 0.001), and limited evidence for effects on severity of depression for yoga compared to relaxation (SMD = −0.62; 95% CI −1.03 to −0.22; P = 0.003; heterogeneity: I² = 0%; χ² = 0.22; P = 0.90) and aerobic exercise (SMD = −0.59; 95% CI −0.99 to −0.18; P=.004; heterogeneity: I² =68%; χ² = 3.08; P= 0.08). Based on Cohen’s categories, these effects were of medium size” (Cramer et al., 2013b; p 1077). However, their interpretation of evidence for yoga compared to usual
car and aerobic exercise must be treated with caution, as heterogeneity between studies is high ($I^2 = 86\%$ and $68\%$ respectively).

This review also investigated the effects of complex yoga interventions, and relative contribution of physical postures, breathing exercises, and meditation to the overall effect of yoga. The authors conclude that the subgroup analysis found evidence only for studies with meditation-based yoga interventions (SMD = $-0.62$; 95% CI $-1.03$ to $-0.22$; $P=0.003$; heterogeneity: $I^2 = 0.0\%$; $\chi^2 = 0.22$; $P=0.90$), but not for studies with multi-component (SMD = $-0.42$; 95% CI $-0.93$ to $-0.08$; $P=0.10$; heterogeneity: $I^2 =68\%$; $\chi^2 = 3.08$; $P=0.08$) or exercise-based yoga interventions (SMD = $-0.36$; 95% CI $-0.80$ to $0.09$; $P=0.12$; heterogeneity: $I^2 =90\%$; $\chi^2 = 9.93$; $P=0.02$). These results must be treated with caution. The subgroup of meditation-based yoga interventions included three RCTs, with a total sample size of 99, and low heterogeneity ($I^2 = 0.0\%$), whereas the multi-component and exercise based subgroups included only two RCTs in each, with total sample sizes of 63 or 84 respectively, and high heterogeneity (68% and 90% respectively). It is difficult to conclude whether the lack of effect is due to lack of effect being present, or low sample sizes and high heterogeneity.

The findings of the systematic review presented by Cramer and colleagues are generally consistent with the findings of previous reviews: there is evidence to support yoga as an effective intervention for reducing depression, but, again, these results must be treated with caution due to the heterogeneity of yoga interventions or poor methodological design and reporting, and that more and better designed RCTs are needed (da Silva et al., 2009; Pilkinson et al., 2005; Uebelacker et al., 2010a). Cramer and colleagues also present the first specific meta-analysis of the effectiveness of yoga for reducing depression, and the results suggest moderate evidence for yoga compared to usual care, and limited evidence for yoga compared to relaxation and aerobic exercise. These results are consistent with a previous meta-analysis which included pooled results of studies of yoga for various psychiatric disorders, of which depression was the most common (Cabral et al., 2011).

Cabral et al (2011) conducted a meta-analysis to examine the efficacy of yoga therapy for psychiatric disorders, including depression, anxiety, schizophrenia, and post-traumatic stress disorder (PTSD). The meta-analysis included ten RCTs with participants who were
either diagnosed with mental illness, or reported similar symptoms. Four of the trials were included in previous reviews (Butler, L. et al, 2008; Janakiramaiah et al, 2000; Sharma, V. et al, 2005; Woolery et al, 2004). The pooled sample included a total of 343 participants, 186 receiving yoga and 157 controls. Several different yoga interventions were used in the various studies, including those described by the researchers as Hatha yoga, iyengar yoga, Sudarshan Kriya Yoga (SKY), and a multitude of integrated or alternative forms of yoga and meditation, which were coded as “other.” The most common yoga-based intervention used in the trials was SKY, and the most common psychiatric disorders of participants in the trials were anxiety and depression. The Cochran Q test for homogeneity among studies was \( Q = 369.69 \) (\( P < .001 \)) for fixed-model data. The authors report that this result indicated heterogeneity among the studies. Exclusion sensitivity analysis showed that excluding single studies did not affect pooled results from the meta-analysis. The combined analysis of all 10 studies provided a pooled effect size (random effects model) of \(-3.25\) (95% CI, \(-5.36\) to \(-1.14\); \( P = .002 \)). This result indicates an overall benefit for several psychiatric disorders, and whilst studies of depression and anxiety disorders were the most common, the authors recognise that a limitation of the study was the lack of trials investigating specific disorders. Regardless, the findings of this meta-analysis provide support for the use of yoga as an effective adjunct treatment for psychiatric disorders, including depression and anxiety.

In 2005, Pilkington and colleagues conducted the first systematic review of research evidence on the effectiveness of yoga for treatment of depression. They identified and reviewed five RCT’s (Broota & Dhir, 1990; Janakiramaiah et al, 2000; Khumar S. et al, 1993; Rohini et al, 2000; Woolery et al, 2004). Whilst each trial reported a positive finding on the primary outcome, methodological details were frequently missing. This initial review suggested potentially beneficial effects of yoga interventions on depressive disorders. However, variations in severity of symptoms, types of intervention, and reporting and limitations of trial methodology, suggested that the findings must be interpreted with caution. Nevertheless, the authors signal the need for further investigation of yoga as a therapeutic intervention (Pilkington et al, 2005).

Similarly, da Silva and colleagues (2009) reviewed nine RCTs of yoga for reducing depression. They included the same five studies reviewed by Pilkington and colleagues,
and an additional four more recent trials (Butler, L. et al, 2008; Krishnamurthy & Telles, 2007; Oretzky, 2006; Sharma, V. et al, 2005). They found that, overall, yoga showed benefits as a mono-therapy or as an augmentation to antidepressant medications, in mild to moderate depression. They conclude that whilst the evidence is limited, and methodological issues suggest that results be interpreted with caution, the positive results support further exploration of yoga as a treatment for mood disorders. They added that the yoga with most evidence as a mono-therapy was a form of yoga with a focus on breath control (slow deep breathing followed by vigorous breathing, and a cyclical breathing pattern of slow, moderate and fast breathing, referred to by the researchers as Sudarshan Kriya Yoga or SKY (Janakiramaiah et al, 2000). The review by Uebelacker and colleagues (Uebelacker et al, 2010a) including seven of the nine studies previously reviewed by da Silva et al (2009), and presented similar results and conclusions.

Balasubramaniam and colleagues also examined the evidence of yoga for psychiatric disorders (Balasubramaniam et al, 2013). Their final review included sixteen RCTs, with any sub-type of yoga as the intervention for a variety of psychiatric conditions, including depression, anxiety, schizophrenia, cognition, memory or attention disorders. Results included a review of four RCTs for depression, two of which have been included in prior reviews (Krishnamurthy & Telles, 2007; and Woolery et al, 2004), with the inclusion of two additional studies (Shahidi et al, 2011; and Vedamurthachar et al, 2006). The study by Shadhidi et al (2011) included an intervention based on “Laughter Yoga”, which, as the name suggests, has a primary component of laughter, and would not usually be included as a component of classical Yoga described earlier. The study by Vedamurthachar et al (2006) utilised the SKY intervention for alcohol dependent participants following a 1-week detox programme. Whilst this trial showed a statistically significant decrease in depression scores compared to no-treatment controls, the acute alcoholism of participants makes it difficult to isolate or confirm the effects of yoga versus the effects of alcohol detoxification, and it was not clear if the subjects met any criteria for depression, which may have been the reason for this RCT not being included in previous reviews. This review does not appear to add to the evidence of prior reviews for yoga as an intervention for reducing depression.
A more recent review by Louie (2014) suggests that most prior reviews on the effectiveness of yoga in treating depression have examined yoga styles that emphasized breathing and meditation and not yoga styles in which the practice of yoga postures (asana) is the core component. This review by Louie examines six studies of yoga styles that emphasize the practice of yoga asanas (Chen et al., 2009; Harner et al., 2010; Krishnamurthy & Telles, 2007; Michalsen et al., 2012; Uebelacker et al., 2010b; Woolery et al., 2004), but clarifies that although most of the yoga styles included in the studies use more multi-component interventions (with postures, breathing techniques, and meditation) the emphasis of these yoga styles is the physical postures.

The review provides a narrative critique of each of the studies, and then, similar to Cramer et al. (2013b), discusses a summary of study characteristics. In particular, four of the studies included were RCTs (Chen et al., 2009; Krishnamurthy & Telles, 2007; Michalsen et al., 2012; Woolery et al., 2004). Of these four, only one RCT included diagnosis or assessment of elevated depression at baseline in the inclusion criteria (Woolery et al., 2004). Overall, they conclude that the findings of these studies support the appropriateness of yoga for treatment of depression, despite the limitations of the studies included. They suggest that the diverse study samples, and geographical and cultural representation speak to yoga’s broad appeal; moderate-to-very good attendance speaks to yoga’s effectiveness and practicability; and the positive outcomes of study interventions, all speak to yoga’s effectiveness and utility (Louie, 2014).

2)ii) Systematic Reviews of yoga for reducing anxiety.

Four systematic reviews of randomised controlled trials (RCTs) for the effectiveness of yoga for reducing anxiety were identified (Cabral et al., 2011; Cramer et al., 2013b; da Silva et al., 2009; Kirkwood et al., 2005). Amongst these reviews, a total of eighteen separate RCTs were included, with each systematic review having its own set of selection criteria. Seven of the eighteen RCTs from previous reviews are included in this review (listed in table 1), and eleven were excluded from the current review (listed in table 4 with reasons for exclusion). Anxiety was the main focus and a primary outcome measure in ten of the eighteen studies (Broota & Sanghivi, 1994; Field et al., 2013; Harner et al., 2010; Javnbakht et al., 2009; Kozasa

The primary focus of the review by Cramer and colleagues (Cramer et al, 2013b) was for depression. However, this report also included a qualitative review of six RCTs with outcome measures for anxiety (Field et al, 2012; Field et al, 2013; Rohini et al, 2000; Sharma, V. et al, 2005; Veale et al, 1992; Woolery et al, 2004), with four of these included in the meta-analysis (Field et al, 2012; Rohini et al, 2000; Sharma, V. et al, 2005; Woolery et al, 2004), with a pooled sample of 172 participants.

Review of single RCTs found significant effects on reducing anxiety, with no group differences when comparing yoga to aerobic exercise (Veale et al, 1992), massage (Field et al, 2012) or social support groups (Field et al, 2013). They also found significant benefit compared to a waitlist control (Woolery et al, 2004). Results of the meta-analysis indicated no evidence for short-term effects on anxiety when comparing yoga to usual care (SMD=-0.00; 95% CI -0.44 to 0.44; p=0.99; heterogeneity: $I^2 = 86\%$; $\chi^2 = 7.04; \ p<0.01$), and limited evidence for short-term effects on anxiety in favour of yoga compared to relaxation (SMD = −0.79; 95% CI -1.3, −0.26; p<0.01; heterogeneity: $I^2 = 6\%$; $\chi^2 = 1.06; \ p=0.30$).

According to Cohen’s criteria (Cohen, J., 1988), this latter result indicates a large effect size with good homogeneity. However, the results were treated with caution. There were two RCTs included in the analysis comparing yoga to relaxation (Rohini et al, 2010; and Sharma et al, 2005). Each trial had small sample sizes (n=30 in each trial). Also, investigation of the original studies indicates that relaxation controls were not actually included. The Rohini study compared the full SKY intervention with a partial SKY, the difference being controlled breathing, and the Sharma study compared a Sahaj Yoga Meditation plus antidepressant medication with the medication alone. Further clarification of the results of the Cramer meta-analysis appears necessary.
The meta-analysis by Cabral and colleagues (Cabral et al., 2011) described earlier, included an evaluation of the efficacy of yoga therapy for psychiatric disorders, including anxiety. Again, the meta-analysis included ten RCTs with participants who were either diagnosed with mental illness, or reported similar symptoms. The pooled sample included a total of 343 participants, 186 receiving yoga and 157 controls. The combined analysis of all 10 studies provided a pooled effect size (random effects model) of $-3.25$ (95% CI, $-5.36$ to $-1.14$; $P = .002$). This result indicates an overall benefit for several psychiatric disorders, and whilst studies of depression and anxiety disorders were the most common, the authors recognise that a limitation of the study was the lack of trials investigating specific disorders. Regardless, the findings of this meta-analysis provide support for the use of yoga as an effective adjunct treatment for psychiatric disorders, including depression and anxiety.

Kirkwood et al. (2005) conducted the first systematic review of research evidence on the effectiveness of yoga for treatment of anxiety and anxiety disorders. Eight studies were included in the review (Broota & Sanghivi, 1994; Malathi & Damodaran, 1999; Norton, G. & Johnson, 1983; Sahasi et al., 1989; Shannahoff-Khalsa et al., 1999; Sharma, I. et al., 1991; Vahia et al., 1973a; Vahia et al., 1973b; summarised in Tables 2 and 3). The authors concluded that the studies reported positive results, although there were many methodological inadequacies. Owing to the diversity of anxiety conditions treated and poor quality of most of the studies, it is not possible to say that yoga is effective in treating anxiety or anxiety disorders in general. However, the authors conclude that there are encouraging results, and further research is necessary (Kirkwood et al., 2005, p 884).

Similarly, da Silva and colleagues (2009) reviewed six RCTs of yoga which included anxiety as an outcome measure. Five of these were included in the review by Kirkwood and colleagues (Broota & Sanghivi, 1994; Malathi & Damodaran, 1999; Norton, G. & Johnson, 1983; Shannahoff-Khalsa et al., 1999; Vahia et al., 1973a), and one additional more recent trial (Sharma, V. et al., 2005). Similar to Kirkwood and colleagues, da Silva and colleagues conclude that whilst the majority of the available data, particularly from RCTs, is derived from depressed populations, where positive results support the further exploration of yoga for mood disorders, the evidence in anxiety disorders is considerably weaker, but suggested benefits encourage further investigation (da Silva et al., 2009).
3. Excluded Trials

The 24 trials excluded from the current review, including seventeen studies identified in previous reviews, and reasons for exclusion, are summarised in Table 4.4. Ten were excluded due to absence of diagnosis or measure of elevated depression or anxiety in eligibility criteria. Seven were excluded on basis of intervention not meeting inclusion criterion as a yoga intervention. Seven studies that were included in prior reviews were excluded on basis of trial design not being an RCT.

Table 4.4 Trials excluded from this review (N = 24)

<table>
<thead>
<tr>
<th>Study</th>
<th>Depression/Anxiety as an outcome measure</th>
<th>Included in prior reviews</th>
<th>Reason for exclusion from this review, based on inclusion criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>Boettcher et al, 2014</td>
<td>Depression and anxiety</td>
<td>N/A</td>
<td>MBSR intervention not identified by authors as yoga-based.</td>
</tr>
<tr>
<td>Bormann et al, 2013</td>
<td>Depression</td>
<td>N/A</td>
<td>Mantram meditation not identified by authors as yoga-based.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Balasubramaniam et al (2013)</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Louie (2014)</td>
<td></td>
</tr>
<tr>
<td>Lee, S. et al, 2007</td>
<td>Depression and anxiety</td>
<td>N/A</td>
<td>Intervention was labelled as meditation training, including yoga-like practices of physical movements and stretching, but authors did not refer to it as yoga.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>da Silva et al (2009)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Louie (2014)</td>
<td></td>
</tr>
<tr>
<td>Pinnigera et al, 2012</td>
<td>Depression and anxiety</td>
<td>N/A</td>
<td>No assessment of depression or anxiety for inclusion. Also, intervention was labelled as mindfulness meditation, including yoga-like practices of body-scan &amp; mindful-movements, but authors did not refer to it as a yoga intervention.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Balasubramaniam et al (2013)</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>da Silva et al (2009)</td>
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</tbody>
</table>
**Discussion**

This review included twenty-four randomised controlled trials (RCTs). Sixteen of these RCTs included an outcome measure for anxiety, twenty-one with an outcome measure for depression, and thirteen of the twenty-four trials included measures for both anxiety and depression. Twelve of the twenty-four RCTs have not been included in previously published systemic reviews. Seventeen studies that were included in one or more prior reviews were excluded from the current review. The main reason for differences in included or excluded studies from the current review compared to prior reviews are largely due to differences in inclusion criteria - particularly whether or not yoga-based meditation and mindfulness interventions, such as MBSR, are identified as being yoga-based interventions. Some researchers have acknowledged that MBSR should be deemed a type of yoga-based intervention, and thus included within systematic reviews, as the distinction between Buddhist and yogic mindfulness meditation could be regarded as artificial (Cramer et al., 2013b; Hofmann et al., 2010b; Louie, 2014; Sharma, M. & Haider, 2013; Tsang et al., 2008; Uebelacker et al., 2010a). Whilst some study authors acknowledge MBSR as yoga-based, others do not, and studies including MBSR as an intervention have generally been excluded from prior reviews. Clarification and consensus amongst researchers is required.
The overall findings suggest positive results of the effect of yoga-based interventions for reduction of depression and anxiety, either separately or together. Strengths of the growing evidence include the range of different sample populations in different studies, making the results more generalizable across the broader population, the variety of measures used in various studies confirming similar outcomes, and the growing number of RCT’s in recent years that have a low risk of bias.

However, the results and interpretations must continue to be treated with caution. As well as methodological limitations, heterogeneity of the nature of interventions across these studies makes it difficult to draw robust conclusions about benefits of yoga as a mental health intervention. Also, studies vary in length of intervention (ranging from 3 days to 12 weeks), intensity and frequency of intervention (daily to once per week, with or without encouragement to practice regularly at home), and different types of active and non-active control comparisons. Considerable heterogeneity of types of yoga interventions, what is classified as a yoga-intervention, including yoga-based mindfulness programmes such as MBSR, remain a concern.

Also, it is difficult to accurately compare the effectiveness of yoga on depression or anxiety, when the characteristics and components of the interventions are under contention. The reason that yoga may be a more effective intervention than one form of exercise (e.g. walking), yet not better than another form of exercise (e.g. ‘high intensity exercise’), may be due to the broad difference in what is included in the yoga intervention they were compared to, as well as differences in the types of exercise. There is a need for accepted consensus on what constitutes ‘yoga’ and the parameters of practice appropriate for yoga interventions. Also, yoga may be practiced in group classes and/or individually, and differences in effectiveness of each or in combination are unknown.

Sample sizes were relatively small, ranging from 22 to 93 participants (median of 46.5), though it is encouraging that larger sample sizes are included in more recent studies, and few studies reported calculation of sample size required for sufficient statistical power.

Few studies provided sufficient information about the specific nature of the various yoga interventions, the level of experience and teaching-method compliance of the teachers
providing those interventions, nor the nature and quality of the interaction between teachers and participants.

Also, blinding remains a challenge, and was not included in the design of any of the trials. Other explanations for the therapeutic outcomes, such as the placebo effect from knowing they are receiving treatment, or expectancy of benefit from the yoga, remain a possibility.

The findings of this review are generally consistent with and add to the findings of previous reviews (Balasubramaniam et al, 2013; Cabral et al, 2011; Cramer et al, 2013b; da Silva et al, 2009; Kirkwood et al, 2005; Louie, 2014; Pilkington et al, 2005; Sharma, M. & Haider, 2013; Uebelacker et al, 2010a).

Conclusions and recommendations

Further research is required to make more conclusive recommendations about the use of yoga for depression and/or anxiety. Yoga is a complex form of mind-body intervention. It is important that future studies investigate the effectiveness of multi-component yoga interventions, as well as identifying the salient efficacy of particular components of the interventions for particular clinical populations and disorders, including depression and anxiety.

To reduce the risk of bias, which was identified as being high in more than half of the trials in this review, it is recommended that future RCTs provide: adequate reporting of random sequence generation and allocation concealment; blinding of participants (though the difficulty of doing this is acknowledged) or, at least, account for their beliefs about the effectiveness of yoga and expectations of outcome; and blinding of outcome assessors. Inclusion of intention-to-treat analysis, and reporting of rates and reasons for participant drop-out are required to improve the quality of evidence. Quality of evidence will also be improved with RCTs that report on sample size being adequate for statistical power of measures and analyses used.

Given the high incidence of comorbidity of depression and anxiety, it is recommended that the development of interventions address this issue, and include measures of both
depression and anxiety. Research that compares yoga in group, individual or combination interventions is warranted. Finally, it is possible that benefit is derived by simply doing anything to improve one’s mental health. To ascertain the benefit of the yoga itself, inclusion of active controls, as well as comparisons with conventional treatments is also recommended.
4.4 Plausible Mechanisms of Action

There are many possible mechanisms by which yoga might have an impact on depression and anxiety. Prior research has primarily focussed on mechanisms related to biological (including neurophysiological), psychological (including emotional and cognitive), and behavioural (Kinser & Lyon, 2014; Riley, K. & Park, 2015; Uebelacker & Broughton, 2016) correlates. These mechanisms have also been described as an integration of “bottom-up” (biological) and “top-down” (psychological) influences (Gard et al, 2014; Schmalzl et al, 2015). In this section, potential psycho-neurophysiological mechanisms are highlighted.

As described in Chapter 2, stress is a known contributor to both depression and anxiety (Cohen, S. et al, 2010; Hammen, 2005; McEwen, 2003; van Praag et al, 2004). The stress response involves a two-way communication between the brain (including a person’s appraisal and perceptual experience in relation to a stressor) and cardiovascular-respiratory, immune, metabolic, and other systems, via the autonomic nervous system (ANS), endocrine system, and the hypothalamus-pituitary-adrenal (HPA) axis (McEwen, 2007). Homeostasis refers to the mechanisms that keep the parameters of one’s physiological functions within the ranges necessary for survival (McEwen & Wingfield, 2010). Allostasis is the adaptive process of maintaining stability during conditions that are outside of the usual homeostatic range, and allostatic load (AL) is the cost to the body for maintaining this stability during deviations from the usual homeostatic range (McEwen, 2007). More specifically, AL refers to the cumulative effect of neurophysiological responses to perceived stressors, which includes the release of a cascade of hormones, amines and neurotransmitters (including catecholamines - adrenaline and noradrenaline, cortisol, serotonin, melatonin, dopamine, and gamma-aminobutyric acid (GABA)), which activate the HPA axis and the sympathetic branch of the ANS. Prolonged activation and increased allostatic load contribute to overactivity of the HPA axis and functions of the sympathetic nervous system (SNS), with associated under-activity of the parasympathetic nervous system (PNS), imbalances in the endocrine system, hormones and neurotransmitters, and may even contribute to adverse changes in brain anatomy and physiology, neurological and cognitive functions (Kiverstein & Miller, 2015; McEwen, 2009; Reppermund et al, 2007; Stewart, 2006). An organism’s responsiveness to internal and external challenges is limited
by the need to maintain stability. Reduced capacity for responsiveness increases allostatic
load (Streeter et al, 2012).

All these factors are known to contribute to a range of physical and psychological health
concerns, and are associated with depression and anxiety disorders (Belmaker & Agam,
McEwen, 1998; McEwen & Wingfield, 2003; Pizzagalli et al, 2007; Purdy, 2013; Stewart, 2006;

Numerous authors have proposed that the primary mechanism by which yoga practices
impact on depression and anxiety is by reducing the effects of stress and allostatic load,
with associated neurophysiological changes (Kinser et al, 2012; Pascoe & Bauer, 2015;
Streeter et al, 2012; Uebelacker et al, 2010a). This mechanism occurs via a number of
pathways, including down regulation of the HPA axis, balancing the functions of the ANS
(reduction of activity in the sympathetic nervous system (SNS) and activation of the PNS -
also known as the “relaxation response”; Benson & Klipper, 1976), vagal nerve stimulation
(VNS) leading to greater heart rate variability (HRV) and neurotransmitter levels, and
regulating hormonal imbalances via decreases of cortisol and catecholamines, and
increases of serotonin, melatonin and GABA levels (Gard et al, 2014; Gard, 2015; Innes et
al, 2005; Kinser et al, 2012; Kinser & Lyon, 2014; McCall, 2013; Riley, K. & Park, 2015; Ross &
Thomas, 2010; Salmon et al, 2009; Sarubin et al, 2014; Schmalzl et al, 2015; Streeter et al,
2012; Uebelacker et al, 2010a).

Reductions in cortisol
Numerous studies have found that a variety of different yoga and yoga-based mindfulness
practices led to decreased cortisol levels, with associated improvements in measures of
depression, anxiety or other indicators of mental health such as perceived stress
(Bershadsky et al, 2014; Carlson et al, 2004; Carlson et al, 2007; Corey et al, 2014; Douglass,
2009; Field et al, 2013; Granath et al, 2006; Harte et al, 1995; Newham et al, 2014; Thirthalli
et al, 2013; Vadiraja et al, 2009; West et al, 2004). For example, Bershadsky and colleagues
studied the effects of yoga on mood and cortisol levels during pregnancy (Bershadsky et
al, 2014). In a within-group comparison of yoga days compared to days of usual activity
they found lower cortisol levels ($p<0.01$) and higher positive affect ($p<0.01$) on yoga days. A between-group comparison of yoga and a usual activity control condition also showed lower cortisol in favour of yoga ($p=0.03$), but no difference between groups in positive affect. Effect sizes and correlations between cortisol and mood were not reported. Another study by Corey et al (2014) compared a restorative yoga intervention (passive, supine relaxation postures) with a yoga-based stretching intervention (without any relaxation components) over 6 months. They found statistically significant differences between the groups in reduction of waking, evening and mean cortisol measures, in favour of the stretching yoga ($p<0.05$ for each). They also found significant reductions in depression scores (Beck Depression Inventory) within both groups ($p<0.05$ for each), but difference between groups was not significant. The results of both these studies suggest that yoga may have psychophysiological benefits, including reduction of cortisol and depression scores, and increased positive affect.

