

***Doctorate in Professional Educational,
Child and Adolescent Psychology***

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Institute of Education

UCL Institute of Education

**Doctorate in Professional Educational Child and Adolescent
Psychology**

**Does Yoga Improve Mental Health in Adolescence? A Systematic
Review Exploring the Impact of Yoga Interventions Implemented
Within Secondary Education.**

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I, Julie Gibbons, confirm that the work presented in this thesis is my own. Where information has been derived from other sources, I confirm that this has been indicated in the thesis.

Word count (excluding appendices and references): 34,712

With special thanks and unreserved gratitude to:
My research supervisors; Professor Jane Hurry and Helen Upton
My placement supervisor; Dr Melernie Meheux
The PEP at Luton Psychology Service; Dr Linda Delmar
and my parents Phil and Angela Gibbons

Abstract

Yoga has been found to improve mental health conditions in adults with preliminary research into its effects on children and young people showing promise. Primary studies exploring the impact of school-based yoga interventions have generated positive albeit small findings for mental health, including improved mood and stress reduction. Previous reviews have focused on a range of outcomes including cognitive, psychological and physical, across both child and adolescent populations. Gard et al (2014) formulated a theoretical model proposing the regulatory mechanisms via which yoga mediates the stress response.

This review aims to update the findings from previous systematic reviews investigating the effects of yoga on mental health outcomes and seeks to include current UK based research. It explores the impact of school-based yoga on quantitative mental health outcomes in adolescence using statistical meta-analysis to estimate a pooled effect size. It seeks to synthesise the findings from qualitative research exploring adolescents' experiences of school-based yoga. It considers whether yoga may impact on mental health outcomes differentially according to gender.

The process outlined by Petticrew and Roberts (2006) for conducting a systematic review was utilised. The GRADE method and TAPUPAS frameworks were used to critically appraise studies. A narrative synthesis was conducted to reflect the quantitative findings across studies reviewed including differential gender effects with a statistical meta-analysis using Stata (Version 17) employed to estimate the overall pooled effect size for specific mental health outcomes. Thematic Analysis informed by Braun and Clarke (2006) was conducted to analyse qualitative studies with a

secondary analysis performed by gender. These findings were then synthesised narratively.

Research exploring anxiety, depression, stress and emotion regulation was appraised as being of low to very low quality and the strength of any recommendations made about the suitability of using yoga to support these outcomes in adolescence is weak. Trends in the data suggest marginally increased beneficial effects for the yoga condition for the majority of outcomes, with most studies employing a PE control. The statistical meta-analysis generated a non-significant pooled effect size of $\theta = 0.20$. Some differences were found between males and females, with emotion regulation increasing more for females than males after yoga compared with PE.

The qualitative analysis yielded some favourable findings with the following themes emerging: yoga and emotion regulation, cognitive impact including enhanced mindfulness, yoga as stress reducing/relaxation inducing, integration between the mind, the body and the breath and interpersonal benefits. Females were more likely to identify that yoga reduced feelings of stress than males, yet teachers were more likely to observe this in males rather than females. Only females identified that yoga helped them to feel more connected to others. Conversely, teachers identified males as demonstrating improved social communication and interaction, but not for females. Overall, males and females were found to enjoy PE and cited a number of physical benefits, however only females reported a preference of PE over yoga. A minority of students reported that yoga did not really help with stress or emotion regulation, that they had not enjoyed yoga or that yoga had not supported their physical wellbeing.

Trends in the quantitative data alongside the qualitative findings provide partial support for Gard et al's (2014) framework, notably that feedback from students suggests that yoga may improve cognitive, top-down skills comparable with mindfulness, combined with the use of breathing practices to support their self-regulation in a bottom-up way.

Impact Statement

The impact of this research, both in relation to further research and to real world issues, are outlined in this statement.

Previous reviews highlighted the need for studies to incorporate outcome measures to supplement self-report measures, these include teacher and parent report measures and physiological measures of stress and/or relaxation. This review found that a few studies had incorporated such measures, yet the majority had not and future research should continue to employ additional measures in order to triangulate data. Two studies (Khalsa et al, 2012 and Felver, 2015) had replicated significant findings favouring the yoga over PE condition on measures of anger and fatigue. It would be pertinent for future research to continue to explore the replicability of findings for studies which have found a significant effect to ascertain their reliability, particularly when these have only been found in isolation.

This study utilised the Gard et al (2014) theoretical model of the proposed self-regulatory processes which yoga is thought to work upon. It would be useful if further research continued to consider self-regulatory mechanisms including top-down processes such as mindfulness and bottom up processes including breath-work to further explore the explanatory power of such frameworks. Only three studies included mindfulness measures despite numerous researchers considering that this

is an area that yoga may improve. The qualitative findings suggested that students found breathing practices supportive of emotion regulation and often utilised them outside of the yoga class for this function. However no studies included questionnaires or physiological measures to assess how yoga may impact on the breath to quantitatively assess this, this would be a prudent area for future research to consider.

Female and male students often spoke differently about the physical practice of yoga, with only females endorsing a preference for yoga over PE. The quantitative data provides some triangulation, with two of the reviewed quantitative studies detecting that yoga may impact more on females than males on measures of emotion regulation and body surveillance. Additionally, some of the findings indicated that yoga may be more desirable to students of a lower physical aptitude than PE and demonstrate a greater impact on such students. Exploring how yoga impacts on different subgroups may prove fertile areas for future research.

The lack of UK research generated and the plausible differences between the UK and USA educational systems, plus possible differences between yoga programmes offered in the UK and the USA illuminate the need for further UK based research to be conducted.

The remainder of this statement will discuss the impact of this research on educational psychology practice. EPs may trial incorporating yogic breathing practices into individual and group-based therapeutic activities in light of the majority of students highlighting using the breath over other yogic practices to support emotion regulation. This may support students to feel more emotionally regulated ahead of engaging with the practitioner in dialogue, conversely towards the end of a

therapeutic session it could help students to regulate before they leave the session and feel ready to integrate back into the school day. EPs may advocate body-based low intensity therapeutic practices which incorporate breathing techniques, such as yoga, to support positive mental health during consultations about individuals or groups with school staff. They should simultaneously highlight the need to actively listen to students' views to consider their willingness to participate in such activities and ensure that any intervention is monitored for impact.

Systemically, at a whole school level, they may encourage schools to offer yoga as a module to students embedded within the PE/PSHE curriculum and suggest that they offer taster sessions to introduce young people to yoga to manage preconceptions. Offering yoga as a PE option is one possibility, in light of the fact that it may be a more desirable form of exercise to some girls and/or those of lower PE ability. Offering it as a PSHE option is an alternative possibility, which may mean those students less likely to choose it as a PE module (e.g some males and/or those of higher P.E ability) still have the option to practice it, without losing out on valuable PE time.

With regard to implementation, EPs should advocate that schools listen to student views about practicing yoga in mixed or same sex classes and that they listen to student feedback about length and duration of classes and operationalise yoga programmes informed or adjusted by these views.

Finally, part of the HCPC competencies for practicing EPs includes an understanding of research methods, of being able to conduct research and of monitoring and evaluating interventions. The educational psychologist's close involvement with schools means that they are well placed to support schools in the evaluation of

SEMH interventions including yoga. Where possible educational psychology services should co-ordinate data collection across schools for analysis which may further support research into this area.

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1 Introduction

There has been a recent national focus on the incidence and apparent escalation of the social, emotional and mental health needs of children and young people. With this rise, have come government initiatives to drive the promotion of positive mental health and the reduction of mental illness in a bid to address the problem. The latest government guidance comes in the form of the mental health guidance for schools document (DfE, 2016.) which attempts to outline how schools can promote wellbeing and identify and support children at risk of developing or already presenting with poor mental health. It has been argued that this advice focuses more on within-child mental illness and disorder and the targeted and specialist interventions to treat them than it does on an ecological understanding of mental health and broader universal and preventive approaches which serve to support mental health and promote well-being.

Yoga is a mind-body practice and yoga classes and interventions have been growing in popularity in UK schools. Preliminary studies have demonstrated that implementing a yoga intervention within a school system can have positive effects on stress reduction, anxiety management, depression, self-esteem, self-regulation and other elements which feed into cultivating good mental health, including numerous physical health benefits (Conboy, 2013; Ferreira-Vorkapic et al, 2015; Greenberg & Harris, 2012; Khalsa et al, 2012; Khalsa & Butzer, 2016; Mendelson et al, 2013; Parker et al, 2014; Weaver & Darragh, 2015). Indeed, yoga philosophy recognises that the body and mind are inextricably linked and that in order to be healthy, one must work simultaneously with the body and the mind.

It is useful at this point to outline positive psychology as the theoretical lens which has been adopted to inform thinking, consider and select definitions and support the decision making process at various points throughout this research and the writing of this report. Positive psychology is “an umbrella term for the study of positive emotions, positive character traits and enabling institutions” (Seligman, Steen, Park and Peterson, 2005, p 410) which has sought to meaningfully define positive aspects of mental health and wellbeing and evaluate the interventions that may enhance them. This is to supplement more traditional psychological research paradigms exploring psychological deficits and disorders, with a focus on promoting strength-based theories to evaluate. Indeed, Petersen and Seligman (2004) devised ‘Character Strengths and Virtues: A Handbook and Classification System’ which describes and classifies strengths and virtues that enable human thriving, with the intention that it would serve as the positive psychology counterpart to the Diagnostic and Statistical Manual of Mental Disorders (American Psychiatric Association (1994)).

The word yoga may be literally translated as ‘to yoke’, meaning to unite, whereby a number of practices are employed to promote integration between different aspects of human experience. There are a number of psychological and physical components that yoga is proposed to help integrate, including amongst others, integration between the mind and the body, between the mind and the breath and of the integration of physical sensations into coherent feelings. It makes sense that research exploring the impact of yoga would consider both positive psychological feelings and traits along with those indicative of emotional distress or mental ill health in a bid to help integrate the experience of both to support balance within the system. Furthermore, as the research was more geared to the general population and the universal implementation of yoga interventions, it was felt that exploring

processes such as emotion regulation which may underlie positive mental health and act as a preventative factor against mental ill health would be fruitful.

This chapter will focus on defining mental health and yoga and will outline the mental health needs of children and adolescents including possible gender differences between those needs. It will explore the evidence base of how yoga may impact on mental health with consideration of the underlying psychological and physiological processes that it may be influencing, with relevant theoretical frameworks to illustrate those processes outlined. Exploration of the viability of the school system within which to implement mental health interventions including yoga and the role of the educational psychologist in researching and signposting schools to mental health interventions, will be discussed. The evidence base for the impact of yoga on mental health in primary schools and of previous systematic reviews on mental health outcomes in children and adolescents will be interrogated. Finally, the rationale for conducting an up-to- date systematic review and its contribution to knowledge will be considered.

1.1 Mental Health Defined

The World Health Organisation defines Mental Health as “a state of wellbeing in which an individual realises his or her own abilities, can cope with the normal stresses of everyday life, can work productively and fruitfully and is able to make a contribution to his or her community.” (WHO, 2004, P.13). They do not offer a definition of mental illness but refer to poor mental health as “associated with rapid social change, stressful work conditions, gender discrimination, social exclusion, unhealthy lifestyle, physical ill-health and human rights violations.” Usefully, poor mental health may be conceptualised as being a part of the same continuum as

positive mental health. However, their definition for mental disorders does not appear to reside within the spectrum of mental health: “Mental disorders comprise a broad range of problems with different symptoms. However, they are generally characterized by some combination of abnormal thoughts, emotions, behaviour and relationships with others. Examples are schizophrenia, depression, intellectual disabilities and disorders due to drug abuse. Most of these disorders can be successfully treated.”

The WHO definition has been praised for moving away from a construct of mental health as solely the absence of mental illness, yet criticised for over simplifying positive mental health. Galderisi et al (2015) argue that including wellbeing as a key aspect of positive mental health negates those instances in which it is mentally healthy to feel low in wellbeing, and to have feelings of sadness or anxiety in response to negative experiences. They offer the following conceptualisation “Mental Health is a dynamic state of internal equilibrium which enables individuals to use their abilities in harmony with universal values of society. Basic cognitive and social skills; ability to recognise, express and modulate one’s own emotions, as well as empathise with others; flexibility and ability to cope with adverse life events and function in social roles; and harmonious relationship between body and mind represent important components of mental health, which contribute in varying degrees, to the state of internal equilibrium.” (Galderisi et al, 2015, P.231) Wellbeing may or may not be experienced as part of positive mental health, though it is likely that experiences or engaging with activities which promote wellbeing contribute to positive mental health more generally. Conversely, experiences which threaten wellbeing such as living in poverty likely feed into poor mental health or the development of mental health conditions (The Good Childhood Report, 2019).

However, despite this association, wellbeing and mental illness do not always go hand in hand with some researchers such as Patalay and Fitzsimmons (2018) reporting a fairly small negative correlation ($r=0.2$) between the two.

Throughout this thesis mental health shall be viewed as a continuum with positive mental health, poor mental health and mental illnesses/disorders viewed as part of this spectrum, not as discrete abnormal phenomena. Of interest Galderisi's (2015) definition of mental health illuminates the interplay between mental and physical health which is espoused by yogic philosophy.

1.2 The Context of Child and Adolescent Mental Health in the UK

A number of reports have documented the apparent rise of mental health conditions in young people for some time now. Green, McGinity, Meltzer, Ford and Goodman (2004) found that 9.8% of children and young people (CYP) between the ages of 5-16 are experiencing a diagnosable mental health condition. The Nuffield Foundation (2013) reported that the number of 15-16 year olds diagnosed with depression had doubled between the 1980s and the 2000s. Young people of the same age with a diagnosis of conduct disorder had also doubled between 1974 and 1999 (Collishaw, Maughan, Goodman & Pickles, 2004). Public Health England (2014) reported that 30% of English adolescents were experiencing mental health issues falling just short of clinically diagnosable conditions. This finding surpasses that of Green et al (2004) who suggested that 15% of children and young people were experiencing problems that put them more at risk of developing a mental health condition in the future. In their 2007 report, the United Nations Children Fund (UNICEF) placed the UK last of 21 developed countries for wellbeing. Indeed, the latest report by the Children's Society

(The Good Childhood Report, 2019) identified a decline in children's happiness which is at its lowest since 2010.

The Good Childhood Report (2012) found age to be most significantly associated with a CYP's wellbeing above factors including family composition and poverty, whereby overall wellbeing decreases from age 8 to 14. This corroborates findings by The Department of Health and Social Care (DHSC, 'No Health Without Mental Health', 2011) which projects that half of all life-long mental health conditions are present at 14 years of age and 75% at 18. Despite such figures, they estimate that 40% of CYP with mental health needs are not receiving any specialist care. This highlights the preventative intervention no later than adolescence to equip our youth with the tools they need to maintain positive mental health during the adolescent period and transition into adulthood.

Other reports have suggested that the picture may not be so bleak, reporting some growth in the happiness of children in the UK, interwoven with periods where that happiness has decreased. The UK moved from bottom to 16th out of 29 countries for overall wellbeing in 2013 (UNICEF, 2013) and The Good Childhood Report (Children's Society, 2014) suggested that the majority of children were generally happy with their lives, with as few as 10% of 8-15 year olds reporting low wellbeing at any given point in time.

Other researchers have consistently found gender differences in the mental health of girls and boys. McLean, Asnaani, Litz and Hoffman (2011) in a large-scale study of the gender differences in diagnoses (Diagnostic Manual of Mental Disorders- IV) of CYP between 11-16, found that females had higher prevalence rates for all of the anxiety conditions except social anxiety. A concern is that anxiety conditions can go

unnoticed due to their internalising nature with externalising behaviours and associated conditions such as conduct disorder being more obvious in the school environment and more frequently displayed by boys (Sauter, Heyne & Westenberg, 2009; Weiner, Suveg & Kendall, 2006; DCSF, 2008). These differences in the mental health needs of boys and girls and the coping strategies that they employ to cope, may indicate that interventions should be tailored to suit each gender, whilst bearing in mind that there will be individual differences across genders. However, the gap between boys and girls happiness with their appearance was found by the Good Childhood Report (2019) to be narrower than in previous years, suggesting that boys were becoming unhappier with their appearance more similarly to girls. Gender differences therefore, may change over time and should be monitored, particularly where interventions have been adjusted to differentially meet the needs of boys and girls.

Recently, the role of trauma on mental health outcomes for young people has been considered, with a number of schools and educational psychology services (EPS) taking up training courses including those offered by Trauma Informed Schools (Sunderland, 2019) and Beacon House (Lyons et al, 2020). These conceptualise children and young people's SEMH needs from a possible trauma experienced perspective, in order to address those needs in trauma sensitive ways. Childhood adversity and trauma has been found to trigger neurobiological events that alter brain development (Shonkoff et al, 2009; Teicher et al, 2002; Martin et al, 2003). These changes may then be implicated in damage to the stress response systems that underlie cognitive and emotion regulatory capacities (Teicher et al, 2016), with chronically stressed children at risk of developing cognitive and emotion regulation difficulties which may predispose them to becoming mentally unwell.

The trauma perspective has helped to further shift the understanding of mental health and wellbeing from a within-child rhetoric to an ecological conceptualisation of mental health and wellbeing, whereby adversity within the family system and more widely within families situated in community systems experiencing socio-economic disadvantage are more likely to have experienced trauma and be at risk of developing poor mental health and mental health conditions (Felitti, 1996, Early Intervention Foundation, 2020; Porche, Costello & Rosen-Reynoso, 2016; Shonkoff & Richmond, 2008; Treanor, 2019; Rowntree, 2020).

1.3 Yoga Defined

Yoga is an ancient mind-body practice widely used to help reduce stress and promote physical and mental health. The first system of yoga was recorded by Patanjali between 200-500 BC. His framework, the 'Eightfold Path of Yoga', is used by yoga teachers to guide the content of classes, to give structure to the class whilst ensuring that key practices and the sequence of them are implemented correctly (Iyengar, 2002). A well-rounded class will incorporate the following aspects:

- 1) The postures (Asanas)
- 2) The breathing practices (Pranayama)
- 3) Centring and grounding practices with an emphasis on focusing inward (withdrawal from the outside world/Pratyahara)
- 4) Teaching concentration (Dharana) which is usually interweaved throughout the first three practices
- 5) The practice of meditation, including relaxation practices which often underpin meditative practices (Dhyana).

1.4 Yoga as a Mind-Body Practice

Yoga is a mind-body practice which impacts upon complex inter-related physiological and psychological systems. It can be challenging to tease apart the separate systems influenced by regular yoga practice due to the bi-directional interactions between them. However, certain specific practices taught within a yoga class may impact upon the physiological systems to a greater extent than the psychological and vice versa. Therefore, despite some practices largely exerting their effects in a top down way, originating from a psychological practice, they have consequent knock-on physiological effects. As an example, a meditation practice may start by focusing the mind inward to become aware of one's thoughts in order to observe them, possibly with the instruction to let them go, yet after some time, as the mind begins to calm, so too does the body. Conversely, one might start with a yoga posture, with the participant directed to focus on lengthening their breath during the pose. Working in this way would have its origins bottom-up, whereby the relaxation of muscles and the slowing and deepening of the breath, activate a bottom-up neural response which subsequently impacts on the psychological, with the participant focusing their attention into the body and the breath and developing an awareness that the mind is becoming less active and more focused. The rest of this section considers the mechanisms via which yoga is proposed to work by exploring the evidence from a combination of studies, a summary of these key mechanisms will be outlined alongside the theoretical model proposed by Gard, Noggle, Park, Vago and Wilson (2014).

1.4.1 Physical Fitness Benefits

Yoga can help to enhance physical fitness, with research finding improvements in neuromuscular coordination and strength, balance, flexibility and respiratory function (Abel, Lloyd & Williams, 2013; Raub, 2002). Improvements in physical fitness have been associated with improved mental state, health, behaviour and performance, demonstrative of the inter-link between physical and mental health (Butzer, Bury, Telles et al, 2016; Khalsa & Butzer, 2016).

1.4.2 Yoga's impact on the Autonomic Nervous System

According to Bujis (2013) the sympathetic nervous system is responsible for mobilising the body in stressful situations to either 'fight or flight' the stressor. The parasympathetic nervous system is responsible for returning the body back to a balanced state. Both the sympathetic and parasympathetic nervous systems which are delicately interconnected, have been considered as the mechanism through which yoga reduces stress (Brown & Gerbarg, 2005; Evans et al, 2011; Field, 2016; Malathi & Damodaran, 1999 and Michaelson et al, 2005).

Yoga interventions have been shown to demonstrate a reduction in cortisol levels, a hormone which helps to mediate the stress response (Harris et al, 2015; Naveen et al, 2016; Ramler et al, 2015; Thirthalli et al, 2013). Thirthalli et al (2013) found that serum cortisol levels were higher in depressed patients than healthy controls. They further showed that more patients in the yoga only (n= 19) and yoga with drugs group (n=19) showed increased reductions in cortisol than the drug only group (n=16). There was a correlation between the psychological measure (Hamilton Depression Rating Scale) and the physiological measure of cortisol for the yoga only group. The role of yoga on the regulation of the hypothalamic-pituitary-adrenal (HPA) axis which governs the

production of cortisol has previously been found (Innes, Vincent & Taylor, 2007; Pascoe & Bauer, 2015; Purdy, 2013 and Ross & Thomas, 2010). Ross and Thomas (2010) found that yoga brought about a decrease in activity of the HPA axis and the sympathetic nervous system and was shown to prevent release of the stress hormones, cortisol and the catecholamines. The potential mediators of yoga's effect on cardiovascular disease were suggested by Innes et al (2007) to be stabilisation of the HPA axis and sympathoadrenal activity which have a regulating effect on stress.

Interestingly for the present research, similar findings have been found in adolescent populations, Pawlow and Jones (2005) investigated the effects of a one-hour standalone session of progressive relaxation within a laboratory setting. This is a technique sometimes employed at the end of a yoga session focusing on integrating the mind, the body and the breath. The control group sat quietly within the laboratory for an equal time period. A significantly lower level of salivary cortisol was found post-intervention for the yoga group but not for the control.

Though the above studies have found that yoga practices have shown positive reductions in cortisol, others have highlighted that the impact of yoga on stress biomarkers is not so clear cut. Kiecolt and Glaser (2010) recruited 50 healthy women into a hatha yoga (yoga including physical postures) condition, movement control or a passive video control. They failed to find a significant difference in cortisol level between the groups after inducing a stress response. In a review of RCT's exploring the impact of yoga on physiological stress and inflammation associated with affective disorders, Pascoe and Bauer (2015) focused on studies including sympathetic nervous system and hypothalamic pituitary adrenal axis measures and concluded that whilst the large majority of the 25 studies reviewed demonstrated evidence that yoga

promotes healthier blood pressure, heart rate, cortisol or cytokine levels, they highlighted a range of methodological limitations.

It is interesting to consider the role of hatha yoga on stress reduction because prolonged stress has been shown to contribute to anxiety and depression (Dantzer et al, 2008; Dantzer, 2012; Maes, 2008; Mazure, 1998 and Monroe et al, 1991). This could mean therefore, that if yoga is effective in helping its practitioners to manage their stress response it could help to decrease their chances of developing depression or anxiety and work protectively against these conditions. There is a considerable research base suggesting that yoga ameliorates symptoms of depression and anxiety in adult practitioners (Broota and Dhir, 1990; da Silva, Ravindran & Ravindran, 2009; Kuttner et al, 2006; Li and Goldsmith, 2012; Pilkington, Kirkwood, Rampes & Richardson, 2005; Telles and Srinvas, 1998). Pilkington et al (2005) found that 5 studies in their systematic review suggested the effectiveness of yoga as a treatment for depression. More specifically Broota and Dhir (1990) compared the effects of yogic relaxation to progressive relaxation on depression. They reported both to be effective in reducing depression with the yogic relaxation demonstrating a greater effect, a finding also supported by da Silva et al (2009).

Previous research on adult participants has found positive effects of yoga on anxiety. Li and Goldsmith (2012) reviewed the evidence exploring the use of yogic principles and exercises and found that 25 out of 35 studies significantly decreased stress or anxiety. Other evidence comes from RCT's using an adolescent sample to explore the impact of yoga on self-report and/or physiological measures of anxiety when compared to either a wait-list or gentle physical exercise control group. Statistically significant improvements were made on both self-report and physiological measures

of anxiety for the yoga conditions (Kuttner et al, 2006; Telles and Srinivas, 1998). In an uncontrolled pre-post intervention pilot study by Hall, Ofei-Tenkorang, Machan and Gordon (2016) evaluating the effects of an outpatient yoga program for 11-18 year-old female outpatients, found statistically significant decreases on measures of anxiety, depression and body image disturbance pre-post intervention. However, lack of a control group makes it difficult to attribute causality to the yoga program alone. In a non-randomised study, Khalsa et al (2013) found a specific improvement in measures of performance anxiety yet not generalised anxiety when they explored the impact of a yoga intervention compared with a control, on feelings of anxiety in adolescent musicians.

In summary the evidence appears to suggest that yoga has a beneficial impact on stress and other mental health outcomes yet the methodological quality of the studies is weak and therefore any recommendations made regarding the practice of yoga to ameliorate stress or other mental health outcomes are also weak.

1.4.3 The Relaxation Response and Parasympathetic Nervous System Activation

The relaxation response is described by Benson et al (1974, p.37) as ‘an integrated hypothalamic response which results in generalised decreased sympathetic nervous system activity and perhaps also increased parasympathetic activity’. The relaxation response is thought to involve the reduction in neuro-cognitive arousal contributing to a reduction in sympathetic nervous system arousal and a reduction in dysphoric mood states in a top down manner (Benson, 1985; Everly & Lating 2013), combined with bottom up neuro-physiological processes including the reduction of neuromuscular arousal. Gellhorn (1964, p.457,) explains that “states of abnormal emotional tension are alleviated in various ‘relaxation’ therapies through reducing proprioceptive

impulses which impinge on the hypothalamus and maintain the cerebral cortex in an abnormal state of excitation". Relaxation therapies often involve 'body work' such as stretching or clenching and releasing muscles, the reduced neural feedback from these muscles leads to reduced stimulation to certain parts of the brain. The relationship between the neuromuscular system and the limbic circuitry responsible for our emotions has been well documented (Gellhorn, 1964; Weil, 1974; Everly & Lating, 2013). It has been argued by Gellhorn and Weil (1964) that the primary mechanism responsible for inducing the relaxation response and decreasing the stress response is the reduction of proprioceptive stimulation to the nervous system. Yoga has been shown to activate the vagus nerve, part of the parasympathetic nervous system which helps to down-regulate the sympathetic nervous system and impacts upon heart rate variability, breathing, sleep and the immune response, helping to calm an overactive sympathetic nervous system caused by chronic stress (Gard et al, 2014; Field, 2016). Bessel Van der Kolk (2014) and Porges (2018) highlight the role that yoga may play in helping individuals to regulate the neural systems underlying both trauma and stress responses. Perry (2006) identifies that in order to help CYP who have experienced trauma and/or are experiencing emotion dysregulation from stress, a neuro-sequential therapeutic approach is required. The first part of this process is regulation of lower-level brain stem systems, which may be hyper-aroused and in a fight-flight stress response or hypo-aroused and in freeze response. Perry (2006), Porges (2018) and Van Der Kolk (2014) suggest that calming physical and rhythmical exercises and breathing practices, of which yoga is one possibility, may help to reduce the excitation of the sympathetic nervous system (fight-flight response) and the dorsal vagal nerve (freeze response). Once regulated the CYP may be more able to engage in relationship and interactions with others and

access higher level cognitive functions necessary for speech and meta-awareness of behaviour, which may help to explain why yoga has been found to increase prosocial behaviour in some instances, such as appreciating the perspectives of others, building functional relationships and making positive behavioural choices in relation to others (Khalsa & Butzer, 2016). (Khalsa & Butzer, 2016).

1.4.4 Mindfulness

Mindfulness as a construct may best map on Dharana and Dhyana as outlined in Patanjali's 8-fold path of yoga; Dharana translates as Concentration and Dhyana as Meditation. Breathing practices conceptualised as 'Pranayama' by Patanjali have been used to support individuals to enhance their mindfulness skills. Kabat-Zinn et al (2003) devised a programme entitled Mindfulness Based Stress Reduction which incorporated a range of mindfulness-based practices including some to increase body awareness such as body scanning and breathing, with the evidence from adult participants supporting its effectiveness in the management of low mood, anxiety and pain. Further research with adults suggests mindfulness-based practices train capacities for attention (Brefczynski-Lewis et al, 2007; Carter et al, 2005; Jha et al, 2007; Lazar et al, 2005; Srinivasan and Baijal, 2007) and enhance the ability to inhibit cognitive and emotional processes, like rumination, that increase or maintain stress (Brefczynski-Lewis et al, 2007). With regard to children and young people, Khalsa and Butzer (2016) suggest that the physical postures, breath regulation and relaxation techniques (bottom-up neurophysiological processes) may be even more relevant to support youths with a high degree of psychophysiological arousal to be able to sit and focus for long enough to meditate or engage with other mindfulness activities (top-down neurocognitive processes).

Some meditative yoga practices are embedded within the physical practice of yoga by directing students to focus their minds on their bodily experience whilst practicing a posture, thus anchoring the mind into the physical experience within a given moment.. In Kripalu yoga, there is an emphasis on witness consciousness or the 'observation of experience without reaction' (Cope, 2006). Witness consciousness can be likened to the state of mindfulness and students are directed to pay attention to what is arising in their body and breath at any given moment to observe their experience without judgement (Gard et al, 2014). Additionally, Brisbon and Lowery (2011) found lower levels of stress and increased levels of mindfulness in advanced yoga practitioners compared to inexperienced practitioners. In this way the development of mindful awareness is a neurocognitive top down process which can be supported by a neurophysiological practice.

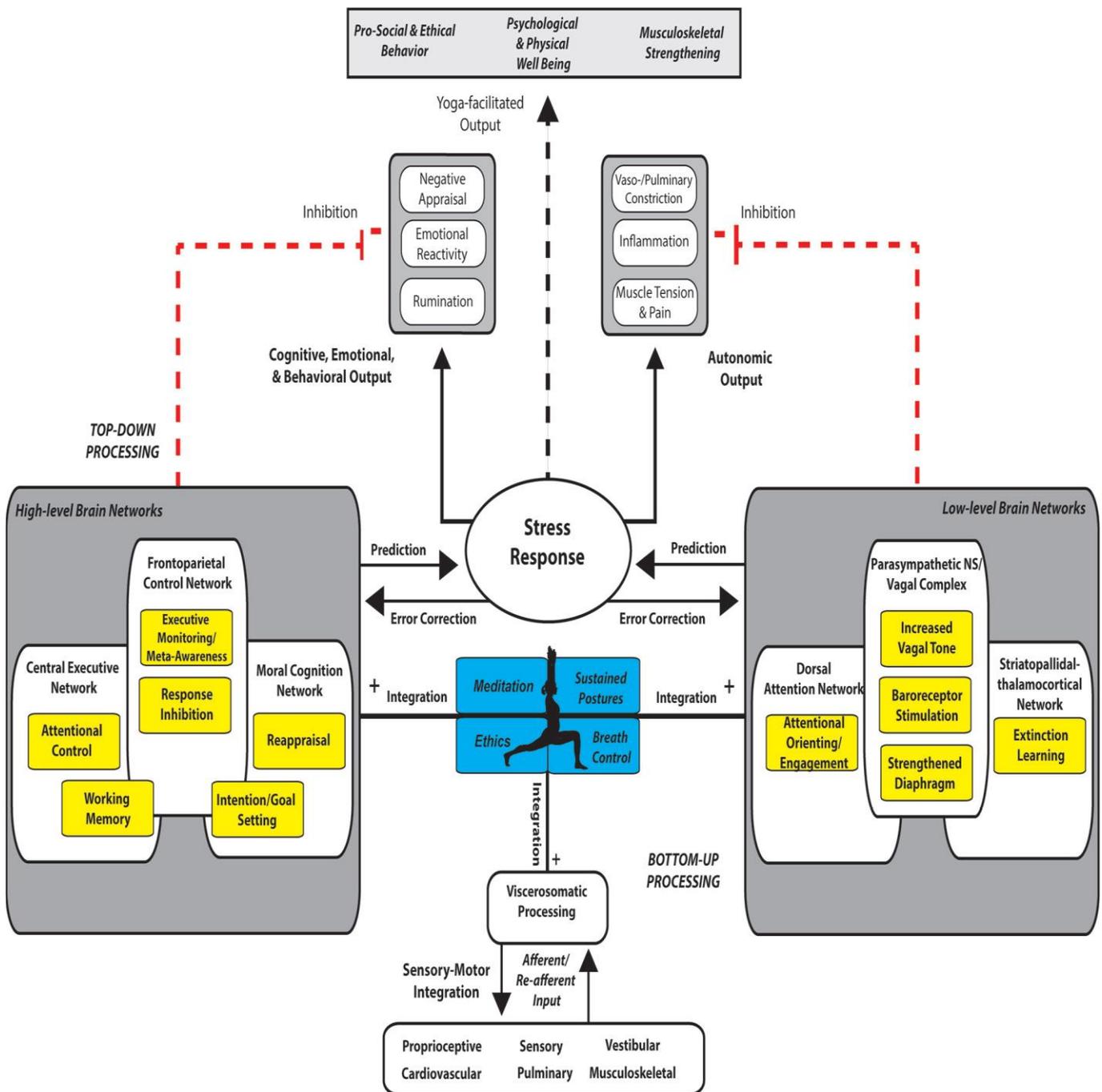
However, White (2012) suggests that there may be cognitive differences between adults and adolescents in their capacity to be mindful. White (2012) highlighted the findings from Bishop (2002, as cited in White, 2012) that mindfulness in adults involved adopting a non-judgemental and accepting quality to mindful awareness and that a physical yoga practice was found to significantly correlate with an increase in non-judgemental attitude, to a greater degree than any other mindfulness technique (Carmody & Baer, 2002 as cited in White, 2010). Nevertheless, when the participants in her study demonstrated increases in their appraisals of stress following a mindful yoga intervention, White rationalised that these non-judgemental and accepting qualities of mindful awareness "may be elusive for children because of their cognitive, emotional, or social level of development" (pg 52, White 2012). Increased appraisals of stress may not indicate that a young person has experienced more stress but that they have an enhanced awareness of stress coupled with a

maturational inability to mindfully detach from this observation which may be experienced as stressful.

1.4.5 Theoretical Model of the Self-Regulatory Mechanisms of Yoga (Gard et al 2014)

Findings such as those outlined above, led to the creation of a theoretical model by Gard et al (2014) to explain the different self-regulatory processes that yoga appears to impact upon, which interact and help to mediate the stress response (Figure 3) to provide a heuristic tool to guide future research. Gard et al (2014) outline four main components of yoga practice; meditation, ethics, which includes basic tenets of yoga philosophy pertaining to the yamas (moral principles requiring you to avoid doing certain things e.g ahimsa, 'non-violence') and the niyamas (the adoption of certain practices to support healthy living e.g swadhyaya, 'study of the self'), sustaining postures and breathing practices. They identify that there are two main pathways responsible for the activation and de-activation of the stress response. The first being top-down higher level brain processes such as cognitive reappraisal and attentional control which are located more closely to the ethics and meditation practices of yoga, and suggest that these aspects of yoga may play a larger role in the mediation of top down or neuro-cognitive processes. The second being bottom-up or neuro-physiological, involving lower level brain processes such as increased vagal activity, with postures and breathing practices working to facilitate bottom-up stress-regulatory processes more strongly. Of course, though some core yoga components may influence process originating from the top or the bottom, the reality is that all components are interlinked and exert synergistic effects on the autonomic nervous system and stress response.

Figure 1 A theoretical framework considering how yoga may impact the stress response (Taken from Gard et al, 2014)



1.5 Mental Health Provision in Schools- Where Might Yoga Fit?

There has been a recent focus on developing mental health provision within UK schools, particularly as CYP's mental health and wellbeing have been evidenced as conducive to effective learning, with mental health symptoms being associated with poorer academic outcomes (Patalay, Deighton, Fonagy & Wolpert, 2015; Durlak, 2011). The Mental Health and Behaviour in Schools-Departmental Advice for School Staff (Department for Education DfE, 2016) sets out "the responsibility of the school, outlines what they can do, and how to support a child or young person whose behaviour- whether it is disruptive, withdrawn, anxious, depressed or otherwise- may be related to an unmet mental health need". This advice has been critiqued for being more focused on targeted intervention and 'mental health disorders' and of referring more often to CAMHs, child psychologists and other therapeutic specialists than on school-based systemic approaches which support mental health and of the role of EP's in supporting them at different levels of the school system; universal, targeted and specialist (Greig, Mackay, Roffey & Williams, 2016).

The current most widely accepted model for the implementation of mental health services in schools in high economic countries is three tiered, comprised of universal, targeted and specialist levels of support. Universal- is a whole school preventive approach; targeted - support is given to a group of children who may be demonstrating risk factors which could lead to poor mental health/mental health conditions but who are not yet meeting criteria for more specialist intervention and specialist interventions for those with diagnosable mental health conditions (Fazel. Hoagwood, Stephen and Ford 2014; DfE, 2016)

The notion that structural and societal factors are impinging upon the mental health and wellbeing of our CYP, which can affect their developing brains suggests that interventions which work at a universal level, not solely targeted at an individual or small group, may be beneficial in helping to support brain development, mental health and wellbeing (Price, 2008; Shonkoff & Richmond, 2008). The evidence base for the impact of universal mental health programmes has grown in recent years. Researchers conducting meta-analyses of social and emotional learning programmes have found improvements in social and emotional skills, quality of peer and adult relationships, self-control, problem solving, commitment to schooling and attitudes (Catalano, 2002; Durlak, 2011). Of interest, Durlak (2011) found an 11 percentile point gain in the achievement of those students who had been involved with universal SEL interventions. Furthermore, schools have been frequently identified as suitable systems to implement mental health interventions with research exploring interventions implemented at different levels of the school system (Catalano, 2002; Greenberg, 2003; Durlak, 2011).

Moreover, some research has found the impact of universal school-based interventions to be greater than interventions at the other two levels. In a systematic review of 12 school-based cognitive behavioural therapeutic interventions for anxiety, larger effect sizes were found for interventions at the universal level than either the targeted or specialist levels (Neil and Christensen 2009). Other research such as that by Calear and Christensen (2010) however, which explored randomised control studies on cognitive behavioural therapeutic interventions for depression, found larger effect sizes for interventions at the targeted or specialist level compared with those implemented universally. Furthermore, McKenzie and Williams (2018) systematically reviewed universal interventions that aimed to

promote wellbeing/improve mental health within UK schools, they retrieved 12 studies yet found that the effectiveness of studies on mental health outcomes was either neutral or small and highlighted the differences between the UK and USA education systems as possible reasons for the differences that they found compared with earlier research by Neil and Christensen (2009) which was based in the USA.

Some of the difficulties of universal social and emotional learning programmes have been outlined by Greenberg (2003) as being that 'Impact is limited due to insufficient co-ordination with other components of school operations and inattention to the implementation and evaluation factors necessary for strong program impact and sustainability'. The best strategy to promote positive mental health alongside the treatment of mental health conditions aims to integrate a multi-leveled approach, whereby universal interventions may support mental health and wellbeing more widely in a preventative manner, with school-based targeted and specialist support playing a part in the identification of conditions and the implementation of appropriate interventions at these levels within the school setting and by relevant professionals including educational psychologists.

This 3 tiered framework is conceptually similar to the 4 tiered stepped care approach outlined by the National Institute for Health and Care Excellence in their guidances (NICE, 2013; NICE, 2019), whereby the treatment of common mental health conditions, including anxiety and depression highlights low intensity evidenced based interventions including self-help approaches such as following an online CBT programme as a first point of call at the Tier 1 or Tier 2 level for mild symptomatology. Care is then stepped up to Tier 2 or Tier 3 for moderate or severe conditions, including for young people of 12 years plus, the possibility of medication with an anti-depressant (for depression) combined with higher intensity psychological

therapies including family therapy (particularly for children under 12 or those at a younger developmental stage for depression) psychodynamic psychotherapy or individual or group CBT amongst others. Finally treatment is escalated for more severe or recalcitrant illness to Tier 3 or 4 with more intensive psychological therapy and possible trial of additional medications (for depression) outlined in response.

Of particular interest here, is how the school-based tiered system may map onto or support the stepped care framework outlined by NICE (2013; 2019). It may be that school-based universal, targeted and specialist interventions are able to provide some support and containment, particularly for young people experiencing common mild to moderate mental health conditions including depression and anxiety or those with more severe conditions, until they are able to access CAMHS services, which are currently over-subscribed and operating long wait lists as a result.

It is plausible that yoga may be beneficial as a low-intensity, self-help approach which could facilitate engagement with and maximise the impact of other self-help approaches such as online CBT for more mild to moderate presentations of anxiety and depression. Furthermore, yoga could be a useful emotion regulation tool when used as an adjunct to other treatment modalities in the treatment of moderate to severe presentations to equip the young person with an additional 'tool' to add to their 'tool box' of self-help skills. The theory being that yoga may support neurophysiological regulation to help prepare the young person to engage with practices which largely work in a top down manner e.g CBT or other talking therapies. In a similar vein, trauma-informed specialists have proposed that in order to help children and young people to recover from stressful experiences and minimise the development of a mental health condition, it is important to provide physical body-based therapeutic practices targeting bottom-up regulation of the

nervous system, with yoga being identified as one possibility (Perry, 2000, 2006; Porges, 2011; Van Der Kolk, 2014).

A number of studies have explored the impact of universal yoga interventions implemented within primary schools on mental health outcomes. Mendelson et al (2010) randomised 4 primary (elementary) schools to a yoga-mindfulness intervention or a wait-list control (n=97). Intervention schools received 4, 45 minute yoga sessions for 12 weeks. Significant differences were found between groups, pre-post intervention on measures of involuntary responses to cope with stress, including decreases in rumination, intrusive thoughts and emotional arousal, favouring the yoga condition. They did not find statistically significant findings on measures of depression and negative affect, neither did they find statistically significant results for the measures on positive affect or relationships with peers and teachers. Berger, Silver and Stein (2009) explored the impact of an after-school yoga program (n=39) one hour per week for 12 weeks, with a matched control (n=32). Results indicated that the yoga group had significantly better scores than the non-yoga group for the negative behaviours children employed in order to cope with stressors.

Research by White (2012) explored the impact of a 'mindful yoga' intervention on perceived stress, coping abilities, self-esteem and self-regulation. One hundred and fifty-five girls from two primary schools participated, schools were randomised to receive the intervention or to act as a wait-list control. White (2012) found no significant differences in perceived stress, however an interaction effect approaching significance found that the yoga group were slightly more likely to experience higher levels of perceived stress (post intervention) than the control group. The yoga group also demonstrated higher 'frequency of coping' scores post intervention compared

with the control group. White (2012) found no increase in the frequency of stressors, yet the yoga group were more likely to report feeling bad about a stressor on the 'Feel Bad Scale'. She suggests that mindfulness training aims to enhance awareness to the stress reaction to better cope with stress and posits the possibility that the scale may be measuring awareness of the feelings of stress rather than stress per se. Furthermore, she identifies that awareness of stress may facilitate coping, which could explain the correlation between stress appraisal and coping frequency, whilst acknowledging that becoming more aware of stress could have led to increased feelings of stress. This study highlights the complex interaction between processes upon which yoga exerts its influence, in that part of the yoga and mindfulness trajectory, is becoming more aware of one's internal landscape of feelings which may in the short term feel more uncomfortable and stressful.

In summary, findings from studies of universal school-based yoga interventions in primary school aged children have been mixed with some preliminary positive findings favouring the yoga condition on measures of involuntary responses to cope with stress including decreases in rumination, intrusive thoughts and emotional arousal and decreases in other negative behaviours children employed to cope with stress. However, the findings by White (2012) suggest that how yoga impacts upon the stress response may be complex and draws distinction between the feelings of stress and the appraisal of stress, suggesting that there may be a developmental trajectory of how mindfulness is experienced from beginning students to more experienced students and by younger versus more developmentally mature adolescents. These nuances may help to explain divergent early findings and warrant further investigation.

There have been a number of systematic reviews conducted to explore the evidence base for the impact of yoga programmes on an array of outcomes; cognitive including memory, academic, psycho-social and other mental health outcomes such as anxiety, mood, tension and self-esteem, which shall be explored in the remainder of this section. Serwacki and Cook-Cottone (2012) appear to have conducted the first systematic- review into the evidence base of the impact of school-based yoga interventions. They identified 12 studies across a range of settings and included students with special educational needs and disability. Ten of these studies focused on children of primary school age. They investigated a broad range of outcomes including cognitive, psycho-social and academic and concluded that the effects of school-based yoga programmes appeared to be beneficial for the most part. Studies were assessed by Serwacki and Cook-Cottone (2012) as being of low to moderate methodological rigour. Four studies included children with SEND with favourable results found in a study on children with autism spectrum condition, whereby decreases in parent and teacher ratings of stress were corroborated by decreases in pulse rate (physiological measure of stress), after the yoga intervention. Further promising results were found on the adaptive functioning and prosocial behaviour in students with learning disability which improved for the yoga group compared to controls who showed declines over time.

Serwacki and Cook-Cottone (2012) found that methodological limitations of the studies reviewed included lack of randomisation, small samples, limited detail regarding the intervention and statistical ambiguities which curtailed the provision of definitive conclusions or recommendations. They drew attention to the fact that the standards used to determine methodological rigour were designed for clinically based research which 'may fail to account for the complexity and challenges inherent

in school-based research' (pg 102, Serwacki & Cook-Cottone, 2012). They outlined the following recommendations for future research; a need for greater methodological rigour and investigations into the mechanisms of success for school-based yoga interventions including, but not limited to, dosage and fidelity of implementation.

Weaver and Darragh (2015) focused exclusively on the evidence base for yoga as an intervention to ameliorate anxiety in children and adolescents across a range of community, clinical and school settings. They concluded that, overall the reviewed evidence was positive and that yoga may be effective in reducing anxiety or anxiety related behaviours. The following limitations were outlined by Weaver and Darragh (2015); the lack of reported effect sizes in some studies precluded meta-analysis, that only 5 of the 16 studies reviewed used a manualised program making comparison between studies and replication of results challenging and that many studies did not incorporate measures of intervention fidelity, whereby differences in implementation may impact study results. Recommendations for future research were outlined as follows: investigations should be conducted into whether programs for specific anxieties are more effective than those focusing on general anxiety, that studies should explore dosage of intervention and include other measures of wellbeing or occupational performance to consider whether reductions in anxiety are beneficial to aspects of daily living and finally that physiological and psychological mechanisms that underlie change need to be better understood, with measures included to triangulate results across multiple levels of data.

Ferreira-Vorkapic et al (2015) reviewed the evidence base for yoga programs delivered to schools on a range of outcomes including psycho-social, academic and cognitive. The review included children and adolescents aged 5-18 and excluded

students with SEND or those with clinical conditions. Nine RCT's met their criteria, with most having low methodological rigour. Most studies scored low due to lack of blindness and follow-up. Due to the limited number of RCT's and the great heterogeneity of variables, analysis of the effect size of specific measures could only be performed on studies which observed the same variables such as mood, tension, anxiety, self-esteem and memory when comparing yoga to control groups. After an overall effect size calculation of each study, the effect sizes from similar measures were grouped together e.g mood, tension, anxiety, self-esteem and memory, results indicated that half of the studies favoured yoga and the other half favoured the control condition. The overall effect was not significant, which they attributed to the heterogeneity of the variables. Effect sizes from mood measures on the POMS calculated from Noggle et al (2012) and Khalsa et al (2012) favoured the yoga condition post intervention significantly and a significant negative effect was found for the anxiety and tension subscales. A positive effect was also found for the yoga condition post intervention on perceptions of self-esteem. Effect sizes calculated across studies for memory also favoured the yoga group post intervention. Other outcomes which could not be meta analysed due to differences in methodology and occurrence of negative effects led to them being considered separately before being compared; 3/6 studies supported benefits of yoga on psychological wellbeing, 2 found an increase in perceived stress, with one finding an increase in self-regulation and greater self-esteem.

They reported that Hagins et al (2013) did not find a specific effect for the benefit of yoga above P.E. The review indicated that often studies comparing yoga and P.E have demonstrated similar effects. They recommended that a good methodological approach would be to incorporate an active control (P.E) and a passive control

group, plus when comparing yoga with P.E it may be useful to use measures that tap into their differences such as self-awareness and mindfulness in order to see how they may be impacting on outcomes in differential ways. They concluded that the practice of yoga may increase awareness of stress initially as part of an adaptation process and recommended that future research should incorporate proximal and distal evaluation to ascertain whether this is a transient process eventually leading to the ability to better cope with stress and reduced appraisals of stress latterly. They further identify that yoga requires attentional control which children and adolescents may not have capacity for and that yoga sessions should be suitably modified. They suggest that future research should include intervention outlines for how these modifications have been managed. It is interesting to note that in the study by Hagins et al (2013), the sessions were 90 minutes long, much longer than a typical CYP yoga session, indeed expecting young people to engage and pay attention for this length of time may have impacted on their appraisal of stress and lead to researchers finding greater stress reported by the yoga condition. They further identified that studies shown to be beneficial to children and adolescents used shortened and condensed yoga sessions, so dosage may be more beneficial 'little and often' rather than longer yoga sessions less often or longer yoga sessions more regularly.

In the most recent review uncovered, Khalsa and Butzer (2016) focused on reviewing the evidence of school-based yoga studies from pre-school to high school and excluded students with special educational needs, no UK based studies were included. Twenty-two of the studies were conducted in middle and high schools with the remaining 25 taking place in elementary or pre-schools. The results were analysed and synthesised across studies regardless of setting. Results on student

self-report measures indicated positive outcomes on measures of mood, self-regulation, pro-social and anti-social behaviours, health, self-esteem and working memory capacity. The 4 qualitative studies uncovered benefits in the ability to focus, to control behaviour under stress, to enhance a sense of calm, and increase self-esteem; to facilitate greater kinaesthetic awareness, more effective mood management, stress reduction, and social cohesion; improving stress management; and focus, perseverance, and positive relationships (Miller, 2014; Finnan, 2014; Conboy 2013 and Case-Smith 2010 as cited in Khalsa & Butzer 2016). Overall, they concluded that there was an improvement on psychosocial wellbeing after a yoga intervention. For teacher-rated outcomes they found positive effects on classroom behaviour and social-emotional skills, performance impairment, concentration, mood, ability to function under pressure, hyperactivity, social skills and attention. Improvements were also detected on the physiological measures reported by a few studies, including decreased cortisol concentrations, respiratory muscle strength, heart rate variability and other measures of stress reactivity such as skin conductance responses.

Khalsa and Butzer (2016) outlined a comprehensive list of limitations and recommendations. They highlighted that some recent studies have attempted to address the critique that only self-report measures were being used by including teacher-ratings and objective measures with which to triangulate self-report measures. Once again, the methodological quality was assessed as low-moderate by this review yet it is unclear which frameworks they employed to assess methodological rigour, which the other reviews explicitly stated. Methodological issues included small sample sizes, that self-reported subjective measures were still the most common outcome, that many studies did not incorporate a control group

and only slightly more than half of the studies employed a randomised control design. Additionally, studies did not report optimal dose of the intervention with regard to frequency and duration of sessions, that fidelity of implementation measures are lacking along with distal measures. However, of more concern is that many of the positive results reported by studies do not reach statistical significance but are instead trends favouring the yoga condition. In addition, in the controlled studies, it is not uncommon that very few outcomes have shown positive changes and in some cases, no significant improvements at all have been reported. Lastly, some studies have uncovered counterintuitive increases in negative mood state and perceived stress in the yoga intervention.