It is important to note that limitations to salivary cortisol measurements have been identified, that can affect the reliability of results (Pascoe & Bauer, 2015). For example, caffeine, antidepressants, smoking, low pH foods and drinks, blood in the saliva, time of day, and pregnancy can affect cortisol levels (Bershadsky et al, 2014; Clow et al, 2004; Granger et al, 2009; Poll et al, 2006; Poll et al, 2007). Home collection has also be associated with compliance issues (Weibel, 2003). Results of studies using salivary cortisol measures must be treated with caution.

A number of further studies have shown the effects of yoga practices on other neurophysiological markers, such as HRV and GABA (Khattab et al, 2007; Lee, M. et al, 2014; Streeter et al, 2007; Streeter et al, 2010).

**Heart rate variability**

Heart rate variability (HRV) represents the system’s ability to respond and adapt to physiological demands, and is often seen as indicative of the ability to adapt to stress (Buijs, 2013; Lin, S.-L. et al, 2015). Increased HRV is interpreted to indicate greater PNS activity and a healthy balance between PNS and SNS (Buijs, 2013; Purdy, 2013). Polyvagal theory proposes that phylogenetic developments of neural regulation of the ANS through
the vagus nerves, allow one’s system to be more responsive to perceived stressors, particularly through higher HRV (Porges, 2001, 2009).

A study by Khattab et al (2007) investigated HRV with cardiac vagal modulation during yoga. The sample included 11 healthy yoga practitioners who were given an intervention of one 90 minute session per week, over five successive weeks. Two of the five sessions included a yoga program developed for cardiac patients. The other three sessions included a placebo program of relaxation. The group of yoga practitioners was compared to a matched group of healthy individuals not practicing any yoga or relaxation techniques. HRV was significantly higher during the time of the yoga intervention compared to the relaxation placebo and to control ($p<0.001$ for both). Whilst participants in the study were all healthy, and no measure of mental health was included, the study demonstrates that relaxation by yoga training is associated with a significant increase of cardiac vagal modulation and HRV among healthy yoga practitioners, and provides support for the hypothesis that yoga practices are associated with mechanisms that reduce the effects of the stress response and allostatic load.

**GABA levels**

Two studies have shown that yoga practices led to increases in GABA levels (Streeter et al, 2007; Streeter et al, 2010). The first was a pilot study that showed significant increases in GABA levels associated with several different types of yoga compared to a reading control group. Experienced yoga practitioners were assessed before and after a 60 minute yoga sessions, and showed 27% increase in GABA levels, with no change in the comparison reading group. Difference between the groups was statistically significant ($p=0.02$). Whilst the sample size in this pilot study was small (8 yoga practitioners and 11 comparison subjects), and the study did not include measures of depression or anxiety, the authors recommended that “the practice of yoga should be explored as a treatment for disorders with low GABA levels such as depression and anxiety disorders” (Streeter et al, 2007; p 419).

Their second study did include self-report measures of mood (Exercise Induced Feeling Inventory, EIFI) and anxiety (Spielberger State–Trait Anxiety Inventory, STAI). In a randomised controlled trial of healthy subjects ($n=34$), a yoga intervention was compared with a metabolically matched walking exercise intervention (60 minutes, 3 times per week, for 12
weeks for both groups with healthy subjects). The yoga subjects reported greater improvement in mood and greater decreases in anxiety than the walking group ($p \leq 0.05$ on each of the measures). They also reported a nearly significant increase in acute thalamic GABA levels in the yoga group ($p = 0.09$), and positive correlations between improved mood and GABA levels ($r > 0.50$) and negative correlations between anxiety and GABA levels ($r < -0.50$) ($p < 0.05$ for each). Whilst all subjects in the study were healthy, with no prior history of depression or anxiety disorders, the study demonstrated that yoga was associated with increased GABA levels, with improved mood and decreased anxiety measures (Streeter et al., 2010).

A more recent study has also demonstrated increases in serotonin and brain-derived neurotropic factor (BDNF) after 12 weeks of yoga compared to a matched no-intervention control (Lee, M. et al., 2014). Group differences were statistically significant in increases in serotonin ($p < 0.05$, effect size $d = 0.45$), and BDNF ($p < 0.01$, effect size $d = 0.86$). However, there was no change in the self-report measure of depression used in the study (Lee, M. et al., 2014).

Streeter and colleagues have proposed a “unifying theory” to explain the effects of yoga in conditions with overlapping pathophysiology, including depression and anxiety. The theory is based on the principle that yoga practices reduce allostatic load in stress response systems, and restore optimal homeostasis (Streeter et al., 2012). Evidence from the studies presented above provides support for their hypothesis that yoga practices have neurophysiological effects on various factors associated with the stress response and allostatic load, which, in turn, are associated with depression and anxiety. In some cases, the neurophysiological effects are directly associated with reductions in self-report measures of depression and anxiety.

In summary, evidence suggests that yoga facilitates changes in several neurophysiological markers that are associated with reductions in measures of stress and allostatic load, and associated improvements in mood and anxiety symptoms. Although there are many different types of yoga practices, each of which may have differing effects and mechanisms of action, each component may cumulatively add to the reduction of stress.
and allostatic load, and associated improvements in depression, anxiety and overall mental health.
SECTION 2 DEFINING THE YOGA INTERVENTION

Chapter 5 Developing the Yoga Intervention for Reducing Depression and Anxiety: A Delphi Method Study

In order to evaluate potential benefits, careful consideration must be given to defining the nature of yoga interventions for clinical research. For the purpose of evaluation in this thesis, the yoga intervention was developed utilising a consensus-based methodology. Details of this study, including method and results, have been published in the peer reviewed journal BioMedCentral (de Manincor et al., 2015). A copy of the published article is included as Appendix I.

As described earlier, Yoga is a very broad term that incorporates an extensive array of techniques and approaches. Whilst classical Yoga is generally known to include a variety and combination of physical postures and movement, breathing techniques, relaxation, meditation (including mindfulness), and other components such as cultivation of positive values, thoughts, attitudes, and lifestyle factors, most modern yoga is generally known to focus primarily on the physical postures.

Prior research investigating benefits of yoga for mental health has shown considerable heterogeneity of the yoga interventions used. Results of the earlier systematic review indicate that heterogeneity included:

i) Type of Yoga: Fourteen RCTs used multi-component yoga interventions, including a combination of yoga postures, plus breathing techniques, relaxation, or meditation/mindfulness, or MBSR; four studies used yoga postures only, three of these included postures that were said to be suitable for pre- or postnatal; the remaining six did not use a physical component of yoga postures at all, and each included a particular form of yoga-based relaxation, breathing or meditation practice.

ii) Group Vs Individual: eight RCTs used yoga interventions in group classes; seven used an individual approach, rather than group classes (either done at the trial venue or at home); and nine studies used a combination of group classes and individual home practice.

iii) Dosage: Frequency and duration of the yoga interventions ranged from twice per day over three consecutive days, to one session per week for twelve weeks. That is, length of
programmes ranged from three days to 12 weeks (median 8 weeks). Each practice session ranged from 12 minutes to 150 minutes (median 60 minutes). And frequency of practice sessions ranged from daily to one session per week, with a number of studies including a combination one group session per week, plus daily home practice.

iv) Yoga Intervention Provider/Facilitator/Teacher: twelve studies reported interventions being offered by a yoga instructor (with varying or unreported levels of training or qualifications); five studies offered interventions by MBSR or mindfulness facilitators; and one intervention was conducted by a clinical psychologist. Six studies did not report training or qualifications of the person conducting the intervention. Also, five of the studies reported that the intervention was conducted by the principal investigator or one of the publication authors.

None of the studies provided a rationale or details of the decision making process for the choice or type of intervention. In consideration of this issue, Sherman (2012) has noted that “Little guidance is available to assist researchers in developing treatment protocols for research on yoga for health concerns. Because yoga is a multi-component mind-body discipline, historically developed for non-medical purposes, numerous decisions must be made in order to thoughtfully develop such protocols.” (Sherman, K., 2012; p1). A systematic approach is recommended, to assist researchers in selecting or developing an intervention that is appropriate for the condition under consideration. Researchers may need to consider the type or “style” of yoga, the components to include (e.g., breathing exercises, postures), as well as the specific protocol for each component, the dose to be delivered (frequency, duration of practice, and the total duration of practice), and issues related to selection of instructors and monitoring the fidelity to the intervention (Sherman, K., 2012).

These overarching recommendations seem useful. However, questions remain about the decision making process of choosing from various types or styles of yoga that are popularly available, particularly for mental health conditions. As discussed earlier, most “styles” or brands of yoga available in the broader community have only been recently developed and popularized, generally place particular emphasis on physical postures with little consideration or inclusion of other aspects of yoga practice, with sometimes questionable
adherence to and consistency with the classical system of Yoga, described earlier, and are mostly offered only in group class settings. Sherman’s recommendations also appear to be specifically related to interventions for physical medical conditions, including back pain, other pain, cardiovascular disease, and cancer, without mention of mental health conditions such as depression or anxiety (Sherman, K., 2012).

The more classical system of Yoga being considered here as an intervention for mental health, is based on a fundamental principle of developing suitable individualised approaches for each person’s presenting symptoms, needs, capabilities, goals and circumstances - a classical approach to yoga practice or yoga therapy known as the viniyoga of yoga (Desikachar TKV et al, 2001; Mohan & Mohan, 2004) - rather than choosing from a selection of standardized modern “styles”, which may or may not be suitable or available. However, development of intervention protocol guidelines, that may be adapted or applied for the individual person, remains necessary.

Related psychological research for treatment of mental health conditions has also recognised the need for more individually tailored interventions (Craske, 2012; Drake et al, 2009; Hasler, 2010; Magyar-Moe, 2009; Malhi et al, 2015; Marcus & Forsyth, 1998; Sin et al, 2011; Wampold et al, 2002).

Consistent with Yoga’s theoretical framework, and broader well-established approaches of mental health interventions, the intervention developed for this study was based on an individualised approach. However, there may also be benefits to the more commonly known group yoga classes, including being deliverable to more people, engagement and motivation in a social activity, and opportunity to directly confirm compliance with the intervention.

Consistent with (most) recommendations from Sherman (2010), the yoga intervention used in this study was developed by utilising a Delphi method approach, for the development of a “consensus statement” amongst “experts” in the field, rather than the researcher’s own opinion.
The Delphi Method Study

Methods

A modified Delphi method (Linstone & Turoff, 1975) was used to document ‘expert opinion’ in the use of yoga interventions for depression and anxiety, by drawing upon the cumulative knowledge and experience of experienced practitioners in the field. We aimed to produce a “consensus statement” documenting recommended elements of yoga interventions for these conditions, which can be used to guide and evaluate evidence-based research in the area.

The Delphi method uses anonymity, iteration and controlled feedback to arrive at a consensus (Linstone & Turoff, 1975). It is economical and not constrained by geographical limitations. This method gives equal weighting to views of each participant reducing the risk of one particular participant or view dominating. The study was given ethics approval by the University of Western Sydney, Human Research Ethics Committee (approval number H9523).

Delphi process and participant selection

Potential components for yoga-based interventions were drawn together from literature and experienced clinicians to generate a questionnaire. Thirty-three yoga teachers/therapists working in the field of yoga and mental health were identified by the primary researcher through literature reviews and professional networks, and invited by email to participate in the study. Eligibility for participation included the equivalent of minimum training required for Senior or Level 3 membership of Yoga Australia (1000 hours training and 10 years teaching experience; double the training requirements for E-RYT 500 with Yoga Alliance, USA); specialized training and experience in teaching people one-to-one and developing personalised yoga practices for individual needs; and a minimum of five years experience working as a yoga teacher/therapist with people experiencing mental health concerns including depression or anxiety. Twenty-four of the thirty-three suitable yoga teachers identified agreed to participate, and eighteen completed. Two rounds of an online questionnaire using Survey Monkey were sent to participants over a period of five months, from May to September, 2012. Survey questions related to expected benefits of yoga for various degrees of symptom severity, recommended frequency and duration of
yoga practice (“dosage” of yoga) required to achieve expected benefit, approaches and techniques to be included or avoided, and required training and experience for yoga teachers. The first round sought initial views of participants, which were summarised and communicated back to the group. The second round sought responses to the relative importance of each item, which were rated as:

Not Recommended | Not Important | Somewhat Important | Very Important | Essential

Responses were collated as frequency per response category. Level of consensus is measured as the number ratings given in each response category. We defined general consensus as more than 75% (14/18) of participants rating in a particular response category. Results are reported as a summary of consensus from both rounds of questionnaires.

Results

1. Participants

Thirty-three eligible yoga teachers, experienced in the field of mental health, were invited to participate in round one of the survey. Twenty-four (19 female and 5 male) agreed to participate, and eighteen (13 female and 5 male) completed the second round (n = 18). Participants were from four different countries - Australia (14), India (3), Switzerland (1), and USA (6). Ten participants were also mental health professionals (psychologist or medical doctor), although this was not an eligibility requirement.

2. Practice parameters (or “dosage” of the yoga intervention)

There was general consensus that doing a suitable individually tailored yoga practice under the guidance of a teacher required a minimum of 15 minutes per session to be of any benefit, and that an average of 30 to 40 minutes was recommended to maximize benefit. Also, the general consensus was for a minimum of 4 sessions per week to achieve benefit, and preferably an average of 5 to 6 times per week to achieve maximum benefit, and to be done over a minimum period of 6 weeks (Table 5.1).
Table 5.1
*General consensus achieved on recommended parameters (“dosage”) of yoga practice*

<table>
<thead>
<tr>
<th>Practice parameter</th>
<th>Recommended minimum</th>
<th>Recommended average</th>
</tr>
</thead>
<tbody>
<tr>
<td>Duration of each session</td>
<td>15 minutes</td>
<td>30 to 40 minutes</td>
</tr>
<tr>
<td>Frequency of sessions</td>
<td>4 sessions per week</td>
<td>5 to 6 sessions per week</td>
</tr>
<tr>
<td>Duration over time</td>
<td>6 weeks</td>
<td>n/a</td>
</tr>
</tbody>
</table>

3. Consensus on Recommended Components of Yoga Practice

*Main components of recommended yoga practice and their relative importance*

There was general consensus that any or all of the four main components of yoga practice (postures, regulation of breathing, relaxation, and meditation) would be recommended in an individually tailored yoga practice for reducing depression or anxiety. There was general consensus that breath regulation was very important or essential in yoga practices for reducing both depression and anxiety, and that yoga postures were very important or essential for reducing depression, and somewhat or very important, but less essential, for reducing anxiety. There was also general consensus that relaxation and meditation were very important or essential for reducing anxiety, and a mixture of somewhat important, very important or essential, without general consensus on their relative importance for reducing depression (Table 5.2).

Table 5.2 Relative importance of components of yoga practice for reducing depression or anxiety

<table>
<thead>
<tr>
<th>Component of yoga practice</th>
<th>General consensus on being very important or essential for reducing Depression</th>
<th>General consensus on being very important or essential for reducing Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Breath regulation</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Postures</td>
<td>Yes</td>
<td>No*</td>
</tr>
<tr>
<td>Relaxation</td>
<td>No</td>
<td>Yes</td>
</tr>
<tr>
<td>Meditation</td>
<td>No</td>
<td>Yes</td>
</tr>
</tbody>
</table>

* Note: there was general consensus that postures were a somewhat or very important, but less essential component for reducing anxiety.

4. Consensus on Recommended Approaches and Techniques

Numerous and detailed recommendations for particular approaches and techniques to include or avoid for people with depression or anxiety were given in the round 1 questionnaire. These were summarised and their relative importance rated in round 2.
Some approaches and techniques were recommended for reducing both depression and anxiety. Others were recommended for reducing either depression or anxiety. A summary of recommended approaches and techniques to include or avoid is provided in Table 5.3.

There was general consensus that yoga is most beneficial when the different components or techniques of yoga practice are used with an integrated and individualised approach (i.e. in combination or conjunction with each other, according to the suitability for each individual).

There was also general consensus that recommended approaches and techniques for reducing depression or anxiety were the same as recommendations for increasing positive emotions and well-being.

Table 5.3  Consensus on importance of approaches and techniques for reducing depression or anxiety, and improving positive emotions and well-being

<table>
<thead>
<tr>
<th>ROUND 1 - RECOMMENDATIONS</th>
<th>ROUND 2 - GENERAL CONSENSUS ON IMPORTANCE</th>
</tr>
</thead>
<tbody>
<tr>
<td>BREATH REGULATION - approaches &amp; techniques</td>
<td>For reducing Depression</td>
</tr>
<tr>
<td>Abdominal breathing</td>
<td>Very important/essential</td>
</tr>
<tr>
<td>Focus on inhalation</td>
<td>Important/less essential</td>
</tr>
<tr>
<td>Focus on exhalation</td>
<td>No recommendation</td>
</tr>
<tr>
<td>Comfortable holding after inhalation</td>
<td>Important/less essential</td>
</tr>
<tr>
<td>Comfortable holding after exhalation</td>
<td>No recommendation</td>
</tr>
<tr>
<td>Alternate nostril breathing</td>
<td>No recommendation</td>
</tr>
<tr>
<td>Right nostril breathing, especially on inhalation</td>
<td>Important/less essential</td>
</tr>
<tr>
<td>Left nostril breathing, especially on exhalation</td>
<td>No recommendation</td>
</tr>
<tr>
<td>Cooling breath (sitali)</td>
<td>Less or not important</td>
</tr>
<tr>
<td>Rapid breathing techniques, such as kapalabhati</td>
<td>Less or not important</td>
</tr>
<tr>
<td>“humming bee” breath (brahmari)</td>
<td>No recommendation</td>
</tr>
<tr>
<td>Regulating the breath to be calm and steady</td>
<td>No recommendation</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>POSTURES - approaches &amp; techniques</th>
<th>For reducing Depression</th>
<th>For reducing Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Coordinated flow of breath with movement</td>
<td>Very important/essential</td>
<td>Very important/essential</td>
</tr>
<tr>
<td>Chest and heart opening, backward bending postures and movements, that also focus on inhalation</td>
<td>Important/less essential</td>
<td>No recommendation</td>
</tr>
<tr>
<td>Moving repetition of postures (rather than long holding)</td>
<td>Important/less essential</td>
<td>No recommendation</td>
</tr>
<tr>
<td>Dynamic sequences of postures, including sun salutations</td>
<td>Important/less essential</td>
<td>No recommendation</td>
</tr>
<tr>
<td>A range of different postures, to keep it interesting</td>
<td>Important/less essential</td>
<td>No recommendation</td>
</tr>
<tr>
<td>Postures that have a calming effect, rather than energising</td>
<td>No recommendation</td>
<td>Very important/essential</td>
</tr>
<tr>
<td>Resting, relaxing or restorative postures</td>
<td>NO CONSENSUS</td>
<td>Important/less essential</td>
</tr>
<tr>
<td>Forward-bending postures</td>
<td>No recommendation</td>
<td>Important/less essential</td>
</tr>
<tr>
<td>Postures and movements that focus on exhalation</td>
<td>No recommendation</td>
<td>NO CONSENSUS</td>
</tr>
<tr>
<td>Simple, gentle sequences of postures</td>
<td>No recommendation</td>
<td>NO CONSENSUS</td>
</tr>
<tr>
<td>RELAXATION - approaches &amp; techniques</td>
<td>For reducing Depression</td>
<td>For reducing Anxiety</td>
</tr>
<tr>
<td>-------------------------------------</td>
<td>-------------------------</td>
<td>---------------------</td>
</tr>
<tr>
<td>Focus on abdominal breathing, lengthening exhale</td>
<td>Not considered</td>
<td>Very important/essential</td>
</tr>
<tr>
<td>Active focus on physical body (e.g. body-scan; progressive muscle relaxation), to shift focus away from mind and thoughts</td>
<td>Very important/essential</td>
<td>NO CONSENSUS</td>
</tr>
<tr>
<td>Done with visualisations, that are positive, expansive and energising, e.g. sun, open space.</td>
<td>Very important/essential</td>
<td>No recommendation</td>
</tr>
<tr>
<td>Done with visualisations, that have a calming effect</td>
<td>No recommendation</td>
<td>NO CONSENSUS</td>
</tr>
<tr>
<td>Using guided relaxation techniques, rather than self directed</td>
<td>Important/less essential</td>
<td>No recommendation</td>
</tr>
<tr>
<td>Restorative (passive-supported) postures</td>
<td>NO CONSENSUS</td>
<td>Important/less essential</td>
</tr>
<tr>
<td>With legs elevated</td>
<td>NO CONSENSUS</td>
<td>NO CONSENSUS</td>
</tr>
<tr>
<td>Resting between and after postures</td>
<td>NO CONSENSUS</td>
<td>NO CONSENSUS</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>MEDITATION - approaches &amp; techniques</th>
<th>For reducing Depression</th>
<th>For reducing Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mindfulness (learning to focus attention on observing the present experience, without judgement)</td>
<td>Very important/essential</td>
<td>Very important/essential</td>
</tr>
<tr>
<td>Something for the mind to do and focus on, rather than just observation (e.g. counting, repeated words or phrases (mantra); visualisation; image or symbol; candle gazing; smiling heart)</td>
<td>Very important/essential</td>
<td>Important/less essential</td>
</tr>
<tr>
<td>Active meditations, e.g. moving, chanting, guided visualisations</td>
<td>Very important/essential</td>
<td>Important/less essential</td>
</tr>
<tr>
<td>A concept, idea or value, such as something positive, energising, confidence building, gratitude.</td>
<td>Very important/essential</td>
<td>No recommendation</td>
</tr>
<tr>
<td>A concept, idea or value, such as something positive, calming, confidence building, gratitude.</td>
<td>No recommendation</td>
<td>Important/less essential</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OTHER COMPONENTS OF YOGA PRACTICE</th>
<th>For reducing Depression</th>
<th>For reducing Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cultivation of positive values, attitudes and behaviours (including gratitude, kindness, compassion, forgiveness)</td>
<td>Very important/essential</td>
<td>Very important/essential</td>
</tr>
<tr>
<td>Awareness of negative sensory input (including TV, movies, music, literature, multi-media, news)</td>
<td>Very important/essential</td>
<td>Very important/essential</td>
</tr>
<tr>
<td>Formulation of meaningful affirmations and intentions (samkalpa)</td>
<td>Important/less essential</td>
<td>Important/less essential</td>
</tr>
<tr>
<td>Visualisation and symbolic imagery techniques (bhavana)</td>
<td>Important/less essential</td>
<td>Important/less essential</td>
</tr>
<tr>
<td>Sound or chanting (from any suitable language or culture)</td>
<td>Important/less essential</td>
<td>Important/less essential</td>
</tr>
<tr>
<td>Spirituality and prayer</td>
<td>Important/less essential</td>
<td>Important/less essential</td>
</tr>
<tr>
<td>Repetition of meaningful words or phrases (mantra)</td>
<td>Important/less essential</td>
<td>Important/less essential</td>
</tr>
<tr>
<td>Symbolic gesture (nyasa &amp; mudra)</td>
<td>Important/less essential</td>
<td>Important/less essential</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>OTHER COMPONENTS OF YOGIC LIFESTYLE</th>
<th>For reducing Depression</th>
<th>For reducing Anxiety</th>
</tr>
</thead>
<tbody>
<tr>
<td>Positive relationships</td>
<td>Very important/essential</td>
<td>Very important/essential</td>
</tr>
<tr>
<td>Developing self-empowering knowledge</td>
<td>Very important/essential</td>
<td>Very important/essential</td>
</tr>
<tr>
<td>Social involvement and support - linking with a supportive community (sanga)</td>
<td>Very important/essential</td>
<td>Very important/essential</td>
</tr>
<tr>
<td>Lifestyle factors, including diet, smoking, drugs and alcohol, sleep, work, exercise</td>
<td>Very important/essential</td>
<td>Very important/essential</td>
</tr>
<tr>
<td>Exposure to sunlight and natural environments</td>
<td>Very important/essential</td>
<td>Very important/essential</td>
</tr>
<tr>
<td>Service to others, including volunteer work</td>
<td>Important/less essential</td>
<td>Important/less essential</td>
</tr>
<tr>
<td>Pleasing environment, free from clutter, with good ventilation and natural light</td>
<td>Important/less essential</td>
<td>Important/less essential</td>
</tr>
<tr>
<td>Education about yoga teachings, and the potential benefits of yoga</td>
<td>Important/less essential</td>
<td>Important/less essential</td>
</tr>
<tr>
<td>Group yoga classes</td>
<td>Important/less essential</td>
<td>No recommendation</td>
</tr>
</tbody>
</table>
4.i. **Recommended approaches and techniques for reducing BOTH depression and anxiety.**

There was general consensus that the following approaches and techniques would be recommended for reducing both depression and anxiety.

a. **Regulation of breathing:** Relaxed abdominal-diaphragmatic breathing is very important or essential.

b. **Postures:** Coordinated flow of breath with movements in postures is very important or essential.

c. **Relaxation:** There was no particular approach to relaxation techniques that was considered very important or essential for reducing both depression and anxiety.

d. **Meditation:** Even though meditation in general was considered less essential for reducing depression, mindfulness techniques (learning to focus attention on observing the present experience, without judgement) was considered very important or essential for reducing both depression and anxiety. Active meditation techniques that give the mind something to do or focus on (rather than just observation; e.g. counting, repeated words or phrases (mantra); visualisation; image or symbol; candle gazing; or smiling heart), or other active meditation techniques (such as moving, chanting or guided meditations), were also considered very important or essential for reducing depression, and somewhat or very important, but less essential for reducing anxiety.