In conclusion, the findings generated from the systematic reviews exploring the impact of yoga on a range of outcomes has been mixed. The reviews by Serwacki and Cook-Cottone (2012), Weaver and Darragh (2015) and Khalsa and Butzer (2016) reported overall that the evidence was generally positive and that yoga may help to support a number of cognitive, social, academic and mental health outcomes including anxiety and mood in young people. Khalsa and Butzer (2016) also reported some triangulation between self-report and teacher-report measures of mood and social-emotional and cognitive skills and physiological measures of stress. However, Ferreira-Vorkapic (2015) in their meta-analysis found that the effect sizes calculated for the yoga and control conditions on measures of mood, tension, anxiety, self-esteem and memory favoured the yoga intervention half of the time, with 2 studies reviewed suggesting an increase in perceived stress for the yoga group post intervention, though one of these studies demonstrated an increase in self-regulation and self-esteem alongside the increase in perceived stress. All of the reviews outlined a number of methodological limitations in the primary studies; most

commonly arising were lack of a control group, randomisation by cluster rather than participant, small sample sizes and lack of an implementation checklist to ensure fidelity.

1.6 The Importance of Focusing on the Impact of Yoga on Mental Health

Outcomes During Adolescence

Many studies have focused on evaluating yoga within primary school settings (Berger et al, 2009; Mendelson et al, 2010; White, 2012) with the review by Serwacki and Cook-Cottone (2012) uncovering that 10 out of the 12 studies reviewed took place within primary school settings. It may be argued that primary schools are structured in a way that makes the implementation of social-emotional and mental wellbeing interventions relatively simpler than within their secondary counterparts. Plausible reasons for this may be the smaller nature of the system, making it easier to communicate and train staff; different drivers between primary and secondary schools, whereby secondary schools are more focused on academic drivers and results; and that the number of sub-systems within a secondary school system are greater and oftentimes working toward different opposing goals which makes it more challenging to achieve staff cohesion and common values/shared aims e.g pastoral versus subject leaders etc (Greenberg, 2003). However, the need to trial and evaluate suitable mental health interventions within secondary schools in order to support individuals' transition through adolescence is considered below.

Adolescence is a period of great transition, conceptualised by Siegel (2014) as the negotiation of two key changes in a child's life 1) puberty and 2) the separation away from parents in favour of increased bonding with peers. It is often experienced as an exciting yet stressful period in one's life. An individual is impacted by the change in

hormones as they evolve through puberty and by developmental changes in the brain. This coincides with a shift in the value placed by the adolescent on peer relationships away from the reliance on familial relationships, thus necessitating a change from the comfort and security of close family bonds to the investment of time in new and dynamic relationships with peers which can lead to feelings of insecurity (Siegel, 2014). Indeed the Children's Society has found that age is one of the most strongly correlated factors of wellbeing, whereby overall wellbeing decreases with age from the age of 8-14 (The Good Childhood Report, 2012)

The following paragraph details other areas that are potentially stressful for adolescents. Collishaw (2015) highlights the role of societal changes in family life such as separation and divorce as stressful life events which may be implicated in the development of mental health conditions. Greig, Mackay, Roffey and Williams (2016) identify the added pressure on today's youth of being tested and categorised with increased expectations coupled with limited opportunities for work in the long term. They further raise the impact of social media on levels of adolescent stress, with young people gaming excessively, being open to the opinions of an increasing number of people, being exposed to photoshopped idealistic images against which they measure themselves and being at risk of online bullying. The Good Childhood Report (2019) identified that material deprivation, bullying and not feeling safe at school correlated most highly with reductions in adolescent wellbeing and both boys and girls were less happy with their appearance than in previous years, suggesting that these are areas that may be perceived as stressful and detrimental to wellbeing.

With these added stresses, changes in relationships, propensity to engage with risk-taking and sensation seeking behaviours and the impact of fluctuating and increasing hormones, adolescence sees a rise in levels of depression and the onset of a range

of other mental health difficulties such as eating disorders, deliberate self-harm and substance misuse (Aggleton, Warwick & Hurry 2000). Lastly, Greig et al (2016) consider alcohol and other substances as potentially being tried as part of the risk taking process of adolescents, prior to being used as a means of coping, which may negatively impact on mental health and on the development of healthier strategies to manage strong emotions and stress (Butzer, LoRusso, Shin & Khalsa, 2017; DoH, 2019) This highlights the critical need for intervention during adolescence to equip our young people with the tools they need to maintain positive mental health through adolescence and the transition into adulthood.

1.7 How is this Research Relevant to EP Practice?

The most recent government paper 'Mental Health and Behaviour in Schools: Advice for school staff' (2016) lists the various clinical conditions that may be encountered by schools. Greig et al (2016, p.7) draw attention to the fact that 'the role of the Educational Psychologist is reduced to one line of one page, thus failing to recognise the key position the profession holds'. This is despite the Mental Health Foundation (1999) suggestion that schools and educational psychologists (EPs) should have a role in the multi-disciplinary support system tackling the mental health problems besetting CYP. The risk with highlighting the various clinical conditions and child mental-ill health issues alongside targeted mental health interventions to schools, is that mental ill health is predominantly focused on as a within-child dilemma as opposed to a broader ecological understanding which could be tackled preventatively by universal approaches. Indeed, in a study by Vostanis et al (2013) exploring interventions used by schools to support CYP with mental health problems, schools

were found not to focus on prevention and were rarely implementing evidence-based approaches.

On the positive side, Greig et al, (2016) highlight the fact that the advice (Mental Health and Behaviour in Schools 2016) provides a framework for implementing a level of proactive systemic approaches which may facilitate a preventative strategy. These include; a committed school management team to take forward mental health issues, training for school staff on causes for concern and curriculum flexibility amongst others. There is however, little mention of how EPs embedded within school systems may support a preventative, systemic approach to mental health. Educational psychologists must use their expertise and their voices to negotiate their role in enhancing child and adolescent mental health within schools. Indeed projects such as the Emotional Literacy Support Assistants (ELSAs) who are trained and supervised by EPs to deliver and evaluate emotional literacy intervention within an attuned relationship to pupils, illustrate how EPs may help schools to deliver and embed social and emotional learning in order to help promote mental health and wellbeing. The expertise of school based EPs may be increasingly relevant as mental health statistics soar and CAMHS services become increasingly difficult to access..

Yoga is already being used by some schools within the UK to promote mental and physical wellbeing, yet our understanding of the evidence base for school-based yoga within the UK education system is unclear. Educational psychologists must keep abreast of new therapeutic possibilities in order to fulfil their role within the field of mental health and mental wellbeing. Educational psychologists are equipped with the research skills necessary to carefully evaluate interventions and are in a good position to advise parents and schools about the efficacy and cost effectiveness of interventions such as yoga to promote mental health in their students.

It is educational psychology's duty to explore and evaluate interventions that may be implemented universally across the school system (Greig et al, 2016). It is suggested that yoga may be a valuable universal intervention which could help to reduce stress, increase relaxation and mental wellbeing and support the physiological and psychological effects of a traumatic experience. This may plausibly therefore, mediate against the development of a mental health condition, help a young person to manage an existing condition or to help young people to feel more in control of their emotional and physiological responses to situations (Khalsa et al, 2012; Gard et al, 2014).

However, the preliminary evidence base for yoga interventions implemented within the school system is still within its infancy and the results are mixed. A piece of research exploring the impact of an 8 week yoga intervention on mental health outcomes delivered to adolescents within a secondary school was initially proposed. This original study would have included a control group and pre-post measures exploring stress, relaxation and wellbeing which were to be triangulated with a cortisol measure. Finally, a purposive sample of the yoga participants would have been interviewed about their experiences of the intervention to permit triangulation between quantitative and qualitative data. Unfortunately, due to school closures and the national lockdown due to Covid 19, this piece of research which hoped to add to yoga research in the UK had to be abandoned. When considering other viable methodological options, it was felt that a systematic review exploring the impact of yoga programmes delivered in secondary school settings on mental health outcomes in adolescence would be both viable and useful. This research may be helpful in supporting EPs to advise schools on whether to implement yoga to benefit mental health outcomes, which outcomes might be best supported by yoga, what the experiences of adolescent practitioners are

and how best to integrate yoga within their setting to most effectively promote mental health outcomes for young people.

1.8 The Current Systematic Review And How It Will Contribute To Knowledge

This section will explore the gaps and limitations in the systematic reviews summarised above and offer a rationale for the direction of this systematic review. In their review Serwacki and Cook-Cottone (2012) focused predominantly on elementary school aged children, likely due to the fact that the majority of studies at that time had been conducted in elementary (Primary) schools as opposed to middle or high (Secondary) schools and included a broad range of outcomes and children including those with special educational needs. Weaver and Darragh (2015) focused specifically on anxiety across a range of settings including clinical and community, seven of the 16 studies were school-based and they found that studies which were targeted more specifically to a certain anxiety condition and with a higher dosage were more likely to produce favourable results. In their review Ferreira-Vorkapic et al (2015) only included RCT's, which have been argued by some as less easily implemented within the school setting (Khalsa et al, 2015; Conboy et al, 2013). Ferreira-Vorkapic et al (2015) highlighted the difficulties with performing meta-analyses due to heterogeneity of both design and tools used to measure variables. They found that only half of the studies exploring psycho-social outcomes reported significantly positive results. They included children and adolescents in their study and there was no discussion regarding differences in implementation between elementary and high schools, precluding those with clinical conditions may mean that studies implemented at a targeted group of students were not included within this review either. Seven of the 9 studies were of secondary school aged students, suggesting that there has been an increase in this type of research since the earlier

review by Serwacki and Cook-Cottone (2012). In their review Ferreira-Vorkapic et al (2015) suggested that the developmental stage of the adolescent e.g their cognitive capacity to pay mindful attention to the moment may rationalise the negative effects of yoga on stress found by some studies and emphasised the need to include both proximal and distal measures in future research, as the negative effects may be transitory and part of the developmental trajectory of mindful practice. Khalsa and Butzer (2016) explored the evidence base for yoga across a range of school - settings and for psycho-social, cognitive and academic outcomes and synthesised data from different school phases. Their failure to separate the analysis by secondary and primary schools may conceal effects due to developmental differences. Usefully, Khalsa and Butzer review the qualitative findings from four studies, yet did not reflect upon the negative themes that arose which may have provided useful feedback in tailoring yoga interventions to students. Furthermore, only one UK based study was considered in all reviews.

The present study will focus on systematically reviewing studies focusing on the impact of secondary school-based yoga interventions on mental health outcomes to update the research since the systematic review conducted by Khalsa and Butzer (2016). In addition, the underlying mechanisms via which yoga is hypothesised to exert its effects in order to help regulate stress and other emotions as informed by the Gard et al model (2014) will be explored. The focus on secondary schools is important considering the challenges which can arise when delivering mental health interventions in these settings, and the possible differential capacities of children and adolescents to pay mindful attention during yoga.

This literature review has considered gender differences in the manifestation of mental health difficulties. In addition, adolescent females and males may be

impacted by school-based yoga interventions in different ways, with boys potentially viewing yoga as stereotypically female and therefore less willing to engage (Conboy et al 2013). It is therefore justifiable that the present research explore the current evidence base regarding the impact of yoga on mental health outcomes in adolescence with a secondary specific focus on gender differences.

Additionally, this research intends to explore the qualitative data from mixed methods and qualitative studies, including the negative aspects of student views about yoga interventions which were not included in previous reviews. This is believed to be crucial in helping to inform future school-based yoga interventions in order to maximise student attendance and the impact on mental health outcomes.

Finally, there has been much growth in the number of schools delivering yoga in the UK, with media coverage and emotive headlines such as ‘Yoga in schools has ‘profound impact’ on behaviour’ (BBC, 2020) and an explosion of training courses for delivering yoga to children and adolescents in schools. It is hoped that the research into yoga in UK schools will also have grown and that such studies will be retrieved by the present review.

The research questions to be answered by the review are outlined below:

RQ 1 What are the quantitative findings from studies exploring the impact of secondary school-based yoga interventions in adolescence?

RQ 1a Are there any gender differences in the impact a secondary school-based yoga intervention has on mental health outcomes?

RQ 2 What are the qualitative findings from studies exploring the experiences of students who engaged with secondary school-based yoga programmes on mental health?

RQ 2a Are there any gender differences in the experiences of secondary school-based yoga intervention participants?

2 Methodology

This section outlines the systematic review method employed to operationalise this study in order to answer the research questions. It outlines the stages within the systematic review process outlined by Petticrew and Roberts (2006) and proposes a slight adaptation to their model, which is more in line with the iterative phased approach proposed by Gough (2017). The researcher's philosophical stance and positionality are discussed within the description of the stages involved. Finally, the type of syntheses conducted are rationalised.

2.1 Systematic Reviews

A systematic literature review is a method of systematically searching databases according to pre-specified search terms to help minimise potential researcher bias during the selection process of research to be reviewed. A systematic review is driven by a research question in a similar way to other methods used by primary studies, yet it explores secondary data from primary studies to answer the research question. In this way, a systematic review is a method of making sense of a large body of information, to more adequately understand findings across studies and interrogate the reliability of findings and the strength of evidence that has contributed to them. Furthermore, they are a helpful way to map out uncertainty and identify where further studies are needed to address gaps in research.

Petticrew and Roberts (2006, p.2) suggest that systematic reviews 'flag up areas where spurious certainty abounds', whereby researchers think that they know more than they do but where there is relatively little evidence to support such claims.

Petticrew and Roberts (2006, p.2) emphasise the importance of reviews in critically interrogating the methods and results of primary studies which are often given

greater credence than they merit 'There are few studies that are so methodologically sound, whose results are so generaliseable and that leave us so certain that the results represent a good approximation of the "truth," that we should accept their findings outright. This is not to deny that single studies with dramatic and important results do exist; but most research can only be understood in context—and a key part of that context consists of the results of other studies that tested the same hypothesis, in similar populations'.

The increased focus on the use of research evidence to inform policy and practice decision-making in evidence informed education (Hargreaves, 1996; Nelson and Campbell, 2017) has increased the attention given to contextual and methodological limitations of research provided by single studies. Reviews of research may help address these concerns when carried out in a systematic, rigorous and transparent manner, emphasising the importance of 'how' reviews are completed. The logic of systematic reviews is that they are a form of research and thus may be improved by using appropriate and explicit methods. As the methods of systematic review have been applied to different types of research questions, there has been an increasing plurality of types of systematic review. Hence the term 'systematic review' is used to refer to a family of research approaches that are a form of secondary level analysis (secondary research) that brings together the findings of primary research to answer a research question. Systematic reviews can therefore be defined as "a review of existing research using explicit, accountable rigorous research methods" (Gough et al, 2017, p. 4).

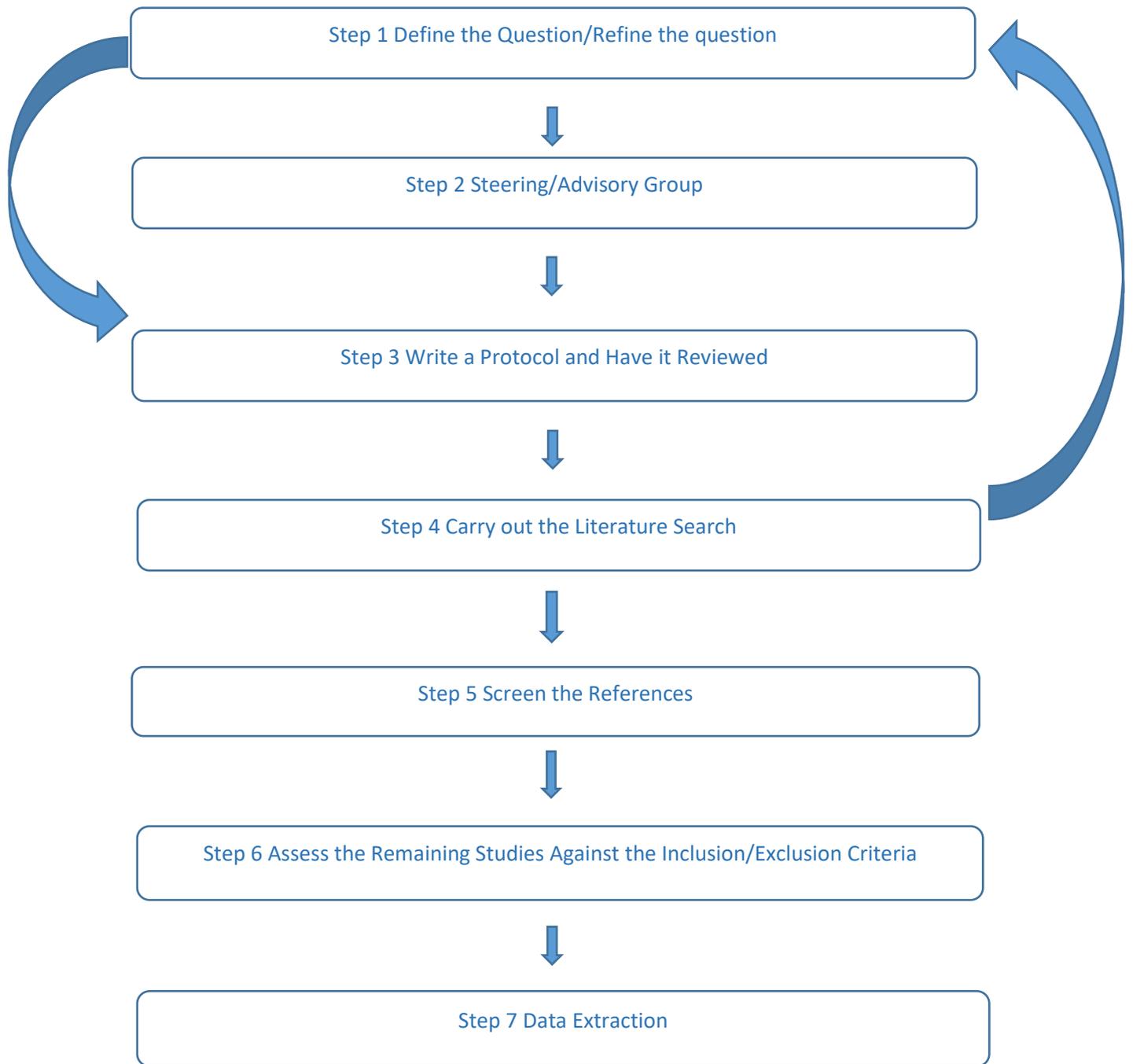
The current review adopted a mixed methodology informed by the process outlined by Moore et al (2009) who adopted novel methods for comparing the data from quantitative and qualitative research designs deductively and inductively. They

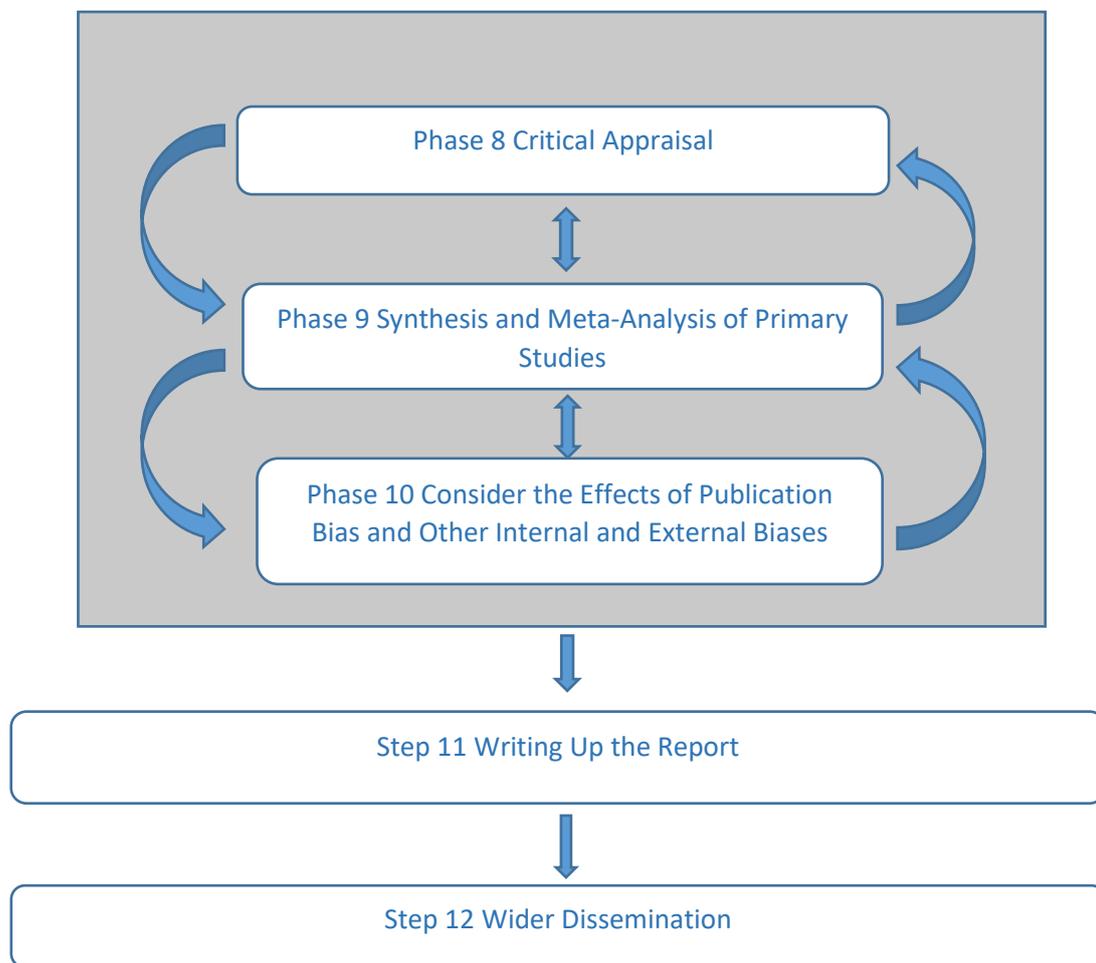
performed a statistical meta-analysis on quantitative data exploring the effectiveness of school based interventions for ADHD (deductive) and compared this with an analysis of qualitative data from studies exploring student experiences and attitudes toward these school based ADHD interventions (inductive). This review aimed to meta-analyse quantitative findings from school based yoga interventions in order to compare and contrast these findings with an inductive analysis of students' experiences of participating in a school based yoga intervention.

2.2 The Systematic Review Process

The following flowchart (Figure 2) has been adapted from the systematic review process outlined by Petticrew and Roberts (2006). The revision recognises that sometimes the primary studies retrieved may not include enough data across studies to effectively answer a research question that was provisionally devised, something which may not be evident until the literature search has begun, therefore the need to reformulate research questions according to the available data contained within the primary studies unearthed is represented by an arrow in Figure 2 which feeds back from Step 4 in the process to Step 1. In addition, the revision includes an iterative phased approach as opposed to discrete steps for working through critical appraisal, synthesis and consideration of the effects of bias. This way of synthesising the evidence from different studies in order to analyse the strength of the evidence base has been informed by the GRADE and 'weight of evidence' frameworks created by Guyatt et al (2008) for the GRADE Working Group and Gough (2007) of the EPPI-centre. These will be discussed in more detail in the sections below.

Figure 2 Flowchart to illustrate the steps involved in the Systematic Review Process





2.2.1 Step 1 Define the question

‘Clearly specify the question that the review aims to answer. If it is a review of the effects of an intervention then specify the intervention, the population, the subpopulations, outcomes of interest, the time period within which you are interested, and the cultural or other context within which the intervention is delivered’ (Petticrew and Roberts, 2006, p.284).

Please see end of Section 1 for the Research Questions

Population= Adolescents who have engaged with a universal school-based yoga intervention and those attending targeted interventions to support their mental health including young people experiencing the following conditions: anxiety, depression, ADHD and attachment difficulties.

Outcomes of interest

1) Mental health outcomes including but not limited to:

- Mental Illness
- Stress, Anxiety and Depression
- Mental Health
- Relaxation, Self-esteem, Confidence, Mindfulness, Self-acceptance and Body Awareness

Time period

2010-2020

Cultural Context

Focus on Western school systems e.g North America, Australia and European countries of less disparity to the UK school system and any UK based studies which may not have been included in previous reviews.

2.2.2 Step 2 Steering/advisory group

Time constraints and the restrictions in place due to Covid-19 did not allow for a formal advisory group to be formed and consulted. However, conversations with my research supervisors Helen Upton (Senior Educational Psychologist and qualified yoga and mindfulness teacher) and Professor Jane Hurry (Lead Academic Supervisor, with a specialist interest in the implementation of universal SEMH interventions within secondary school settings) led to considerations of how yoga and mindfulness may work in different ways for children and adolescents at different developmental stages according to brain development and maturity, differential

effects and experiences of yoga according to gender and the strength of the available evidence for interventions implemented at the targeted and universal levels. These considerations were echoed by the scoping review of the literature which gave credence to the exploration of the available research according to these concepts which informed the research questions.

There were a number of provisional research questions outlined, which were refined according to the retrieved papers and the questions that they had answered.

Plausible questions which were considered included 'Are there different effects of yoga according to the age of the young people who are exposed to it?' and 'Are targeted or universal interventions more effective?' It became clear that the first of these questions would be difficult to answer due to the often-mixed ages of the adolescent participants, plus the fact that the primary studies had not analysed the data according to age which therefore made it challenging to separate out the data according to ages. Had I had time to contact the researchers and ask for original data sets, where these were still in existence, this may have been viable. The second of these questions was dropped due to the imbalance between the number of targeted and universal studies retrieved, only four studies were implemented at a targeted level compared with 15 at the universal level and of these four, two were of low methodological rigour, making drawing conclusions from comparisons challenging.

2.2.3 Step 3 Write a protocol and have it reviewed

This was written in the form of a proposal and reviewed as part of an iterative process with my supervisors, in line with Gough's (2007) 'emergent iterative review' process. The limits regarding study type were kept broad due to the uncertainty of

the extent of the research available, particularly with regard to that based in the UK. Indeed, due to the nature of the systematic review, whereby there is uncertainty about the studies which will be retrieved by the search terms and therefore the types of study design, data or analysis used by them, it was challenging to predict what type of review this would be and what synthesis the present review would subsequently perform. Therefore, the initial protocol has been revisited and refined in an iterative and reflexive manner according to the studies retrieved. Please see Appendix 1 for the protocol with original and revised research questions outlined.