General consensus was also achieved on recommendations for **other components of yoga practice and yogic lifestyle** for reducing both depression and anxiety.

e. **Other components of yoga practice:** Cultivation of positive values, attitudes and behaviours, including gratitude, kindness and compassion; and awareness of negative sensory input (pratyahara), including TV, movies, music, multimedia, or news, were both considered very important or essential. Other components were considered somewhat or very important, but less essential, including formulation of meaningful affirmations and intentions (samkalpa); visualisation and symbolic imagery techniques (bhavana); use of sound or chanting (from any suitable language or culture); cultivation of spirituality or prayer (isvarapranidhana); repetition of meaningful words or phrases (mantra); and meaningful symbolic gestures (nyasa & mudra).
f. **Other components of yogic lifestyle**: Cultivating positive relationships; education and developing self-empowering knowledge; social involvement and support (linking with a supportive community - sanga); lifestyle factors including diet, smoking, drugs, alcohol, sleep, work and exercise; and exposure to sunlight and natural environments, were each considered very important or essential. Service to others (including volunteer work); pleasing environment, free from clutter, with good ventilation and natural light; and education about yoga teachings and potential benefits of yoga, were also considered somewhat or very important, but less essential.

### 4.ii Additional approaches and techniques recommended for reducing depression.

Along with recommendations for reducing both depression and anxiety, there was general consensus on recommendation of the following approaches and techniques for reducing depression.

a. **Regulation of breathing**: A focus on inhalation, comfortable holding after inhalation, and right nostril breathing, especially on inhalation, were considered somewhat or very important, but less essential. Cooling breath (sitali) and rapid breathing techniques (such as kapalabhati) were considered as less or not important.

b. **Postures**: Moving repetition of postures, rather than longer holding; chest and heart opening, backward bending postures and movements, that also focus on inhalation; dynamic sequences of postures, including sun salutations; doing a range of different postures to keep it interesting; were each considered somewhat or very important, but less essential.

c. **Relaxation**: Active focus on the physical body (e.g., body awareness scan, progressive muscle relaxation) to shift focus of attention away from mind and thoughts; visualisations that are positive and energising (e.g., sun, open space) were considered very important or essential; and guided relaxation techniques, rather than self-directed, were somewhat or very important, but less essential.

d. **Meditation**: Giving a specific concept, idea or value to focus on, that is positive, energising, or confidence building for the person was considered very important or essential.
e. Other components of yoga practice: There were no additional components of yoga practice recommended for reducing depression.

f. Other recommended yogic-lifestyle factors: Attending group yoga classes was considered somewhat or very important, but not essential.

4.iii Additional approaches and techniques recommended for reducing anxiety.

Unlike depression, the main components of yoga practice that were considered most important for reducing anxiety were relaxation, breath regulation, and meditation. Postures were considered important, but less essential.

Along with recommendations for reducing both depression and anxiety, there was general consensus on the following approaches and techniques for reducing anxiety.

a. Relaxation: A focus on relaxed abdominal breathing, and lengthening the exhale in relaxation techniques are considered very important or essential. Restorative (passive-supported) postures are considered somewhat or very important, but less essential. And, other components with a mixture of somewhat important, very important, or essential, without general consensus on how important, included an active focus on the physical body during relaxation (e.g. body awareness scan, progressive muscle relaxation) to shift focus of attention away from mind and thoughts; and visualizations that have a calming effect for the person.

b. Regulation of breathing: Lengthening the exhalation, calm and steady breathing, and “humming bee” breathing, were considered very important or essential. And, cooling breath (sitil), alternate nostril breathing (nadi shodhana), left nostril breathing, especially on exhalation, and comfortable holding after exhalation were each considered somewhat or very important, but less essential.

c. Meditation: Giving a specific concept, idea or value to focus on, that is positive, calming, or confidence building for the person was considered somewhat or very important, but less essential.

d. Postures: Doing yoga postures that have a calming effect, rather than energising, was considered very important or essential. And, forward bending postures, and resting,
relaxing or restorative postures, were considered somewhat or very important, but less essential. Other approaches were recommended with a mixture of somewhat important, very important, or essential, but without general consensus on how important, included, simple gentle sequences of postures, and postures that focus on exhalation.

e. Other components of yoga practice and yogic-lifestyle: There were no additional components of yoga practice or yogic-lifestyle recommended for reducing anxiety.

4. iv Approaches and techniques recommended to AVOID

There was general consensus that it is important, very important or essential to avoid a number of yoga practices or techniques for both depression and anxiety, and some techniques particularly for anxiety. Summary of consensus on approaches and techniques to avoid for people depression or anxiety is provided in Table 5.4.

a. Recommended to AVOID for BOTH depression and anxiety: Rapid breathing techniques should be avoided for anxiety, and for depression if a history of anxiety or trauma is also indicated. It is also recommended to avoid meditation practices without a specific focus (such as emptiness or inner silence) for both depression and anxiety; and strong or strenuous postures, if there is low motivation or energy.

b. Additional techniques to AVOID for anxiety: yoga done in heated, crowded or enclosed spaces, and breath regulation that focuses on holding after inhalation should be avoided for people with anxiety. And, techniques and practices that emphasize ability, accomplishment or competition, or require difficult and complex instructions, should also be avoided.
Table 5.4 Consensus on approaches and techniques to AVOID, for people with depression or anxiety

<table>
<thead>
<tr>
<th>ROUND 1 - RECOMMENDATIONS TO AVOID</th>
<th>ROUND 2 - General consensus achieved</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>For people with Depression</td>
</tr>
<tr>
<td>Meditation practices without any specific focus (such as emptiness or inner silence meditation)</td>
<td>Important or Essential to AVOID</td>
</tr>
<tr>
<td>Rapid breathing techniques, such as kapalabhati (if anxiety or history of trauma is also present)</td>
<td>Important or Essential to AVOID</td>
</tr>
<tr>
<td>Strong, vigorous or strenuous postures</td>
<td>Important or Essential to AVOID</td>
</tr>
<tr>
<td>Yoga done in heated, crowded, enclosed spaces</td>
<td>No consensus</td>
</tr>
<tr>
<td>Any practices which are too introspective</td>
<td>No consensus</td>
</tr>
<tr>
<td>Techniques that emphasise ability, accomplishment, performance, competition</td>
<td>No recommendation</td>
</tr>
<tr>
<td>Techniques that require difficult and complex instructions</td>
<td>No recommendation</td>
</tr>
<tr>
<td>Comfortable holding after inhalation</td>
<td>No recommendation</td>
</tr>
</tbody>
</table>

5. Training and experience of yoga teachers (for delivery of yoga intervention protocols).

General consensus was achieved in recommendations for training and experience of yoga teachers delivering the protocol for people with depression or anxiety. It was considered very important or essential for teachers to have a minimum of 500 training hours over two years, two years teaching experience, training in developing personalised yoga practices, training in yoga for mental health, and professional supervision or mentoring.

6. Expected benefits

There was general consensus that a benefit of 50% to 90% (median 80%) reduction of symptoms of depression or anxiety, and associated increases in positive emotions and well-being, would be expected for a person with mild or moderate depression or anxiety doing a suitable, individually tailored yoga practice, based on these protocols, under the guidance of a suitably trained and experienced teacher, and generally done in conjunction with other forms of treatment or intervention. There was also general consensus that less benefit would be expected for more severe conditions.
Discussion

The aim of this Delphi study was to identify by general consensus components of yoga practice that could be used in the development of intervention protocols and future research evaluating yoga for reducing depression or anxiety and improving well-being. The Delphi technique has successfully been used to reach consensus in medical and health services research (Jones & Hunter, 1995), and complementary medicine treatment protocols, including yoga for musculoskeletal conditions (Ward et al., 2014), and acupuncture (Cochrane et al., 2011; Smith, C. et al., 2011a; Smith, C. et al., 2012).

Yoga teachers from four different countries, experienced in the field of mental health participated in two rounds of an online survey. Moderate recruitment and completion rates indicate professional interest in the importance of addressing identified issues of heterogeneity in yoga interventions in prior research.

Survey questions related to three main areas of yoga intervention protocols: parameters of frequency and duration of yoga practice (or “dosage” of yoga); approaches and techniques to be included or avoided; and required training and experience for yoga teachers delivering the interventions. A fourth area was related to expected benefits from the interventions. General consensus (> 75% agreement) was achieved on a number of items in each of these areas.

Interventions in prior research are predominantly comprised of group yoga classes, with varying frequency and duration, as well as style or type of yoga taught, and most yoga teachers are primarily trained to teach group yoga classes. In this study, there was general consensus that a suitable individually-tailored yoga practice, with lessons and guidance on a one-to-one basis from a suitably trained and experienced teacher, would be beneficial for people with depression or anxiety. This is consistent with current treatment recommendations on the importance of individually tailored treatment approaches in mental health (Mind Health Connect, 2014). People with depression may also gain benefit from group classes, perhaps due to the importance of social engagement. Individually-tailored or personal yoga practice is also consistent with historical teachings and practice of yoga (Desikachar TKV, 1995), and the approach is sometimes known as ‘viniyoga’ (Desikachar TKV, 1995; Desikachar TKV et al., 2001; Kraftsow, 1999). When yoga is
used to assist people in treatment or recovery from injury, illness or disability, it is often referred to as ‘yoga therapy’ (Mohan & Mohan, 2004). Whilst group classes are popular in many parts of the world today, they are a modern, western phenomenon. Personal or home-practice, has also emerged as a controversial and polarizing issue in another Delphi study on yoga interventions for musculoskeletal conditions (Ward et al, 2014). This may be due to concerns about teaching supervision, compliance and monitoring of yoga practices done at home. When designing and describing yoga interventions, it is important to identify whether the yoga intervention is to be done in modern group classes, or as a personal practice, done at home. Further research to consider the relative effectiveness of each approach for reducing depression and anxiety is recommended.

A minimum amount (dosage) of 15 minutes (or preferably 30 to 40 minutes) per day, for a minimum of 4 (or preferably 5 to 6) times per week, over a minimum period of 6 weeks, is recommended as necessary to gain benefits. Whilst this seems to be a reasonable set of recommendations, adherence to this amount of regular yoga practice amongst people who experience symptoms of depression or anxiety, may be difficult and needs to be assessed for its practicality. Further research is also required to evaluate minimum, maximum and optimum amounts of yoga required to gain benefit, as well as differences amongst people with varying severity of conditions.

Again consistent with historical approaches to yoga, results from this study provide consensus for the development of a set of intervention protocol guidelines, to be used in a non-prescriptive integrated and individualised approach (i.e. in multidimensional combinations, according to the suitability for each individual). This may seem at odds with common approaches to best practice, practitioner training and delivery, and research requirements for standardised interventions that are replicable. However, this indicates the importance of a pragmatic balance between evidence-based standardization and individual participant needs, and quality multidimensional research methodology that explores optimum patient outcomes.

The strengths of this study include moderate recruitment and completion rates, the considerable expertise and experience of participants, the open scope for recommended intervention approaches, and the reproducible Delphi method. Limitations of the study are
also noted. Firstly, whilst efforts were made to invite a reasonable number and representative sample of professionals in the field, the views of those who were invited and agreed to participate may not be representative of views generally held. We have little information about those who were invited but did not participate. Panelists were largely from Australia and USA, with little representation from European or other countries, including India. There may be different cultural and professional views from different parts of the world. Consideration must be given to the popular view that yoga in countries like USA and Australia, seems to emphasise the physical aspects of yoga postures, whereas in India and some European countries, there may be a more wholistic, philosophical or psychological approach to yoga. In contrast, consensus views from the current study did not emphasise the importance of yoga postures, and include a range of wholistic approaches and techniques. The sample size of this study was too small to support quantitative comparisons. Regardless, the efficacy of the consensus-based intervention protocol from the current study requires evaluation in clinical trials. Also, whilst participants were identified and invited based on eligibility criteria, specific demographic details of participants, such as age, education level, and style(s) of yoga taught, were not included. Furthermore, whilst open format of the Delphi methodology is a strength for gathering views, numerous and varied responses for techniques to include in interventions were recommended, and some of these may have overlap and inconsistencies. The static process of survey methodology makes it difficult for participants to respond to each recommendation from other participants, which may affect consensus outcomes. Finally, general consensus that an average of 80% reduction of symptoms for mild or moderate severity of conditions is a substantial claim, and requires further testing. In recommending key components and ‘dosage’ of yoga interventions, further consideration may need to be given to the severity and chronicity of conditions and how these are defined, particular symptoms being addressed, interactions with other forms of treatment including medications, and referral and source of diagnosis (self or health practitioner). In particular, assessment of severity of condition and distinctions between mild, moderate and severe conditions is somewhat subjective, and relies primarily on client self-reporting. In clinical practice, diagnosis by health practitioners often includes self-report measures such as the Depression, Anxiety and Stress Scale (DASS), where severity is based on conventional labels...
(normal, mild moderate, severe) and differences are essentially differences of degree, rather than allocation to discrete diagnostic categories postulated in classificatory systems such as the DSM (Lovibond, S. & Lovibond, 1995b). This study did not include clarification of participants' conceptualisation or understanding of these factors, nor particular descriptions of symptom reductions. Further clarification of conditions and symptoms being assessed for expected benefits is required.

**Conclusion**

The Delphi process has achieved a consensus opinion on the application of yoga-based interventions for reducing anxiety and depression, and improving the well-being of people with these conditions. This provides a checklist for the identification of key components, commonalities and differences in interventions in prior research in the field. Future research can proceed to develop and evaluate consensus-based yoga intervention protocols for the reduction of anxiety and depression, and improvements in well-being.
SECTION 3 EVALUATING THE YOGA INTERVENTION

Chapter 6 The Randomised Controlled Trial

Consistent with findings and recommendations from prior research, further clinical research evaluating yoga as a treatment intervention for reducing depression and anxiety is warranted, and central to this thesis.

A randomised controlled trial was conducted to evaluate the benefits of a 6-week individualised yoga intervention for reducing symptoms of depression and anxiety, and improving well-being. Details of the clinical trial, including methodology and results, have been published in the peer reviewed journal *Depression and Anxiety* (de Manincor et al., 2016). A copy of the published article is included as Appendix II.

### 6.1 Clinical Trial - Methodology

**Design**

A two-group randomised controlled trial design compared the mental health outcomes of a six-week yoga plus treatment-as-usual (TAU) intervention group, with a non-yoga waitlist plus TAU control group. The control group was offered the yoga intervention following the 6-week waitlist period, which also became a single-group crossover comparison of mental health outcomes over the wait-period and the yoga intervention. Participants were assessed at baseline, end of intervention, and 6-weeks after completion of the intervention. The study was conducted in accordance with the Declaration of Helsinki, and was approved by the University of Western Sydney, Human Research Ethics Committee (approval number H9529).

**Participant Recruitment and Eligibility**

Participants were recruited through a variety of sources, including referrals from local psychologists and general medical practitioners, mental health service providers, advertisements in local papers, email newsletters and social media posts. The intervention was provided in 5 cities in New South Wales (Sydney, Newcastle, Bowral, Goulburn and Byron Bay/Mullumbimby). Recruitment was conducted between February 2013 and March 2014. Potential participants were initially assessed for their eligibility via a telephone screening, and then further assessed for eligibility in a face-to-face interview/screening.
session which included completion of the Depression, Anxiety and Stress Scale - 21 item (DASS-21) (Lovibond, S. & Lovibond, 1995b). Inclusion and exclusion criteria are summarised in Table 6.1.

Table 6.1 Inclusion and Exclusion Criteria Summary

<table>
<thead>
<tr>
<th>Inclusion Criteria</th>
<th>Exclusion Criteria</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Ability to give informed consent.</td>
<td>• Any serious injury, medical or psychological disorder likely to preclude completion of the trial, including significant cardiovascular, respiratory or endocrine disorders; recent surgery; acute or chronic pain; current psychiatric illness (other than depression or anxiety disorders) or dementia.</td>
</tr>
<tr>
<td>• Age 18-65 inclusive.</td>
<td>• Frequent alcohol or recreation drug use.</td>
</tr>
<tr>
<td>• Ability to speak, read and write English.</td>
<td>• Those already undertaking a personal yoga practice, an average of more than once a week, over the past 3 months.</td>
</tr>
<tr>
<td>• General health and ability to be involved in the yoga programme.</td>
<td>• DASS-21 scores in the normal range of depression and anxiety sub-scales, or in the extremely severe range of either sub-scale.</td>
</tr>
<tr>
<td>• Medication (including herbal medication, such as St John’s Wort) and professional mental health assistance unchanged for 3 months.</td>
<td></td>
</tr>
<tr>
<td>• DASS-21 scores demonstrating at least mild, moderate or severe depression or anxiety (i.e. depression score between 10 and 27; or anxiety score between 8 and 19).</td>
<td></td>
</tr>
</tbody>
</table>

Sample Size Calculation

Sample size calculations were performed using GLIMPSSE (University of Colorado Denver, 2015) and assumed a 0.65 correlation between baseline and follow-up measures. Power calculations indicated that a sample size of 96 (allowing for 20% withdrawal) is sufficient to detect a 0.5 standard deviation difference between groups in the primary outcome measures (3.9 points on the depression sub-scale, and 3.3 points on the anxiety sub-scale of the converted DASS-21 scores). These changes have been established in prior research as the minimally clinically important effect size (Bilich et al, 2008; Schreiner & Malcolm, 2008; Smith, J. et al, 2011b; Splevins et al, 2009; Thompson et al, 2006).

Randomisation

Eligible participants were randomly assigned to either the yoga plus TAU intervention, or the TAU control group. Randomisation was conducted by administrative staff independent of the research team, using computer-generated randomisation of numbered allocation. Randomisation allocation was concealed using sealed envelopes. Screening sessions were conducted by 4 different members of the research team. Applicants who were ineligible for participation, were provided with referral details for suitable psychological support services, if required. Participants in the trial, were also provided with details for suitable psychological support services, and were monitored for any adverse reaction throughout the trial.
Intervention

The yoga intervention given to each participant included four individual 1-hour consultations/lessons over a six-week period, with a suitably qualified yoga teacher. Yoga teachers delivering the intervention met the recommended training requirements established in the Delphi study, and were provided with an orientation and training for familiarisation with the intervention recommendations established in the consensus statement of the Delphi study. Teachers were also provided with mentoring and case supervision as required, throughout the intervention. During the yoga sessions, an individualised yoga practice was developed and taught to the participant, and given for him or her to do at home. Yoga practices conformed to the consensus-based guidelines developed from the Delphi study described earlier, and was individualised for each participant according to his or her presenting symptoms, needs, abilities, goals and circumstances - a classical approach to yoga practice or yoga therapy known as the viniyoga of yoga (Desikachar TKV et al, 2001; Mohan & Mohan, 2004). Each individualised yoga practice specified appropriate physical postures and movement; breathing exercises; relaxation; mindfulness and meditation; and other aspects of yoga practice such as cultivation of positive values, thoughts and attitudes, and lifestyle factors. Some components were recommended for reducing both depression and anxiety, some were recommended to include or avoid specifically for depression or anxiety (de Manincor et al, 2015). Teacher and participant established an agreement on suitable parameters of the yoga practice, including time of day, duration, and frequency. Participants were taught their yoga practice during the sessions, and a written copy of the practice, including diagrams and instructions, was provided to assist with doing the practice at home. A summary of key components of each practice was recorded by the teacher. Depending on the participant’s feedback and the teacher’s observations at each consultation, the yoga practice may have been revised or developed over the course of the four sessions. Actual amount of yoga done, and adherence to the given practice were recorded at each subsequent session. Amount of yoga done included reporting on “Since our last session, how often did you do your yoga practice?” and “On average, how many minutes each day did you do your yoga?”. Level of adherence was determined by participants’ reporting on “Did you complete the yoga practice the same as it was given to you by the...
teacher?“ Weighted average of “not at all or some parts of it” was categorized as low adherence; “generally similar” was categorized as moderate; and “almost the same or exactly” as high adherence. Encouraging reminders were given to participants by phone call, SMS or email in weeks when consultation sessions were not conducted.

Fifteen qualified yoga teachers provided the yoga sessions. Qualifications of yoga teachers included minimum training and registration requirements for level 2 membership of Yoga Australia (minimum 500 hours teacher training and 5 years teaching experience, equivalent to E-RYT500 of Yoga Alliance in USA). Yoga teachers also had specific training and experience in designing and teaching individualised yoga practices, and training in intervention protocol guidelines utilised in the study (de Manincor et al. 2015).

A summary of the timetable for the intervention is given in Table 6.2.

<table>
<thead>
<tr>
<th>Table 6.2 Yoga Intervention Timetable</th>
<th>Week</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>-1</td>
</tr>
<tr>
<td>Eligibility screening and</td>
<td>✓</td>
</tr>
<tr>
<td>randomised group allocation</td>
<td>✓</td>
</tr>
<tr>
<td>Demographic details</td>
<td>✓</td>
</tr>
<tr>
<td>Individual consultations / yoga</td>
<td>✓</td>
</tr>
<tr>
<td>lessons</td>
<td>✓</td>
</tr>
<tr>
<td>DASS-21</td>
<td>✓</td>
</tr>
<tr>
<td>K10</td>
<td>✓</td>
</tr>
<tr>
<td>SF-12</td>
<td>✓</td>
</tr>
<tr>
<td>SPANE</td>
<td>✓</td>
</tr>
<tr>
<td>Flourishing Scale</td>
<td>✓</td>
</tr>
<tr>
<td>CD-RISC 2</td>
<td>✓</td>
</tr>
<tr>
<td>CEQ (adapted)</td>
<td>✓</td>
</tr>
<tr>
<td>Health Activities Questionnaire</td>
<td>✓</td>
</tr>
</tbody>
</table>

- DASS-21 = Depression Anxiety Stress Scale (21 item short version)
- K10 = Kessler Psychological Distress Scale
- SF-12 = Short-Form Health Survey
- SPANE = Scale of Positive and Negative Emotions
- CD-RISC 2 = Connor-Davidson Resilience Scale 2
- CEQ = Credibility-Expectancy Questionnaire

Control

Participants allocated to the control group were informed that there was a short wait-period of six weeks, prior to commencement of the yoga classes. Upon the completion of the wait-period, participants were offered the yoga intervention.
Treatment As Usual (TAU)

All participants were asked to continue their current treatment as usual (regular care), including any medications, complementary therapies, counseling, psychotherapy, or other mental health services. Details of adherence to or changes in TAU were collected at each consultation session. Changes in TAU were classified as increase in usual treatment, reduction or discontinuation of usual treatment, or no change in usual treatment.

Blinding

Participants volunteered to receive the yoga instruction, were unaware of study design and blinded to group allocations, but were aware of when they were and were not receiving the active intervention. Those allocated to the yoga group commenced the intervention within 1 week of their allocation, and those allocated to the waitlist group were informed that there was a wait-period of 6 weeks until availability for commencement of their yoga sessions. Participants were aware that completion of outcome measure self-report scales occurred pre and post intervention. Yoga teachers providing the intervention and supervising participant completion of the outcome scales were blinded to initial group allocations. Data entry and analyses were unblinded.

Data Collection

Socio-demographic characteristics, recent or current mental health treatments, medical history, recreational drug and alcohol use, and prior yoga experience were collected at baseline. All were self-reported.

6.2 Outcome Measures

Six self-report measures were applied at commencement and completion of the yoga training and waitlist periods, and at 6-week follow-up. Sample copies of outcome measures are included in Appendix IV.

i) Primary Outcome Measure - DASS-21

The Depression Anxiety and Stress Scale - 21 item (DASS-21) (Lovibond, S. & Lovibond, 1995b) was used as the primary outcome measure. The DASS-21 is a shorter version of the
42 item DASS, and has been shown to have good reliability and validity properties with clinical populations (Antony et al, 1998; Brown, T. et al, 1997; Crawford & Henry, 2003; Henry & Crawford, 2005; Lovibond, S. & Lovibond, 1995b; Page et al, 2007). Studies have confirmed a factor structure with sub-scales of depression, anxiety and stress, which exhibit high convergent validity with other measures of anxiety and depression (Antony et al, 1998; Brown, T. et al, 1997; Clara et al, 2001; Lovibond, S. & Lovibond, 1995b). The shorter version has a number of advantages over the full-length version. Firstly, it takes less time to complete (and thus is more acceptable to both patients with limited concentration and busy clinicians). Second, the items retained from the full-length version are generally superior to those omitted and, as a result, it has a cleaner factor structure (Henry & Crawford, 2005). Extensive normative data are available (Clara et al, 2001; Crawford et al, 2011; Crawford et al, 2009; Crawford & Henry, 2003; Henry & Crawford, 2005; Lovibond, S. & Lovibond, 1995b), including recently compiled normative data for the Australian general population (Crawford et al, 2011). The DASS-21 is well accepted and recommended as a measure of change in intervention trials (Antony et al, 1998; Parkitny & McAuley, 2010).

The DASS-21 was chosen in preference to other measures for depression and anxiety, such as the Beck Depression Inventory (BDI) and Beck Anxiety Inventory (BAI), and the Hamilton Rating Scale for Depression (HRSD) and Hamilton Rating Scale for Anxiety (HRSA), because of the convenience of using a single measurement instrument, with valid and reliable sub-scales for depression and anxiety, rather than using two independent measurements of depression and anxiety, and the availability of recent Australian normative data for the DASS-21 (Crawford et al, 2011). Details of findings from the Australian general population sample are given in Table 6.3, and recommended range of scores for severity of symptoms are given in Table 6.4.

The DASS manual (Lovibond & Lovibond, 1995) recommends raw scores from the DASS-21 to be multiplied by 2, to enable comparisons with scores from the full DASS (42 item).