2.2.4 Philosophical Stance

In order to answer the research questions outlined above, it is necessary to reflect upon the ontological stance taken; realism coupled with a constructivist epistemology, which together form the basis of critical realism (Bhaskar 1978, 1989; Lakoff, 1987). There may be a true reality that can be measured, it may be true that yoga impacts upon the physiological and objective measures of stress (e.g cortisol) which have been correlated with mental health in a reliable way across individuals. However, for the psychological experience of stress, there may also be one true reality, yet people's interpretation of that experience is likely different and their construction of how yoga impacts upon stress and mental health will also vary from person to person, which makes it challenging to construct psychological measures which reliably assess these constructs across individuals. There are a number of standardised measures for mental health outcomes which have demonstrated reliability and validity when used to assess psychological states, which may aim to measure the true reality of that state (ontological realism), however these are often based on ratings scales and only assess responses to the questions posed within

them, thereby limiting that person to endorse only what is described, which effectively constrains what they are able to say about their experience.

To only include studies utilising quantitative measures, based on theory and deductive in nature, may risk omitting invaluable inductive data exploring an individuals' own interpretation of their experience and construction of reality (epistemological constructivism). In my opinion, including qualitative studies exploring an individual's own interpretation and construction of how yoga may have impacted on their mental health, adds rich understanding to the information that can be gleaned from quantitative research which the majority of primary studies and reviews have focused upon.

Furthermore, as a yoga practitioner and teacher I understand that certain yoga poses are said to have different physical and mental benefits, for example, seated forward folds may help to lengthen the hamstrings, stretch the back of the body and induce a physiological calming effect which interacts with the mental state of the practitioner to calm the mind. However, this pose, despite being experienced like this by the majority, may be experienced by another as claustrophobic and panic-inducing. Standardised measures analysed for this group may have demonstrated a positive effect yet the experience of that one person, despite being profound, risks being overlooked.

For the above reasons, a systematic review underpinned by a pragmatic mixed methodology whereby both quantitative and qualitative studies meeting the inclusion criteria have been included, critically appraised, assessed for bias and synthesised was adopted.

2.2.5 Step 4 The Literature Search

A planner outlined by Gough (2019) was employed to consider the primary concepts contained within the research questions to formulate search terms and synonyms (See Appendix 2). A table containing the dates and details from searches of key databases was created as recommended by Gough (2019, see Appendix 3).

The primary search terms were 'yoga AND school AND mental health AND adolescence'. Other combinations included 'yoga AND education AND mental health AND adolescence'. When relatively few studies were retrieved the search was simplified by omitting 'adolescence'. Further combinations included the term 'mental health' substituted by 'stress', 'mental illness' and 'relaxation'. The only term that generated further studies from the primary search term 'mental health' was 'relaxation'. The term 'wellbeing' was not searched due to its multifaceted nature yet also because wellbeing was often a key word which came up when searching under the terms 'mental health' and 'relaxation'.

The search strategy outlined above was used to search within each of the following databases; ASSIA, BEI EBSCO, ERIC (ProQuest), PsychArticles, Scopus, Web of Science and PsychInfo. A further search of the same terms was conducted within The International Journal of Yoga Therapy to ensure any potentially relevant studies had not been missed.

During the systematic review it became evident that contrary to the prediction that more studies may have been conducted in the UK since the previous systematic reviews were undertaken, they had not been. This led to additional searches being undertaken to consider 'grey' literature reflecting UK based research. This was attempted by searching Google using a combination of the same search terms, the

list of 'hits' was considered until articles became less related to the search terms and was exhausted. One further website (TeenYoga) was searched which had been 'snowballed' from the original Google search. Finally, one article not uncovered by the systematic review was sent by the research director (Nick Kearney) of TeenYoga.

2.2.6 Step 5 Screen the references

This step entailed examining the retrieved titles, sifting out irrelevant studies and prioritising reading relevant abstracts. See the Preferred Reporting Items for Systematic reviews and Meta-Analyses flow diagram in the results section for visual representation of the stages and numbers of studies screened (PRISMA; Moher, Liberati, Tetzlaff and Altman, 2009).

2.2.7 Step 6 Assess the remaining studies against the inclusion/exclusion criteria

Table 1 demonstrates the inclusion and exclusion criteria used to assess the studies retrieved. These criteria were formulated to best answer the research questions and respond to questions emanating from previous studies.

Table 1 Inclusion and Exclusion Criteria

Inclusion	Exclusion
The Intervention must include yoga postures	Mindfulness/meditation/breathing practices without inclusion of yoga postures
Middle, High and Secondary Schools with children from 11-19	Early Years, Elementary and Primary Schools and Universities and Colleges with children and young people younger than 11 and older than 19.
Outcomes studied must be related to mental health outcomes	Outcomes related to physical health alone.
Studies taking place between 2010 and 2020	Studies prior to 2010
Studies in European and American countries	Studies from outside of Europe and the USA.
<p>Participants attending a universal intervention</p> <p>Participants attending a targeted intervention to support their mental health, including young people with SEMH or ADHD.</p>	Participants attending targeted interventions focused on young people with other forms of SEND including ASD and learning disability.
Primary studies	Systematic reviews

During the inclusion and exclusion process it was necessary to adapt the inclusion criteria pertaining to secondary schools and colleges. In the USA adolescents attend high school until the age of 18 and college is 'higher' as opposed to 'further' education as is the case here. Additionally, USA based studies retrieved, were at times conducted in middle schools. In the USA adolescents most often in grades 5-8 attend middle school which corresponds to UK years 6-9. Therefore, in studies conducted in middle schools, the year group was further considered and where data in middle schools were collected from different year groups e.g grades 5 and 6 (UK Year 6 and 7) the studies were only included if the data could be separated by year group. The fact that in America, schools are divided into a three-tier system amongst other systemic differences between UK and USA schools adds credence to the need to consider and evaluate yoga interventions implemented in the UK education system.

2.2.8 Step 7 Data extraction

This systematic review extracted data according to PICOS; participants, intervention, comparisons, outcomes and study design, as indicated by Petticrew and Roberts (2006), Gough (2019) and by PRISMA (Moher, Liberati, Tetzlaff and Altman, 2009). Quantitative data was extracted to assess whether it met criteria for meta-analysis, this will be discussed within *Phase 9 Synthesis*. Finally, qualitative data was extracted into a table for later synthesis. Data extraction was then performed again for quantitative studies which had conducted analysis by gender. Codes were later identified by gender in order to observe whether males and females had differentially contributed to themes. Data could be identified by gender in 6/8 studies, yet 1 of these studies was based in a PRU with only male participants. In the study by Weaver, student voices were not identifiable by gender yet teacher observations

were, however teachers were only reported to make observations of male students. Therefore female data came from 4 studies and male data came from 6.

2.2.9 Phase 8 Critical appraisal

A number of frameworks used to critically appraise studies were considered prior to selection. These included Sackett's Levels of Evidence (1986) and the Oxford Centre for Evidence Based Medicine Levels of Evidence (OCEBM, 2011), informed by Sackett, both of which were employed by earlier quantitative reviews considering the impact of school-based yoga on mental health outcomes (Serwacki and Cooke-Cotton, 2012; Weaver and Darragh, 2015; Ferreira-Vorkapic, 2016). It has been argued that these frameworks more appropriately assess the rigour of clinical research compared with research within real-world social systems e.g schools (Bagshaw and Bellomo, 2008; Cook et al, 2015; Khalsa and Butzer, 2016; Kongsted and Konnerup, 2012; Weaver and Darragh, 2015) As such RCT studies, consistently receive higher ratings of rigour than a well-thought out piece of real world research sensitive to the needs and complexities of the system that it is exploring (e.g observational research Bagshaw and Bellomo, 2008; Cook et al, 2015; Kongsted and Konnerup, 2012). Educational researchers propose that our knowledge about the world may not exactly reflect the 'truth' of the world, that the research of a system effectively interacts and changes that system and that attempts to establish causality are unfruitful. This is coupled with the notion that the efficacy of a highly structured intervention or one assessed within a clinic will likely change when implemented in an educational setting or when implemented as that setting is usually operated (Biesta, 2010 and Tellings, 2017). Indeed, Weaver and Darragh (2015) recommended that research standards more suited to assessing the methodological rigour of school-based studies as opposed to clinical settings may best be used. For

these reasons, a framework was sought which allowed for well-designed non-RCT studies hypothesised to be more often implemented within an educational setting to be fairly evaluated as opposed to be given an automatically low strength of evidence rating. Thus the GRADE (Guyatt et al, 2008) approach was selected as the framework for critical appraisal of the quantitative studies reviewed.

The GRADE system was constructed by Guyatt et al (2008) to address the problems with a purely hierarchical rating system whereby RCT's are rated higher than other forms of study without scope for moving down the levels of evidence upon interrogating bias and observational are rated lower without being able to move upwards upon detecting a strong effect inexplicable by possible confounding variables. In addition, the evidence is appraised across studies by outcome as opposed to rating the evidence by individual study. Once the evidence has been rated across studies by outcome, the strength for recommending an intervention or treatment according to the quality of evidence is suggested. The GRADE system therefore categorises quality of evidence and strength of recommendations, clearly separating the two. The quality of evidence is classified as high, moderate, low and very low. The evidence from RCTs starts as 'high' but may be moved down the scale (e.g. poor quality study, reporting bias). Observational studies (e.g. cohort and case-control studies) start with a 'low quality' rating yet may be graded upwards if they meet the following conditions; the magnitude of treatment effect is very large or if all plausible biases would decrease the magnitude of an apparent treatment effect. The strength of recommendation is rated as either weak or strong (Guyat et al 2008, Ryan et al 2016). The GRADE approach is now classed as mandatory for all systematic reviews undertaken by the Oxford Centre for Evidence Based Medicine (Ryan et al, 2016) See Appendix 4 for further instructions of how to grade quality of

evidence and Appendix 5 for moving from quality of evidence to strength of recommendation.

Three frameworks were considered to assess the quality of the qualitative research retrieved. The three frameworks considered were the Weights of Evidence Framework (Gough 2007), The Standards for Reporting Qualitative Research (SRQR, O'Brien et al, 2014) and the TAPUPAS Quality Standards Framework (Social Care institute for Excellence, SCIE, Pawson et al, 2003). The decision was made to use the TAPUPAS framework mainly for pragmatic reasons. Gough (2007) in his paper demonstrated how his Weights of Evidence framework could be mapped onto the TAPUPAS framework, yet it was felt that the simplicity of the second was preferential for a first-time reviewer. The SRQR is a more thorough tool, for which time constraints prevented usability. Nonetheless, some of the SRQR standards were kept in mind to inform the critical thinking during the appraisal process. This framework was also used to assess the quantitative studies exploring gender, as the outcomes within the studies exploring gender were not the same and therefore could not be graded across studies utilising the GRADE approach. All of the qualitative and the quantitative studies exploring gender were assessed according to the following 6 generic standards: Transparency, Accuracy, Purposivity, Utility, Accessibility and Propriety and one subject specific standard 'Specificity'. See Appendix 7 for the details regarding critical appraisal using TAPUPAS.

2.2.10 Phase 9 Synthesis of the primary studies; Quantitative including Meta-Analysis

In order to minimise researcher and reporting bias by synthesising and focusing only on significant results, a strategy was employed whereby quantitative outcome measures were explored across studies and cross-referenced to the initial outcomes of interest outlined in the review protocol and inclusion criteria. The outcomes that were most frequently explored by studies regardless of whether they achieved statistical significance were selected to be included in the present quantitative synthesis to reflect the least biased interpretation of relevant findings across studies, which is a strength of systematic reviews (Petticrew & Roberts, 2006). The most frequent outcomes found across studies were: *anxiety, depression, stress and emotional regulation*.

In order to explore trends in the data and to perform the meta-analysis, the difference means from pre to proximal post-intervention measures were either extracted from studies or where possible calculated from the reported condition means. The Cohen's *d* effect sizes and the pooled standard deviations were also extracted from the data where reported (Cohen, 1988). The studies which reported such data or where the difference means, pooled standard deviation and effect sizes could be calculated for the outcomes of interest were synthesised into a pooled meta-analysis to yield a more precise estimate of the effects (Card 2016, Haidich, 2010). More information about which studies met the criteria and were included in the meta-analysis are reported in the results section. The data were entered into the Stata software package (Version 17) which generated a random effects model, yielded a pooled effect size across outcomes to generate a theta value and calculated a forest plot (Card 2016, Haidich, 2010). Separate meta-analyses by

outcome were run using the same package where there were enough studies employing measures contributing to the outcome to do so.

In order to explore the differential impact of yoga interventions by gender, studies were examined according to whether they had analysed their quantitative data using gender as a variable, due to the fact that only 4/19 studies inputted gender in their analysis of variance and employed different outcome measures, a narrative synthesis rather than a meta-analysis was employed, whereby results were reported descriptively and graphically as appropriate.

2.2.11 Qualitative Synthesis

The qualitative data extracted across studies included direct quotations from students and teachers from interviews and focus groups which were reported by the primary studies along with written feedback from open ended questions included in questionnaires also selected by the primary researchers to reflect in their reports. A thematic analysis was then conducted across studies on this qualitative data following the guidance by Braun and Clarke (2006). Codes were generated bottom up from the data with no pre-determined codes created, once the data had been coded, the codes were printed and cut out, codes were then meaningfully organised into themes at a semantic level inductively, themes were then checked against the original data which had been coded to ensure that theme fitted the original coded data as well as the code for that data. See Appendices 11 and 12 for an excerpt of the transcribed qualitative data, codes and photographic evidence of one example of how codes were sorted into sub-themes, themes and superordinate themes.

Reflexivity

It is important to discuss my positionality at this point as although codes were not pre-determined, my experience, understanding and personal biases will have impacted upon the coding and theming of data. This is particularly important when attempting to suspend pre-conceived ideas to perform a bottom-up analysis. I am a qualified yoga teacher and taught yoga prior to embarking on the doctoral program, as such I have certain beliefs that yoga is a helpful practice in becoming more aware of one's own thought processes in order to help manage emotional reactions to situations and I do credit yoga with having helped in my journey to stay mentally healthy. However, as my path on the doctorate has evolved, I have practised yoga less and have not taught for a couple of years, this has helped me to distance myself from my own beliefs somewhat, in order to be a more objective researcher. In a sense this has been a yoga practice in its own right, in that I have been able to reflect upon and observe my own thoughts about yoga rather than being immersed in my belief system.

Furthermore, to minimise possible bias and to consider my thinking in the categorising of data into codes and themes, I reflected on my analysis with a non-yoga practicing Educational Psychologist who acted as an independent coder. I took on board suggestions to reword a couple of codes to more adequately reflect the data. It is notable that we agreed on the manner in which I had themed this data, though there was some discussion about the interconnectivity between certain themes and how for the sake of parsimony and clarity it was sometimes necessary to make rational decisions regarding emerging patterns. An example of this is the self-regulation in response to others theme, which was categorised under the superordinate theme of interpersonal skills, rather than the superordinate theme of

self-regulation, this was because the participants had explicitly mentioned regulating themselves in response to other people where under the self-regulation theme they had not. In this sense themes can be organised separately yet may be interconnected, reflecting the complexity and interaction of different elements of human experience. If time had permitted, it may have been useful to have asked somebody outside of both the EP and the yoga world to co-reflect on the data, as they may have had a different conceptualisation of how the data should be organised compared with the epistemological constructions of two practicing EPs.

The table below was adapted from Braun and Clarke (2006) and outlines the stages followed during the thematic analysis.

Table 2 Phases of Thematic Analyses (Adapted from Braun and Clarke, 2006)

Phase	Description of the Process
1. Familiarising yourself with your data:	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas.
2. Generating initial codes:	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.
3. Searching for themes:	Collating codes into potential themes, gathering all data relevant to each potential theme.
4. Reviewing themes:	Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic 'map' of the analysis.
5. Defining and naming themes:	Ongoing analysis to refine the specifics of each theme, and the overall story the

analysis tells, generating clear definitions and names for each theme.

6. Producing the report:	The final opportunity for analysis. Selection of vivid, compelling extract examples, final analysis of selected extracts, relating back of the analysis to the research question and literature, producing a scholarly report of the analysis.
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A thematic diagram was produced for a visual representation of the qualitative synthesis across studies. The results from this qualitative synthesis, which focused on participants' experiences of school-based yoga interventions, were reported by theme with quotations selected to best illustrate that theme. Some themes were identified as connected under a wider umbrella termed a 'Superordinate Theme'. Furthermore, some themes could be further parsed into constituent sub-themes.

Finally, to examine possible gender differences in participant experiences of school-based yoga interventions, the codes and corresponding data were screened for whether it could be classified as male or female. Data that could be, was analysed by exploring the similarities and differences of the contributions of female and male participants according to the general themes. The identified similarities and differences were discussed with another EP to clarify their existence according to the data as opposed to the researcher's perceptions of the data.

2.2.13 Phase 10 Consider the effects of publication bias, and other internal and external biases

Steps 8-10 may be conceptualised as phases rather than discrete steps as outlined by Petticrew and Roberts (2006). The original steps outlined provided a clear systematic pathway which helped to operationalise this review. However, their representation may be an oversimplification of the review process, the reality being that these steps are more fluid iterative phases. For example, the GRADE approach explores bias as part of the critical appraisal process, where actually bias can either increase or decrease confidence in a study's level of evidence rather than using study type alone. Additionally, Gough (2007) uses a matrix, including risk of bias and strength of evidence to consider the 'weight' a study should carry in the overall synthesis. In this review, the strength of evidence and the risk of bias were considered together, they were then reflected on within the narrative syntheses to ensure that the reader is aware of how results may be impacted by both strength of evidence and risk of bias. The meta-analysis function on Stata (version 17) was employed to calculate the weight of each of the studies which were pooled into the meta-analyses, this is reported in the results section.

- In an attempt to minimise publication bias, grey literature was included, this was also useful to capture any new studies awaiting to be peer-reviewed prior to publication.
- The GRADE approach incorporates risk of bias at the critical appraisal phase of the study. Please see Appendix 6 in the results section for considerations.
- The TAPUPAS framework allows for reflection on the possible level of bias in a study, particularly within the Transparency and Accuracy standards and reflections can be found in Appendix 8

2.2.13 Step 11 Writing up the report

This review adheres to the reporting standards reflected by PRISMA (2009) 'Preferred reporting items for Systematic Reviews and Meta-Analyses' (Appendix 9) and the UCL-IOE guidance on thesis writing.

2.2.14 Step 12 Wider dissemination

This review will be written up as a doctoral thesis and made available via the university's library which may be retrieved in yoga related searches by other researchers. An executive summary will also be prepared which will be used to feedback to the Educational Psychology Service in which I work. This report will then be disseminated to secondary schools who are considering implementing yoga within their setting to help inform them of the current evidence base and to support the implementation of a yoga intervention sensitive to prior students' experiences of school-based yoga programs.

2.3 Potential ethical issues

The potential ethical issues considered in the application for Ethical Approval, which was granted by the UCL-IOE Ethics committee, focused on considering how the findings of this review might be utilised and how recommendations might be actioned which could impact on the mental health and wellbeing of young people, as opposed to directly relating to individual participants and data collection. Please see Appendix 10 for the Ethical Approval form.

3 RESULTS

3.1 Systematic Review Search Results

The Prisma Flow Diagram (Figure 3) below documents the search, screening, exclusion and record extraction process along with reasons for exclusions. Of the 19 included studies, 17 were conducted in the USA, 1 in Canada and 1 in the UK. Twelve of the studies were published after 2015. Thirteen studies employed a quantitative research design including seven randomised controlled trials (RCTs), 2 utilised a mixed-methods approach (9 of these used a P.E control) and four operationalised a qualitative study. Four of the studies explored the impact of a yoga intervention targeted to a specific population or delivered within an alternative provision (Frank, Bose and Schrobenhauser-Clonan, 2014; Powell and Potter, 2010; Fishbein, Miller, Herman-Stahl, Williams, Lavery et al, 2015 and Weaver, 2019), the remaining 15 focused on the impact of a universally delivered yoga intervention in mainstream schools. The total number of participants across studies is 1,761. The reviewed studies and key data extracted using PICOS (Population, Intervention, Comparison/Control, Outcomes and Study Type; Higgins and Green, 2013) is outlined in Table 3



Figure 3 PRISMA Flow Diagram Documenting Search, Screening, Exclusion and Extraction Process

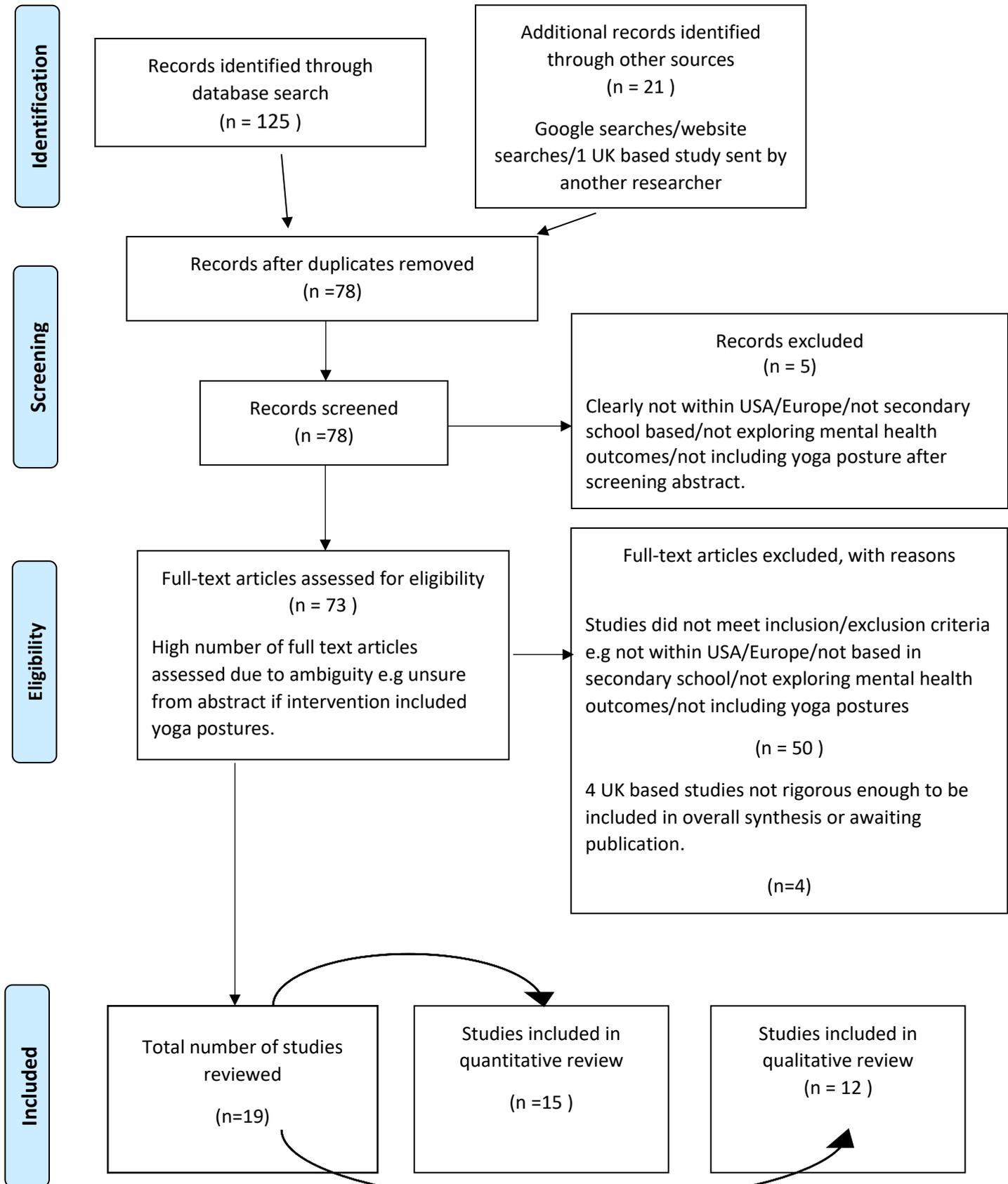


Table 3 Reviewed Studies

No	Study	Aims and RQ's Sample Size	Study Design Level of implementation	Intervention/Comparison	Outcomes	Analysis/Results
1	*Beets and Mitchell 2010 USA	To consider the effect of yoga on stress, depressive symptoms, and health-related quality of life (HRQL) in adolescents. n=55 Year 10 pupils	2x2 crossover design Universal	4 or 5, 45 minute yoga sessions per week P.E control	Depression Stress Health Related Quality of Life (Kinder Lebensqualit at fragebogen-adolescent form)	T-tests and chi-square conducted to assess group equivalence, no differences found Pharmacokinetic commands in stata 9.2 to explore treatment and carryover effects. Treatment effects were observed for measures of stress and the overall HRQL including physical health, general feelings, and self-esteem KINDL subscales.
2	*Berezowski, Gilham and Robinson 2017 Canada	To explore the experiences of students participating in the yoga 11 curriculum To uncover and understand any potential perceived benefits of the yoga 11 curriculum 3 Year 12 girls and 1 Year 13 boy n=4	Qualitative-narrative inquiry Universal	Yoga 11 curriculum-USA government approved P.E equivalent (asana and breathing, philosophy /ethics and mindful practice)	Semi structured interviews	Inductive coding and theming, a posteriori application of yoga framework <ul style="list-style-type: none"> ●Overall, students were able to express and give examples of how yoga made them feel happier, kinder and more self-confident. ●The male student demonstrated a change in his opinion from perceiving yoga as a 'girls' activity. ●A female student was able to articulate the importance of thinking about how her thoughts and actions can affect others ●The researchers noted themes arising using the eightfold path as a deductive framework.