<table>
<thead>
<tr>
<th>Sub-Scale</th>
<th>Mean</th>
<th>Median</th>
<th>SD</th>
<th>Range</th>
<th>( \alpha ) (95% CL’s)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression</td>
<td>2.57</td>
<td>1</td>
<td>3.86</td>
<td>0-20</td>
<td>0.90 (0.89, 0.91)</td>
</tr>
</tbody>
</table>
Table 6.4  Recommended range of scores for severity of symptoms (Lovibond & Lovibond, 1995)

<table>
<thead>
<tr>
<th></th>
<th>Depression (Range 0-42)</th>
<th>Anxiety (Range 0-42)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Normal</td>
<td>0-9</td>
<td>0-7</td>
</tr>
<tr>
<td>Mild</td>
<td>10-13</td>
<td>8-9</td>
</tr>
<tr>
<td>Moderate</td>
<td>14-20</td>
<td>10-14</td>
</tr>
<tr>
<td>Severe</td>
<td>21-27</td>
<td>15-19</td>
</tr>
<tr>
<td>Extremely Severe</td>
<td>28+</td>
<td>20+</td>
</tr>
</tbody>
</table>

Scores relate to the full DASS (42 item version).

Based on related research, a 25% improvement from baseline measures can be expected from the intervention (3 points on the depression scale or 2.5 points on the anxiety scale) (Bilich et al, 2008; Schreiner & Malcolm, 2008; Smith et al, 2011; Splevins et al, 2009; Thompson et al, 2006)

ii) Secondary Outcome Measures

Psychological distress, anxiety, depression, and general physical and mental health, were also measured using the Kessler Psychological Distress Scale (K10) (Kessler et al, 2002), and the Short-Form 12-Item Health Survey (SF-12v2) (Ware, 2003).

Kessler Psychological Distress Scale (K10)

The K10 is widely used in epidemiological studies of mental health throughout the world, including the Australian Mental Health and Well-Being Survey (ABS, 2008), and has become one of the most widely used mental health screening instruments in contemporary psychiatry in many countries, including Australia (Andrews & Slade, 2001). The scale is also widely used in clinical practice by medical practitioners in Australia for assessment and consequent referral of patients for mental health services. Its general acceptance in clinical medical practice in Australia, makes it a very useful and well understood instrument. The K10 has shown good results for validity and reliability (Andrews & Slade,
2001), and sensitivity to change (Perini et al, 2006). Evidence also suggests that the K10 is not only a measure of psychological distress, but also a short term measure of anxiety and depression symptoms (Perini et al, 2006).

Short-Form Health Survey (SF-12v2)

The SF-12 (shorter form of the SF-36) is a health status questionnaire, which has been used in related research, including Australian populations, for many years (Perini et al, 2006; Tucker et al 2010; Ware & Sherbourne, 1992). The SF-12 measures functional status and disability related to health concepts and role limitations due to physical and mental health during the past 4 weeks, yielding physical component and mental component summary scales (SF12-PH and SF12-MH, respectively) (Perini et al, 2006; Ware et al, 1996). The SF-12 is used in preference to the SF-36 to reduce burden on participants.

Measures of psychological well-being were taken using the Scale of Positive and Negative Experience (SPANE) and the Flourishing Scale (FS) (Diener et al, 2010). This data allows consideration of the effectiveness of yoga in increases positive emotion and well-being, consistent with conceptualisations of mental health in emerging field of Positive Psychology.

Scale of Positive and Negative Experience (SPANE)

The SPANE yields a score for positive experience and feelings (6 items), a score for negative experience and feelings (6 items). This brief scale has a number of desirable features compared to earlier measures of positive and negative feelings. In particular, the scale assesses with a few items a broad range of negative and positive experiences and feelings, not just those of a certain type, and is based on the frequency of feelings during the past month (Diener et al, 2009). Because of the general items included in the scale, it can assess not only the pleasant and unpleasant emotional feelings that are the focus of most scales, but also reflects other states such as interest, flow, positive engagement, and physical pleasure (Diener et al, 2010).

Flourishing Scale (FS)
The FS (previously called the Psychological Well-being Scale - PWB) consists of eight items describing important aspects of human functioning including positive relationships, feelings of competence, and having meaning and purpose in life (Diener et al., 2010). The scale provides a single overall rating of psychological well-being in mental health (Seligman, 2011). High scores signify that respondents view themselves in positive terms in important areas of functioning, and yields an overview of positive functioning across diverse domains that are widely believed to be important (Seligman, 2011).

Both measures have established psychometric properties, and are substantially correlated with other psychological well-being scales (Diener et al., 2009; Diener et al., 2010; Hone et al., 2014; Silva & Caetano, 2013).

**Connor-Davidson Resilience Scale 2 (CD-RISC 2)**

The Connor-Davidson Resilience Scale (CD-RISC 2) is a 2-item measure of resilience, defined as the personal qualities that enable a person to thrive in the face of adversity, and a measure of successful stress-coping ability (Connor & Davidson, 2003). Resilience and related concepts such as ‘hardiness’ have also been seen as an index of mental health (Maddi & Khoshaba, 1994). The scale shows good reliability and validity, and is correlated with other related measures of perceived stress and vulnerability measures (Vaishnavi et al., 2007).

**Credibility-Expectancy Questionnaire (CEQ)**

The CEQ (Devilly & Borkovec, 2000) is a quick and easy to use scale for measuring treatment expectancy and rationale credibility for use in clinical outcome studies. It relates to two factors of thinking and feeling about a treatment intervention, which have been shown to be stable across different populations (Devilly & Borkovec, 2000). The scale has demonstrated good internal consistency and test-retest reliability, and the expectancy factor has been shown to be a predictor of outcome on some measures (Devilly & Borkovec, 2000). The scale was included in this study as a measure of participant belief in the efficacy of yoga, and possible factor predictive of outcome.

**Health Activities Questionnaire**
Participants were also asked to complete a Health Activities Questionnaire (HAQ) at each session, including questions about their current exercise, recreation, social activity, additional yoga undertaken, caffeine and alcohol intake, work, and sleep.

**Adverse Events and changes to TAU**

Adverse events and changes to TAU (including medications, herbs, supplements and other forms of mental health treatments) were also recorded at each session.

6.3 **Statistical Methods**

Data was analysed using the SPSS software (version 23). A data entry error audit conducted with an independent re-entering of complete data sets from 10% of participants (n = 11) selected at random revealed no significant issues.

Main analyses were conducted on an intention to treat (ITT) basis. Missing data were imputed using last value carried forward. Further analyses were conducted on a per protocol (PP) basis, where data of participants who withdraw from the study or were non-compliant with the intervention protocol were excluded from the analyses. Subgroup analyses were also conducted for three planned subgroups: i) participants with elevated baseline depression scores; ii) participants with elevated baseline anxiety scores; iii) participants with elevated baseline depression and anxiety scores.

Baseline data are summarised for the intervention group and waitlist group separately, with Pearson’s chi-square or independent samples t-tests used to check for any significant baseline differences. Effect of the intervention was tested using between-group analysis of covariance (ANCOVA), where each post-intervention outcome was predicted by intervention group, after adjustment for pre-intervention levels. Results are presented as post-intervention means, adjusted mean differences between groups (AMD), with associated 95% confidence intervals (CI) and p-values, and effect sizes calculated as standardized mean differences (SMD) using Cohen’s d. P-values of <0.05 were taken to indicate statistical significance. Potential outlying influential data were identified using Cook’s distance, and the generally accepted rule of thumb of Cook’s distance values > 4/
Where influential data were identified, effect of the intervention was analysed using the same ANCOVA model after trimming of data where Cook’s distance values were > 0.04 (n=101). Group difference in frequency of changes in TAU was analysed using Fisher’s exact test. Effect of changes in TAU on intervention outcomes was tested using the between-group ANCOVA, including adjustments for changes in TAU. Clinical significance was analysed using number of people with elevated baseline scores of depression or anxiety above “normal” DASS range (Lovibond, S. & Lovibond, 1995b), who scored within the normal range after intervention (Kendall, P & Norton-Ford, 1982; Nietzel & Trull, 1988). Group differences were analysed using Person’s chi-squared test.
Chapter 7  Results - Main Analyses and Primary Outcomes of Randomised Controlled Trial

Results of the clinical trial have been published in the peer reviewed journal Depression and Anxiety (de Manincor et al., 2016). A copy of the published article is included as Appendix II.

1. Enrollments and group randomisation

Figure 2 summarises enrollments, exclusions and participation in the study. 144 were assessed for eligibility with 107 randomised, and 6 post-randomisation exclusions. 101 were included in the main between-group ITT analyses. 48 were included in the supplementary single group crossover analyses.

![Flow diagram of progression through phases of trial.](image)
2. Between-group baseline comparisons

Table 7.1 summarises group differences on demographics, clinical and general health information, prior yoga experience, and baseline outcome measures. There were no statistically significant differences between groups on demographics or clinical factors, or baseline outcome measures.

### Table 7.1 Demographics, clinical and general health information, prior yoga experience, outcome measures at baseline

<table>
<thead>
<tr>
<th>Demographic/Experience</th>
<th>Group</th>
<th>Sample n</th>
<th>Yoga (n=47)</th>
<th>Wait-list (n=54)</th>
<th>t-test [df=99]</th>
<th>signif. [2-tailed]</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Age</strong></td>
<td></td>
<td></td>
<td>mean (sd)</td>
<td>mean (sd)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Male</td>
<td>20</td>
<td>6 (12.8)</td>
<td>14 (25.9)</td>
<td>2.74</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>81</td>
<td>41 (87.2)</td>
<td>40 (74.1)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Education</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Secondary school</td>
<td>19</td>
<td>12 (25.5)</td>
<td>7 (13.0)</td>
<td>2.6</td>
<td>0.12</td>
<td></td>
</tr>
<tr>
<td>Tertiary - post school</td>
<td>82</td>
<td>35 (74.5)</td>
<td>47 (87.0)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Employment</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Full-time</td>
<td>37</td>
<td>16 (34.0)</td>
<td>21 (39.6)</td>
<td>5.01</td>
<td>0.08</td>
<td></td>
</tr>
<tr>
<td>Part-time</td>
<td>29</td>
<td>10 (21.3)</td>
<td>19 (35.8)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Not employed</td>
<td>34</td>
<td>21 (44.7)</td>
<td>13 (24.5)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Relationship status</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Married/de facto</td>
<td>50</td>
<td>24 (52.2)</td>
<td>26 (48.1)</td>
<td>1.16</td>
<td>0.69</td>
<td></td>
</tr>
<tr>
<td>Not in a relationship</td>
<td>50</td>
<td>22 (47.8)</td>
<td>28 (51.9)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Unknown</td>
<td>1</td>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Prior mental illness</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>diagnosis, including depression or anxiety</td>
<td>78</td>
<td>37 (78.7)</td>
<td>41 (75.9)</td>
<td>0.11</td>
<td>0.74</td>
<td></td>
</tr>
<tr>
<td>Psycho-pharmaceutical medications (anti-depressants, anti-psychotic and other medications for mental illness)</td>
<td>35</td>
<td>19 (40.4)</td>
<td>16 (30.2)</td>
<td>1.15</td>
<td>0.28</td>
<td></td>
</tr>
<tr>
<td>Currently receiving professional assistance for mental health</td>
<td>40</td>
<td>27 (57.4)</td>
<td>20 (37.7)</td>
<td>0.24</td>
<td>0.62</td>
<td></td>
</tr>
<tr>
<td><strong>Recent yoga experience (yoga classes in past 12 months)</strong></td>
<td>48</td>
<td>24 (51.1)</td>
<td>24 (44.4)</td>
<td>0.44</td>
<td>0.51</td>
<td></td>
</tr>
</tbody>
</table>

### Outcome Measure at Baseline

<table>
<thead>
<tr>
<th>Measure</th>
<th>Sample (n=47)</th>
<th>Mean (sd)</th>
<th>Sample (n=54)</th>
<th>Mean (sd)</th>
<th>t-test [df=99]</th>
<th>signif. [2-tailed]</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression - DASS-21 subscale</td>
<td>101</td>
<td>17.66 (8.92)</td>
<td>17.81 (10.46)</td>
<td>-0.08</td>
<td>0.94</td>
<td></td>
</tr>
<tr>
<td>Anxiety - DASS-21 subscale</td>
<td>12.98 (7.38)</td>
<td>14.65 (9.45)</td>
<td>-0.98</td>
<td>0.33</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stress - DASS-21 subscale</td>
<td>21.32 (6.79)</td>
<td>24.07 (9.25)</td>
<td>-1.68</td>
<td>0.10</td>
<td></td>
<td></td>
</tr>
<tr>
<td>DASS - TOTAL</td>
<td>51.96 (18.11)</td>
<td>56.56 (23.74)</td>
<td>-1.08</td>
<td>0.28</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Psychological Distress - K10</td>
<td>17.38 (6.53)</td>
<td>15.74 (6.33)</td>
<td>1.28</td>
<td>0.20</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Physical Health - SF12</td>
<td>47.81 (9.16)</td>
<td>50.37 (7.45)</td>
<td>-1.55</td>
<td>0.13</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Mental Health - SF12</td>
<td>28.35 (5.24)</td>
<td>29.00 (7.33)</td>
<td>-0.51</td>
<td>0.61</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Positive Experiences - SPANE+</td>
<td>16.49 (3.72)</td>
<td>17.63 (4.04)</td>
<td>-1.47</td>
<td>0.15</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Negative Experiences - SPANE-</td>
<td>20.49 (3.56)</td>
<td>19.67 (4.54)</td>
<td>1.00</td>
<td>0.32</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Flourishing Scale</td>
<td>37.64 (7.95)</td>
<td>39.70 (7.68)</td>
<td>-1.33</td>
<td>0.19</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Resilience - CD-RISC2</td>
<td>5.13 (1.54)</td>
<td>5.11 (1.56)</td>
<td>0.05</td>
<td>0.96</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Credibility (CEQ)</td>
<td>28.36 (5.63)</td>
<td>27.48 (5.40)</td>
<td>0.79</td>
<td>0.43</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Expectancy (CEQ)</td>
<td>13.27 (3.65)</td>
<td>12.63 (4.10)</td>
<td>0.81</td>
<td>0.42</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
3. Between-group post-intervention comparisons

3.1. Intention to Treat Analyses

Table 7.2 summarises results of the effectiveness of the yoga intervention compared to the waitlist control group, on an Intention To Treat (ITT) basis. Missing data were imputed (using last value carried forward) for 5 participants who withdrew from the yoga group (10.6%), and 5 who withdrew from waitlist group (9.3%).

<table>
<thead>
<tr>
<th>Primary Outcome Measures</th>
<th>Post yoga + TAU (n = 47)</th>
<th>Post wait-period + TAU (n = 54)</th>
<th>ANCOVA (adjusted for baseline levels)</th>
<th>Effect size*</th>
<th>SMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression - DASS-21 subscale</td>
<td>11.87 (9.22)</td>
<td>16.26 (10.77)</td>
<td>-4.30 -7.70 -0.91 0.01 0.04</td>
<td>-0.44</td>
<td></td>
</tr>
<tr>
<td>Anxiety - DASS-21 subscale</td>
<td>9.62 (6.97)</td>
<td>12.56 (9.65)</td>
<td>-1.91 -4.58 0.76 0.16 -</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary Outcome Measures</th>
<th>Post yoga + TAU (n = 47)</th>
<th>Post wait-period + TAU (n = 54)</th>
<th>ANCOVA (adjusted for baseline levels)</th>
<th>Effect size*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stress - DASS-21 subscale</td>
<td>16.55 (7.73)</td>
<td>20.67 (9.79)</td>
<td>-2.48 -5.48 0.53 0.11 -</td>
<td></td>
</tr>
<tr>
<td>DASS - TOTAL</td>
<td>38.04 (20.48)</td>
<td>49.48 (25.12)</td>
<td>-8.77 -16.58 -0.97 0.03 -0.50</td>
<td></td>
</tr>
<tr>
<td>Psychological Distress - K10</td>
<td>11.43 (6.51)</td>
<td>15.09 (7.47)</td>
<td>-4.58 -7.01 -2.14 &lt;0.01 -0.52</td>
<td></td>
</tr>
<tr>
<td>Physical Health - SF12-PH</td>
<td>49.37 (8.01)</td>
<td>51.03 (6.72)</td>
<td>0.11 -1.74 1.97 0.90 -</td>
<td></td>
</tr>
<tr>
<td>Mental Health - SF12-MH</td>
<td>34.06 (7.28)</td>
<td>29.59 (7.61)</td>
<td>4.83 2.22 7.44 &lt;0.01 0.60</td>
<td></td>
</tr>
<tr>
<td>Positive Experiences - SPANE+</td>
<td>19.70 (4.25)</td>
<td>18.11 (3.98)</td>
<td>2.34 1.04 3.64 &lt;0.01 0.39</td>
<td></td>
</tr>
<tr>
<td>Negative Experiences - SPANE-</td>
<td>17.11 (4.08)</td>
<td>18.70 (4.28)</td>
<td>-2.08 -3.45 -0.70 &lt;0.01 -0.38</td>
<td></td>
</tr>
<tr>
<td>Flourishing Scale</td>
<td>42.23 (8.00)</td>
<td>40.06 (8.11)</td>
<td>3.81 1.71 5.90 &lt;0.01 0.27</td>
<td></td>
</tr>
<tr>
<td>Resilience - CD-RISC2</td>
<td>5.79 (1.40)</td>
<td>5.07 (1.64)</td>
<td>0.70 0.25 1.16 &lt;0.01 0.47</td>
<td></td>
</tr>
</tbody>
</table>

* Effect sizes calculated as standardized mean difference (SMD) using Cohen’s d

3.1.1. Primary outcome measures of depression and anxiety

There was a statistically significant reduction of DASS depression scores in the yoga group relative to the waitlist group (AMD -4.30; 95% CI's -7.70, -0.91; p=0.01; effect size -0.44). The reduction of DASS anxiety scores with yoga relative to waitlist was not statistically significant (AMD -1.91; 95% CI's -4.58, 0.76; p=0.16). However, influential outlying data were observed in changes from pre to post anxiety scores (with Cook’s distance values > 0.04). After trimming of these data, group differences on anxiety scores were statistically significant (AMD -2.53; CI's -4.71, -0.35; p=0.02; effect size -0.40).

3.1.2. Secondary outcome measures

There were statistically significant differences between groups in favour of yoga on total DASS score (p=0.03), reduction of psychological distress - K10 (p<0.01), improved mental
health composite score - SF12-MH ($p<0.01$), frequency of positive and negative experiences - SPANE ($p<0.01$ for each), flourishing - FS ($p<0.01$), and resilience - CD-RISC2 ($p<0.01$). The reduction of DASS stress scores with yoga relative to waitlist was not statistically significant ($p=0.11$). There was no significant difference between groups on physical health - SF12-PH ($p=0.90$).

There was a significantly greater frequency of reductions in treatment in the yoga group ($n=6/47, 12.8\%$) compared to the waitlist group ($n=0/53, 0.0\%$) (Fisher’s exact test $p<0.01$). There was no significant difference between groups in frequency of increases in treatment ($n=3/47, 6.4\%$ in yoga group, and $3/53, 5.7\%$ in waitlist group; Fisher’s exact test $p=1.00$).

The effect of the yoga intervention compared to wait-period remained statistically significant after correcting for changes in TAU (increases, decreases and no change) in the ANCOVA on post-intervention DASS depression scores ($\text{AMD} -5.47; \text{CI's} -8.88, -2.06; p=0.02$).

When baseline credibility and expectancy scores (CEQ) were accounted for in the covariate analyses, neither factor had any significant effect on outcome measures.

3.2. *Per Protocol Analyses*

Data was also analysed on a *per protocol* (PP) basis, utilising the same statistical test methods as above, after data of participants who withdrew from the study or were non-compliant with the intervention protocol were removed from the analyses. Number of participants that were excluded from the PP analyses, and reasons for exclusion are summarised in Table 7.3.
3.2.1. Primary outcome measures of depression and anxiety

Consistent with the ITT analysis, there was a statistically significant reduction of DASS depression scores in the yoga group relative to the waitlist group ($p<0.01$), with a greater mean difference and effect size, compared to the ITT analysis. (AMD -6.13; 95% CI's -10.03, -2.22; $p<0.01$; effect size -0.59). Unlike the ITT analysis, the reduction of DASS anxiety scores with yoga relative to waitlist was statistically significant (AMD -3.76; 95% CI's -6.52, 0.99;
p<0.01; effect size -0.55). This is consistent with the ITT analysis after trimming of outlying influential data.

3.2.2. Secondary outcome measures

Again, consistent with the ITT analyses, there were statistically significant differences between groups in favour of yoga on total DASS score, reduction of psychological distress - K10, improved mental health composite score - SF12-MH, frequency of positive and negative experiences - SPANE, flourishing - FS, and resilience - CD-RISC2 (p<0.01 for each), with greater effects sizes for each, except resilience. And, there was no significant difference between groups on physical health - SF12-PH (p=0.90). Unlike the ITT analysis, the reduction of DASS stress scores with yoga relative to waitlist was statistically significant (p=0.02).

4. Follow-Up Analyses

Table 7.5 summarises results of within-group comparisons of pre, post and follow-up measures, for participants who completed the yoga intervention to follow-up (n = 37). At 6-week follow-up, benefits of the yoga-intervention continued to show statistically significant improvements over baseline mean on mean depression, anxiety, stress, total DASS (p<0.01 for each), psychological distress (K10, p=0.03), mental health (SF12-MH, p=0.01), and reduction of negative experiences (SPANE-, p=0.03). There was no evidence of change from post-yoga to follow-up on measures of positive experiences (SPANE+, p=0.38); flourishing (p=0.07) or resilience (p=0.16). Differences in measures from baseline (pre-yoga) to follow-up (6 weeks yoga + 6 weeks follow-up) were statistically significant on all measures (p<0.01; except physical health (SF12-PH), where p=0.04).
Table 7.5 Effect of intervention at 6-week follow-up (n = 37)

<table>
<thead>
<tr>
<th>Primary Outcome Measures</th>
<th>Pre-Yoga (Baseline)</th>
<th>Post-Yoga</th>
<th>Follow-up</th>
<th>Difference Post-Yoga to Follow-up (6 weeks)</th>
<th>Paired Sample t test (2-tailed)</th>
<th>Effect Size*</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>mean (sd)</td>
<td>mean (sd)</td>
<td>mean (sd)</td>
<td>mean (sd)</td>
<td>lower CI</td>
<td>upper CI</td>
</tr>
<tr>
<td>Depression - DASS-21 subscale</td>
<td>17.24 (9.57)</td>
<td>11.03 (8.48)</td>
<td>8.11 (7.90)</td>
<td>-2.92 (5.96)</td>
<td>-4.91 -0.93</td>
<td>-2.98 &lt;0.01</td>
</tr>
<tr>
<td>Anxiety - DASS-21 subscale</td>
<td>13.03 (7.90)</td>
<td>9.08 (7.02)</td>
<td>6.65 (6.26)</td>
<td>-2.43 (5.21)</td>
<td>-4.17 -0.70</td>
<td>-2.84 &lt;0.01</td>
</tr>
</tbody>
</table>

| Secondary Outcome Measures     |                      |           |           | Difference Baseline to Follow-up (12 weeks) | Paired Sample t test (2-tailed) | Effect Size* |
|                                | mean (sd)            | mean (sd)| mean (sd)| mean (sd)                                  | lower CI                        | upper CI     |
| Stress - DASS-21 subscale      | 21.35 (6.83)         | 16.86 (7.10)| 13.19 (7.42)| -3.68 (7.08)                              | -6.04 -1.32                     | -3.16 <0.01  |
| DASS - TOTAL                   | 51.62 (19.16)        | 36.97 (18.88)| 27.95 (15.99)| -9.03 (14.23)                             | -13.77 -4.28                    | -3.86 <0.01  |
| Psychological Distress - K10   | 17.49 (7.23)         | 11.11 (6.50)| 9.28 (6.17)   | -1.82 (4.91)                              | -3.46 -0.19                     | -2.26 0.03   |
| Physical Health - SF12         | 48.87 (8.95)         | 50.93 (6.74)| 51.38 (7.33) | 0.45 (5.13)                               | -1.26 2.16                      | 0.54 0.60    |
| Mental Health - SF12           | 28.63 (5.49)         | 33.85 (7.11)| 36.09 (7.23) | 2.24 (5.26)                               | 0.48 3.99                       | 2.59 0.01    |
| Positive Experiences - SPANE+  | 16.46 (3.66)         | 20.05 (4.24)| 20.54 (4.66) | 0.49 (3.36)                               | -0.63 1.61                      | 0.88 0.38    |
| Negative Experiences - SPANE-  | 20.78 (3.35)         | 17.05 (3.98)| 15.89 (4.75) | -1.16 (3.10)                              | -2.19 -0.13                     | -2.28 0.03   |
| Flourishing Scale              | 37.62 (8.22)         | 43.05 (6.64)| 44.50 (7.08) | 1.45 (4.75)                               | -0.14 3.03                      | 1.85 0.07    |
| Resilience - CD-RISC2          | 5.08 (1.52)          | 5.68 (1.40)| 5.97 (1.74)  | 0.30 (1.27)                               | -0.13 0.72                      | 1.43 0.16    |

* Effect sizes calculated as standardized mean difference (SMD) using Cohen’s d.
5. Amount of yoga (frequency and duration) and adherence

Table 7.6 summarises results of frequency, duration, and cumulative amount of yoga practice completed, and level of adherence to the yoga practice given. Yoga practice was done an average of 4.8 days per week during the intervention, for 29.0 minutes per session, with moderate to high adherence. These amounts of practice and adherence were continued throughout follow-up period.

| Table 7.6 Amounts of yoga practice completed (“dosage”) and adherence during intervention and follow-up |
|-------------------------------------------------|----------|-----|------|--------|------|
| 1. Amounts of yoga practice completed*         | Mean     | sd  | 95% CI| Range | Min-Max |
| Frequency of practice: days per week            |          |     |       |        |        |
| Yoga intervention (n=42)                         | 4.8      | 1.2 | 4.5   | 5.2    | 4.7    | 2.3 - 7.0 |
| Follow-up period (n=37)                          | 4.9      | 1.2 | 4.6   | 5.2    | 4.7    | 2.3 - 7.0 |
| Duration of practice: minutes of each practice  |          |     |       |        |        |
| Yoga intervention                               | 29.0     | 18.6| 23.3  | 34.8   | 108.3  | 6.7 - 115.0 |
| Follow-up period                                | 27.8     | 15.4| 24.2  | 31.4   | 108.3  | 6.7 - 115.0 |
| Cumulative weekly practice: total minutes per week |          |     |       |        |        |
| Yoga intervention                               | 147.5    | 121.3| 109.7| 185.3  | 674    | 27.5 - 701.5 |
| Follow-up period                                | 141.3    | 101.0| 117.5| 165.0  | 677.4  | 24.1 - 701.5 |

2. Adherence* (to the yoga practice given by teacher)

<table>
<thead>
<tr>
<th>Yoga intervention</th>
<th>Low</th>
<th>Moderate</th>
<th>High</th>
</tr>
</thead>
</table>

* Based on weighted individual means over the 6 weeks

6. Components of Yoga Practices

Yoga practices were individually tailored to each individual’s perceived needs and abilities. Table 7.7 summarises the frequency of components that were included as a main focus in individual practices. Components included as a main focus for the majority of participants (more than 50%) included moving repetition (rather than static holding) of breath-focused gentle postures and sequences, passive relaxation postures, relaxed abdominal breathing, a longer/slower exhalation, meditation practices with a given object of focus (rather than emptiness), and formulation of a personal intention. Other components were also included in each practice, but not necessarily a main focus.
### Table 7.7  Frequency of components included in participants’ practices

<table>
<thead>
<tr>
<th>Components of yoga practice interventions</th>
<th>Group N = 47</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>n</td>
</tr>
<tr>
<td><strong>Postures and movements with a focus on:</strong></td>
<td></td>
</tr>
<tr>
<td>Backward bending</td>
<td>11</td>
</tr>
<tr>
<td>Forward bending</td>
<td>23</td>
</tr>
<tr>
<td>Standing balances</td>
<td>8</td>
</tr>
<tr>
<td>Inverted 1/2 shoulder stand</td>
<td>4</td>
</tr>
<tr>
<td>Moving repetition (rather than static holding)</td>
<td>40</td>
</tr>
<tr>
<td>Breath-focused movements</td>
<td>47</td>
</tr>
<tr>
<td>Gentle postures &amp; sequences</td>
<td>44</td>
</tr>
<tr>
<td>Holding (&gt; 5 breaths)</td>
<td>17</td>
</tr>
<tr>
<td>Resting/Restorative</td>
<td>41</td>
</tr>
<tr>
<td>Dynamic sequences (including sun salutations)</td>
<td>20</td>
</tr>
<tr>
<td><strong>Regulation of Breathing with a focus on:</strong></td>
<td></td>
</tr>
<tr>
<td>Relaxed abdominal</td>
<td>38</td>
</tr>
<tr>
<td>Longer/slower exhalation</td>
<td>31</td>
</tr>
<tr>
<td>Inhalation</td>
<td>2</td>
</tr>
<tr>
<td>Rapid-forced breathing (kapalabhati or bhatrika)</td>
<td>4</td>
</tr>
<tr>
<td>Alternating nostril</td>
<td>2</td>
</tr>
<tr>
<td><strong>Relaxation with a focus on:</strong></td>
<td></td>
</tr>
<tr>
<td>Passive relaxation postures</td>
<td>41</td>
</tr>
<tr>
<td>Active process (e.g. progressive muscle relaxation)</td>
<td>21</td>
</tr>
<tr>
<td>Guided (recorded) relaxation (including yoga nidra)</td>
<td>18</td>
</tr>
<tr>
<td>Supported inversion (legs up the wall)</td>
<td>14</td>
</tr>
<tr>
<td><strong>Meditation with a focus on:</strong></td>
<td></td>
</tr>
<tr>
<td>Mindfulness meditation technique*</td>
<td>18</td>
</tr>
<tr>
<td>With a given object of focus (rather than emptiness)</td>
<td>34</td>
</tr>
<tr>
<td><strong>Other components with a focus on:</strong></td>
<td></td>
</tr>
<tr>
<td>Repetition of a word or phrase (mantra)</td>
<td>18</td>
</tr>
<tr>
<td>Use of sound or chant</td>
<td>18</td>
</tr>
<tr>
<td>Formulation of a personal intention (sankalpa)</td>
<td>29</td>
</tr>
<tr>
<td>Cultivation of values (e.g. gratitude, compassion)</td>
<td>17</td>
</tr>
</tbody>
</table>

* Mindful awareness is also considered an intrinsic component of each component of yoga practice, as well as the specified mindfulness meditation.

Italics signify frequencies greater than 50%
7. **Clinical Significance**

Table 7.8 summarises benefits of clinical significance. For depression, 15 participants (37.5%) in the yoga group with elevated baseline DASS depression scores returned to normal range, compared to 7 (16.7%) in control group (RR=2.25, 95% CI=1.03-4.95, \( p = 0.04 \), NNT=4.8). For anxiety, 13 participants (36.1%) in the yoga group with elevated baseline DASS anxiety scores returned to normal range, compared to 11 (25.0%) in control group (RR=1.44, 95% CI=0.74-2.83, \( p = 0.28 \), NNT=9.0).

<table>
<thead>
<tr>
<th>Table 7.8</th>
<th>Number of participants gaining benefit of clinical significance</th>
<th>Yoga ( n ) (%)</th>
<th>Control ( n ) (%)</th>
<th>Pearson chi-square</th>
<th>signif.</th>
</tr>
</thead>
<tbody>
<tr>
<td>DASS Depression: Elevated at baseline (DASS ≥ 10: mild, moderate or severe)</td>
<td>40 (85.1)</td>
<td>42 (77.8)</td>
<td>6.36</td>
<td>0.93</td>
<td></td>
</tr>
<tr>
<td>Post intervention scores reduced to &lt; 10 (normal range)</td>
<td>15 (37.5)</td>
<td>7 (16.7)</td>
<td>4.53</td>
<td>0.03</td>
<td></td>
</tr>
<tr>
<td>DASS Anxiety: Elevated at baseline (DASS ≥ 8: mild, moderate or severe)</td>
<td>36 (76.6)</td>
<td>44 (81.5)</td>
<td>14.22</td>
<td>0.36</td>
<td></td>
</tr>
<tr>
<td>Post intervention scores reduced to &lt; 8 (normal range)</td>
<td>13 (36.1)</td>
<td>11 (25.0)</td>
<td>1.16</td>
<td>0.28</td>
<td></td>
</tr>
</tbody>
</table>

8. **Adverse Effects**

No adverse effects related to the yoga intervention were reported.

**Summary of results from main analyses of RCT**

Between-group comparisons on an ITT basis indicated statistically significant differences in favour of yoga plus TAU compared to waitlist control plus TAU, with small to medium effect sizes for depression (\( p = 0.01 \), effect size -0.44), total DASS (\( p = 0.03 \), effect size -0.50), psychological distress (\( p < 0.01 \), effect size -0.52), overall mental health (\( p < 0.01 \), effect size 0.60), frequency of positive and negative experiences (\( p < 0.01 \) for each, effect sizes 0.39 and -0.38 respectively), flourishing (\( p < 0.01 \), effect size 0.27) and resilience (\( p < 0.01 \), effect size 0.47). After trimming of influential outlying data (Cook’s distance values > 0.04), group differences on anxiety scores were also statistically significant in favour of yoga (\( p = 0.02; \)
effect size -0.40). Reduction of DASS stress scores with yoga relative to waitlist was not statistically significant (AMD -2.48; \( p=0.11 \)), and there was no significant difference between groups on physical health - SF12-PH (AMD 0.11; \( p=0.90 \)).

After exclusion of data from participants who withdrew or did not adhere to intervention protocol, per protocol analyses indicated statistically significant differences between groups, with greater mean differences and medium effect sizes for reduction of depression (\( p<0.01 \); effect size -0.59) and anxiety (\( p<0.01 \); effect size -0.55). There were also statistically significant differences between groups in favour of yoga on DASS stress scores (\( p=0.02 \); effect size -0.67), total DASS score (\( p<0.01 \); effect size -0.70), reduction of psychological distress - K10 (\( p<0.01 \); effect size -0.71), improved mental health composite score - SF12-MH (\( p<0.01 \); effect size 0.77), frequency of positive and negative experiences - SPANE (\( p<0.01 \) for each; effect size 0.51 and -0.57 respectively), flourishing - FS (\( p<0.01 \); effect size 0.49), and resilience - CD-RISC2 (\( p<0.01 \); effect size 0.43). There was no significant difference between groups on physical health - SF12-PH (\( p=0.42 \)).

At 6-week follow-up, benefits of the yoga-intervention continued to show statistically significant improvements on mean depression, anxiety, stress, total DASS (\( p<0.01 \) for each), psychological distress (K10, \( p=0.03 \)), mental health (SF12-MH, \( p=0.01 \)), and reduction of negative experiences (SPANE-, \( p=0.03 \)). There was no evidence of change from post-yoga to follow-up on measures of positive experiences (SPANE+, \( p=0.38 \)); flourishing (\( p=0.07 \)) or resilience (\( p=0.16 \)). Differences in measures from baseline (pre-yoga) to follow-up (6 weeks yoga + 6 weeks follow-up) were statistically significant on all measures (\( p<0.01 \) for each, except physical health (SF12-PH), where \( p=0.04 \)).

Benefits were achieved from yoga practice that was done an average of 4.8 days per week, for 29.0 minutes per session, with moderate to high adherence. These amounts of practice and adherence were continued throughout follow-up period.
Chapter 8  Results - Supplementary Analyses: crossover design and clinical subgroups

1. **Within-group crossover from waitlist to yoga intervention**

1.1. **Intention to Treat (ITT)**

All the above findings (except reductions in total DASS scores and increases in resilience scores) were reproduced in a within-group comparison of changes in pre-post scores over the wait-period and the yoga intervention period for the control group alone. Results were included as supplementary materials to the main article published in *Depression and Anxiety* (de Manincor et al., 2016). Results of the effectiveness of the yoga intervention (ITT) compared to waitlist period are summarised in Table 8.1.

1.1.1. **Primary measures of depression and anxiety**

There was a -4.5 reduction in DASS depression scores associated with the yoga intervention compared to the wait-period, and this was statistically significant (p=0.04). However, there was no statistically significant difference between periods in changes in DASS anxiety scores (difference in means -0.86; p=0.64).

1.1.2. **Secondary measures**

There were statistically significant improvements associated with the yoga intervention compared to the wait-period in reduction of psychological distress - K10 (p=0.02),
improvement in mental health composite score - SF12-MH (p=0.01), positive and negative experiences - SPANE (p<0.01 and 0.05 respectively), and flourishing - FS (p<0.01). Resilience (CD-RISC2) also appeared to improve more during the yoga intervention, although this effect was not statistically significant (p=0.09). There was no significant difference over the two periods on the stress score (p=0.36), total DASS score (p=0.15), or physical health - SF12 (p=0.68).

The results generally confirm findings of the primary analyses that the yoga intervention in addition to regular care was effective in the reduction of depression when compared with regular care alone, as well as reduction of psychological distress, improved mental health, increased positive experiences and reduced negative experiences, and increased flourishing (FS). Resilience also appeared to improve more during the yoga intervention, although this was not statistically significant in the crossover study. Also similar to findings of the main study, the yoga intervention was not effective in the reduction of anxiety or stress when compared with regular care alone, and showed no improvements in the general measure of physical health.

1.2. Per Protocol (PP)

Data from the within-group crossover design was also analysed on a per protocol (PP) basis, utilising the same statistical test methods as above, after data of participants who withdrew from the study or were non-compliant with the intervention protocol were removed from the analyses. In addition to the thirteen participants that were excluded from the waitlist period, one participant did not commence the yoga intervention, and a further ten were excluded during the yoga intervention after crossover from the waitlist period (see Table 14 for summary of participants that were excluded for the PP analyses, and reasons for exclusion). Table 8.2 summarises results of the PP analyses for the within-group crossover design.
1.2.1. **Primary outcome measures of depression and anxiety**

Consistent with the ITT analysis, there was a statistically significant reduction of DASS depression scores in the yoga group relative to the waitlist group ($p<0.01$), with a greater mean difference and slightly increased effect size, compared to the ITT analysis. (AMD -8.87; 95% CI’s -14.26, -3.48; $p<0.01$; effect size -0.61). The reduction of DASS anxiety scores with yoga relative to waitlist remained statistically non-significant ($p=0.12$).

1.2.2. **Secondary outcome measures**

Unlike the ITT analyses of the crossover design, differences between groups on DASS stress scores and total DASS score became statistically significant in favour of yoga (for stress AMD -5.13; 95% CI’s -9.24, -1.03; $p=0.02$; effect size -0.47; for total DASS AMD -17.73; 95% CI’s -29.45, -6.02; $p<0.01$; effect size -0.57). Consistent with the ITT analyses, reduction of psychological distress - K10, improved mental health composite score - SF12-MH, frequency of positive and negative experiences - SPANE, and flourishing - FS were statistically significant in favour of yoga ($p\leq0.01$ for each). No significant difference between groups remained on physical health - SF12-PH ($p=0.90$) and resilience ($p=0.18$).

### Table 8.2 Yoga Effect - Crossover Group (PP; $n=30$)

<table>
<thead>
<tr>
<th>Primary Outcome Measures</th>
<th>Change over wait-period mean (s.d.)</th>
<th>Change over yoga intervention mean (s.d.)</th>
<th>Mean difference (s.d.)</th>
<th>95% CI’s lower</th>
<th>95% CI’s upper</th>
<th>Paired Sample t-tests (2-tailed) t</th>
<th>Sig.</th>
<th>Effect Size* SMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression - DASS-21 subscale</td>
<td>-0.27 (8.18)</td>
<td>-9.13 (8.35)</td>
<td>-8.87 (14.44)</td>
<td>-14.26</td>
<td>-3.48</td>
<td>-3.36</td>
<td>&lt;0.01</td>
<td>-0.61</td>
</tr>
<tr>
<td>Anxiety - DASS-21 subscale</td>
<td>-0.90 (7.45)</td>
<td>-4.67 (8.33)</td>
<td>-3.77 (12.87)</td>
<td>-8.57</td>
<td>1.04</td>
<td>-1.60</td>
<td>0.12</td>
<td>-</td>
</tr>
</tbody>
</table>

### Secondary Outcome Measures

| Stress - DASS-21 subscale | -2.53 (6.43) | -7.67 (8.50) | -5.13 (11.00) | -9.24 | -1.03 | -2.56 | 0.02 | -0.47 |
| DASS - TOTAL | -3.73 (16.31) | -21.47 (21.89) | -17.73 (31.36) | -29.45 | -6.02 | -3.10 | <0.01 | -0.57 |
| Psychological Distress - K10 | 1.17 (6.44) | -6.37 (6.22) | -7.53 (11.38) | -11.78 | -3.29 | -3.63 | <0.01 | -0.66 |
| Physical Health - SF12-PH | 0.92 (6.56) | 0.69 (6.84) | -0.23 (11.11) | -4.38 | 3.92 | -0.11 | 0.91 | - |
| Mental Health - SF12-MH | -0.07 (6.31) | 6.47 (7.21) | 6.54 (11.31) | 2.31 | 10.76 | 3.17 | <0.01 | 0.58 |
| Positive Experiences - SPANE+ | 0.13 (2.37) | 3.00 (3.47) | 2.87 (4.70) | 1.11 | 4.62 | 3.34 | <0.01 | 0.61 |
| Negative Experiences - SPANE- | -0.73 (3.53) | -3.47 (3.74) | -2.73 (5.38) | -4.74 | -0.72 | -2.78 | 0.01 | -0.51 |
| Flourishing Scale | -0.17 (3.66) | 4.40 (4.72) | 4.57 (5.90) | 2.36 | 6.77 | 4.24 | <0.01 | 0.77 |
| Resilience - CD-RISC2 | -0.03 (1.54) | 0.50 (1.08) | 0.53 (2.13) | -0.26 | 1.33 | 1.37 | 0.18 | - |

* Effect sizes calculated as standardized mean difference (SMD) using Cohen’s d

2. **Adverse Effects**

No adverse effects related to the yoga intervention were reported.
3. Subgroup analyses

Analyses were also conducted based on three pre-defined subgroups of participants: i) those with elevated baseline depression scores; ii) those with elevated baseline anxiety scores; and iii) those with elevated baseline depression and anxiety scores. Table 8.3 summarises number of participants in each subgroup. Each subgroup includes a high percentage of the whole sample (81.2%, 79.2%, and 61.4% respectively). There were no statistically significant differences in number of participants allocated to the yoga and control groups (see Table 7.1, page 141).

<table>
<thead>
<tr>
<th>Sub-group</th>
<th>Baseline DASS scores</th>
<th>Yoga</th>
<th>Waitlist</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total Sample</td>
<td>DASS Depression ≥ 10 OR Anxiety ≥ 8</td>
<td>47</td>
<td>54</td>
<td>101</td>
</tr>
<tr>
<td>Elevated Depression</td>
<td>DASS Depression ≥ 10</td>
<td>40</td>
<td>42</td>
<td>82</td>
</tr>
<tr>
<td>Elevated Anxiety</td>
<td>DASS Anxiety ≥ 8</td>
<td>36</td>
<td>44</td>
<td>80</td>
</tr>
<tr>
<td>Co-morbidity</td>
<td>DASS Depression ≥ 10 AND Anxiety ≥ 8</td>
<td>29</td>
<td>32</td>
<td>61</td>
</tr>
<tr>
<td>Elevated Depression, but not Anxiety</td>
<td>DASS Depression ≥ 10 AND Anxiety ≥ 8</td>
<td>11</td>
<td>10</td>
<td>21</td>
</tr>
<tr>
<td>Elevated Anxiety, but not Depression</td>
<td>DASS Anxiety ≥ 8 AND Depression &lt; 10</td>
<td>7</td>
<td>12</td>
<td>19</td>
</tr>
</tbody>
</table>
3.1. Between-group baseline comparisons

Table 8.4 summarises group differences in baseline outcome measures, in respective subgroup samples. There were statistically significant differences between yoga and waitlist groups on baseline measures of stress in the anxiety subgroup sample \((p=0.02)\), and the comorbid subgroup sample \((p=0.01)\), and the difference approached statistical significance in the depression subgroup sample \((p=0.06)\). There was also a statistically significant difference between yoga and waitlist groups in the overall measure of physical health in the depression subgroup sample \((p=0.04)\). There were no statistically significant differences between groups on any other measure, in any of the three subgroup samples.

<table>
<thead>
<tr>
<th>Table 8.4</th>
<th>Group Differences at Baseline</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Depression sample:</strong> baseline DASS Depression ≥ 10 ((n = 82))</td>
<td></td>
</tr>
<tr>
<td><strong>Primary Outcome Measures</strong></td>
<td></td>
</tr>
<tr>
<td>Depression - DASS-21 subscale</td>
<td>Yoga ((n = 40)) mean (s.d.)</td>
</tr>
<tr>
<td>19.95 (7.52)</td>
<td>21.76 (8.23)</td>
</tr>
<tr>
<td>Anxiety - DASS-21 subscale</td>
<td>13.40 (7.85)</td>
</tr>
<tr>
<td><strong>Secondary Outcome Measures</strong></td>
<td></td>
</tr>
<tr>
<td>Stress - DASS-21 subscale</td>
<td>21.40 (7.15)</td>
</tr>
<tr>
<td>DASS - TOTAL</td>
<td>54.75 (18.08)</td>
</tr>
<tr>
<td>Psychological Distress - K10</td>
<td>18.33 (6.49)</td>
</tr>
<tr>
<td>Physical Health - SF12</td>
<td>46.43 (9.12)</td>
</tr>
<tr>
<td>Mental Health - SF12</td>
<td>27.89 (5.19)</td>
</tr>
<tr>
<td>Positive Experiences - SPANE+</td>
<td>16.10 (3.53)</td>
</tr>
<tr>
<td>Negative Experiences - SPANE-</td>
<td>20.78 (3.62)</td>
</tr>
<tr>
<td>Flourishing Scale</td>
<td>36.15 (7.38)</td>
</tr>
<tr>
<td>Resilience - CD-RISC2</td>
<td>5.00 (1.47)</td>
</tr>
</tbody>
</table>

| **Anxiety sample:** baseline DASS Anxiety ≥ 8 \((n = 80)\) | | |
| **Primary Outcome Measures** | | |
| Depression - DASS-21 subscale | Yoga \((n = 36)\) mean (s.d.) | Waitlist \((n = 44)\) mean (s.d.) | Mean Difference | Std Error Difference | 95% CI | t-test | Signif. |
| 18.11 (9.84) | 17.27 (11.08) | 0.84 | 2.37 | -3.88 | 5.56 | 0.35 | 0.72 |
| Anxiety - DASS-21 subscale | 15.72 (6.11) | 17.48 (8.04) | -1.76 | 1.63 | -4.99 | 1.48 | -1.08 | 0.28 |
| **Secondary Outcome Measures** | | |
| Stress - DASS-21 subscale | 22.56 (6.74) | 26.50 (8.17) | -3.94 | 1.70 | -7.33 | 0.56 | -2.32 | 0.02 |
| DASS - TOTAL | 56.39 (18.06) | 61.27 (23.27) | -4.88 | 4.74 | -14.32 | 4.55 | -1.03 | 0.31 |
| Psychological Distress - K10 | 18.14 (6.98) | 16.61 (6.40) | 1.53 | 1.50 | -1.46 | 4.51 | 1.02 | 0.31 |
| Physical Health - SF12 | 48.14 (9.26) | 49.81 (7.47) | -1.67 | 1.87 | -5.39 | 2.05 | -0.89 | 0.37 |
| Mental Health - SF12 | 28.31 (5.17) | 28.47 (6.99) | -0.16 | 1.40 | -2.95 | 2.64 | -0.11 | 0.91 |
| Positive Experiences - SPANE+ | 16.44 (4.04) | 17.82 (4.05) | -1.37 | 0.91 | -3.18 | 0.44 | -1.51 | 0.14 |
| Negative Experiences - SPANE- | 20.56 (3.93) | 20.14 (4.64) | 0.42 | 0.97 | -1.50 | 2.34 | 0.43 | 0.67 |
| Flourishing Scale | 38.33 (8.27) | 39.55 (7.74) | -1.21 | 1.79 | -4.78 | 2.36 | -0.68 | 0.50 |
| Resilience - CD-RISC2 | 5.17 (1.63) | 4.98 (1.49) | 0.19 | 0.35 | -0.51 | 0.88 | 0.54 | 0.59 |

| **Comorbid sample:** baseline DASS Depression ≥ 10 AND Anxiety ≥ 8 \((n = 61)\) | | |
| **Primary Outcome Measures** | | |
| Depression - DASS-21 subscale | Yoga \((n = 29)\) mean (s.d.) | Waitlist \((n = 32)\) mean (s.d.) | Mean Difference | Std Error Difference | 95% CI | t-test | Signif. |
| 21.38 (7.91) | 22.25 (8.60) | -0.87 | 2.12 | -5.12 | 3.38 | -0.41 | 0.68 |
| Anxiety - DASS-21 subscale | 16.97 (6.04) | 18.84 (8.05) | -1.88 | 1.84 | -5.56 | 1.80 | -1.02 | 0.31 |
| **Secondary Outcome Measures** | | |
| Stress - DASS-21 subscale | 22.97 (7.16) | 28.63 (7.98) | -5.66 | 1.95 | -9.56 | 1.76 | -2.90 | 0.01 |
| DASS - TOTAL | 61.31 (16.43) | 69.75 (20.95) | -8.44 | 4.86 | -18.16 | 2.18 | -1.74 | 0.09 |
| Psychological Distress - K10 | 19.62 (6.82) | 19.19 (5.26) | 0.43 | 1.55 | -2.67 | 3.54 | 0.28 | 0.78 |
| Physical Health - SF12 | 46.31 (9.25) | 49.53 (7.72) | -3.22 | 2.17 | -7.57 | 1.13 | -1.48 | 0.14 |
| Mental Health - SF12 | 27.67 (5.06) | 25.85 (5.20) | 1.82 | 1.32 | -0.82 | 4.45 | 1.38 | 0.17 |
| Positive Experiences - SPANE+ | 15.90 (3.86) | 16.32 (3.40) | -0.43 | 0.94 | -2.30 | 1.45 | -0.46 | 0.65 |
| Negative Experiences - SPANE- | 20.97 (3.95) | 21.34 (3.36) | -0.38 | 0.96 | -2.30 | 1.55 | -0.39 | 0.70 |
| Flourishing Scale | 36.45 (7.73) | 37.19 (7.32) | -0.74 | 1.95 | -4.65 | 3.17 | -0.38 | 0.71 |
| Resilience - CD-RISC2 | 5.00 (1.56) | 5.06 (1.41) | -0.06 | 0.38 | -0.82 | 0.70 | -0.16 | 0.87 |
3.2. **Between-group post-intervention comparisons**

Effect of the intervention was tested for each subgroup sample using the same between-group analysis of covariance (ANCOVA), where each post-intervention outcome was predicted by intervention group, after adjustment for pre-intervention levels. Similar to the main whole-sample analyses, results are presented as post-intervention means, adjusted mean differences between groups (AMD), with associated 95% confidence intervals (CI) and p-values, and effect sizes calculated as standardized mean differences (SMD) using Cohen’s $d$. P-values of <0.05 were taken to indicate statistical significance.