Table 3 Reviewed Studies

No	Study	Aims and RQ's Sample Size	Study Design Level of implementation	Intervention/Comparison	Outcomes	Analysis/Results
3	*Bergen-Cico, Razza and Timmins 2015 USA	The aims of the study were to (a.) evaluate the impact of a mindful yoga program on self-regulation among emerging adolescents and (b.) to assess the feasibility of integrating mindful yoga into sixth grade English Language Arts (ELA) curriculum. Intervention (n = 72) Control (n = 70) N=142 N=60 written feedback Universal	Non RCT Universal	Yokids Yoga as part of regular class routine 3 times per week for 4 min at the beginning of class. (English classes)	Self-regulation	T-tests to explore baseline differences. ANOVA to explore condition and time effects. Followed up by post-hoc tests of simple effects ●The intervention and control groups significantly differed in total regulation and difference varied over time. ●Within the intervention group, total regulation and long-term but not short-term regulation showed a significant increase from pre-post. ●Within the control, long-term regulation demonstrated an overall significant decrease from pre-post.
4	*Butzer, LoRusso, Shin and Khalsa 2017 USA	To evaluate whether school-based yoga reduces the emotional and behavioral risk factors for substance use, as well as whether yoga promotes protective factors for adolescent substance use. To examine whether yoga prevents substance use initiation and/or reduces substance use frequency, To evaluate potential long-term	RCT Universal	A 32-session version of the Kripalu Yoga in the Schools P.E control	Mood Stress Impulsivity Emotion Regulation Substance abuse willingness use	Analysis of baseline measures across groups using t-tests and ANOVA ANCOVAs to examine pre-post intervention effects Post-hoc ANOVAs to explore gender and condition. ●Participants in the control group reported a significantly greater willingness to smoke cigarettes at time 2 than participants in the yoga group. ●None of the other risk/protective factors were significantly different between groups post intervention, including mood, stress, impulsivity, emotional self-regulation, or willingness to use beer, marijuana, or other drugs

Table 3 Reviewed Studies

No	Study	Aims and RQ's Sample Size	Study Design Level of implementation	Intervention/Comparison	Outcomes	Analysis/Results
		effects of yoga on adolescent substance use by conducting 6-month and 1-year post-intervention assessments. Intervention n=117 Control n=94 n=211				
5	*Butzer, LoRusso, Windsor, Riley, Frame, Khalsa and Conboy 2017 USA	To specifically investigate student perceptions of school based yoga To explore the perceptions of middle school aged children as previous studies have explored those of elementary and high school students To directly compare quantitative and qualitative results emerging from the same sample. n=16 Year 8 students	Qualitative Universal	32-class version of the Kripalu Yoga in the Schools (KYIS) curriculum, 35 min long and occurred 1–2 times per week.	Semi-structured Interviews conducted 6-weeks post yoga program Open q's posed prior to directed q's Emergent and pre-determined themes arising.	A mixed inductive and deductive design incorporating open and direct questions and inductive (emergent, E) versus pre-determined (PD) themes Themes: (1) <i>Usability</i> (a) <i>Yoga vs. Physical Education (E)</i> (b) <i>Yoga Classes (PD)</i> (c) <i>Application of Yoga Outside of Class (PD)</i> (d) <i>Yoga and Athletics (E)</i> (e) <i>Breathing Techniques (PD)</i> (f) <i>Postures (PD)</i> (2) <i>Effect</i> (a) <i>Relaxation</i> (b) <i>Stress-Mood (PD)</i> (c) <i>Social Interaction (E)</i> (d) <i>Self-Regulation of Behavior (PD):</i> (e) <i>Sleep (PD)</i>

Table 3 Reviewed Studies

No	Study	Aims and RQ's Sample Size	Study Design Level of implementation	Intervention/Comparison	Outcomes	Analysis/Results
						(f) <i>Substance Use (PD)</i> (g) <i>Academic Performance (PD)</i>
6	*Cox, Ulrich-French, Howe and Cole 2017 USA	<p>The aims of the study were:</p> <p>(a) to test for change in body image variables during participation in a 12-week, yoga-based high school physical education (PE) pilot curriculum</p> <p>(b) to examine how change in trait body surveillance relates to change in physical self-worth and body appreciation.</p> <p>c) to test the concurrent relationships between state mindfulness of the body and state body surveillance during yoga classes.</p> <p>Years 10 to 13 n =43 Control 23 p's 13 female 20 in yoga intervention 18 female Universal</p>	Non RCT.	Anusara one 40 min and one 75 min class per week P.E control	Trait and State Body Surveillance Physical self-worth State Engagement State Mindfulness	<p>Baseline t-tests performed to consider differences between groups.</p> <p>Pillai's trace Omnibus test conducted, age removed as covariate as nonsignificant, gender included as covariate. Post-hoc analysis on female data using Pillai's trace.</p> <p>Multi-level modelling analysis to explore correlation between measures of mindfulness and body surveillance.</p> <ul style="list-style-type: none"> ● A Significant moderate time X condition effect for body surveillance ● A nonsignificant minimal effect for time x condition for physical self-worth ● No significant effect for body appreciation ● Physical worth increased and body surveillance decreased for the yoga class but not P.E.
7	Dariotis, Cluxton-Keller, Mirabal-Beltran,	<p>How do youth define stress?</p> <p>In what ways, if any, was a mindful yoga</p>	Qualitative focus groups	16-week mindful yoga	6 focus groups N=2-6 per group	Thematic analysis, inductive emergent themes, independently coded by 3 coders

Table 3 Reviewed Studies

No	Study	Aims and RQ's Sample Size	Study Design Level of implementation	Intervention/Comparison	Outcomes	Analysis/Results
	Gould, Greenberg and Mendelson (2017) USA	intervention helpful to youth during stress experiences? n = 22 middle school students 10 males Year 6 and 7. Universal		intervention 2 x per week	semi-structured	Three themes emerged: (1) youth conflated stress with negative emotions; (2) peer and family conflicts were common stressors (3) youth reported improved impulse control and emotional regulation following intervention.
8	Felver, Butzer, Olson, Smith and Khalsa 2015 USA	To directly compare the acute effects of participating in a single yoga class versus a single standard physical education (PE) class on student mood. Does yoga offer any unique benefits for student psychosocial well-being compared to standard school curricula such as physical education (PE) class? n=47 high school students (Year 10 and 11) Universal	Within-subjects controlled study	Kripalu Yoga in the Schools (KYIS) P.E control	Mood Affect	Pre-post class difference scores calculated, normally distributed data compared using paired samples t-tests, non-normally distributed data compared using Wilcoxon signed rank tests. Between conditions ● Students reported improved mood and affect after yoga relative to PE; only the Brunel Mood Scale (BRUMS) Anger, Depression and Fatigue variables were statistically significant ● Small effect sizes for BRUMS Anger and Depression mood variables, and a nearly medium effect size for BRUMS Fatigue mood variable Within condition ● After participating in yoga, students had statistically significant improvements in five mood variables ● Only two mood variables showed significant improvement after P.E. ● Effect sizes were consistently larger for yoga students.

Table 3 Reviewed Studies

No	Study	Aims and RQ's Sample Size	Study Design Level of implementation	Intervention/Comparison	Outcomes	Analysis/Results
9	*Fishbein, Miller, Herman-Stahl, Williams, Lavery et al 2015 USA	To test whether a mindful yoga intervention had beneficial impact on substance use and its psychological and psychophysiological correlates in adolescents. Years 10-13 alternative provision e.g PRU n= 85 (40 control, 45 intervention) Targeted.	Pilot RCT	Yoga intervention or care-as-usual control (classes as usual) 20-session mindful yoga curriculum 3 times a week, for 50 min, over 7 weeks	Readiness for physical activity Blood pressure Emotional Dysregulation Response to Stress Mindfulness Mood Drug Use Behavior Assessment The Stop-Change Task (SCT: Logan and Burkell 1986), Heart rate, Heart rate variability and skin conductance	Multi-level modelling exploring group by time interaction was used with age and gender as covariates. Participants displaying extreme scores were excluded as were those who had not attended the minimum pre-determined dosage of 8 sessions. Marginally significant (at $p < .10$) differences in change over time found for alcohol use, social skills, and stress reactivity as measured by skin conductance Group by time interaction indicated a decrease in the frequency of alcohol use for the yoga group. No differences between the control and yoga conditions on levels of mindfulness, emotional regulation, or involuntary engagement coping.
10	*Frank, Bose and Schobenhauser-Clonan 2014 USA	The effectiveness of a yoga-based social-emotional wellness program on adolescent emotional distress, prosocial behavior and attitudes toward violence. n= 49 year 11, 12 and 13 students in a PRU equivalent.	Non-RCT	Transformative Life Skills (TLS) 12 lessons (Tutor time control)	Affect Psychological distress and Psychiatric disorders Responses to Stress Interpersonal forgiving	Paired t-tests on pre post intervention measures, corrected for multiple pairwise comparisons using Benjamini-Hochberg correction. Cohen's d calculated for effect sizes. Yoga students showed significant reductions in anxiety, depression, and global psychological distress., rumination, intrusive thoughts,

Table 3 Reviewed Studies

No	Study	Aims and RQ's Sample Size	Study Design Level of implementation	Intervention/Comparison	Outcomes	Analysis/Results
		Targeted			and vengeance.	physical arousal, and emotional arousal. Yoga students significantly less likely to endorse revenge-motivation orientations in response to interpersonal transgressions and overall less hostility than comparison. No statistically significant pre to post differences on measures of positive affect, negative affect, or somatization found.
11	*Frank, Kohler, Peal and Bose 2017 USA	The effectiveness of a yoga-based social-emotional wellness programme on indicators of emotional distress, prosocial behavior, and school functioning. N=159 Year 7 and Year 10 students Universal	RCT	Transformative Life Skills 30 mins 3-4 days per week in tutor time Control: Tutor time as usual	Implementation checklists School Engagement Student Academic and Behavioral Records Attitude toward violence Affect Responses to stress Somatisation Children's Intervention Ratings	Independent t-tests to establish baseline equivalence ANCOVA's conducted for each outcome using grade, race, gender and pre-test scores as covariates. Benjamini-Hochberg correction used to correct for multiple pairwise comparisons. Cohen's d used to calculate effect size between conditions. ●Results of ANCOVA analyses revealed no significant differences on measures of student suspensions or student grades in English or Maths. ● Students in the intervention condition had significantly fewer unexcused absences fewer detentions and higher levels of school engagement ●No significant differences on attitudes toward violence, affect, primary coping, emotion regulation, problem solving or emotional expression

Table 3 Reviewed Studies

No	Study	Aims and RQ's Sample Size	Study Design Level of implementation	Intervention/Comparison	Outcomes	Analysis/Results
						<ul style="list-style-type: none"> ●Statistically significant effects found on measures of secondary coping, positive thinking and cognitive restructuring ●No significant effect found on measures of acceptance or somatization.
12	*Haden, Daly and Hagins 2014 USA	The effects of yoga on children's emotional and behavioural functioning when compared with physical education (PE) classes. Year 7 n=30 Universal	RCT	12 week Ashtanga-based yoga intervention. (based on the 8 limbed path of yoga and sequencing postures into a flow) 1.5 hour sessions, 3 times per week Home practice encouraged (P.E control)	Affect Child Behaviour Self-reported aggressive behaviours Self-worth Student engagement	Repeated measures ANOVA for within subject by group interaction effects on all outcomes. <ul style="list-style-type: none"> ● No significant interaction between time and condition for positive affect, global self-worth, self-reported reactive aggression, proactive aggression or externalising and internalising problems, ●A significant interaction between time and group on negative affect emerged ● No main effect for group on negative affect at time-point one or time-point two , inspection of the means revealed a crossover-effect, such that negative affect increased for the yoga condition and decreased for the PE condition. ●Negative affect at time-point two was greater for the yoga condition than the PE condition, while at time-point one it was greater for the PE condition than the yoga condition
13	*Khalsa, Hickey-Schultz, Cohen, Steiner	To conduct a preliminary study to identify which psychological constructs may be useful to include in	RCT	11 weeks of 2-3, 30-40 min, yoga - sessions per week	Self-reported behaviour Mood Resilience	<ul style="list-style-type: none"> ●Baseline differences analysed yet type of analysis unclear. ●Difference score means calculated and t-tests conducted to explore change in means between groups. Effect sizes calculate,

Table 3 Reviewed Studies

No	Study	Aims and RQ's Sample Size	Study Design Level of implementation	Intervention/Comparison	Outcomes	Analysis/Results
	and Cope 2012 USA	future research evaluating the impact of yoga on mental health constructs Years 12 and 13 n= 109 Universal		Yoga Ed P.E Control	Stress Positive attitude	method described yet type not reported. <ul style="list-style-type: none"> ●Secondary analyses included correlational analysis between yoga class attendance and measures (e.g dosage effect) ●Observations and student comments reported by yoga instructors were reported. ●Three variables showed statistically significant change in the yoga group compared with the control group. ● The yoga group had an insignificant increase in resilience whereas the control group significantly decreased. ● The yoga group decreased whereas the control group increased on measures of anger control. ● Statistically significant between-group difference over time in the Fatigue/Inertia subscale of the POMS-SF, yoga group showed a strong decrease whereas the control group showed a statistically insignificant increase. ●There were no statistically significant changes on other measures. ●Students reported they felt more relaxed, made improvements in dealing with stress, mood and affect
14	*Noggle, Steiner,	To explore the impact of a yoga intervention on mental health	Pilot RCT	A Kripalu-based yoga program	Primary outcome measures for	<ul style="list-style-type: none"> ● Baseline equivalence tests (method not reported) did not find any differences. Data combined for

Table 3 Reviewed Studies

No	Study	Aims and RQ's Sample Size	Study Design Level of implementation	Intervention/Comparison	Outcomes	Analysis/Results
	Minami, Khalsa 2012 USA	when implemented within the curriculum, using measures designed for normative populations rather than clinical which included aspects of positive and negative mental health. To explore impact of yoga on self-regulatory skills which may support mental health. n=51 Years 12 and 13 students Universal		2 - 3 times per week for 10 weeks. (P.E as usual)	mood and affect Additional measures; stress and positive attitudes. Secondary measures of self-regulatory skills included resilience, anger expression and mindfulness. P.E Control	grade, gender and class, ANCOVA's conducted between groups with baseline as the covariate on end program scores. ● Reported open ended comments of the Yoga Evaluation Questionnaire and proportion of favourable, neutral, unfavourable comments given. ● Total mood disturbance (global POMS-SF score) significantly better following yoga compared with PE-as usual ● Scores on Tension-Anxiety subscale significantly less in the yoga group compared with PE. ● Trend favouring yoga on Confusion-Bewilderment subscale. ● Depression-Dejection, Anger-Hostility, Vigor-Activity, and Fatigue-Inertia no significant results. ● Negative affect significantly better for yoga group than PE. ● Positive affect was not significantly different between groups. ● Secondary outcomes were not significant. ● There were no statistically significant differences on any other measures.
15	*Powell and Potter 2010	Feasibility and value of providing an intervention involving massage and yoga in a PRU for boys experiencing	Pre- post test uncontrolled	The Self Discovery Program, 12, 1 hr sessions	Behavioural profiles Strengths and Difficulties	● Independent and paired t-tests according to parametric assumptions to analyse pre-post change scores.

Table 3 Reviewed Studies

No	Study	Aims and RQ's Sample Size	Study Design Level of implementation	Intervention/Comparison	Outcomes	Analysis/Results
	UK	emotional and behavioural difficulties. n=23 boys Targeted	.	over 2 terms Self and peer hand massage. Simple hatha yoga postures, breathing and meditation Unqualified yoga teachers	Questionnaire Qualitative data from open-ended questions	<ul style="list-style-type: none"> ● Questionnaires given post intervention to explore pupil views, yet students with literacy difficulties were unable to complete and the researcher conducted informal interviews to gain views. Qualitative analysis not formally described. ● The total mean behavioural score indicated overall improvement in behaviour. ● Improvements in self-confidence, social confidence and communication with peers and teachers and self-control and attention span. ● The pro-social score also indicated improvement ● None of the SDQ scores were of statistical significance with the exception of hyperactivity rated by teachers. ● Most pupils reported enjoying the program, however yoga the most disliked activity from program.
16	*Ramadoss and Bose 2010 USA	School-based pilot study evaluating the effects of an 18-week yoga program on student perceived stress and self-control 15 classrooms, 472 students for yoga 3 classrooms, 85 students as control n=557	Non -RCT	15 minute sessions of TLS 1, 2, 3 or 5 classes per week for 18 weeks No intervention control	Stress Self-control	<ul style="list-style-type: none"> ● T-tests and ANOVA to explore within group differences. ● Small but statistically significant downward trend in stress for intervention group, not control. ● Statistically significant reductions in stress scores were noted for those receiving five classes as compared to three, two, or one class(es) per week.

Table 3 Reviewed Studies

No	Study	Aims and RQ's Sample Size	Study Design Level of implementation	Intervention/Comparison	Outcomes	Analysis/Results
		Universal				<ul style="list-style-type: none"> ● No significant change in self-control scores within intervention group from pre-test to post-test ● Nonsignificant observed decrease in self-control pre-post-for control ● No significant differences between the number of classes delivered and post-test self-control scores
17	Schulte 2016 USA	<p>Potential of yoga to increase positive psychological health, decrease depressive symptoms and increase flourishing in students.</p> <p>RQ 1: How do high school students experience yoga embedded in a PE class?</p> <p>RQ 2: What does their experience reveal about adolescent positive psychological health?</p> <p>RQ 3: What does their experience reveal about the impact of yoga on adolescent depressive symptoms?</p> <p>RQ 4: What does their experience reveal about the impact of yoga on adolescent flourishing?</p> <p>n=65 year 12/13 students</p>	Mixed methods RCT and qualitative	<p>12 weeks/1 hr yoga intervention (non manualised)</p> <p>P.E Control</p>	<p>Depression</p> <p>Flourishing Scale for Teens</p> <p>Positive Psychological constructs</p> <p>Qualitative Open-ended questions about wellness and experience in PE/yoga</p> <p>5 yoga students interviewed</p>	<p>Quantitative</p> <p>Baseline analysis using chi-square tests to explore equivalence</p> <p>ANCOVAs with group as IV, DV mean score at time 2 or 3 and covariate as baseline</p> <p>MANCOVA explored all measures at once at different times with IV as group and covariate as baseline scores.</p> <p>No significant differences were found except yoga had significantly less depressive symptoms than control 5 months after the intervention.</p> <p>Qualitative</p> <p>Mayring's qualitative content analysis, deductive approach. Yoga instructor was also the researcher and no independent coder used.</p> <p>Written responses (themes)</p> <p>Attitude toward yoga</p> <p>Transfer of Skills</p> <p>Breathing/Physical Use/Mental Use of techniques</p>

Table 3 Reviewed Studies

No	Study	Aims and RQ's Sample Size	Study Design Level of implementation	Intervention/Comparison	Outcomes	Analysis/Results
		Universal				Interviews (themes) Effects of yoga, attitude toward yoga, and transfer of skills to life.
18	Wang and Hagins 2016 USA	Student responses to the introduction of a yoga program within several middle and high schools RQ's Do urban youth perceive benefits from learning and practicing yoga? And if so, in what specific ways?" n=74 Universal	Qualitative	1 year yoga program Manualised yoga curriculum 1-2 classes/week	6 semi-structured focus groups Focus groups 20-40 mins conducted by somebody not affiliated with the research	Constant comparative method. Deductive, preliminary provisional codes until grounded by relevant quotes. Four main mental health benefits emerged: self-regulation, mindfulness, reduction of stress and increased self-esteem. Physical benefits included physical conditioning, energy levels, and increased athletic performance.
19	Weaver 2019 USA	Effects of an 8-week school-based yoga program on measures of anxiety, stress and self-regulation. RQ's As compared to an 8-week structured exercise control group, does an 8-week school-based yoga program improve anxiety symptoms and self-efficacy for self-regulation of anxiety among youth? 2. What are the mediators and moderators that	Mixed methods RCT and group/individual interviews.	Move-Into-Learning for Anxiety program (MIL-A). 8 weeks, 1/week for 45 mins. P.E Control	Self and teacher reports for Behaviour Anxiety Stress Self and Teacher reports for Self-Regulation Sensory Profile 2 group interviews	No statistically significant results reported despite some trends favouring yoga condition on some subscales. Interview questions designed to explore constructs examined by the quantitative arm of study. Two coders employed with inter-rater reliability kappa level of 0.94. Qualitative case study approach. Themes: (1) General Perceived Benefits, (2) Behavioural Impacts (3) Strengthening Self-Regulation and (4) Identifying Program Needs and Limitations.

Table 3 Reviewed Studies

No	Study	Aims and RQ's Sample Size	Study Design Level of implementation	Intervention/Comparison	Outcomes	Analysis/Results
		<p>explain the relationship between yoga and the dependent variables? 3. As compared to an 8-week structured exercise control group, does an 8-week school-based yoga program improve adaptive skills and sensory responses among youth demonstrating anxiety symptoms?</p> <p>n=19</p> <p>Exploration of participants' thoughts and perceptions of intervention.</p> <p>What are the participant's perspectives on how an 8-week school-based yoga program affected internalizing/externalizing behavior, self-regulation, adaptive skills, and sensory processing?</p> <p>n=9</p> <p>Targeted</p>			<p>post intervention</p> <p>4 teacher interviews</p> <p>Semi-structured</p>	

*Studies which did not explicitly state Research Questions

3.2 Quantitative Review

This section reviews the quantitative data extracted from the retrieved studies for the four most commonly occurring outcomes measured across studies, the critical appraisal of the quality of studies by outcome and the statistical meta-analysis of findings across studies and by outcome where the data permitted separate analyses. Finally, the last segment details studies which explored the interaction between gender and condition on quantified mental health outcomes.

3.2.1 Critical Appraisal

The outcomes used by studies were tallied up across studies to consider the frequency with which they were tested and to reduce the tendency to focus in on significant findings and to consider replicability and reliability across studies. The four outcomes related to mental health most frequently tested were: Anxiety, Depression, Stress and Emotion Regulation and the evidence contributing to those outcomes was critically appraised across studies. The evidence contributing to each outcome was graded from low to very low and as such only weak recommendations for the practice of yoga above and beyond that of PE to improve these four outcomes can be afforded. The table outlining the decisions arrived at via the critical appraisal process using the GRADE approach can be found in Appendix 5.6.

3.2.2 Overall Statistical Meta-Analysis

Eight of the 15 studies which generated quantitative findings explored the outcomes of stress, anxiety, depression and emotion regulation (Beets, 2010; Butzer, 2017; Felver, 2015; Frank, 2017; Khalsa, 2012; Noggle, 2012; Schulte, 2015; and Weaver, 2019). Six of these reported difference means, pooled standard deviations and

effect sizes (Cohen's d) or reported the relevant data from which to calculate these statistics and were included in the statistical meta-analyses. The Weaver (2019) study was excluded from the statistical meta-analyses due to small sample size ($n=18$) and failure to report effect sizes. Noggle et al (2012) only reported effect sizes and difference means for statistically significant findings, therefore only data for the anxiety outcome, for which the effect size was reported was included in the overall analysis. The measures used and data processed for the meta-analysis from these studies are reported in Table 4.

The meta-analysis would not run with the data from the Beets et al study (2010), the random effects model failed to converge whilst this study was included in the data set, likely because of the difference in the effect size found by this study (Cohen's $d=0.89$) compared to the modest effect sizes reported by the rest of the studies, for this reason the data from the Beets study was excluded from the meta-analysis which was run on the remaining studies. Twenty measures from 6 studies were included overall. Two of the included studies investigating the outcome of stress employed the Perceived Stress Scale. Five studies explored anxiety with 2 studies employing the BRUMS tension subscale, 2 utilising the POMS tension/anxiety subscale, 1 employing the CDC somatisation subscale and 1 using the BASC-2 anxiety, somatisation and internalising subscales and the Test Anxiety Scale. Four studies investigated the outcome of depression, with 2 studies employing the BRUMS depression subscale measure, 1 using the CES-D measure, 1 using the BASC-2 depression subscale and 1 using the POMS depression subscale. Two studies explored emotion regulation with one study using a measure of emotion expression, one using emotion regulation, one a measure of emotion self-control and one study employing a measure of emotion dysregulation.

Table 4 to show studies, outcome measures, sample and effect sizes for processing in the overall meta-analysis

Author, Year	Outcome Code	Outcome	Outcome Measure	Sample Size (n)	Mean Difference	Pooled Standard Deviation	Standard Error	Cohen's d (d)
Butzer et al., 2017	1	Stress	Perceived Stress Scale	207	-0.54	2.7	0.19	0.2
Butzer et al., 2017	2	Anxiety	BRUMS Tension	207	-0.49	0.41	0.03	0.2
Butzer et al., 2017	3	Depression	BRUMS Depression	207	-0.33	2.12	0.15	0
Butzer et al., 2017	4	Emotion Regulation	Emotional Self-Control	207	0.52	6.61	0.46	0
Butzer et al., 2017	5	Emotion Regulation	Emotion Dysregulation	207	-0.14	8.44	0.59	0
Felver et al., 2015	2	Anxiety	BRUMS Tension	47	-0.25	1.56	0.16	0.16
Felver et al., 2015	3	Depression	BRUMS Depression	47	-0.31	1.15	0.12	0.27

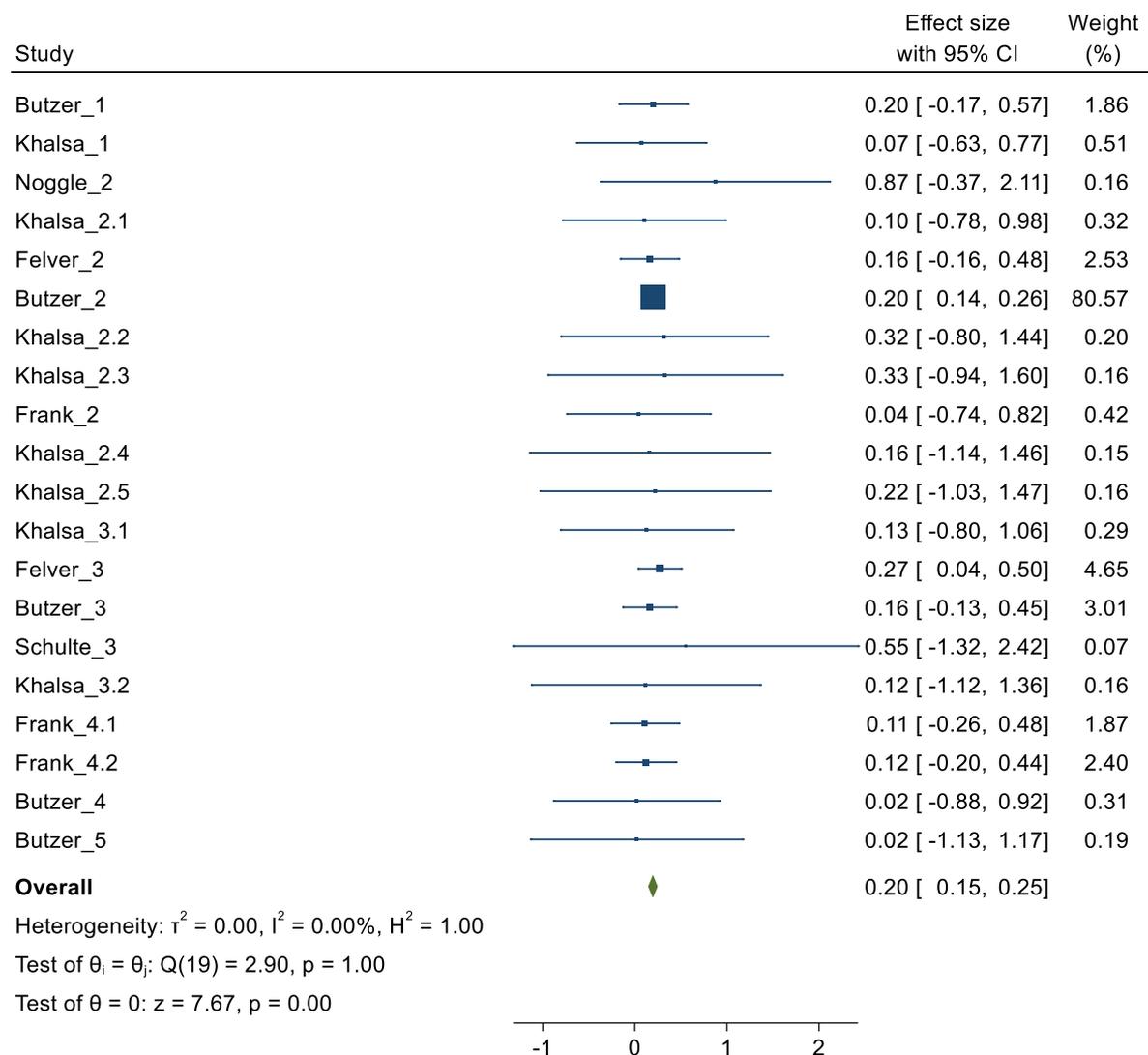
Frank et al., 2017	2	Anxiety	CBC	159	0.2	5	0.4	0.04
Frank et al., 2017	4.1	Emotion Regulation	Emotion Expression	159	0.26	2.36	0.19	0.11
Frank et al., 2017	4.2	Emotion Regulation	Emotion Regulation	159	0.25	2.08	0.16	0.12
Khalsa et al., 2012	1	Stress	Perceived Stress Scale	100	-0.25	3.57	0.36	0.07
Khalsa et al., 2012	2.1	Anxiety	POMS Tension/Anxiety	100	-0.45	4.5	0.45	0.1
Khalsa et al., 2012	2.2	Anxiety	BASC-2 Anxiety	100	-1.83	5.72	0.57	0.32
Khalsa et al., 2012	2.3	Anxiety	Test Anxiety	100	-2.14	6.48	0.65	0.33
Khalsa et al., 2012	2.4	Anxiety/Somatization	BASC-2 Somatization	100	1.06	6.63	0.66	0.16

Khalsa et al., 2012	2.5	Anxiety/Depression	BASC-2 Internalising	100	-1.4	6.36	0.64	0.22
Khalsa et al., 2012	3.1	Depression	POMS Depression	100	-0.62	4.77	0.48	0.13
Khalsa et al., 2012	3.2	Depression	BASC-2 Depression	100	-0.76	6.33	0.63	0.12
Noggle et al., 2012	2	Anxiety	POMS Tension/Anxiety	40	-3.9	4.48	0.63	0.87
Schulte, 2017	3	Depression	CES-D	65	-4.48	7.7	0.96	0.55

The sample size ($k=20$) was used to calculate the standard errors, weighted (r) effect sizes and confidence intervals which are graphically displayed in the forest plot below (Figure 4). The overall estimated pooled effect size generated using the meta-analysis function on Stata (Version 17) was non-significant at $\theta = 0.20$ with tests of heterogeneity being met ($T^2=0.00$, $I^2=0.00\%$, $H^2=1.00$). However other researchers have outlined the following classification system to guide interpretations of the magnitude of effect sizes, stating that 0.20 may be considered a small effect size, 0.50 a moderate effect size and 0.80 a large effect size (Cohen, 1988; Dancey & Reidy, 2017; Goldberg et al., 2019). This interpretation may suggest that yoga

operationalised universally in the school system, has at best, a small impact on these mental health outcomes over and above that of PE which the majority of studies used as a comparison control.

Figure 4 Forest Plot to demonstrate effect sizes, weight of studies, confidence intervals and overall estimated pooled effect size (θ)



Random-effects REML model

3.2.3 Synthesis of Quantitative Data by Outcome

Anxiety: RCT's

Five RCT's explored the impact of a school-based yoga intervention on measures of anxiety. Four utilised a P.E-as-usual control (Butzer et al, 2017, n=211; Khalsa, 2012, n=109; Noggle et al, 2012, n= 51; Weaver, 2015, n=19) and Frank et al (2017, n=159) used a 'treatment-as-usual' control during tutor time, yet did not find a statistically significant improvement on the somatisation subscale of the Child Behaviour Checklist. Only Noggle et al (2012) demonstrated that anxiety as measured by the tension-anxiety Subscale (POMS-SF) significantly differed pre-post intervention, specifically scores decreased for the yoga group yet increased for the P.E control ($F=10.76$, $p= 0.0020$, $d=0.87$). This finding was not however replicated by Khalsa et al (2012) who used the same measure.

Anxiety: Non RCT's

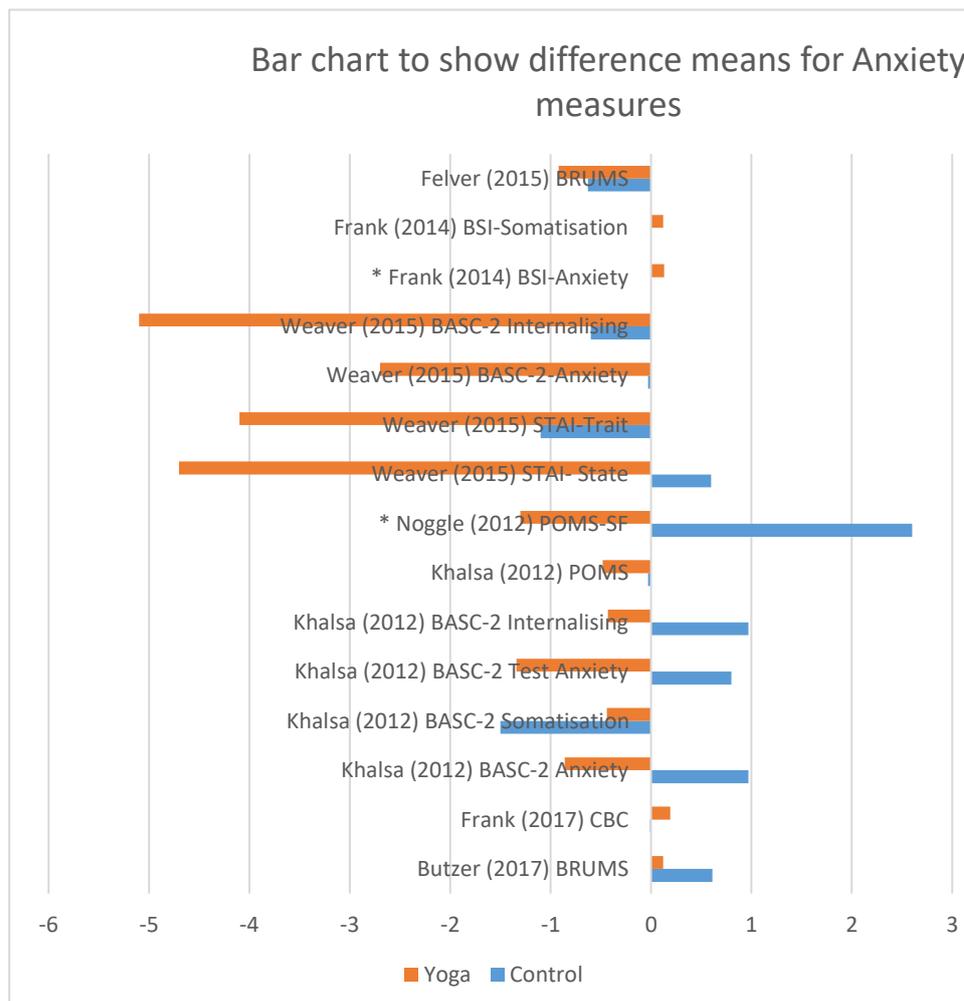
Two non-RCT's explored the impact of a school-based yoga intervention on measures of anxiety. Felver et al (2015) did not find any statistically significant findings using the tension subscale of the BRUMS, whereas Frank et al (2014, n=49) who implemented a targeted, uncontrolled study within an alternative provision found statistically significant improvements on measures of student anxiety (Brief Symptom Inventory-18, $T=-3.51$, $p=0.01$, Cohen's $d = 0.23$), but not for somatisation.

Difference Means

Anxiety scores decreased from pre-post yoga intervention on 11/15 measures. In studies which used controls decreases were found on 7/13 measures, though three

of these decreases were negligible. Noggle et al (2012) found a decrease in the yoga condition for anxiety as measured by the POMS-SF and an increase in the control condition. Khalsa et al (2012) found decreases in scores for the yoga condition on the BASC-2 Anxiety, Internalising and Test Anxiety subscales, whilst finding a simultaneous increase for the control group. In addition, when both conditions showed a reduction in anxiety, the decrease in the yoga group was of a greater magnitude than for the control condition, except for on the BASC-2 somatisation subscale in the Khalsa (2012) study. Furthermore, in the Butzer (2017) study, where both conditions demonstrated an increase in anxiety, this was greater for the control. See Figure 4 for a visual representation of the difference mean score.

Figure 5



Positive values indicate an increase in anxiety pre-post intervention, negative values indicate a decrease.

Statistical Meta-Analysis for the Outcome of Anxiety

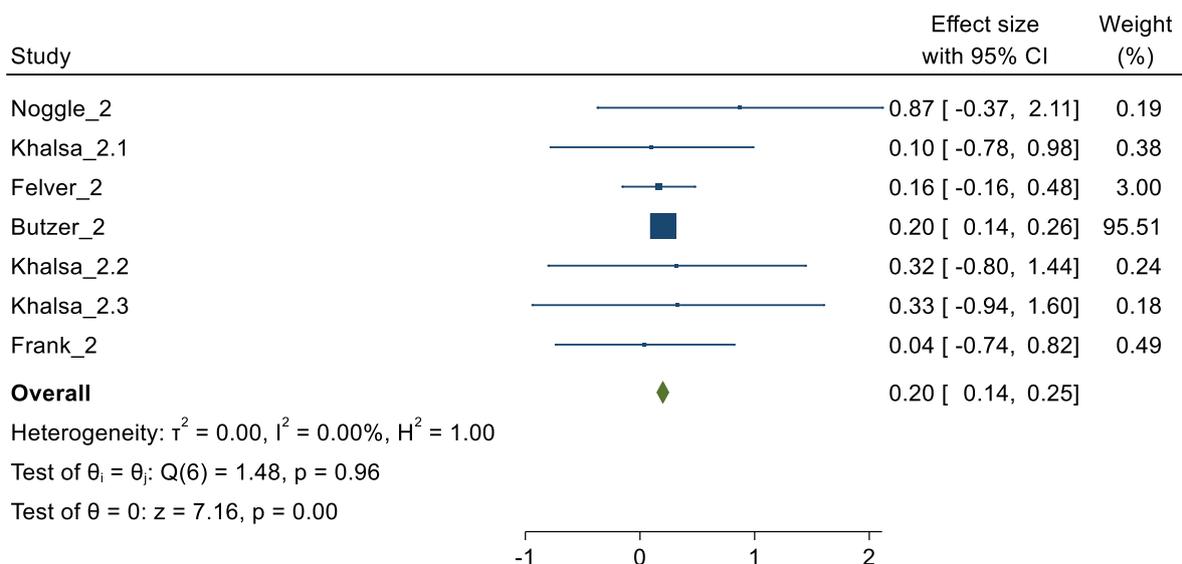
A separate meta-analysis was run using Stata (Version 17) on the anxiety measures reflected in Table 5. Somatisation and the internalising measures employed by the Khalsa (2012) study were not included within this secondary meta-analysis under the anxiety specific heading as they tap slightly different constructs.

Table 5 to show studies, outcome measures, sample and effect sizes for processing in the overall meta-analysis

Author, Year	Outcome Code	Outcome	Outcome Measure	Sample Size (n)	Mean Difference	Pooled Standard Deviation	Standard Error	Cohen's d (d)
Butzer et al., 2017	2	Anxiety	BRUMS Tension	207	-0.49	0.41	0.03	0.2
Felver et al., 2015	2	Anxiety	BRUMS Tension	47	-0.25	1.56	0.16	0.16
Frank et al., 2017	2	Anxiety	CBC	159	0.2	5	0.4	0.04
Khalsa et al., 2012	2.1	Anxiety	POMS Tension/Anxiety	100	-0.45	4.5	0.45	0.1
Khalsa et al., 2012	2.2	Anxiety	BASC-2 Anxiety	100	-1.83	5.72	0.57	0.32
Khalsa et al., 2012	2.3	Anxiety	Test Anxiety	100	-2.14	6.48	0.65	0.33
Noggle et al., 2012	2	Anxiety	POMS Tension/Anxiety	40	-3.9	4.48	0.63	0.87

Five studies involving seven measurements were included in this sub-analysis and their standard errors, weighted (*r*) effect sizes and confidence intervals are graphically displayed in the forest plot below (Figure 6). The overall estimated pooled effect size generated using the meta-analysis function on Stata (Version 17) was non-significant at $\theta = 0.20$ with tests of heterogeneity being met ($T^2=0.00$, $I^2=0.00\%$, $H^2=1.00$). However other researchers have outlined the following classification system to guide interpretations of the magnitude of effect sizes, stating that 0.20 may be considered a small effect size, 0.50 a moderate effect size and 0.80 a large effect size (Cohen, 1988; Dancey & Reidy, 2017; Goldberg et al., 2019). This interpretation may suggest that yoga operationalised universally in the school system, has at best, a small impact on the mental health outcome of anxiety when compared with a PE control.

Figure 6 Forest Plot to show effect sizes, weight of studies and confidence intervals and overall estimated pooled effect size (θ)



Random-effects REML model

Depression: RCT's

Five RCT's explored the impact of a school-based yoga intervention on measures of depression, all of which used a P.E control (Beets and Mitchell, 2010, n= 55; Butzer et al, 2017, n=211; Khalsa et al, 2012, n=109; Noggle et al, 2012, n= 51; Schulte, 2015, n=65). No significant findings were reported on self-report measures of depression pre to immediately post-intervention. Schulte (2015) using the CES-D scale (measure of depression), found a non-significant trend favouring yoga on proximal post-measures and a statistically significant difference decrease for the yoga group for measures taken 5 months post-yoga intervention ($F(1, 51) = 7.50, p = .01$). In divergence, Butzer et al (2017) did not find any significant differences between groups for distal measures taken at 6 and 12 months post-intervention.

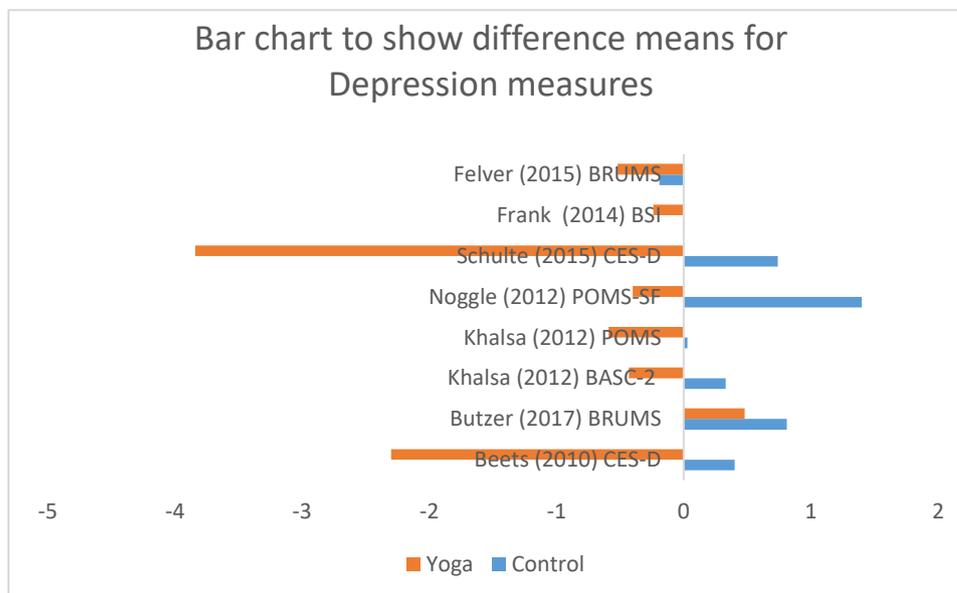
Depression: Non RCT's

Two non-RCT's explored the impact of a school-based yoga intervention on measures of depression. Frank et al (2014, n=49) in their uncontrolled study, found statistically significant improvements on depression as measured by the BSI-Depression ($T=-3.29, p=0,01, \text{Cohen's } d= 0.32$). Felver et al (2015, n=47) in their unrandomized controlled, pre-post-test study, also found statistically significant differences between the yoga and P.E control conditions on depression as measured by the BRUMS Depression subscale ($Z=2.20, p=0.028, \text{Cohen's } d=0.27$).

Difference Means Across Studies

Decreases in the difference means pre-post intervention were found on 7/8 measures for the yoga condition, whereas increases in 6/7 depression measures were found pre-post for the control condition. Beets and Mitchell (2010), Khalsa et al (2012), Noggle et al (2012) and Schulte (2015) showed trends in the data which suggested that scores for measures of depression decreased for the yoga condition yet increased for the control condition. In their study Felver (2015) found a decrease in depression for both conditions, yet the decrease was of larger magnitude for the yoga condition than control. Conversely, Butzer et al (2017) found increases in depression across both conditions pre-post-intervention, however the increase was larger for the control condition than for the yoga condition. See Figure 6 for a visual representation of the difference mean scores

Figure 7



Positive values indicate an increase in anxiety pre-post intervention, negative values indicate a decrease.

Statistical Meta-Analysis for the Outcome of Depression

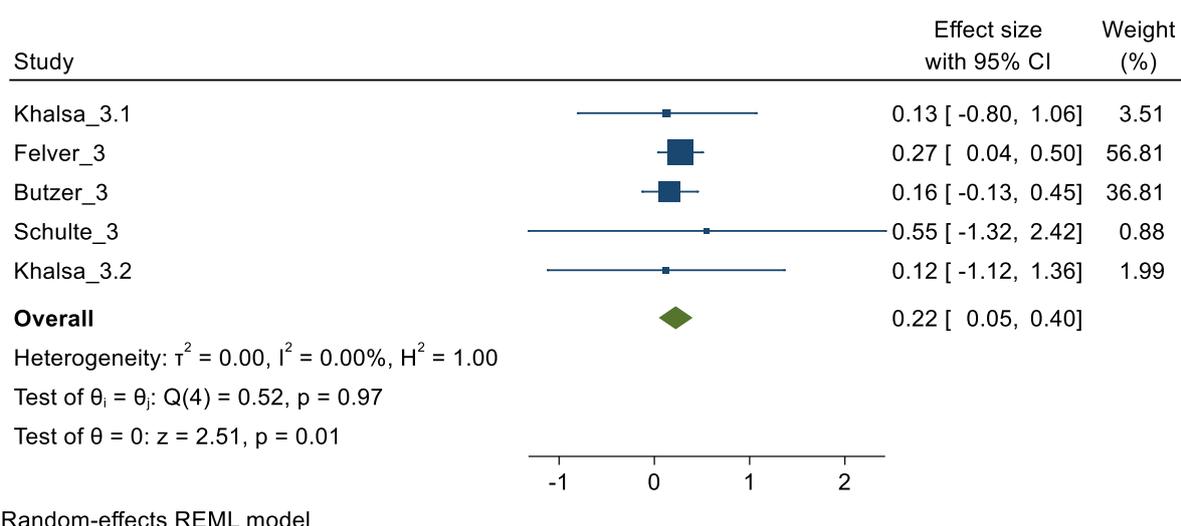
A separate meta-analysis was run using Stata (Version 17) on the depression measures reflected in Table 6.

Table 6 to show studies, outcome measures, sample and effect sizes for processing in the overall meta-analysis

Author, Year	Outcome Code	Outcome	Outcome Measure	Sample Size (n)	Mean Difference	Pooled Standard Deviation	Standard Error	Cohen's d (d)
Butzer et al., 2017	3	Depression	BRUMS Depression	207	-0.33	2.12	0.15	0
Felver et al., 2015	3	Depression	BRUMS Depression	47	-0.31	1.15	0.12	0.27
Khalsa et al., 2012	3.1	Depression	POMS Depression	100	-0.62	4.77	0.48	0.13
Khalsa et al., 2012	3.2	Depression	BASC-2 Depression	100	-0.76	6.33	0.63	0.12
Schulte, 2017	3	Depression	CES-D	65	-4.48	7.7	0.96	0.55

Four studies involving five measurements were included in this sub-analysis and their standard errors, weighted (*r*) effect sizes and confidence intervals are graphically displayed in the forest plot below (Figure 7). The overall estimated pooled effect size generated using the meta-analysis function on Stata (Version 17) was non-significant at $\theta = 0.22$ with tests of heterogeneity being met ($T^2=0.00$, $I^2=0.00\%$, $H^2=1.00$). However other researchers have outlined the following classification system to guide interpretations of the magnitude of effect sizes, stating that 0.20 may be considered a small effect size, 0.50 a moderate effect size and 0.80 a large effect size (Cohen, 1988; Dancey & Reidy, 2017; Goldberg et al., 2019). This interpretation may suggest that yoga operationalised universally in the school system, has at best, a small impact on the mental health outcome of depression when directly compared with PE.

Figure 7



Stress: RCT's

Six RCT's exploring the impact of a school-based yoga intervention on measures of stress were identified, five used a PE control (Beets and Mitchell, 2010, n= 55; Butzer et al, 2017, n=211; Fishbein et al, 2015, n=85; Khalsa et al, 2012, n=109; Noggle et al, 2012, n= 51; Weaver, 2015, n=19). Fishbein et al (2015) used a 'classes-as-usual' control. The majority of RCT's employed the self-report Perceived Stress Scale to measure stress pre-post-intervention (PSS, Beets and Mitchell, 2010; Butzer et al, 2017; Khalsa et al, 2012; Noggle et al, 2012 and Weaver, 2015). The only significant difference in scores on the PSS was found by Beets and Mitchell (2010), who found decreases in both conditions yet scores for the yoga group decreased significantly more ($F=4.12$, $p=0.022$, Cohens- $d= -0.60$). Fishbein et al (2015) explored skin conductance tests (physiological markers of stress) which showed group differences in change over time approaching significance (interaction $b =0.29$, $p=0.10$). Specifically, the control group showed a decrease in skin conductance in response to stress approaching significance, whilst the yoga group showed a slight non-significant increase pre-post-intervention. Measures of greater skin conductance at times of threat are linked to an increased ability to direct cognitive resources to a plan of action.

Stress: Non RCT's

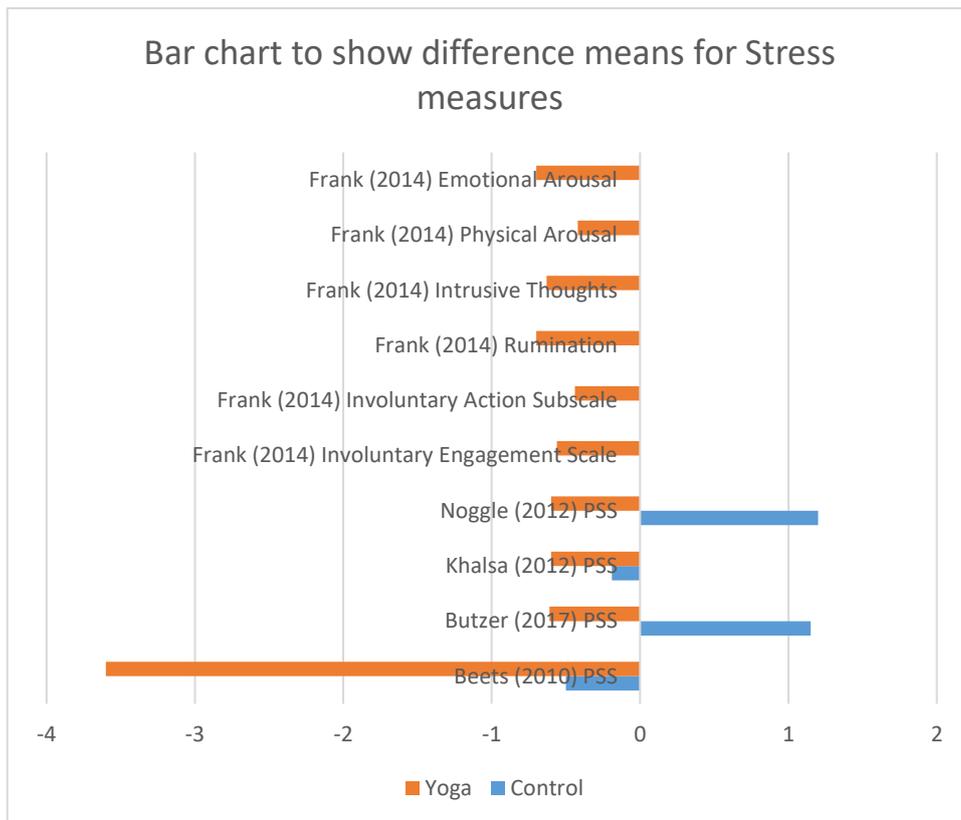
Frank et al (2014, n=49) found statistically significant improvements across all measures of stress employed: Involuntary engagement Scale ($T=-7.23$, $p=0.01$, $d= -0.56$); Involuntary Action Subscale ($T=-3.78$, $p=0.01$, $d=-0.44$); Rumination ($T=-8.18$, $p=0.01$, $d=-0.70$); Intrusive Thoughts ($T=-5.91$, $p=0.01$, $d=-0.63$); Physiological Arousal ($T=-4.49$, $p=0.01$, $d=-0.42$) and Emotional Arousal ($T=-6.88$, $p=0.01$, $d=-$

0.70). Ramadoss and Bose (2010; n=557) found a significant decrease in stress as measured by the PSS for the yoga condition ($F=3.124$, $p=0.002$) but not for the control condition when analysing scores within groups, they did not however perform more robust between-group analyses.