3.2.1. **Depression Group (Elevated baseline depression)**

Table 8.5 summarises results of the effectiveness of the yoga intervention compared to the waitlist control group, on an Intention To Treat (ITT) basis for the depression subgroup sample.

| Table 8.5 Depression group: Post-intervention mean outcome measures and effect sizes (ITT: n = 82) |
|-------------------------------------------------|---------------------------------|---------------------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| **Primary Outcome Measures**                   | **Post yoga**                  | **Post wait-period**            | **ANOVA**         | **Effect size** |
|                                               | mean (sd)                      | mean (sd)                      | AMD             | 95% CI's       | p-value         | SMD             |
| Depression - DASS-21 subscale                  | 13.00 (9.13)                   | 19.00 (10.10)                  | -5.17           | -9.16, -1.17   | 0.01            | -0.62           |
| Anxiety - DASS-21 subscale                     | 9.50 (6.81)                    | 12.95 (10.30)                  | -2.53           | -5.51, 0.45    | 0.10            | -               |

**Secondary Outcome Measures**

- Stress - DASS-21 subscale: 15.85 (7.39) vs. 21.67 (9.83), AMD -5.82, 95% CI’s -2.44, -1.17, p-value <0.05, effect size -0.65.
- DASS - TOTAL: 38.35 (20.70) vs. 53.62 (26.03), AMD -15.28, 95% CI’s -2.44, -1.17, p-value <0.05, effect size -0.65.
- Psychological Distress - K10: 11.93 (6.73) vs. 16.76 (7.27), AMD -4.83, 95% CI’s -2.44, -1.17, p-value <0.05, effect size -0.65.
- Physical Health - SF12-PH: 48.38 (8.24) vs. 50.95 (7.25), AMD -2.57, 95% CI’s -2.44, -1.17, p-value <0.05, effect size -0.65.
- Mental Health - SF12-MH: 33.79 (7.64) vs. 27.83 (7.58), AMD 5.96, 95% CI’s 2.44, 1.17, p-value <0.05, effect size 0.78.
- Positive Experiences - SPANE+: 19.45 (4.35) vs. 17.17 (3.94), AMD 2.28, 95% CI’s <0.001, 0.001, p-value <0.05, effect size 0.55.
- Negative Experiences - SPANE+ : 16.98 (4.22) vs. 19.69 (4.03), AMD -2.71, 95% CI’s <0.001, 0.001, p-value <0.05, effect size -0.66.
- Flourishing Scale: 41.13 (8.01) vs. 38.26 (8.03), AMD 2.87, 95% CI’s <0.001, 0.001, p-value <0.05, effect size 0.36.
- Resilience - CD-RISC2: 5.73 (1.38) vs. 5.05 (1.64), AMD 0.68, 95% CI’s <0.001, 0.001, p-value <0.05, effect size 0.45.

* Effect sizes calculated as standardized mean difference (SMD) using Cohen’s $d$.

3.2.1.1. **Primary outcome measures of depression and anxiety**

There was a statistically significant reduction of DASS depression scores in the yoga group relative to the waitlist group for (AMD -5.17; 95% CI’s -9.16, -1.17; $p=0.01$; effect size -0.62).

The reduction of DASS anxiety scores with yoga relative to waitlist was not statistically significant (AMD -2.53; 95% CI’s -5.51, 0.45; $p=0.10$). Consistent with the whole sample.
analyses, group differences on anxiety scores were statistically significant after trimming of influential outlying data (Cook’s distance values > 0.04) (AMD -2.97; CI’s -5.35, -0.58; \( p=0.02 \); effect size -0.40).

3.2.1.2. Secondary outcome measures

There were statistically significant differences between groups in favour of yoga on DASS stress scores (\( p=0.02 \)), total DASS score (\( p=0.02 \)), reduction of psychological distress - K10 (\( p<0.01 \)), improved mental health composite score - SF12-MH (\( p<0.01 \)), frequency of positive and negative experiences - SPANE (\( p<0.01 \) for each), flourishing - FS (\( p<0.01 \)), and resilience - CD-RISC2 (\( p<0.01 \)). There was no significant difference between groups on physical health - SF12-PH (\( p=0.80 \)).

3.2.2. Anxiety Group (Elevated baseline anxiety)

Table 8.6 summarises results of the effectiveness of the yoga intervention compared to the waitlist control group, on an Intention To Treat (ITT) basis for the depression subgroup sample.

<table>
<thead>
<tr>
<th>Primary Outcome Measures</th>
<th>Post yoga + TAU (n = 36)</th>
<th>Post wait-period + TAU (n = 44)</th>
<th>ANCOVA (adjusted for baseline levels)</th>
<th>Effect size* SMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression - DASS-21 subscale</td>
<td>11.50 (9.29)</td>
<td>16.27 (10.57)</td>
<td>-5.26</td>
<td>-8.90</td>
</tr>
<tr>
<td>Anxiety - DASS-21 subscale</td>
<td>10.83 (7.02)</td>
<td>14.55 (9.41)</td>
<td>-2.61</td>
<td>-5.83</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary Outcome Measures</th>
<th>Post yoga + TAU (n = 36)</th>
<th>Post wait-period + TAU (n = 44)</th>
<th>ANCOVA (adjusted for baseline levels)</th>
<th>Effect size* SMD</th>
</tr>
</thead>
<tbody>
<tr>
<td>Stress - DASS-21 subscale</td>
<td>16.94 (7.67)</td>
<td>23.05 (8.89)</td>
<td>-4.12</td>
<td>-7.58</td>
</tr>
<tr>
<td>DASS - TOTAL</td>
<td>39.28 (20.26)</td>
<td>53.86 (24.26)</td>
<td>-11.86</td>
<td>-20.50</td>
</tr>
<tr>
<td>Psychological Distress - K10</td>
<td>11.67 (6.50)</td>
<td>15.80 (7.58)</td>
<td>-4.89</td>
<td>-7.74</td>
</tr>
<tr>
<td>Physical Health - SF12</td>
<td>49.41 (8.15)</td>
<td>50.33 (6.93)</td>
<td>0.30</td>
<td>-1.69</td>
</tr>
<tr>
<td>Mental Health - SF12</td>
<td>34.19 (7.39)</td>
<td>29.43 (7.39)</td>
<td>4.85</td>
<td>1.86</td>
</tr>
<tr>
<td>Positive Experiences - SPANE+</td>
<td>19.81 (4.46)</td>
<td>18.30 (3.96)</td>
<td>2.40</td>
<td>0.91</td>
</tr>
<tr>
<td>Negative Experiences - SPANE-</td>
<td>17.17 (4.16)</td>
<td>18.84 (4.33)</td>
<td>-1.91</td>
<td>-3.50</td>
</tr>
<tr>
<td>Flourishing Scale</td>
<td>42.81 (7.47)</td>
<td>39.73 (8.16)</td>
<td>4.01</td>
<td>1.79</td>
</tr>
<tr>
<td>Resilience - CD-RISC2</td>
<td>5.83 (1.44)</td>
<td>4.91 (1.51)</td>
<td>0.82</td>
<td>0.28</td>
</tr>
</tbody>
</table>

* Effect sizes calculated as standardized mean difference (SMD) using Cohen’s d.
# Adjusted Mean Difference (AMD)
3.2.2.1. Primary outcome measures of depression and anxiety

Similar to the depression subgroup, there was a statistically significant reduction of DASS depression scores in the yoga group relative to the waitlist group for (AMD -5.26; 95% CI's -8.90, -1.61; p<0.01; effect size -0.48). The reduction of DASS anxiety scores with yoga relative to waitlist was not statistically significant (AMD -2.61; 95% CI's -5.83, 0.68; p=0.11). Again, group differences on anxiety scores were statistically significant (AMD -3.01; CI's -5.63, -0.40; p=0.02; effect size -0.50), after trimming of influential outlying data (Cook’s distance values > 0.04).

3.2.2.2. Secondary outcome measures

There were statistically significant differences between groups in favour of yoga on DASS stress scores (p=0.02), total DASS score (p<0.01), reduction of psychological distress - K10 (p<0.01), improved mental health composite score - SF12-MH (p<0.01), frequency of positive and negative experiences - SPANE (p<0.01 and p=0.02 respectively), flourishing - FS (p<0.01), and resilience - CD-RISC2 (p<0.01). There was no significant difference between groups on physical health - SF12-PH (p=0.76).
3.2.3. Comorbid Group (Elevated baseline depression and anxiety)

Table 8.7 summarises results of the effectiveness of the yoga intervention compared to the waitlist control group, on an Intention To Treat (ITT) basis for the depression subgroup sample.

Table 8.7  Comorbidity group: Post-intervention mean outcome measures and effect sizes (ITT; n = 61)

<table>
<thead>
<tr>
<th>Primary Outcome Measures</th>
<th>Post yoga + TAU (n = 29)</th>
<th>Post wait-period + TAU (n = 32)</th>
<th>ANCOVA (adjusted for baseline levels)</th>
<th>Effect size*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Depression - DASS-21 subscale</td>
<td>12.97 (9.31)</td>
<td>19.88 (9.67)</td>
<td>-6.48</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Anxiety - DASS-21 subscale</td>
<td>10.97 (6.80)</td>
<td>15.81 (9.95)</td>
<td>-3.62</td>
<td>0.06</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Secondary Outcome Measures</th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Stress - DASS-21 subscale</td>
<td>16.07 (7.22)</td>
<td>25.25 (7.82)</td>
<td>-7.41</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>DASS - TOTAL</td>
<td>40.00 (20.74)</td>
<td>60.94 (23.43)</td>
<td>-16.66</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Psychological Distress - K10</td>
<td>12.41 (6.75)</td>
<td>18.25 (6.95)</td>
<td>-5.98</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Physical Health - SF12</td>
<td>48.06 (8.47)</td>
<td>49.97 (7.64)</td>
<td>-0.63</td>
<td>0.60</td>
</tr>
<tr>
<td>Mental Health - SF12</td>
<td>33.85 (7.90)</td>
<td>27.07 (7.09)</td>
<td>6.10</td>
<td>0.01</td>
</tr>
<tr>
<td>Positive Experiences - SPANE+</td>
<td>19.48 (4.64)</td>
<td>17.13 (3.93)</td>
<td>2.60</td>
<td>0.01</td>
</tr>
<tr>
<td>Negative Experiences - SPANE-</td>
<td>17.00 (4.38)</td>
<td>20.19 (3.91)</td>
<td>-3.00</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Flourishing Scale</td>
<td>41.41 (7.45)</td>
<td>37.25 (7.85)</td>
<td>4.70</td>
<td>0.01</td>
</tr>
<tr>
<td>Resilience - CD-RISC2</td>
<td>5.76 (1.43)</td>
<td>4.81 (1.45)</td>
<td>0.98</td>
<td>&lt;0.01</td>
</tr>
</tbody>
</table>

* Effect sizes calculated as standardized mean difference [SMD] using Cohen’s d.
# Adjusted Mean Difference (AMD)

3.2.3.1. Primary outcome measures

Similar to both depression and anxiety subgroups, there was a statistically significant reduction of DASS depression scores in the yoga group relative to the waitlist group for (AMD -6.48; 95% CI’s -10.91, -2.04; p<0.01; effect size -0.73). The reduction of DASS anxiety scores with yoga relative to waitlist was not statistically significant (AMD -3.62; 95% CI’s -7.39, 0.15; p=0.06). Again, after trimming of influential outlying data (Cook’s distance values > 0.04), group differences on anxiety scores were statistically significant (AMD -3.70; CI’s -6.70, -0.71; p=0.02; effect size -0.59).

3.2.3.2. Secondary outcome measures

There were statistically significant differences between groups in favour of yoga on DASS stress scores, total DASS score, reduction of psychological distress - K10, improved mental health composite score - SF12-MH, frequency of positive and negative experiences - SPANE , flourishing - FS, and resilience - CD-RISC2, (p<0.01 for each). There was no significant difference between groups on physical health - SF12-PH (p=0.60).
4. Overall effect of the yoga intervention - within-group comparison of pre, post and follow-up measures (n = 101)

Overall effect of the yoga intervention was analysed using paired-sample t-tests. Table 28 summarises the results of analyses on an ITT basis. Differences from pre to post intervention (6 weeks) were statistically significant on all measures ($p<0.01$), with the exception of overall physical health where there was no meaningful change ($p=0.16$). Effects sizes on all measures of improvement were moderate ($d>0.4$). Benefits were maintained on all measures from post intervention to follow-up (6 weeks), with no change in physical health. There were continued reductions in depression and increases in flourishing, but these were not statistically significant ($p=0.06$ and 0.13 respectively). Continued reductions in anxiety, stress, overall DASS, psychological distress, overall mental health, and frequency of negative experiences were all statistically significant ($p<0.01$, except anxiety $p=0.02$), as well as increases in frequency of positive experiences and resilience ($p=0.03$ for each). Improvements from pre-intervention to follow-up (12 weeks) were statistically significant on all measures ($p<0.01$), except physical health, where there was no meaningful change ($p=0.78$). Effect sizes of measures of improvement were moderate to large, ranging between $d=0.057$ to 0.97, with the greatest effect size being in the overall measure of mental health.
### Table 8.8: Overall effect of yoga intervention (ITT: n = 101)

<table>
<thead>
<tr>
<th>Measure</th>
<th>Pre-Yoga</th>
<th>Post-Yoga</th>
<th>Difference from Pre to Post Yoga</th>
<th>Confidence Intervals</th>
<th>Paired Sample F-test (2-tailed)</th>
<th>Effect Size*</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Primary Outcome Measures</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Depression - DASS-21 subscale</td>
<td>16.06 (10.12)</td>
<td>10.34 (9.20)</td>
<td>-5.72 (9.01)</td>
<td>3.90 (0.00)</td>
<td>-6.39 &lt;0.01 (0.63)</td>
<td>9.23 (9.44)</td>
</tr>
<tr>
<td>Anxiety - DASS-21 subscale</td>
<td>11.78 (8.46)</td>
<td>8.77 (7.94)</td>
<td>-3.01 (6.94)</td>
<td>-3.43 &lt;0.01 (0.43)</td>
<td></td>
<td>7.39 (7.18)</td>
</tr>
<tr>
<td><strong>Secondary Outcome Measures</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Stress - DASS-21 subscale</td>
<td>20.24 (8.72)</td>
<td>15.52 (8.65)</td>
<td>-4.72 (8.72)</td>
<td>-0.43 &lt;0.01 (0.27)</td>
<td>2.00 (0.27)</td>
<td>13.33 (8.59)</td>
</tr>
<tr>
<td>DASS - TOTAL</td>
<td>48.08 (22.45)</td>
<td>34.63 (22.31)</td>
<td>-13.45 (21.67)</td>
<td>-7.72 &lt;0.01 (0.62)</td>
<td>2.69 (0.27)</td>
<td>29.94 (21.30)</td>
</tr>
<tr>
<td>Psychological Distress - K10</td>
<td>15.63 (7.26)</td>
<td>10.52 (6.73)</td>
<td>-5.11 (6.48)</td>
<td>-3.83 &lt;0.01 (0.79)</td>
<td>0.30 (0.27)</td>
<td>9.34 (7.00)</td>
</tr>
<tr>
<td>Physical Health - SF12</td>
<td>49.87 (8.10)</td>
<td>50.60 (7.05)</td>
<td>0.73 (5.23)</td>
<td>0.16 &lt;0.01 (0.27)</td>
<td>0.05 (0.27)</td>
<td>50.05 (7.43)</td>
</tr>
<tr>
<td>Mental Health - SF12</td>
<td>28.93 (6.73)</td>
<td>34.38 (7.41)</td>
<td>5.45 (7.04)</td>
<td>4.05 &lt;0.01 (0.78)</td>
<td>2.69 (0.27)</td>
<td>36.19 (7.47)</td>
</tr>
<tr>
<td>Positive Experiences - SPANE+</td>
<td>20.45 (4.12)</td>
<td>20.15 (4.37)</td>
<td>0.30 (3.69)</td>
<td>0.17 &lt;0.01 (0.73)</td>
<td>0.47 (0.27)</td>
<td>20.74 (4.87)</td>
</tr>
<tr>
<td>Negative Experiences - SPANE-</td>
<td>19.21 (4.03)</td>
<td>16.14 (4.66)</td>
<td>-3.07 (3.89)</td>
<td>-2.00 &lt;0.01 (0.79)</td>
<td>0.47 (0.27)</td>
<td>15.28 (4.92)</td>
</tr>
<tr>
<td>Flourishing Scale</td>
<td>39.40 (8.29)</td>
<td>43.25 (7.80)</td>
<td>3.85 (5.74)</td>
<td>2.72 &lt;0.01 (0.67)</td>
<td>0.62 (0.27)</td>
<td>43.95 (8.16)</td>
</tr>
<tr>
<td>Resilience - C3-RISC2</td>
<td>5.20 (1.55)</td>
<td>7.54 (1.61)</td>
<td>2.34 (1.08)</td>
<td>0.33 &lt;0.01 (0.50)</td>
<td>0.21 (0.27)</td>
<td>5.95 (1.59)</td>
</tr>
</tbody>
</table>

* Effect sizes calculated as standardized mean difference (SMD) using Cohen’s d.
Summary of results from supplementary analyses

Single-group crossover comparisons on an ITT basis indicated statistically significant differences in favour of yoga compared to the waitlist control period, for depression ($p=0.04$, effect size -0.30), psychological distress ($p=0.02$, effect size -1.00), overall mental health ($p<0.01$, effect size 0.42), frequency of positive experiences ($p<0.01$, effect size 0.44) and negative experiences ($p=0.05$, effect size -0.29), and flourishing ($p<0.01$, effect size 0.53). There were no statistically significant differences on anxiety ($p=0.64$), stress ($p=0.36$), total DASS ($p=0.15$), overall physical health ($p=0.68$) or resilience ($p=0.09$). Consistent with the whole sample analyses, group differences on anxiety scores were statistically significant after trimming of influential outlying data ($p=0.02$; effect size -0.40). Analyses after trimming also indicated statistically significant differences in favour of yoga on stress scores ($p=0.02$; effect size -0.47) and total DASS score ($p<0.01$; effect size -0.57). These results generally confirm findings of the main analyses from the RCT, apart from reduction of anxiety.

Results of between-group comparisons for each of the depression, anxiety and comorbid clinical subgroup analyses were similar to the whole sample main analyses. In all three subgroup analyses, there were statistically significant reductions of DASS depression scores in favour of yoga compared to waitlist controls (depression subgroup: $p=0.01$, effect size -0.62; anxiety subgroup: $p<0.01$, effect size -0.48; comorbid subgroup: $p<0.01$, effect size -0.73). The reduction of DASS anxiety scores with yoga relative to controls was not statistically significant in any of the three depression, anxiety or comorbidity subgroups ($p=0.10$, 0.11 and 0.06 respectively). Again consistent with the whole sample main analyses, group differences on anxiety scores were statistically significant after trimming of influential outlying data (depression subgroup: $p=0.02$, effect size -0.40; anxiety subgroup: $p=0.02$, effect size -0.50; comorbid subgroup: $p=0.02$, effect size -0.59). There were also statistically significant differences in favour of yoga compared to waitlist controls in each of the three subgroup analyses on DASS stress scores, total DASS, reduction of psychological distress (K10), improved mental health composite score (SF12-MH), frequency of positive and negative experiences (SPANE), flourishing (FS), and resilience (CD-RISC2) ($p<0.05$ for each measure in all three subgroup analyses). There were no significant difference between groups in any of the subgroup analyses on physical health (SF12-PH).
Effect of the yoga intervention for the whole sample indicated statistically significant differences from pre to post intervention (6 weeks) on all measures \( (p<0.01) \), with the exception of overall physical health where there was no meaningful change \( (p=0.16) \). Effects sizes on all measures of improvement were moderate to large, ranging between \( d=0.43 \) to \( 0.79 \). Benefits were maintained on all measures from post intervention to follow-up (6 weeks), with no change in physical health. Continued reductions in anxiety, stress, overall DASS, psychological distress, overall mental health, and frequency of negative experiences were all statistically significant \( (p<0.01, \text{ except anxiety, } p=0.02) \), as well as increases in frequency of positive experiences and resilience \( (p=0.03 \text{ for each}) \). Continued reductions in depression and increases in flourishing, were not statistically significant \( (p=0.06 \text{ and } 0.13 \text{ respectively}) \). Improvements from pre-intervention to follow-up (12 weeks) were statistically significant on all measures \( (p<0.01) \), except physical health, where there was no meaningful change \( (p=0.78) \). Effect sizes of measures of improvement were moderate to large, ranging between \( d=0.57 \) to \( 0.97 \), with the greatest effect size being in the overall measure of mental health.

Results of the within-group crossover analyses, each of the between-group clinical subgroup analyses, and the within-group whole sample analyses, are generally consistent with and confirm findings of the main analyses from the RCT.
SECTION 4 DISCUSSION, RECOMMENDATIONS AND CONCLUSION

Chapter 9 Discussion, recommendations and conclusion

9.1 Discussion and recommendations

The aim of this study was to investigate the potential benefits of yoga for reducing symptoms of depression and anxiety, and evaluate associated improvements in mental health and well-being. Our investigation has included consideration of current conceptualisations of depression, anxiety and their comorbidity, conventional approaches to management and treatment of the disorders, re-conceptualisations of mental health from the field of positive psychology with inclusion of positive aspects of mental health, classical Yoga as a system of mind-body health, and the opportunity development of non-conventional approaches to therapeutic interventions. Essential to the development of management and treatment approaches is the establishment of a robust evidence-base through clinical research. Supported by a broader field of related mental health research, prior research into the benefits of yoga for reducing depression and anxiety has demonstrated evidence of potential benefits, and further clinical research has been recommended. Central to this thesis was the conducting of a randomised clinical trial to evaluate a consensus-based yoga-intervention for reducing depression and anxiety, and increasing well-being.

To our knowledge, this is the first clinical trial that has utilised an individualised yoga intervention approach for mental health, based on therapeutic applications of classical yoga teachings and practice. This is also the first trial to utilise a consensus-based methodology for the development of the intervention protocol in yoga for mental health research.

The overall results of the clinical trial suggest that the yoga intervention in addition to regular care was effective in the reduction of symptoms of depression and anxiety when compared with regular care alone. The benefits remained statistically significant after correcting for changes in usual treatment, and were maintained at six-week follow-up. These results were demonstrated in the randomised controlled trial, as well as the single group crossover trial design.
It is important to note that there were mixed results for reduction of anxiety. Whilst reduction in anxiety scores were greater in the yoga intervention compared to waitlist control, the difference between groups was not statistically significant in the initial intention to treat (ITT) analyses. However, after identification and trimming of influential outlying data, group differences were statistically significant. This result was confirmed with the per protocol analyses (PP), and overall effect of the intervention for the whole sample. However, it was not confirmed in the crossover design analysis. Further investigation of the yoga intervention for reducing anxiety is warranted.

The yoga intervention was also effective for reduction of psychological distress, improvements in measures of overall mental health, increased frequency of positive experiences, reduced frequency of negative experiences, and increases in measures of flourishing and resilience. These results were generally consistent across the between-group RCT and the single-group crossover trial. Consistency of benefits across these various measures suggests good generalizability of improvements in factors associated with overall mental health. These results also support the plausibility of a more integrated approach to consideration of both negative and positive aspects of mental health proposed in the emerging field of Positive Clinical Psychology (Wood & Tarrier, 2010).

Similar to anxiety, the results for reduction of stress were unclear. Group differences in the initial ITT analyses were not statistically significant. However, when comparisons were corrected for changes in usual treatment, the yoga intervention showed a statistically significant difference compared to controls. Similar results were reproduced in the single group crossover design. As stress reduction is considered an important underlying mechanism for symptom reduction in depression and anxiety, further investigation is warranted.

There was no improvement in the overall measure of physical health. This finding suggests the effectiveness of the intervention may be due to its targeted approach (to reduce symptoms of depression and anxiety) rather than a more general approach, or that physical benefits may take longer to achieve. Given that there were negligible changes in the physical health measure in the whole sample analysis of the yoga intervention (n=101) from baseline to follow-up (12 weeks), the latter seems unlikely.
There is growing interest in the application of yoga interventions for a range of physical health concerns (Bodhe & Jankar, 2015; Büssing et al, 2012b; Smith, K. & Pukall, 2009; Ward et al, 2013). However, further investigation of potential benefits of yoga for physical health concerns is beyond the scope of this thesis.

Benefits on all measures (except physical health) were maintained or continued to improve at a 6-week follow-up period. Yoga may be effective as a mental health intervention where people can initially be taught suitable therapeutic self-care practices, which can be maintained without professional assistance. Some participants receiving the yoga intervention also reduced their use of other usual treatments. Reasons for these reductions are unknown, and further investigation is warranted.

Using Cohen’s classifications of standardized effect size (Cohen, J., 1988) the yoga intervention demonstrated a medium effect size compared to controls in the main ITT analysis of reduction of symptoms of depression (ES=-0.44), in the crossover design analysis (ES=-0.30), and the whole sample intervention effect (pre to post ES=-0.63, pre to follow-up ES=-0.71). These effect sizes are consistent with those reported in a meta-analysis of similar studies of multi-component group-yoga interventions compared with usual care (mean ES=-0.69; Cramer et al, 2013b). The results are also comparable to findings reported in meta-analyses of studies on benefits of various treatment interventions for depression compared to waitlist, no intervention or placebo (exercise: mean ES=-0.62, Cooney et al, 2013; seven different forms of psychotherapy: mean ES=-0.62, Barth et al, 2013; manualized psychotherapies: mean ES=-0.50, Westen & Morrison, 2001; CBT: mean ES=-0.53, after adjustment for significant publication bias, Cuijpers et al, 2013; mindfulness-based therapies: mean ES=-0.53, Khoury et al, 2013; and pharmacotherapy: mean ES=-0.35, Cuijpers et al, 2014b; and -0.49, Arroll et al, 2009). Similar effect sizes were demonstrated for reduction of anxiety, but only after trimming outlying data in the main ITT analysis (ES=-0.40).