Difference Means Across Studies

Difference means are displayed in Figure 6 below. Difference means could not be computed for the Fishbein (2015) or Weaver (2019) studies as they did not report the means pre-post-intervention, they have therefore been omitted from this part of the synthesis. Decreases were found across all possible 10 measures for the yoga condition. Four studies employed a control and the controls demonstrated decreases 2/4 times on the PSS and increases in stress the other 2 times. Khalsa et al (2012) and Beets and Mitchell (2010) found stress to decrease for both conditions yet the magnitude of the effect was greater for the yoga condition. The data from Noggle et al (2012) and Butzer (2017) suggest that stress decreased for the intervention group yet increased for the control despite not reaching significance. A meta-analysis could not be conducted for this outcome due to the fact that the Weaver (2019) and Noggle et al (2012) studies failed to report effect sizes and that the effect size data from the Beets and Mitchell (2010) study failed to converge with the random effects model, leaving the sample size too small to run the analysis.

Figure 7



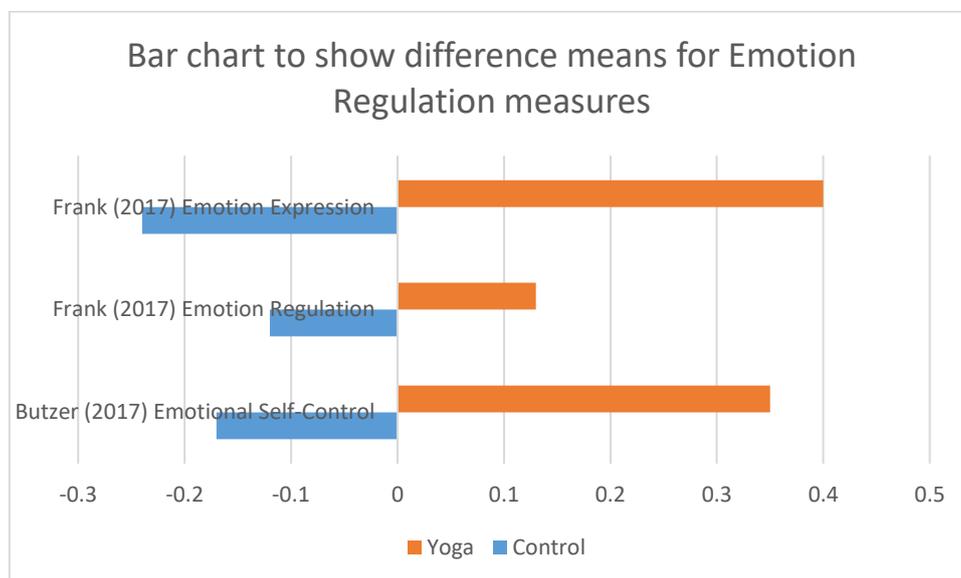
Emotion Regulation: RCT's

Three RCT's exploring the impact of a school-based yoga intervention on measures of emotion regulation were identified (Butzer et al 2017; n=211, Fishbein et al 2015; n=85, Frank et al 2017; n=159). Butzer et al (2017) employed a P.E control, whereas Fishbein et al (2015) and Frank et al (2017) used a 'classes-as-usual' control. Only Frank et al (2017) reported significant increases in emotion regulation for the yoga condition compared with the control pre-post-intervention, with a small effect size ($F=4.90$, $p=0.05$, $d=0.12$).

Difference Means Across Studies

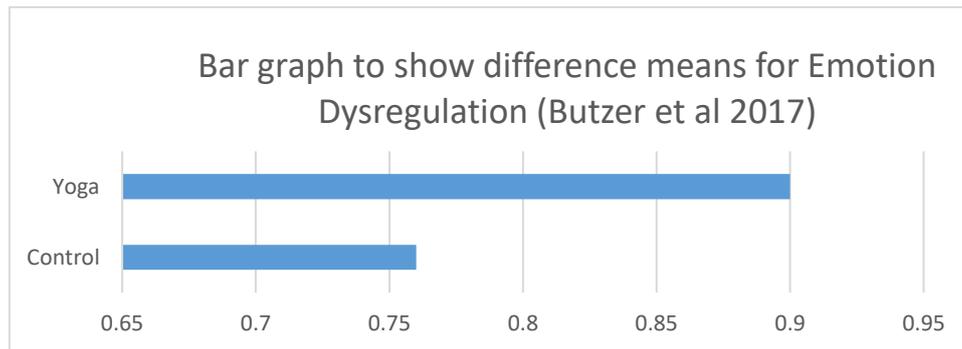
Difference means could not be computed for the Fishbein (2015) study as they did not report the means pre-post intervention. The measures used in the Frank (2017) study along with one of the measures in the Butzer et al (2017) study found increases in emotion regulation for the yoga group and are plotted in Figure 7. Butzer et al (2017) also measured emotion dysregulation and these findings are plotted in Figure 8. As can be seen, all measures indicated an increase in emotion regulation pre-post the yoga intervention, with the control demonstrating a decrease. In contrast, evidence from the Butzer et al (2017) research demonstrated an increase in emotion dysregulation for both conditions and a larger increase for yoga compared with the control.

Figure 8



Positive figures indicate an increase in emotion regulation and negative numbers indicate a decrease in emotion regulation pre-post condition.

Figure 9



Positive figures indicate an increase in emotion dysregulation

A meta-analysis was not run for this outcome due to the small number of studies which contributed to it.

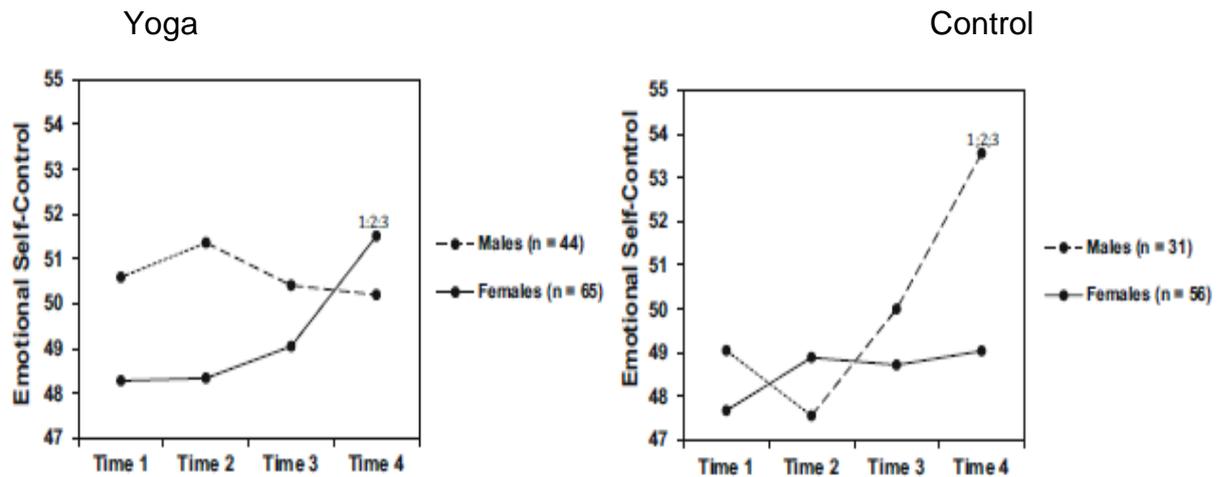
3.2.4 Critical Appraisal of Studies Exploring Impact of Yoga by Gender

Out of 19 retrieved studies only four analysed the differential effects of yoga by gender (Cox et al, 2017; Frank et al, 2017; Khalsa et al, 2012 and Butzer et al, 2017). Heterogeneity of outcome measures across studies negated the use of the GRADE framework for critical appraisal and the TAPUPAS framework was employed (SCIE, Pawson et al, 2003). Butzer et al's (2017) study appears affected by sampling bias, only 211 students out of 407 eligible students signed up for the research with 63% female and 37% male and students had no volition over whether they engaged with the yoga intervention or not. Butzer et al (2017) suggested that fewer males may have signed up for the study, wrongly conceiving that this would bypass participation in yoga. The Cox (2017) study had a small sample size with group selection possibly leading to 'best case' data e.g use of a predominantly female, low ability, P.E class. Khalsa's study (2012) may have introduced statistical bias, whereby corrections were not made for multiple pairwise comparisons. Please see Appendix 5.7 for the full critical appraisal.

3.2.5 Synthesis of Quantitative Data Exploring Gender Differences

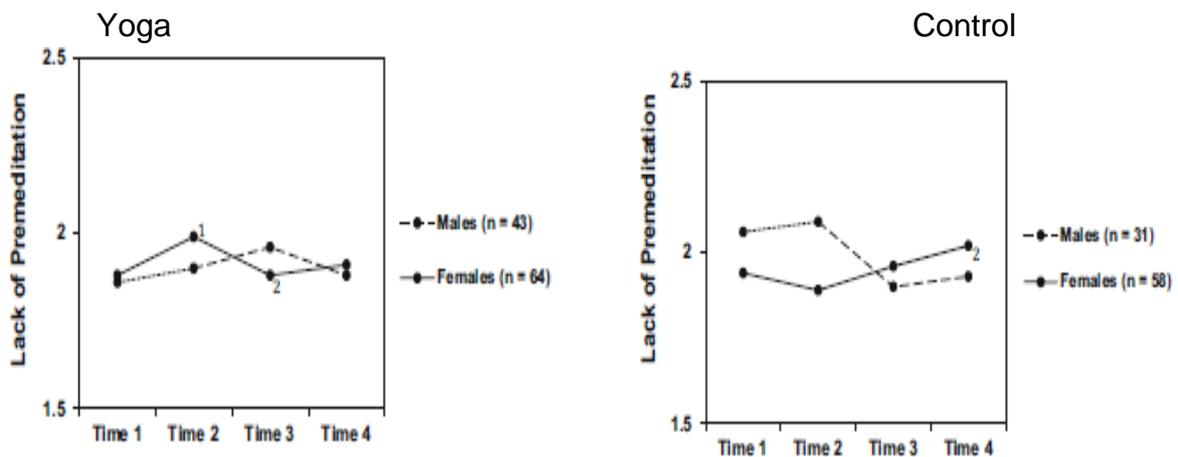
In Butzer et al's RCT (2017, yoga n=117, P.E n=94) a few baseline differences according to gender were found, these included: Males scored significantly higher than females at baseline on present time perspective (a measure of one's orientation to the present rather than the future), willingness to drink beer, negative urgency (tendency to act impulsively due to negative emotions), sensation seeking and positive urgency (the tendency to act rashly due to positive emotions). In their primary analysis of end program scores (Time point 2, 1 week post-intervention) using ANCOVAS with baseline scores as the covariate, only one significant difference was found between the yoga and P.E groups on willingness to smoke, whereby the control demonstrated greater willingness to smoke cigarettes than the yoga condition (M = 3.44, SD = 1.06, M = 3.21, SD = 0.76, respectively). Post-hoc analysis were conducted to examine change between group and gender across all four time points. Butzer et al (2017) reported a significant 3-way interaction between time, condition and gender (partial eta squared = 0.02) on emotional self-control. Post-hoc separate analyses conducted for males and females showed that females demonstrated significant increases in emotional self-control over time in the yoga group, whereas males did not. In contrast, males in the P.E control reported significant increases in emotional self-control over time, whereas females did not. See Figure 10

Figure 10 taken from Butzer et al (2017)



A significant 3-way condition x time x gender interaction was also found for the lack of premeditation (tendency to act without thinking) subscale of the UPPS-P Impulsive Behavior Scale (Lynam et al, 2006, partial eta squared =0.02). Post-hoc analyses revealed that females in the yoga group reported a statistically significant increase in lack of premeditation between time 1 and time 2, then a significant decrease from time 2 to time 3, whereas males in the yoga group did not report significant changes. Conversely, females in the control group reported a significant increase in lack of premeditation between time 2 versus time 4 whereas males did not. It appears that the yoga condition had an impact on impulsivity in females yet not males. See Figure 11.

Figure 11 taken from Butzer et al (2017)



Cox et al (2017, yoga n=20, P.E n=23) explored the impact of yoga on measures of body surveillance (the degree to which somebody thinks about their body from an observer's perspective) physical self-worth (positive feelings about their physical self) and body appreciation (respect of, acceptance of and satisfaction with their body). Univariate (ANOVA) tests found a significant moderate time by condition effect for body surveillance ($F(1, 40) = 9.26, p = .004, \eta^2 = .19$), a non-significant time by condition effect for physical self-worth ($F(1,40) = 2.70, p = .108, \eta^2 = .06$) and no effect for body self-worth. Specifically, body surveillance declined and physical self-worth increased for the yoga group but not for the P.E comparison. The researchers' decided to run the analyses again to explore the female data in isolation, ANOVA results indicated a significant time x condition effect for body surveillance ($F(1, 29) = 6.51, p = .016, \eta^2 = .18$). In addition, they observed a minimal yet significant time x condition effect for physical self-worth $F(1, 29) = 4.42, p = .044, \eta^2 = .13$ of greater magnitude for the female only data than for the sample as a whole. There were still no significant effects found for body appreciation.

The other two studies did not report any significant effects by gender on measures including; school engagement, student academic and behavioural measures, attitudes towards violence, positive and negative affect, responses to stress, somatisation, self-report of personality, mood, resilience, perceived stress and positive psychological attitudes (Frank et al, 2017 and Khalsa et al, 2012).

3.3 Qualitative Review

Out of the 19 retrieved studies, 12 reported a qualitative component, 4 employed a purely qualitative design (Berezewski et al, 2017; Butzer et al, 2017; Dariotis et al, 2016 and Wang & Hagins, 2016), 2 had a qualitative strand within a mixed methods paradigm (Schulte, 2015 and Weaver, 2015) and the remaining 6 (Bergen-Cico et al, 2015; Frank et al, 2017; Khalsa et al, 2012; Noggle et al, 2012; Powell and Potter, 2010 and Ramadoss and Bose 2010) focused predominantly on quantitative data yet incorporated an open-ended written question within a questionnaire or other similar approach which yielded some qualitative data.

TAPUPAS (SCIE, Pawson et al, 2003) was again used to critically appraise the qualitative studies to be synthesised, via the critical appraisal process decisions were made in relation to which studies should be included within the synthesis and which should be ruled out. The studies by Frank et al (2017), Khalsa et al (2012), Ramadoss and Bose (2010) and Schulte (2015) were excluded for not adequately meeting one of the Transparency, Accuracy, Purposivity or Utility strands. See Appendix 5.7 for detailed critical appraisal.

A thematic analysis was conducted across studies on the qualitative data extracted from the studies following the guidance outlined in section 2.2.12 by Braun and Clarke (2006). Codes were generated bottom-up from the data with no pre-determined codes created, these were then organised by meaning into subthemes, themes and superordinate themes. See Appendices 5.9 and 5.10 for an excerpt of the transcribed qualitative data and codes and for photographic evidence of one example of the sorting of codes into sub-themes, themes and superordinate themes. A thematic diagram was created to display the themes that emerged (Figure 10). Once themed the codes were then identified by gender in order to compare and contrast female and male data. Only 6/8 qualitative studies identified participants by gender (Berezowski et al, 2017; Butzer et al, 2017; Dariotis et al, 2016; Noggle et al, 2012; Powell and Potter, 2010 and Weaver, 2015), one of these only captured the views of male participants (Powell & Potter, 2010) and one included teacher views which identified teachers talking about male students, yet did not identify student views by gender (Weaver, 2015). Figure 12 provides a visual representation of how the qualitative data diverged and converged for males and females. The rest of this section outlines the emerging themes in general and discusses any gender differences which arose .

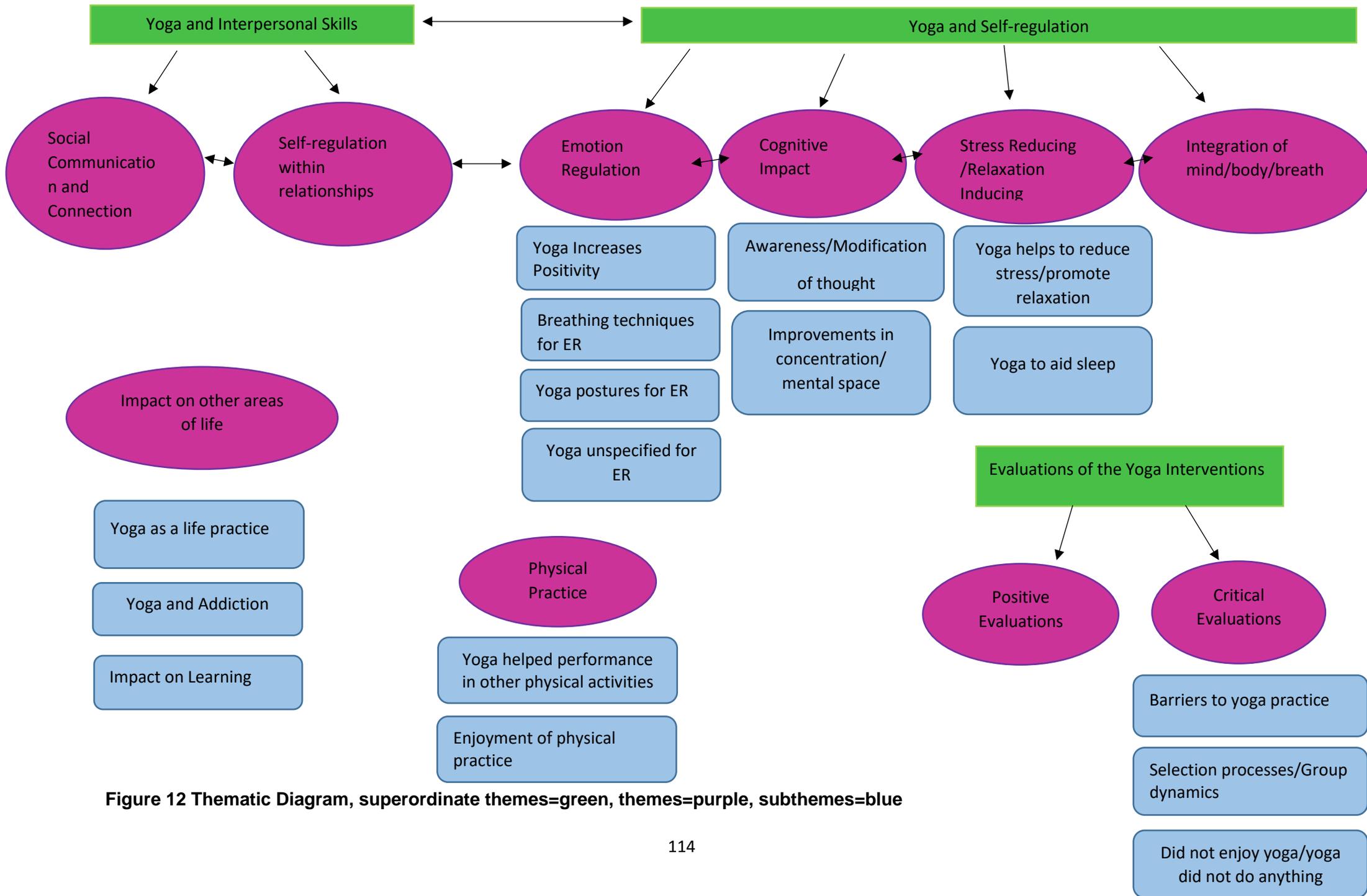


Figure 12 Thematic Diagram, superordinate themes=green, themes=purple, subthemes=blue

Superordinate Theme: Yoga and Self-Regulation

The themes of Emotion Regulation, Cognitive Impact, Stress Reducing/Relaxation Inducing and Integration of the Mind, Body and Breath could be meaningfully grouped under the superordinate theme 'Yoga and Self-Regulation'

Theme: Emotion Regulation

This theme emerged from the data as students were reported to talk about whether yoga could help increase positive feelings, of using breathing techniques, yoga postures and of using yoga without specifying a technique, to emotionally regulate.

Sub-theme Yoga Increases Positivity

Female students from two studies spoke about how yoga made them feel happier and helped them to develop a more positive outlook as demonstrated by this quote from Sally "I think yoga made me a happier person when I was taking it, not just because I was moving my body around, but because it was a class I actually enjoyed, and just lets people take it at their own pace...and everyone was happy and enjoying their time there." (Berezowski et al, 2017). Conversely, one male student was reported by one study to say that yoga might help people to feel 'ok' if they were feeling sad, yet would not necessarily make them happy.

Subtheme: Breathing Techniques to Emotionally Regulate

Students in 6/8 studies included in the qualitative synthesis spoke about using breathing practices to help them to regulate their emotions including anxiety and anger. They spoke about using the breath to manage anxiety outside of yoga classes, to manage anxiety before or during a test and other demanding situations.

Breathing practices were employed to regulate emotions in different contexts such as in the home. They spoke about understanding how to breathe more effectively and of using the breath to manage stress. Finally, one observed how it was easier to use breathing techniques than yoga postures outside of a yoga class, in a stressful situation. This quote from Wang and Hagins (2016) illustrates this sub-theme “The inhale and exhale helped my anxiety. I would do it when I became anxious during the day.”

Subtheme: Using Yoga Postures to Emotionally Regulate

Students from just 2/8 studies spoke about using yoga postures to distract them and to help them to emotionally regulate and calm down. The following quote highlights this, “It relaxed me like when I’d get angry sometimes I’d like start doing the poses, like...kind of like get my mind off things.” (Weaver, 2019)

Subtheme: Yoga to Emotionally Regulate (not mentioning specific techniques)

Students from across 4 studies spoke about how the practice of ‘yoga’ helped them to manage their emotions such as anxiety and anger in order to help them feel calmer and more able to deal with demanding situations. At times they talked about the holistic practice of yoga, at other times they appear to have used the term ‘yoga’ interchangeably for breathing practices and/or posture work. The following quotation illuminates this sub-theme ‘I think that [yoga] has helped me calm down before tests, in classes where I had a test. If I have yoga and then I know in the next class I’m going to have a test, then it can help me calm down for that test’ (Butzer et al, 2017). However, in balance, another student spoke about how yoga did not help to change their feelings “it didn’t calm me down and it wasted class time.”

Theme: Stress Reducing/Relaxation Inducing

This theme was generated from the data by noticing that students spoke about how yoga classes aided stress reduction and promoted relaxation, that students often reported using yoga techniques to help them to reduce feeling of stress and feel more relaxed outside of the yoga class itself, they identified that feelings of relaxation induced by yoga extended beyond the class and finally some students held the belief that yoga could aid sleep.

Subtheme: Yoga's Impact on Stress and Relaxation

A high proportion of students across all 8 studies identified that the yoga classes provided an opportunity within the, oftentimes stressful school day, to release tension and stress in order to feel more relaxed and calmer and that this often translated beyond the school day and into the home environment. One student highlighted how this feeling is the reason students perceive yoga as beneficial, another suggested that regular practice is necessary as the feeling is transitory. Furthermore, there was an awareness that yoga helped manage the physiological aspects of stress, such as helping the muscles to relax. Students talked about utilising postures and breathwork to help reduce stress in situations outside of the yoga class such as within the workplace. This is illustrated by a quote taken from Weaver (2019); "I liked the breathing of it, and then sometimes it would relax me. Not just in the program, but sometimes at school during the day."

However, some students did not link yoga practice with stress reduction or even suggested a contradictory feeling e.g "more jumpy" after a class (Bergen-Cico et al, 2015) A male student in the Dariotis (2016) study explained that walking away from conflict was still challenging for him and explained that he could not remember

explicitly being taught postures or strategies that may be beneficial during times of stress “It’s just hard to walk away if they do something. ... I mean I don’t remember doing any like poses or anything for stress”

Females were reported to speak about how yoga reduces feelings of stress and induces feelings of relaxation more often than boys were, with the data supporting this arising across 3/4 studies. The following quotation from a female in the Butzer et al (2017) study illustrates this “I like the end ‘cause this school can be pretty stressful so, you can like relax even if you have like a test coming up that day. You don’t have to be anywhere you can just relax. So I like that. It was just a good time to be relaxed and not focus on anything” (female class 4). Males also reported reduced feelings of stress and increased feelings of relaxation in 3/6 studies.

An interesting finding was that two teachers from two different studies reported that male students felt less stressed and more relaxed after yoga, even when the male students themselves had not self-reported this change. One of these studies (Powell and Potter, 2010) used an all-male sample, yet the Weaver (2019) study had a mixed sample. No teachers from the Weaver study made observations about female students feeling less stressed or more relaxed or reported females having conveyed this information. This teacher from the Weaver study reported a conversation that she had with a male student “The other student loved yoga, saw the benefit, said he was really relaxed when he came out, loved to go there once a week, looked forward to it, so he was way more invested emotionally and mentally to use that or to see it as a benefit.”

Subtheme: Yoga and Sleep

Some students from one study spoke about how the yoga intervention helped students to fall asleep, improved their sleep and of using breathing techniques to actively induce sleep as this quotation reflects ‘Yea, I can sleep a lot better, fall asleep faster’ (Butzer et al, 2017). A couple from the same study, did not think yoga had impacted their sleep negatively or positively and one student observed that yoga may induce feelings of tiredness which may not be conducive to learning ‘In the morning you get like really tired after you do yoga and then you’re just going through your classes in a like trance’ (Butzer et al, 2017).

Theme: Integration of Mind/Body/Breath

Students from two studies talked about a combination of elements that yoga had helped with, it was more complex than talking about one facet and to be included in this theme there had to be a combination of two different aspects pertaining to mind/body/breath. Students talked about focusing on the breath and present moment mindfully, yoga as helping to feel physically and mentally relaxed, developing connectedness between the physical and mental, of pausing, breathing and thinking before reacting and using the breath combined with visualising a ‘safe place’ to feel powerful and regulate emotions.