The majority of participants (60%) presented with comorbidity of elevated scores on both depression and anxiety, and results from symptomatic subgroups (elevated depression, anxiety or both) demonstrated similar patterns of results to the whole sample. Participants gained benefit whether they were presenting with elevated symptoms of depression or anxiety or both. This may suggest that the yoga intervention provides trans-syndromal
mental health benefits. It is also possible that the individually tailored nature of the intervention was able to address individual differences related to presenting symptoms. However, yoga teachers providing the intervention were unaware of participants’ depression and anxiety scores, and were able to individually tailor practices based on participants’ verbal description of how they were generally feeling. The extent to which individualised yoga protocols targeted depression, anxiety or comorbidity is unclear, and further investigation of targeted interventions specific for each condition and comorbidity is recommended. This may be particularly important given the high prevalence of comorbidity, and the current debate concerning distinctions and overlaps in diagnostic categories of depression and anxiety disorders.

Benefits were achieved with doing the yoga practice for an approximate mean frequency of 5 days per week, and mean duration of 25 to 30 minutes for each practice, with moderate to high adherence to the yoga practice given by the teachers. This is a practical and achievable amount of yoga for most people, especially when the yoga practice (both “dose” and techniques) is tailored for the needs and capabilities of the individual. Further investigation of effective amounts of yoga practice with differing levels of symptom severity is recommended.

All participants presented with elevated symptoms of depression and/or anxiety (required for eligibility) with mean depression and anxiety scores (DASS sub-scales) in the moderate range of severity (sample means (sd) were 17.02 (9.92) and 13.29 (8.53) for depression and anxiety respectively), compared to the general Australian population (14 to 20 for moderate depression, and 10 to 14 for moderate anxiety (Crawford et al, 2011). Seventy-seven percent (n=78) of sample participants also reported having a prior diagnosis of a mental health condition, though it is difficult to know how reliable this is. However, mean baseline scores of psychological distress (K10), which is often used by general medical practitioners in Australia for assessment and referral for psychological treatment, were in the “likely to be well and unlikely to have a mental disorder” range (scores of 10 to 19, Andrews & Slade, 2001; trial sample mean (sd) was 16.05 (6.65)). This suggests that some participants with elevated symptoms and prior diagnoses, may have been experiencing residual or sub-syndromal symptoms of depression and/or anxiety, and many may not have
been seeking or be referred for treatment. Further investigation of the relationship between elevated symptoms of depression and anxiety, current psychological distress, and current medical assessment for referral to treatment in Australia is warranted.

As well as reductions in symptoms of depression, anxiety and psychological distress, benefits have also been demonstrated with increases in the overall measure of mental health, frequency of positive experiences, “flourishing”, and resilience, amongst participants with elevated baseline depression and/or anxiety. This provides evidence in support of reconceptualisations of mental health in the field of Positive Psychology. Yoga may be seen as something positive that one can do for one’s own mental health. Whether the focus of treatment is reduction of symptoms or improvements in positive factors of well-being, the degree to which the person adopts a task-focused orientation towards improving mental health concerns seems important (Bohart, 2002). As well as being a mind-body intervention, the yoga intervention used in this study may also be seen within the framework of being a Positive Psychology Intervention (Lyubomirsky et al., 2005b; Rashid & Seligman, 2011), and is consistent with the Positive Psychology approach of the importance of individually tailoring interventions described as “person-activity fit” (Sin et al., 2011).

Results also showed that the efficacy of the intervention was not likely to be the result of belief in the yoga or expectation of outcome. Baseline credibility and expectancy scores (CEQ) were accounted for in the covariate analyses, and neither factor had any significant effect on outcome measures. Although participants were randomised into intervention and control conditions, the sample was self-selecting and (presumably) motivated to do the yoga. Again, this suggests that the yoga intervention itself showed efficacy, particularly for people who are generally interested in and motivated to do the yoga. It is difficult to design a clinical trial that would allow blinding of participants to yoga as a treatment condition. This may be possible by offering a similar “mind-body” intervention without necessarily giving it the label of “yoga”. Further investigation with participant blinding of the intervention is warranted.

The extensive and varied components of yoga practice (including movements and postures, breath regulation, relaxation, mindfulness and meditation, cultivation of values,
visualisations, affirmations, gestures, diet and lifestyle, relationship or connection with the teacher), and how these work in combination, indicate yoga is a complex intervention. This renders it difficult to standardize interventions, conduct randomised controlled trials, identify the effectiveness of key components of interventions, or draw generalizable conclusions of the benefits of yoga. To improve the clinical understanding of how yoga might work as a whole, further investigation is required into each of the components of yoga, testing of their specific outcomes, and whole systems understanding is required.

9.2 Clinical Implications

Yoga is a multidimensional intervention that may be taught individually or in group classes, and can be adapted to the needs and abilities of different individuals and groups. Given the general interest and increased popularity and availability of yoga throughout the world, yoga may be both effective and appealing for people with symptoms of depression or anxiety. As a non-pharmaceutical form of intervention, yoga could also be used as a lifestyle adjunct to conventional treatments, which can be modified for people with specific concerns, such as pregnant women, and others who are reluctant to use medications. Yoga may simultaneously have a range of other desirable effects in general health and well-being (Innes et al., 2007; Clarke, D. & Currie, 2009; Lyubomirsky et al., 2005a; Norrish & Vella-Broderick, 2008; Pressman & Cohen, 2005).

Whilst a qualified yoga teacher or yoga therapist is generally required to initially design and teach suitable yoga practices for individual needs, the yoga practice may be taught and continued as a form of self-help intervention. Evidence-based self-help interventions, and interventions offered by paraprofessionals such as yoga teachers, are recognized as particularly important for reducing burden of disease, especially in sub-clinical populations (Boer et al., 2004; Boer et al., 2005; Morgan & Jorm, 2008). Yoga may be particularly beneficial in this regard.

Whilst some adverse events and injuries have been associated with yoga practice, they are usually related to more extreme types of physical postures and breathing techniques, or pre-existing conditions, such as glaucoma (Cramer et al., 2013a). No adverse effects related to the yoga intervention were reported in our clinical trial.
Cramer and colleagues also suggested that yoga “can be recommended to patients with physical or mental ailments, as long as it is appropriately adapted to their needs and abilities and performed under the guidance of an experienced and medically trained yoga teacher” (Cramer et al, 2013a). Whilst the recommendation for “medically” trained yoga teachers is ambiguous, appropriate training, knowledge and skills of yoga teachers for delivery of interventions for people with mental health concerns does require further consideration. Consensus from the Delphi study included in this thesis indicated that “it was very important or essential for yoga teachers to have a minimum of 500 training hours over 2 years, 2 years teaching experience, training in developing personalised yoga practices, training in yoga for mental health, and professional supervision or mentoring” (de Manincor et al, 2015, p 7). Yoga teachers in our clinical trial met these requirements in training and experience. It is unknown if similar benefits can be gained with interventions being delivered by yoga teachers, medical doctors, psychologists, or other mental health professionals, who do not meet these recommended minimum training requirements.

A personalised yoga practice designed to be done at home, may also be appealing for people with depression or anxiety, if attendance at group yoga classes is unsuitable or difficult to access. However, motivation and compliance to self-care practices for individuals with mental health concerns remains a challenge, and not seen as a panacea for all.

Individually focused approaches to cater for the needs of different people, have also been frequently recommended in the broader psychotherapeutic literature (Castle et al, 2012; Craske, 2012; Drake et al, 2009; Hasler, 2010; Malhi et al, 2015). It is also considered important for an emerging or non-conventional intervention to be classified as a “bona fide” treatment that the therapist is trained to provide the treatment; the therapist develops a relationship based on face-to-face meetings with the patient, and the treatment was individualised for the patient (i.e. did not involve a standard protocol delivered rigidly to each patient); and that the treatment contained psychologically valid components (Wampold et al, 2002). The development of individualised yoga-interventions appears to meet these requirements.
A final consideration for developing yoga as an effective intervention for mental health, with or without specific diagnoses such as depression or anxiety and their comorbidity, is the significance of the therapeutic relationship or alliance. This has been given extensive attention in both the psychotherapeutic and pharmacological research literature (Ankarberg & Falkenstrom, 2008; Castonguay et al, 1996; Gelenberg et al, 2010; Kanter et al, 2009; Malthi et al, 2015; McQueen et al, 2013), is central to the teaching tradition and healing applications of yoga and yoga therapy (Desikachar TKV & Cravens, 2011).

9.3 Strengths and limitations of the study

In this study, utilization of an individualised intervention approach provides closer adherence to traditional yoga teaching or therapy and practice, which can be evaluated in the context of an underlying psychological and philosophical framework of classical yoga (Bryant, 2009; Desikachar TKV, 1995; Desikachar TKV et al, 2001; Desikachar et al, 2005; Hariharananda, 1983). This has been identified as an important feature in the development of “bona fide” treatment interventions in mental health (Wampold et al, 1997). It has also been identified as an important feature in yoga research, as it reflects the real-world setting of how yoga and yoga therapy is generally offered for people with a variety of health conditions (Ross et al, 2016).

Utilization of a census-based methodology for the development of intervention protocol guidelines reduces individual and popular biases in the yoga interventions being studied, allows for replication of the study utilising the intervention protocol, and addresses concerns of reviews of prior research (Cramer et al, 2013b; Sherman, K., 2012; Uebelacker et al, 2010a). A sample size of 101 participants from varying geographic and socio-economic backgrounds, with interventions delivered by 15 different yoga teachers, and range of outcome measure for mental health, provide reasonable generalizability of findings.

Several limitations of the study warrant mention. Whilst participants in this study met eligibility and were group randomised, it was a volunteer sample interested in and amenable to yoga. Yoga may not be appealing and effective for everyone with mental health concerns.
The eligibility process included a single assessment for elevated depression and anxiety scores on DASS sub-scales at intake session, which were re-assessed for baseline measures at commencement of the yoga intervention. This resulted in some participants being eligible and randomised at intake, but no longer eligible at commencement of the trial (6 of 107 randomised, 0.06%). Whilst 77% of participants reported a prior diagnosis of depression or anxiety, 31% of participants reported currently receiving professional assistance, and 41% were currently taking psychopharmacological medications, these do not provide a reliable indication of a current diagnosable disorder (not required for eligibility). Reconsideration of eligibility and intake procedures, including diagnosis or additional assessment of elevated depression and anxiety symptoms, such as the M.I.N.I. International Neuropsychiatric Interview (Sheehan et al., 1998) may be warranted.

Study measures were all self-report, including participant reporting of compliance to the intervention. Inclusion of non self-report measures, including bio-markers and neuroimaging are warranted.

Strength of the effects of simply doing something in addition to usual care, especially in a self-selecting sample, and the connection or relationship with the teacher is unknown. It has been previously suggested that nonspecific processes may be sufficient to produce change among patients with less severe depressions, but that specific mechanisms that go beyond the simple provision of contact with a therapist and the expectation of change may be required for patients with more severe depressions (Hollon & Ponniah, 2010). An active placebo control group, that includes similar interaction with a teacher is recommended, as well as comparisons of yoga-based interventions with conventional interventions, such as different forms of bona fide psychotherapy, CBT, mindfulness-based interventions, and pharmacological. Also, follow-up measures had no control comparison. Whilst there were ethical and practical considerations of participant retention related to the decision to provide the yoga intervention to the waitlist control group, inclusion of a control group with follow-up comparison is warranted.

The majority of participants (80%) were female. While this is typical of participation in modern yoga classes, findings may not be generalizable to men, and potential gender differences require further investigation.
Variability in the “dosage” (frequency and duration), and compliance to yoga practices was considerable. Whilst individual application of yoga intervention appears justified and clinically relevant, further clarification of the intervention in future research and clinical application is recommended.

Further investigation of other potential factors that may affect outcomes, such as changes in exercise, drug and alcohol consumption, and social engagement, and significant life events, is also recommended.

Finally, the cost-effectiveness of yoga as a mental health intervention has been alluded to. Further investigation of the cost-effectiveness of yoga interventions, including both group classes and individualised personal practices, is warranted.

9.4 Conclusions

With the high prevalence of depression and anxiety, associated global burden of mental health concerns, limited resources for and access to conventional medical and psychological treatments, there is a need for the development of strategies to reduce symptoms in non-clinical populations, shorten episode duration, prevent recurrence, and potentially reduce demand on conventional mental health care services. It is well recognised that there is no one proven way that people recover from mental health concerns such as depression or anxiety. However, there is a range of effective interventions that can help people recover, stay well, and live more fulfilling lives. The important thing is offering the right intervention for the individual’s needs.

This thesis has demonstrated the effectiveness of a yoga intervention for reducing elevated symptoms of depression and anxiety, improving general mental health, well-being and resilience amongst a sub-clinical population. The demonstrated effectiveness of the yoga intervention used in this study, and the growing popularity of evidence-based yoga and other mind-body practices, may be particularly beneficial in the broader community. Reduction of depression and anxiety, and improvements in well-being, are also been associated with a range of additional health benefits.
REFERENCES


Bell, I., Caspi, O., Schwartz, g., et al. (2002). Integrative Medicine and Systemic Outcomes Research - Issues in the Emergence of a New Model for Primary Health Care. Archives of Internal Medicine, 162, 133.140.


Michael de Manincor


Hagins, M., Moore, W. & Rundle, A. (2007). Does practicing hatha yoga satisfy recommendations for intensity of physical activity which improves and maintains
health and cardiovascular fitness? BMC Complementary and Alternative Medicine, 7 (1), 1-9.


Wray, N. (2015a). Genetic Epidemiology of Anxiety Disorders. In Boyce, P., Harris, A., et al. (Eds.), *The Sydney Handbook of Anxiety Disorders - A guide to the symptoms,
causes and treatments of anxiety disorders. Sydney, Australia: The University of Sydney.


APPENDICES

Appendix I: Publication 1

Appendix II: Publication 2

de Manincor et al. (2016) Individualized yoga for reducing depression and anxiety, and improving well-being: a randomised controlled trial
Appendix III: Clinical trial protocol documentation

III.i Privacy

In accordance with ethical guidelines, the anonymity, confidentiality and privacy of participants will be protected. All publication material will refer to general trial results as aggregate data and no individual participant names or identifying information will be released. The source data records was kept in a locked cabinet in the office of the principal investigator during data collection, and relocated to a secure cabinet at Western Sydney University (WSU) at completion of the study. Electronic data has been password protected by the principal investigator and a copy of this data has been kept by the supervising investigator. Data will be kept for a minimum of 15 years: after 5 years, it will be archived by Records and Archives Management Service. This is consistent with current WSU policy. The procedures for this trial might change to remain in accordance with WSU Privacy and Confidentiality policies.

III.ii Participant withdrawal criteria

Participants may withdraw from the study at any time and for any reason. Further, discontinuation may be advised by the research team in the event of adverse effects from the intervention. Withdrawal, and the reasons or associated information, will be documented in the source data forms. The data of the withdrawing participant will continue to be used in the analyses based on intention-to-treat principles. The participant will not be replaced in the clinical trial. There will not be follow up for participants who withdraw, with the exception of ongoing involvement by the research team for participants requiring adverse event management. With the exception of potential risk, there should be no reason to stop the trial prematurely.
Adverse Events

Definitions

Adverse Event: An Adverse Event is any untoward occurrence that a trial participant may experience, which does not necessarily have a causal relationship with the intervention. An Adverse Event can therefore be any unfavourable and unintended sign or symptom temporally associated with the use of a trial intervention, whether or not related to the intervention.

Mild Adverse Event: The event causes minimal discomfort and does not significantly interfere with the participant’s normal activities.

Moderate Adverse Event: The event is sufficiently uncomfortable to cause some impairment to the participant’s normal activities.

Severe Adverse Event: The event is incapacitating and prevents the participant from participating in normal activities.

Serious Adverse Event: A Serious Adverse Event is any untoward occurrence that results in death, is life threatening (at the time), requires in-patient hospitalisation or prolongation of existing hospitalisation, results in persistent or significant disability or incapacity.

Severe refers to the severity of the event at the time as opposed to the seriousness of the participant’s event outcome e.g. a headache might be severe and disabling but not serious. A mild heart attack though not disabling at the time has more serious health consequences.

Adverse Event Management

In addition to standard questioning and reasonable duty of care, participants can contact the Principal Investigator (PI) throughout the trial on a mobile phone number provided, to discuss any concerns or report adverse events. Once an adverse event is noted, the PI will consult with the participant, the relevant yoga teacher, and/or other members of the research team, who will review the yoga intervention and continuation status in the trial, communicate with other appropriate health professionals and coordinate emergency medical attention as is appropriate and required. If an adverse event is present when the
clinical trial is terminated, its course will be followed until the event subsides or the investigator deems it to be unrelated to the trial and appropriate case management is organised.

To monitor the overall trial risk-benefit status, the research team (consisting of the PI, supervisors, and yoga teachers) will discuss evidence for harm (safety) from adverse event log and interim safety analyses on a 4 weekly basis. A meeting can be called at any time by any member of the research team, in the event of participant risk concerns in the trial.

**Adverse Event Reporting**

All adverse events will be recorded on individual files and in the adverse event log. The adverse event log will be available on request by any monitoring groups, including the HREC of Western Sydney University. Should there be any concern regarding safety issues from monitoring or interim analyses, results from another new study or any other reason to perceive change to the benefit-risk relationship, these will be reported to the sponsor and the HREC.
Appendix IV: Additional documentation for clinical trial

IV.i Participant Information Sheet

On Western Sydney University’s letterhead:

Dear Participant,

You are invited to apply to participate in a study conducted by Michael de Manincor (PhD candidate) at the Centre for Complementary Medicine Research (CompleMED), at the University of Western Sydney (UWS).

The research is titled “Evaluation of yoga-based interventions for depression, anxiety and subjective well-being.”

What is this research project about?

This research project is part of a PhD degree, under the supervision of Prof Alan Bensoussan. The purpose of this study is to investigate the benefits of yoga in the reduction of depression and anxiety, and associated increases in well-being.

Why is the project needed?

Over 45% of people in Australia report a mental health concern at some time in their lives. Nearly 15% of Australians currently suffer from anxiety, and 7% suffer from depression. The World Health Organisation predicts that mental illness will significantly increase in the next 10 years, causing significant impact on the lives of many sufferers and their families. Current treatments for depression and anxiety are known to have limitations and unwanted side-effects. Many people who practice yoga report significant benefits in mental health. However, there is little scientific evidence to support these claims. This research is important because it will help to provide a better understanding of different approaches to mental health, in conjunction with current treatments.

What do I need to do?

The study involves attending an initial intake session, four (4) individual yoga lessons, and a follow-up session. Some participants with higher scores on depression or anxiety scales may also require a letter of confirmation from a medical doctor or clinical psychologist, and a mid-way review of their participation.

The individual yoga lessons are generally 1 hour. At these sessions, a qualified yoga teacher will design, teach and review a suitable personalised yoga practice for participants to do at home each day. The yoga practice may take between 15 minutes and up to 1 hour per day, depending on the circumstances of each participant. We will also call you by phone between yoga sessions in case you have any questions.

There will also be a number of questionnaires to complete. Completion of questionnaires will take between 10 and 30 minutes at each of the sessions, and again after a 6-week follow-up period.

Will the study benefit me?

Participants will gain the benefit of receiving individual yoga lessons and a personalised yoga practice at no cost. Participants will also benefit from the knowledge that the findings may be of benefit to many people with mental health concerns, such as depression or anxiety.
Will the study involve any discomfort for me?
Individual yoga practices will be designed and taught according to the needs and abilities of each participant. If done according to instruction, the yoga is unlikely to cause any discomfort. It is possible that mild and temporary muscle soreness may be experienced from physical activity.

How is the study being paid for?
The study is being conducted as part of a PhD research project by the Centre for Complementary Medicine Research, at the University of Western Sydney. There is no external funding for this study.

Will anyone else know the results? How will the results be disseminated?
A report of the results of this study may be submitted for publication. Individual participants will not be identified in such reports. All other aspects of the study, will be confidential and only the researchers will have access to information on participants, which will be securely stored. You will be sent a letter at the end of the whole study outlining the trial results.

Can I withdraw from the study?
Participation is entirely voluntary. You are not obliged to be involved. If you do participate, you can withdraw at any time without giving any reason and without any consequences.

Can I tell other people about the study?
Yes, you can tell other people about the study and provide them with the principal investigator’s contact details. They can contact the principal investigator to discuss their participation in the research project and obtain an information sheet.

What if I am not eligible for the study now?
If you are not eligible for the study now, and your circumstances change in the future, you are welcome to contact us again.

What if I require further information?
When you have read this information, Michael de Manincor or a designated yoga teacher will discuss it with you further and answer any questions you may have. If you would like to know more at any stage, please feel free to contact the principal researcher.

Michael de Manincor
(Principal Researcher)
or Research Assistant
0404 587 643
e-mail m.demanincor@uws.edu.au

or Prof Alan Bensoussan,
Director, CompleMED
(02) 4620 3284
a.bensoussan@uws.edu.au

What if I have a complaint?
This study has been approved by the University of Western Sydney Human Research Ethics Committee. The Approval number is H9529

If you have any complaints or reservations about the ethical conduct of this research, you may contact the UWS Ethics Committee through the Office of Research Services on (02) 4736 0229 or email humanethics@uws.edu.au.
Any issues you raise will be treated in confidence and investigated fully, and you will be informed of the outcome.

If you agree and are eligible to participate in this study, you will be asked to sign the Participant Consent Form.

Thank you for your interest in this study.
IV.ii  Participant Consent Form

On Western Sydney University’s letterhead:

I N F O R M E D  C O N S E N T  F O R M  -  Y O G A  T R I A L

“Evaluation of Yoga-based interventions for depression, anxiety and subjective well-being”

I, …………………………………………………………………., voluntarily consent to participate in the research project titled: Evaluation of yoga-based interventions for depression, anxiety and subjective well-being.

I acknowledge that:

• I have read the participant information sheet and have been given the opportunity to discuss the information and my involvement in the project with the researcher/s.

• The procedures required for the project and the time involved have been explained to me, and any questions I have about the project have been answered to my satisfaction.

• I consent to the individual yoga lessons, regular home yoga practice, phone contact, and completion of questionnaires used in the study.

• I understand that my involvement is confidential and that the information gained during the study may be published, but no information about me will be used in any way that reveals my identity.

• I understand that I can withdraw from the study at any time, without affecting my relationship with the researcher/s now or in the future.

• I acknowledge receipt of a copy of this Consent Form and the Participant Information Sheet

• I understand that if I have any further questions relating to my participation in this research, I may contact the Principal Researcher: Michael de Manincor  mob 0404 587 643  or email m.demanincor@uws.edu.au

• I understand that if I have any complaints or reservations about the ethical conduct of this research, I may contact the Ethics Committee through the Office of Research Services on Tel (02) 4736 0229, Fax (02) 4736 0013 or email humanethics@uws.edu.au. Any issues I raise will be treated in confidence and investigated fully, and I will be informed of the outcome.

This study has been approved by the University of Western Sydney Human Research Ethics Committee. The approval number is: H9529

________________________________  ________________________________
Signature of Participant    Signature of Researcher or Assistant
________________________________  ________________________________
Please print name     Please print name
________________________________  ________________________________
Date       Date
1. Age and Gender

<table>
<thead>
<tr>
<th>Gender</th>
<th>Date of Birth</th>
<th>Age</th>
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<td>Male</td>
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<tr>
<td>Female</td>
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2. Social History

Were you born in Australia?
YES □ 1 NO □ 2

If no, which country were you born in?

______________________________

What is your marital status?

Single □ 1
Married □ 2
De Facto □ 3
Widowed □ 4
Divorced □ 5
Separated □ 6

3. Education

Which of the following best describes your highest level of completed education?

School □ 1
Skills training □ 2
Undergraduate □ 3
Postgraduate □ 4

School = At or below secondary school completion
Skills training = Completed TAFE, diploma, or equiv training
Undergraduate = Completed undergraduate degree
Postgraduate = Completed postgraduate degree
4. **Employment**

Which of the following best describes your main working status?

<table>
<thead>
<tr>
<th>Option</th>
<th>Code</th>
</tr>
</thead>
<tbody>
<tr>
<td>Full time work</td>
<td>☐ 1</td>
</tr>
<tr>
<td>Part time work</td>
<td>☐ 2</td>
</tr>
<tr>
<td>Unemployed</td>
<td>☐ 3</td>
</tr>
<tr>
<td>Unable to work</td>
<td>☐ 4</td>
</tr>
<tr>
<td>Retired</td>
<td>☐ 5</td>
</tr>
<tr>
<td>Home carer</td>
<td>☐ 6</td>
</tr>
<tr>
<td>Student</td>
<td>☐ 7</td>
</tr>
</tbody>
</table>

What is your main profession?
_______________________________

If working, how many hours per week is your paid work?
________

5. **Mental Health History - Depression and Anxiety**

a. Have you been diagnosed with any mental health condition, by a medical practitioner or psychologist?

   YES ☐ 1   NO ☐ 2

b. If so, what was the diagnosis?

   ________________________________
   ________________________________

   c. When? ________________________________

6. **General Medical History**

<table>
<thead>
<tr>
<th>Relevant acute and chronic health conditions, including mental health conditions other than depression or anxiety:</th>
<th>Approx. Dates (dd/mmm/yyyy)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Relevant injuries and surgeries:</th>
<th>Approx. Dates (dd/mmm/yyyy)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Any health concerns, injuries or surgeries that would exclude this participant from the trial?

⇒ To be marked on checklist on *Participant Master File* page 6.

| YES □ NO □ |

If unsure, please check with Principal Researcher before proceeding with the yoga lessons.
7. **Recreational Drugs and Alcohol use**

<table>
<thead>
<tr>
<th></th>
<th>Question</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>a</td>
<td>On average, do you drink alcoholic drinks or use recreational drugs more than three days per week?</td>
<td>YES 1</td>
<td>NO 2</td>
</tr>
<tr>
<td>b</td>
<td>Do you regularly drink more than four (4) standard alcoholic drinks on any single occasion?</td>
<td>YES 1</td>
<td>NO 2</td>
</tr>
<tr>
<td>c</td>
<td>Do you experience any problems associated with alcohol or drug use, including difficulties with family, personal or work commitments, or legal or financial problems?</td>
<td>YES 1</td>
<td>NO 2</td>
</tr>
<tr>
<td>d</td>
<td>Has your Doctor, family members, friends or workmates told you that they are worried about your drinking or using?</td>
<td>YES 1</td>
<td>NO 2</td>
</tr>
<tr>
<td>e</td>
<td>Do you ever get complaints about your drinking or using?</td>
<td>YES 1</td>
<td>NO 2</td>
</tr>
<tr>
<td>f</td>
<td>Do you ever become verbally or physically abusive after drinking or using?</td>
<td>YES 1</td>
<td>NO 2</td>
</tr>
</tbody>
</table>

Has the person answered YES to any of the questions 1 to 6 above?

If YES, this person is not eligible to participate in the trial

⇒ To be marked on *Eligibility Checklist on Participant Master File* page 6.

If unsure, please check with Principal Researcher before proceeding with the yoga lessons.
## 8. Yoga Experience

<table>
<thead>
<tr>
<th>a. Have you ever done yoga before?</th>
<th>YES ☐ 1  NO ☐ 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>If NO, there is no need to answer the remaining questions in this section on Yoga Experience</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>b. Have you attended yoga classes in the past 12 months? If NO, please skip part c. and go to part d.</th>
<th>YES ☐ 1  NO ☐ 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Please tick one only)</td>
<td></td>
</tr>
<tr>
<td>Less than 1 class per month ☐ 1</td>
<td></td>
</tr>
<tr>
<td>About one class per month ☐ 2</td>
<td></td>
</tr>
<tr>
<td>About two classes per month ☐ 3</td>
<td></td>
</tr>
<tr>
<td>About one class per week ☐ 4</td>
<td></td>
</tr>
<tr>
<td>About two classes per week ☐ 5</td>
<td></td>
</tr>
<tr>
<td>More than two classes per week ☐ 6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>c. On average, how often have you attended yoga classes in the past 12 months?</th>
<th>YES ☐ 1  NO ☐ 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Please tick one only)</td>
<td></td>
</tr>
<tr>
<td>Less than 1 class per month ☐ 1</td>
<td></td>
</tr>
<tr>
<td>About one class per month ☐ 2</td>
<td></td>
</tr>
<tr>
<td>About two classes per month ☐ 3</td>
<td></td>
</tr>
<tr>
<td>About one class per week ☐ 4</td>
<td></td>
</tr>
<tr>
<td>About two classes per week ☐ 5</td>
<td></td>
</tr>
<tr>
<td>More than two classes per week ☐ 6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>d. Are there any particular styles of yoga that you have done regularly?</th>
<th>YES ☐ 1  NO ☐ 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>If YES, please list styles of yoga that you have done regularly</td>
<td></td>
</tr>
<tr>
<td>____________________________________________________________________</td>
<td></td>
</tr>
<tr>
<td>____________________________________________________________________</td>
<td></td>
</tr>
<tr>
<td>____________________________________________________________________</td>
<td></td>
</tr>
</tbody>
</table>

| e. If YES, please list styles of yoga that you have done regularly |
|____________________________________________________________________|
|____________________________________________________________________|
|____________________________________________________________________|

<table>
<thead>
<tr>
<th>f. Have you done a personal yoga practice (e.g. at home) in the past 12 months? If NO, there is no need to answer the remaining question.</th>
<th>YES ☐ 1  NO ☐ 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Please tick one only)</td>
<td></td>
</tr>
<tr>
<td>Less than once per month ☐ 1</td>
<td></td>
</tr>
<tr>
<td>About once per month ☐ 2</td>
<td></td>
</tr>
<tr>
<td>About twice per month ☐ 3</td>
<td></td>
</tr>
<tr>
<td>About once per week ☐ 4</td>
<td></td>
</tr>
<tr>
<td>About twice per week ☐ 5</td>
<td></td>
</tr>
<tr>
<td>More than twice per week ☐ 6</td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>g. On average, how often have you done a personal yoga practice in the past 12 months?</th>
</tr>
</thead>
<tbody>
<tr>
<td>(Please tick one only)</td>
</tr>
<tr>
<td>Less than once per month ☐ 1</td>
</tr>
<tr>
<td>About once per month ☐ 2</td>
</tr>
<tr>
<td>About twice per month ☐ 3</td>
</tr>
<tr>
<td>About once per week ☐ 4</td>
</tr>
<tr>
<td>About twice per week ☐ 5</td>
</tr>
<tr>
<td>More than twice per week ☐ 6</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>8. Has this person been doing a personal yoga practice (average of more than once a week, over the past 3 months?)</th>
<th>YES ☐ 1  NO ☐ 2</th>
</tr>
</thead>
<tbody>
<tr>
<td>To be marked on Eligibility Checklist on Participant Master File page 6.</td>
<td></td>
</tr>
</tbody>
</table>
### IV.iv Eligibility Checklist

<table>
<thead>
<tr>
<th>Eligibility Checklist</th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Participant has signed the Consent Form?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 DASS: eligible score on anxiety or depression (from page 3)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Referral letter from GP, Psychiatrist, Clinical Psychologist (if required)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Age: 18-65 inclusive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 English competency: read, write, speak</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6 Anti-depressant/anxiety medications (including complementary): stable for at least 3 months (from TREATMENT LOG)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Professional Assistance: stable for at least 3 months (from TREATMENT LOG)</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Items 1 to 7 must be ticked YES to be eligible**

<table>
<thead>
<tr>
<th></th>
<th>YES</th>
<th>NO</th>
</tr>
</thead>
<tbody>
<tr>
<td>8 Serious medical conditions, injuries or surgeries (from INTAKE FORM - page 4)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9 Alcohol/drug abuse (from INTAKE FORM - page 5)?</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10 Already doing a personal yoga practice (average of more than once a week, over the past 3 months (from INTAKE FORM - page 6)?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**AND, items 8, 9 & 10 must be ticked NO to be eligible**

Confirm Participant is eligible to enrol:  

**YES □ NO □**

*If No, list reason why:______________________________
_________________________________________________________________

**Applicants NOT Eligible:** If the participant does not meet the eligibility criteria checklist, please explain the following to them:

*Thank you for this information. Unfortunately, this study is not suitable for you at this time. ➡ Explain reason given above*

*If you are concerned about feelings of depression or anxiety, please contact your G.P. or other health practitioner. If you don’t have a medical doctor or other practitioner, we recommend that you contact Lifeline to discuss your concerns, and we can provide you with contact details for Lifeline.*

*If your circumstances change after a period of three months, please feel free to contact us again. Thank you again for your interest in this study.*

**Eligible Participants => Randomised Group Allocation**

Eligible participants given randomised allocation to waitlist group or yoga group, and corresponding Participant ID.
### IV.v Outcome Measures

#### IV.v.i Depression Anxiety and Stress Scale (DASS-21)

**DASS21 - Depression, Anxiety and Stress Scale**  
This questionnaire asks questions about symptoms of depression, anxiety and stress.

Please read each statement and circle a number 0, 1, 2 or 3 which indicates how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement.

*The rating scale is as follows:*

- 0  Did not apply to me at all
- 1  Applied to me to some degree, or some of the time
- 2  Applied to me to a considerable degree, or a good part of time
- 3  Applied to me very much, or most of the time

<table>
<thead>
<tr>
<th>Statement</th>
<th>Rating</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. I found it hard to wind down</td>
<td></td>
</tr>
<tr>
<td>2. I was aware of dryness of my mouth</td>
<td></td>
</tr>
<tr>
<td>3. I couldn't seem to experience any positive feeling at all</td>
<td></td>
</tr>
<tr>
<td>4. I experienced breathing difficulty (e.g. excessively rapid breathing, breathlessness in the absence of physical exertion)</td>
<td></td>
</tr>
<tr>
<td>5. I found it difficult to work up the initiative to do things</td>
<td></td>
</tr>
<tr>
<td>6. I tended to over-react to situations</td>
<td></td>
</tr>
<tr>
<td>7. I experienced trembling (e.g. in the hands)</td>
<td></td>
</tr>
<tr>
<td>8. I felt that I was using a lot of nervous energy</td>
<td></td>
</tr>
<tr>
<td>9. I was worried about situations in which I might panic and make a fool of myself</td>
<td></td>
</tr>
<tr>
<td>10. I felt that I had nothing to look forward to</td>
<td></td>
</tr>
<tr>
<td>11. I found myself getting agitated</td>
<td></td>
</tr>
<tr>
<td>12. I found it difficult to relax</td>
<td></td>
</tr>
<tr>
<td>13. I felt down-hearted and blue</td>
<td></td>
</tr>
<tr>
<td>14. I was intolerant of anything that kept me from getting on with what I was doing</td>
<td></td>
</tr>
<tr>
<td>15. I felt I was close to panic</td>
<td></td>
</tr>
<tr>
<td>16. I was unable to become enthusiastic about anything</td>
<td></td>
</tr>
<tr>
<td>17. I felt I wasn't worth much as a person</td>
<td></td>
</tr>
<tr>
<td>18. I felt that I was rather touchy</td>
<td></td>
</tr>
<tr>
<td>19. I was aware of the action of my heart in the absence of physical exertion (e.g. sense of heart rate increase, heart missing a beat)</td>
<td></td>
</tr>
<tr>
<td>20. I felt scared without any good reason</td>
<td></td>
</tr>
<tr>
<td>21. I felt that life was meaningless</td>
<td></td>
</tr>
</tbody>
</table>
### Kessler Psychological Distress Scale (K10)

This questionnaire asks questions about your general emotional and mental health, over the past four weeks.

Please circle a number (0, 1, 2, 3 or 4) which best indicates your answer for each.

<table>
<thead>
<tr>
<th>In the past four weeks,</th>
<th>None of the time</th>
<th>A little of the time</th>
<th>Some of the time</th>
<th>Most of the time</th>
<th>All of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 About how often did you feel tired out for no good reason?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>2 About how often did you feel nervous?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>3 About how often did you feel so nervous that nothing could calm you down?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>4 About how often did you feel hopeless?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>5 About how often did you feel restless or fidgety?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>6 About how often did you feel so restless you could not sit still?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>7 About how often did you feel depressed?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>8 About how often did you feel that everything is an effort?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>9 About how often did you feel so sad that nothing could cheer you up?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>10 About how often did you feel worthless?</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
</tr>
</tbody>
</table>
### SF-12 Health Survey

This questionnaire asks for your views about your health. This information will help keep track of how you feel and how well you are able to do your usual activities. Please answer every question by marking one box. If you are unsure about how to answer, please give the best answer you can.

<table>
<thead>
<tr>
<th></th>
<th>In general, would you say your health is</th>
<th>Excellent</th>
<th>Very Good</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

The following items are about activities you might do during **a typical day**. Does your health now limit you in these activities? If so, how much?

<table>
<thead>
<tr>
<th></th>
<th>Moderate activities, such as moving a table, pushing a vacuum cleaner, bowling or playing golf</th>
<th>Yes, limited a lot</th>
<th>Yes, limited a little</th>
<th>No, not limited at all</th>
</tr>
</thead>
<tbody>
<tr>
<td>2</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

During the **past month**, have you had any of the following problems with your work or other regular activities, as a result of your **physical health**?

<table>
<thead>
<tr>
<th></th>
<th>Accomplished less than you would like</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>4</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

During the **past month**, have you had any of the following problems with your work or other regular activities, **as a result of any emotional problems (such as feeling depressed or anxious)**?

<table>
<thead>
<tr>
<th></th>
<th>Accomplished less than you would like</th>
<th>Yes</th>
<th>No</th>
</tr>
</thead>
<tbody>
<tr>
<td>6</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

During the **past month**, how much did **pain** interfere with your normal work (including outside the home and housework)?

<table>
<thead>
<tr>
<th></th>
<th>Not at all</th>
<th>A little bit</th>
<th>Moderately</th>
<th>Quite a bit</th>
<th>Extremely</th>
</tr>
</thead>
<tbody>
<tr>
<td>8</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

These questions are about how you feel and how things have been **during the past month**. For each question, please give one answer that comes closest to the way you have been feeling. How much of the time during the **past month**:

<table>
<thead>
<tr>
<th></th>
<th>Have you felt calm and peaceful?</th>
<th>All of the time</th>
<th>Most of the time</th>
<th>A good bit of the time</th>
<th>A little of the time</th>
<th>None of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>9</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Did you have a lot of energy?</th>
<th>All of the time</th>
<th>Most of the time</th>
<th>A good bit of the time</th>
<th>A little of the time</th>
<th>None of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Have you felt downhearted and blue?</th>
<th>All of the time</th>
<th>Most of the time</th>
<th>A good bit of the time</th>
<th>A little of the time</th>
<th>None of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>11</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

During the **past month**, how much of the time has your **physical health or emotional problems** interfered with your social activities (like visiting friends, relatives, etc)?

<table>
<thead>
<tr>
<th></th>
<th>All of the time</th>
<th>Most of the time</th>
<th>A good bit of the time</th>
<th>A little of the time</th>
<th>None of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>12</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
**Scale of Positive and Negative Experience (SPANE)**

Please think about what you have been doing and experiencing during the *past 4 weeks*.

Then report how much you experienced each of the following feelings, using the scale below.

For each item, circle a number from 1 to 5 to indicate your response.

<table>
<thead>
<tr>
<th>During the <em>past 4 weeks</em>, rate how much you experienced each of the following</th>
<th>very rarely or never</th>
<th>rarely</th>
<th>sometimes</th>
<th>often</th>
<th>very often or always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Positive Feelings</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>2 Negative Feelings</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>3 Good Feelings</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>4 Bad Feelings</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>5 Pleasant Feelings</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>6 Unpleasant Feelings</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>7 Happy Feelings</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>8 Sad Feelings</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>9 Afraid Feelings</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>10 Joyful Feelings</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>11 Angry Feelings</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
<tr>
<td>12 Contented Feelings</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
</tr>
</tbody>
</table>
### Flourishing Scale (FS)

Below are eight statements with which you may agree or disagree.

Using the 1–7 scale below, indicate your agreement with each item by indicating that response for each statement.

<table>
<thead>
<tr>
<th></th>
<th>strongly agree</th>
<th>agree</th>
<th>slightly agree</th>
<th>mixed or neither agree nor disagree</th>
<th>slightly disagree</th>
<th>disagree</th>
<th>strongly disagree</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I lead a purposeful and meaningful life</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>2</td>
<td>My social relationships are supportive and rewarding</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>3</td>
<td>I am engaged and interested in my daily activities</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>4</td>
<td>I actively contribute to the happiness and well-being of others</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>5</td>
<td>I am competent and capable in the activities that are important to me</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>6</td>
<td>I am a good person and live a good life</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>7</td>
<td>I am optimistic about my future</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>8</td>
<td>People respect me</td>
<td>7</td>
<td>6</td>
<td>5</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
</tbody>
</table>
## IV.vi  Connor-Davidson Resilience Scale 2 (CD-RISC 2)

### Connor-Davidson Resilience Scale 2 (CD-RISC 2)

For each item, please circle the number that best indicates *how much you agree* with the each statement as they apply to you over the **last month**. If a particular situation has not occurred recently, answer according to how you think you would have felt.

<table>
<thead>
<tr>
<th>Over the <strong>last month</strong></th>
<th>not true at all</th>
<th>rarely true</th>
<th>sometimes true</th>
<th>often true</th>
<th>true nearly all the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>I am able to adapt when changes occur</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>2</td>
<td>I tend to bounce back after illness, injury or other hardships</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
### Credibility-Expectancy Questionnaire (CEQ)

We would like you to indicate below how much you believe right now that the yoga you are receiving will help to reduce your symptoms of anxiety or depression, and improve your happiness and sense of well-being.

Belief usually has two aspects to it:
1. what one thinks will happen; and
2. what one feels will happen.
Sometimes these are similar; sometimes they are different.

**Set 1: answer these questions in terms of what you think.**

1. At this point, how logical does the yoga being offered to you seem?
   
<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>not at all logical</td>
<td>somewhat logical</td>
<td>very logical</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. At this point, how useful do you think this treatment will be in reducing your symptoms?
   
<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>not at all useful</td>
<td>somewhat useful</td>
<td>very useful</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

3. How confident would you be in recommending yoga to a friend who experiences similar problems?
   
<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>not at all confident</td>
<td>somewhat confident</td>
<td>very confident</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

4. By the end of the yoga trial period, how much improvement in your symptoms do you think will occur?
   
<table>
<thead>
<tr>
<th>0%</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
<th>60%</th>
<th>70%</th>
<th>80%</th>
<th>90%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>10%</td>
<td>20%</td>
<td>30%</td>
<td>40%</td>
<td>50%</td>
<td>60%</td>
<td>70%</td>
<td>80%</td>
<td>90%</td>
<td>100%</td>
</tr>
</tbody>
</table>

**Set 2: answer these questions in terms of what you really and truly feel.**

For this set, close your eyes for a few moments, and try to identify what you really feel about the yoga and its likely success. Then answer the following questions.

1. At this point, how much do you really feel that yoga will help you to reduce your symptoms?
   
<table>
<thead>
<tr>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
<th>6</th>
<th>7</th>
<th>8</th>
<th>9</th>
</tr>
</thead>
<tbody>
<tr>
<td>not at all</td>
<td>somewhat</td>
<td>very much</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

2. By the end of the yoga period, how much improvement in your symptoms do you really feel will occur?
   
<table>
<thead>
<tr>
<th>0%</th>
<th>10%</th>
<th>20%</th>
<th>30%</th>
<th>40%</th>
<th>50%</th>
<th>60%</th>
<th>70%</th>
<th>80%</th>
<th>90%</th>
<th>100%</th>
</tr>
</thead>
<tbody>
<tr>
<td>0%</td>
<td>10%</td>
<td>20%</td>
<td>30%</td>
<td>40%</td>
<td>50%</td>
<td>60%</td>
<td>70%</td>
<td>80%</td>
<td>90%</td>
<td>100%</td>
</tr>
</tbody>
</table>
## IV.vi Health Activities Questionnaire (HAQ)

<table>
<thead>
<tr>
<th>Health Activities Questionnaire</th>
</tr>
</thead>
<tbody>
<tr>
<td>The following questions ask about regular health related activities.</td>
</tr>
</tbody>
</table>

1. How many days in the **past week** did you do some form of **physical exercise**?

2. On average, how many minutes of **physical exercise** did you do **each of these days**?

3. How days in the **past week** did you do some form of **recreational activity**? e.g., go to movies, surfing.

4. On average, how many minutes of **recreational activity** did you do **each of these days**?

5. On average, how many minutes of **social interaction** did you do **each day**, over the **past week**?

6. On average, how many minutes of additional **yoga or meditation**, apart from the personalised yoga you have been given for this study, have you done **each day**, over the **past week**?

7. On average, how many drinks with **caffeine** (including tea, coffee, Red Bull, Coke, etc) did you drink **each day**, over the **past week**?

8. On average, how many **alcoholic drinks** (including beer, wine, spirits) did you drink **each day**, over the **past week**?

9. On average, **how many days** did you use **recreational drugs** (including marijuana), over the **past week**?

10. On average, how many hours of **sleep** did you have **each night**, over the **past week**?
Medication Log (to be used at INTAKE SESSION, AND EACH SESSION throughout the trial)

Please WRITE THE NAMES of all MEDICATIONS including HERBAL MEDICINES and SUPPLEMENTS that you regularly take, the reason for taking them and how often you take them. Please also write down the duration of time you have been taking each medication.

Include ALL medications, even headache tablets, antacids and other indigestion medicine, contraceptive pills, high doses of vitamins, sedatives, and any herbal medications. If you cannot remember exactly, please write your best guess.

<table>
<thead>
<tr>
<th>Today's Date</th>
<th>Medication Name</th>
<th>Reason for taking this medication</th>
<th>Dosage &amp; How Often?</th>
<th>Start Date of taking the medication</th>
<th>End Date of taking the medication</th>
<th>Stable for 3 months?</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.g. 25/JUN/2012</td>
<td>Lipitor</td>
<td>Lower cholesterol</td>
<td>20mg, once per day</td>
<td>05/JUN/2008</td>
<td>ongoing</td>
<td>YES</td>
</tr>
</tbody>
</table>

*changes to medication noted during trial only

Medication Log - Continued Next Page
Professional Assistance Log (to be used at INTAKE SESSION, AND EACH SESSION throughout the trial)

Please complete details of any professional assistance or support that you are currently receiving for depression, anxiety, stress or mental health. This may include assistance or support through counselling, psychotherapy, medical or other allied health practitioner, support group, online courses, yoga, etc.

<table>
<thead>
<tr>
<th>Today's Date</th>
<th>Session #</th>
<th>Type of Practitioner</th>
<th>Type of Assistance / Service Provided</th>
<th>Main Reason / Focus (if commenced or increased during trial, record any associated Adverse Event)</th>
<th>How Often?</th>
<th>Date of Commencement (or changing?)</th>
<th>End Date (or &quot;ongoing&quot; if continuing)</th>
</tr>
</thead>
<tbody>
<tr>
<td>E.g. 25/JUN/2012 Intake (week 0)</td>
<td>Psychologist</td>
<td>Counselling</td>
<td>Depression</td>
<td>one session per week</td>
<td>05/JUN/2011</td>
<td>ongoing</td>
<td></td>
</tr>
</tbody>
</table>

* changes to professional assistance noted during trial only

(Continued on next page)
### ADVERSE EVENTS FORM (see reverse for definitions)

Please record all adverse experiences, injuries, and health concerns that the participant has had during the trial.

<table>
<thead>
<tr>
<th>Today's Date (dd/mm/yyyy)</th>
<th>Adverse Event (AE)</th>
<th>Date AE Began (dd/mm/yyyy)</th>
<th>Date AE Ended (dd/mm/yyyy)</th>
<th>Severity</th>
<th>Relationship of AE to Yoga Intervention</th>
<th>Effect on Trial</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1 = Mild</td>
<td>0 = Unrelated</td>
<td>0 = None</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>2 = Moderate</td>
<td>1 = unlikely</td>
<td>1 = Withdrew</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3 = Severe</td>
<td>2 = Possible</td>
<td>1 = Complete withdrawal form</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4 = Life Threatening</td>
<td>3 = Likely</td>
<td>4 = Not Assessable</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>1</td>
<td>0</td>
<td>2</td>
</tr>
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<td></td>
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<td>2</td>
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<td>3</td>
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<td>3</td>
<td>0</td>
<td>1</td>
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<td></td>
<td></td>
<td>4</td>
<td>0</td>
<td>1</td>
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<td></td>
<td>1</td>
<td>0</td>
<td>2</td>
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<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td>3</td>
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<td></td>
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<td>3</td>
<td>0</td>
<td>1</td>
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<td></td>
<td>4</td>
<td>0</td>
<td>1</td>
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<td>1</td>
<td>0</td>
<td>2</td>
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<td></td>
<td></td>
<td></td>
<td>2</td>
<td>1</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>3</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td>4</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>

Adverse Events Record
### Definitions

**Adverse Event**: An Adverse Event is any untoward occurrence that a trial participant may experience, which does not necessarily have a causal relationship with the intervention. An Adverse Event can therefore be any unfavourable and unintended sign or symptom temporally associated with the use of a trial intervention, whether or not related to the intervention.

#### SEVERITY

<table>
<thead>
<tr>
<th>Level</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mild</td>
<td>A reaction of limited duration (&lt; 48 hours), which may or may not require treatment. The event causes mild discomfort and does not significantly interfere with normal activities.</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Moderate</td>
<td>A reaction of longer duration, or which requires further treatment, or causes sufficient discomfort that limits normal activities.</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Severe</td>
<td>A reaction of any duration which results in hospitalisation and/or longer term limitations in normal activities.</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Life Threatening</td>
<td>Any occurrence that was life threatening at the time of the event.</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>

- **PLEASE REPORT ALL SEVERE OR LIFE THREATENING EVENTS TO PRINCIPAL RESEARCHER IMMEDIATELY**

#### RELATIONSHIP OF ADVERSE EVENT TO YOGA INTERVENTION

<table>
<thead>
<tr>
<th>Relationship</th>
<th>Description</th>
<th>Example</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unrelated</td>
<td>Sufficient information exists to indicate that the cause is unrelated to the yoga intervention.</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Unlikely</td>
<td>When there is no reasonable temporal association between the yoga intervention and the suspected adverse event. The event could have been related to the participant’s prior conditions or concomitant treatment(s).</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Possible</td>
<td>There is some evidence to suggest a causal relationship (e.g., because the event occurs within a reasonable time associated with the yoga intervention). However, the influence of other factors may have contributed to the event (e.g., the participant’s prior conditions, other concomitant treatments).</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Likely</td>
<td>There is clear evidence to suggest a causal relationship, based on: temporal relationship to the yoga; known potential response to the yoga; improvement of the event after reduction of the yoga; the event reappears after repeated exposure (re-challenge).</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Not assessable</td>
<td>When causality is, for one reason or another not accessible, e.g., because of insufficient evidence, conflicting data or poor documentation.</td>
<td>---------------------------------------------------------------------------------------------</td>
</tr>
</tbody>
</table>

- **PLEASE REPORT ALL POSSIBLE, LIKELY, OR NOT ASSESSABLE EVENTS TO PRINCIPAL RESEARCHER IMMEDIATELY**