This quotation aptly describes the impact of yoga on integrating aspects of body, breath and mind “I love nature, like just looking out the window right now and seeing all the different colours. Yoga really made me realize to just sit down, breathe, and just look, enjoy, see, instead of just sitting. I could just go sit outside and think about the million things that I’m stressing about, or I can just enjoy the moment and look at the beauty that’s right in front of me. It took me a long time to realize I have to enjoy

simple moments like that but yoga just opened your eyes to it.” (Tommy from Berezowski et al, 2016)

More males than females were reported to speak about an integration between the mind, the body and the breath. This finding came from the data across two studies, both of whom had a mixed sample. (Berezowski et al, 2017 and Dariotis et al, 2016)

Theme: Cognitive Impact

Two subthemes could be meaningfully grouped under this theme; one saw students highlight that yoga helped to improve their concentration and created mental space, the other demonstrated an awareness of their own thinking patterns and the ability to modify their thoughts.

Subtheme: Yoga Improves Concentration/Creates Mental Space

Participants from five studies spoke about how yoga promoted concentration and focus and of noticing that their concentration diminished on the days that they did not practice yoga. A few students expressed that yoga helped to carve out some mental space for them. The following quote provides an example “I felt like having yoga was very helpful because it made me focus more in class and it stopped my headaches” (Bergen-Cico et al, 2015).

Subtheme: Awareness/Modification of Thought

This subtheme arose from observing that students across four studies identified that yoga could help with the cognitive aspects of stress and that they had developed an awareness of how thoughts can impact on feelings and behaviour. They spoke about developing greater introspection and of being more aware of their own thoughts and feelings. They were able to discern more easily between reactions and responses

and were more able to let go of unhelpful thoughts. There was also a developing awareness of the difference between thinking and observing at any given moment. A number of these reported changes in thought processes can be understood under the umbrella of mindfulness. This Year 7 male reported: “The program makes you actually think about things twice, twice before you start to yell and stuff ... get mad ... tantrum” (Dariotis et al, 2016).

A further change in thinking focused on assumptions of what yoga might be like prior to starting it and then appraising it differently upon starting. One female identified that she had thought that yoga would not have been physically challenging enough, yet after starting she recognised that some aspects of yoga were physically challenging and that she enjoyed it. A male student talked about having a preconception that yoga was a girls’ activity, yet after practising it, he learnt that it was stronger than he thought and his mind was opened to the possibility of it being a unisex activity.

Superordinate Theme: Yoga and Interpersonal Skills

The themes of Social Communication and Connection and Self-Regulation in Relation to Others could be meaningfully classified under the superordinate theme ‘Yoga and Interpersonal Skills’

Theme: Social Communication and Connection

Participants felt there had been clear improvements in their or their students’ social interactions and communication skills along with a growing desire to treat other people in a kinder, more compassionate way. The social communication skills that they discussed included; becoming more ‘friendly’, initiating more conversations with peers, engaging with two-way conversations and small talk with peers and teachers

and volunteering to do chores within class which meant moving around the classroom in front of the class.

Furthermore, students highlighted the role of yoga in helping them to form connections with others, to feel empowered by being a part of a wider peer group, the yoga class (meaning group) as a safe space to try different practices and the building of new friendships. One student highlighted that students had developed trusting relationships enabling them to laugh at themselves and each other when attempting challenging yoga postures. This quotation highlights this “Probably the thing I witness more than anything is the social relationships... actually last week I noticed ‘A’ wanting to go and sit with the group of peers because, you know, he was sitting all by himself...he took it all upon himself to you know, go over and join another group, which at the beginning of the year, I don’t know that he would have done that...been bold enough to, you know, want to...want to be social. You know, I think at the beginning of the year, he would have just been content sitting by himself doing his work. So, you know, I have seen more social interaction on... really on both their parts.”

Of interest, only females were reported to have identified how yoga provided a space for students to feel interconnected, to get to know each other and of the power of the peer group, whereas males had not identified this in themselves, or at least did not talk about this, despite the data coming from mixed gender studies (Berezowski et al, 2015 and Butzer et al, 2017). Conversely, teachers identified males as demonstrating improved social communication and interaction, but did not observe this in female counterparts. This finding was generated from the data within one study, although did involve more than one teacher (Weaver, 2019).

Theme: Self-Regulation in Relation to Others

This theme emerged from students speaking about regulating a combination of their thinking, their feelings and their behavioural responses toward others. Students spoke about being able to modify thinking which helped to change their responses to situations. Some students identified that yoga has helped to reduce the reasons to get in a fight and that yoga helped to clear their minds of negative thoughts about others. Many students spoke about being able to understand other people's perspectives which in turn helped regulate feelings of anger or upset directed towards them. They spoke about developing tolerance towards other people and an awareness that everybody has issues to deal with which helped them to cultivate a kind and compassionate attitude. Furthermore, students were able to think about how their actions affected others. Students also spoke about using breathing practices or yoga to help regulate strong emotions such as anger or anxiety directly, rather than by modifying thought, which allowed them to act differently towards or around other people. Sometimes students simply acknowledged changes in their behavioural responses since practicing yoga, for example being in fewer physical altercations and arguments and of being able to walk away from a situation rather than act inappropriately. This quote from a girl named 'Cecelia' illustrates this theme (Berezowski et al, 2016) "It [yoga] just made you realize that, um, everybody has their own little problems and issues and to be kind to each other".

Students not only spoke about how yoga impacted on their self-regulation skills within their relationships at school but also in the home contexts within their relationships with parents and siblings as this quote illustrates "If I go to my big brother and he gets me angry, I go somewhere and calm myself down and then I talk to him respectfully and I tell him why I am angry." (Wang and Hagins, 2016).

However, some students did not feel that yoga could help to modify actions or responses to others as this quote illustrates “I think [yoga] doesn’t really do anything to help one’s actions. Because after the stretch, you’re still yourself. Nothing really has changed except maybe something, maybe your mood or something. But like besides that I don’t think anything else has really changed.” (Butzer et al, 2017)

Theme: The Physical Practice

The thematic analysis generated a theme where students were reported to endorse their enjoyment of practicing the yoga postures and other physical aspects of the practice, in addition they identified that practising yoga had knock on effects to other physical activities that they engaged with.

Subtheme: Enjoyment of the Physical Practice

Participants often spoke about enjoying engaging with the postures, some students suggested that they liked it more than they enjoyed P.E and liked the fact that it was non-competitive. They also highlighted that improvements in their physical practice promoted self-confidence and a realisation that their practice could evolve over time rather than being fixed and immutable. “You could be yourself . . . the one environment and are not graded on your ability to do something. . . you are just doing something to better yourself. I am capable of doing more now than before.” (Wang and Hagins, 2016) Conversely, some participants reported that the yoga classes were not physically challenging enough or that they were too physically challenging. One student identified that yoga had caused over-stretching and more seriously, another had reported temporary loss of vision in one eye, caused by performing a yoga posture with a pre-existing unknown-about medical condition. For

example “yoga could be made a little bit more active and not us just sitting still.

Maybe more moving around’ (Butzer et al, 2017)

In general females were more likely to express a liking of the physical practice and a preference to yoga over P.E (except from one female), in the identifiably male data, males did not report feeling this way. A female had the following to say about practicing yoga in a mixed class however “It’s kind of weird when you’re supposed to do some pose then you go over to your mat and you’re next to someone you don’t know who’s a boy” (Butzer et al, 2017)

Subtheme: Yoga’s Impact on Other Physical Activities

Another cited positive were the physical benefits gained from yoga which could be generalised to other physical endeavours. Participants spoke about yoga having improved their flexibility and balance which helped during dance classes and other sports, that they could apply skills and techniques learned in yoga to boost their performance and that yoga has encouraged them to pay more attention to stretching the body before and after other forms of exercise. A quote from Butzer et al (2017) illumines this “I like to run, a lot. And it can usually go better when I feel flexible. And I’ve been feeling better when I run [since practicing yoga]. I also ski and the balance has helped a lot. I [do] better trails, harder trails now.”

Theme: The Impact of Yoga on Other Areas of Life

This theme arose from students talking about their perceptions of how yoga may impact on addiction and education and be used as a holistic life practice.

Subtheme: Yoga and Addiction

Within the study by Butzer et al (2017) directed questions were included within their interview schedule to specifically target participants' views on how yoga may impact addiction. Only data from this study led to the emersion of this theme and therefore the evidence is weaker than for other themes emerging across studies. Students mainly responded with uncertainty about whether yoga could impact upon a person's decision to use alcohol or drugs, with one student identifying that students in the school that they attended generally held negative beliefs about taking drugs and alcohol and that it may be more effective in a school where youth were more likely to experiment with substances e.g "The [students] who are [at this school] all have like practically a negative view on alcohol and drugs. Because they're like 'Oh no that's bad for you it's gonna like make you live less long,' so I don't really think yoga will have such a change here maybe because we're already like thinking drugs and alcohol are bad for you. But like maybe in like, somewhere like, in a, I don't want to say this but like a worse school? Like maybe yoga would have more of an impact [there] because, yeah, [students there] don't really have too much of a negative view on drugs and alcohol, per say" Lastly, one student identified that it would not be a cure for addiction on its own, yet it could help a person believe that they can change.

Subtheme: Yoga as a Life Practice

This sub-theme emerged from a relatively small number of students (across studies) talking about the powerful impact yoga had on their lives: such as the translation of

yoga teachings into their lives 'off of the mat', or yoga as a practice which helps you to achieve balance in your life and yoga as a journey of self-discovery and personal change. The following quotation from Christina best outlines this "I think that it [yoga] has definitely changed my understanding on everything, on yoga... before I took yoga, I say that a lot, it's like I was the person before I started yoga and the person after I did yoga. I think that the person that I was when I took yoga, it was almost like my brain kind of opened, and my heart kind of opened into things that you know I normally wouldn't have tried before because: (a) I was either too scared, or thought I'd get made fun of. But it's like I understand everything just completely different. I'm able to do a lot more than I thought." (Berezowski, 2017).

Subtheme: The Impact of Yoga on Learning

This sub-theme arose from students speaking about the impact of yoga on education. Only one student spoke about the direct impact that yoga had on their academic progress which was specific to one subject scheduled straight after the yoga session, which he attributed his improved grades to. The majority of observations of yoga impacting on student's learning and academic performance were made by teachers. Teachers spoke about improved engagement within lessons, improved emotional regulation when tackling a learning task, better concentration leading to more classroom contributions, being able to engage in learning activities that they previously did not have the confidence for e.g reading aloud to the class and being able to manage transitions more easily. One teacher reflected that "the mindful practices helped her and her students' transition into class and prepared them for listening, sustained concentration and the internal reflective process of writing." (Bergen-Cico, 2015)

Other students expressed uncertainty about whether yoga had impacted on their grades or felt that it had not and a couple suggested that yoga was not helpful as it ate into their learning time. In the study by Butzer et al (2017) one male shared, 'I'm not sure about [whether yoga might help with grades] because this is the first year that I've been at a much larger school where [...] the grades aren't inflated ... but I don't think [yoga] actually has helped that much with [grades]' Despite not feeling as though yoga had directly impacted his grades, he alluded to how engaging with a yoga class prior to a test helped him to calm down , which may have indirectly impacted his grades. 'I think that [yoga] has helped me calm down before tests, in classes where I had a test. If I have yoga and then I know in the next class I'm going to have a test, then it can help me calm down for that test'

When considering the data according to gender, it was found that only data from male students contributed to this sub-theme. This may have been a coincidence regarding which quotations were selected to be reported from the Butzer study (2017), which incorporated a question regarding impact on education posed to both females and males. Other evidence for this sub-theme came from teachers in the Powell and Potter (2010) study in a PRU comprised of male students.

Superordinate Theme: Evaluations of the Yoga Interventions

This superordinate theme arose from the evaluative comments by yoga participants and teachers which could best be grouped into two themes corresponding to positive and negative evaluation of the school-based yoga interventions.

Theme: Positive Evaluations

Participants talked about the intervention being experienced as enjoyable and interesting, of introducing yoga to students who would not otherwise discover it, that

other students were expressing interest in yoga, that the time commitment for teaching was minimal and that the benefits outweighed this, that the length and timing of sessions was ok and that students actually sought out further classes at a yoga studio or online once the school-based intervention had ceased. “I’d like to see that yoga come back here. I have other students I could recommend, for sure, that would be open. They’ve even asked one of my students’ questions...they’re curious...and he told them what they’re doing and they said, “I need that”... I just feel like it is a good thing for the students to do some yoga to do some relaxation, to do some stretching, to do something different to help themselves with their stress or their worries or whatever is going on in their lives...in this school in particular there’s a lot that goes on at home in a lot of these kids’ lives and I feel like that would be a positive to help them almost cope or forget.” (Weaver, 2019).

Theme: Critical Evaluations

This theme emerged from the data as students critiqued the yoga intervention highlighted that it was not enjoyable, that elements of the implementation of the intervention relating to selection and group dynamics were not ideal and identification of certain barriers that reduced the likelihood of them practising yoga.

Subtheme: Yoga was not enjoyable

A small proportion of students, all of whom came from the Powell and Potter (2010) study identified that they had not enjoyed yoga some because it was boring, some stating they had enjoyed other aspects of the multi-component program more or that meditations were repeated too often. The following quotation taken from the study by Powell and Potter (2010) evidences this ‘Yoga was the most disliked activity,

although in at least one case, the boy who disliked yoga the most, cited Tai Chi as the most enjoyable part’.

Subtheme: Barriers to yoga practice

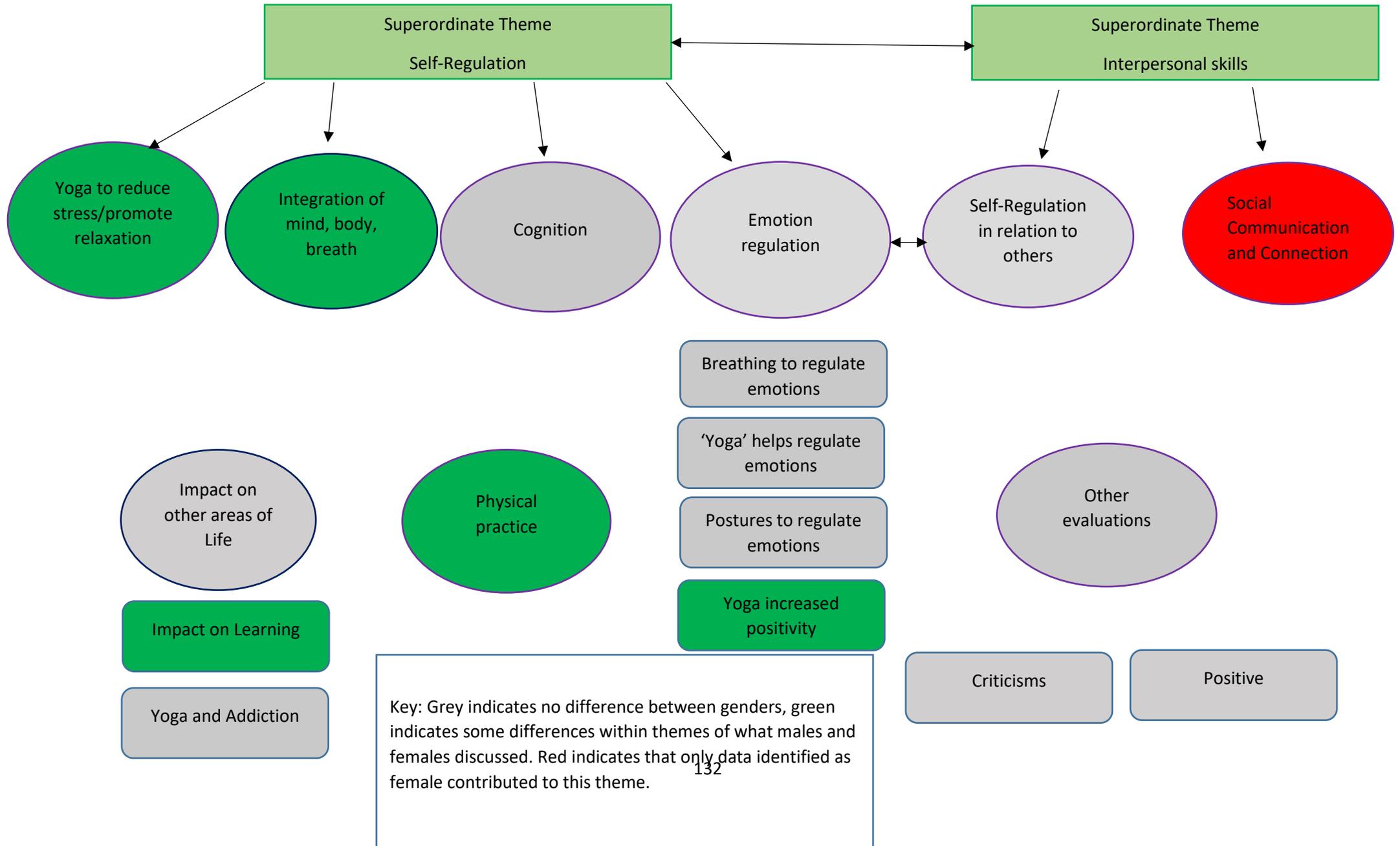
Participants identified a number of barriers to both the yoga intervention within school and to engaging with yoga practice at home. These included: Issues with noise levels in school and available space, time to engage with a home practice and adequate space in which to do this, feeling that the program did not go on for long enough or that there were school-based time constraints that meant they did not have enough sessions. An illustration of this comes from Weaver (2019) “The only thing I didn’t like about it is just, we didn’t...we didn’t get enough time.” Conversely, a minority suggested that the intervention went on for too long (Butzer et al, 2017)

Subtheme: Selection processes/Group dynamics

A teacher observed that some students who participated in a targeted intervention were separated from their peers and may have felt singled out, in a similar vein one student did not want to miss out on what his classmates were doing whilst he was doing the yoga intervention; Weaver (2019) reported that “Two teachers also indicated that a potential negative of the program was that students were “pulled out” or “separated” from peers and that there was the potential for feeling singled out”. Students from one RCT (Butzer et al, 2017) spoke about wanting to have a choice about being in the yoga or P.E condition. Finally there was some degree of self-consciousness of doing yoga at the beginning of a regular class.

Figure 13 below maps the gender differences that have been outlined and interweaved throughout the description of themes. Variances were found between the genders in the following themes: yoga to reduce stress and induce relaxation, integration of mind, body and breath, physical practice and social communication and connection and in the following sub-themes: impact of yoga on learning and yoga increased positivity.

Figure 13 Thematic Diagram to Illustrate Similarities and Differences in Themes According to Gender



4 Discussion

This section provides a brief summary of the main findings from the quantitative review including the overall meta-analysis, the secondary meta-analyses for the outcomes of anxiety and depression, the differential findings according to gender from the quantitative analysis and the findings from the qualitative review including any gender differences in the way students experienced yoga. The Gard model (2012) is used as a framework to interpret these findings and consider whether the present research is supportive of this explanatory model of how yoga may impact upon self-regulatory mechanisms to mediate the stress response and support positive mental health and wellbeing. Many of the studies which employed a control utilised a PE control condition and consideration is given about how both yoga and PE may impact on mental health and wellbeing and how certain subgroups may respond more beneficially to either yoga or PE. Ideas for the successful implementation of yoga classes within educational settings are outlined according to student feedback. The strengths and weaknesses of this study are then detailed followed by the implications for both future research and EP practice.

4.1 Summary of the Main Findings

4.1.1 Quantitative Review and Meta-Analysis

RQ 1 What are the quantitative findings from studies exploring the impact of secondary school-based yoga interventions in adolescence?

The quantitative review focused on four mental health outcomes; anxiety, depression, stress and emotion regulation. The research contributing to these outcomes was appraised as being of low to very low quality and the strength of any

recommendations made about the suitability of using yoga to support emotion regulation and decrease anxiety, depression and stress in adolescents was found to be weak when compared to largely PE controls. The overall meta-analysis generated a non-significant pooled effect size of $\theta = 0.20$. This suggests, at best, a small impact of yoga on these mental health outcomes overall, when using the interpretative framework suggested by researchers such as Cohen (1988), Dancey & Reidy (2017) and Goldberg et al (2019) whereby effect sizes of 0.20 are considered small, 0.50 as moderate and 0.80, large.

Anxiety

Of the five RCT studies which explored the impact of yoga interventions on anxiety, only one reported a significant finding on the tension-anxiety subscale of the POMS (Noggle et al 2012). Of the two non-RCTs, only Frank et al (2017) in their uncontrolled study, found a significant finding pre-post intervention for the yoga condition, on the anxiety subscale of the BRUMS. The secondary meta-analysis for the outcome of anxiety generated a non-significant pooled effect size of $\theta = 0.20$, which can at best be interpreted as a small impact of yoga on the mental health outcome of anxiety when using Cohen's (1988) framework.

Depression

Examination of the evidence for the outcome of depression identified that none of the 5 RCTs which incorporated measures of depression found significant differences between the yoga and control conditions. Both of the non-RCT studies (Frank et al 2014 and Felver et al 2015) demonstrated improvements on measures of depression, yet one of these was an uncontrolled study and the other demonstrated decreases in depression for both conditions, though the decrease was greater for the

yoga class, albeit with only a small effect size (Cohen's $d=0.27$). The control groups showed increases on measures of depression except from the Felver (2015) study which showed a decrease. Schulte (2015) did uncover a significant finding on distal measures of depression taken 5 months post intervention, whereby lower scores on the CES-D measure of depression were found for the yoga condition than for the PE control. The secondary meta-analysis for the outcome of depression generated a non-significant pooled effect size of $\theta = .22$, which can at best be interpreted as a small impact of yoga on the mental health outcome of depression compared with PE when employing Cohen's (1988) framework.

Stress

Out of six RCTs which explored the impact of yoga on stress, only Beets and Mitchell (2010) found levels of stress to significantly decrease for the yoga condition however they also found a decrease for the PE control, yet the magnitude of this effect was greater for the yoga condition. Frank et al (2014) found significant effects on all measures of stress employed, yet the findings are less robust due to the lack of a control condition. Ramadoss and Bose (2010) also found significant within condition pre-post effects, complete with dosage effect, yet did not analyse for between condition effects despite having employed a control. A secondary meta-analysis for the outcome of stress was not possible due to the lack of effect sizes reported by some studies (Weaver, 2019; Noggle, 2012) and the failure of the Beets and Mitchell (2010) study data to converge with the random effects model generated.

Emotion Regulation

Three studies employed an RCT design to explore emotion regulation, only Frank et al (2017) found a statistically significant effect favouring the yoga condition who

demonstrated increases in emotion regulation, however this was in comparison with a 'classes-as-usual' control as opposed to a specific effect of yoga above and beyond that of PE. Further meta-analysis of this outcome was negated by the small sample size of studies contributing data.

In summary, the quantitative review suggests that yoga has a neutral or slightly favourable impact on the four mental health outcomes; anxiety, depression, stress and emotion regulation, yet was unable to detect a specific and favourable impact of yoga when compared to PE. However, trends in the data favoured the yoga condition on these outcomes across the majority of studies. This appears to suggest that PE may also impact favourably on mental health outcomes and the finding that yoga does not specifically impact more greatly does not preclude the notion that yoga is still beneficial to mental health.

4.1.2 Gender Differences

RQ 1a Are there any gender differences in the impact a secondary school-based yoga intervention has on mental health outcomes?

Two of the four studies which included analysis by gender uncovered some differences on how yoga impacted on mental health outcomes in females compared with males. Butzer et al (2017) found a significant three-way gender-condition-time interaction, with separate analyses indicating that females in the yoga group showed increases in emotional control whereas males in the yoga group did not. Conversely, males in the PE group showed increases in emotional control whereas females did not. These results appear to suggest that yoga may be more favourable than P.E in supporting emotion regulation in females, yet that PE may be more favourable in supporting emotion regulation in males.

The Cox study (2017) utilised a PE class which consisted largely of students who either did not like PE or were less able in this area and the majority of students were female. They found some significant evidence to suggest that yoga may help to lessen an individual's tendency to think about their body from another person's perspective (body surveillance) compared to PE, with the magnitude of this effect increasing when analysing female data in isolation. In addition, this post-hoc analysis demonstrated that females in the yoga group also displayed increases in physical self-worth.

These findings appear to indicate that yoga may impact differentially on emotion regulation, body surveillance and physical self-worth in females and males. It further suggests that yoga may be more beneficial for female students and those students who are less able in traditional PE classes whereas PE may be more beneficial to male students.

4.1.3 Qualitative Review

The qualitative review thematically analysed the data extracted across studies, bottom-up, to understand the main themes generated from what students were speaking about during interviews, focus groups and open-ended written feedback. A subsequent analysis involved identifying the data as female or male, in order to compare and contrast the data by gender.

RQ 2 What are the qualitative findings from studies exploring the experiences of students who engaged with secondary school-based yoga programmes on mental health?

RQ 2a Are there any gender differences in the experiences of secondary school-based yoga intervention participants?

The analysis yielded three superordinate themes; Yoga and Self-regulation, Yoga and Interpersonal Skills and Evaluations of Yoga Interventions. Under the umbrella of 'Yoga and Self-Regulation' arose the themes of Emotion Regulation, Cognitive Impact, Stress Reducing/Relaxation Inducing and the Integration of Mind, Body and Breath, with the majority of students conveying that yoga helped to improve these areas when practiced. The gender synthesis identified that females were more likely to identify the role of yoga in reducing feelings of stress than males, yet teachers were more likely to observe this in male students.

The themes of 'Social Communication and Connection' and 'Self-regulation Within Relationships' form the superordinate theme of 'Yoga and Interpersonal Skills', with participants generally identifying that yoga impacted favourably on these areas. Of interest, only females were reported to have identified how yoga provided a space for students to feel interconnected. Conversely, teachers were reported to identify males as demonstrating improved social communication and interaction, but not for females.

Within the superordinate theme of 'Evaluations of Yoga Interventions' the majority of students were found to positively evaluate the yoga intervention as enjoyable alongside time and duration of the interventions as amenable, giving rise to the theme of Positive Evaluations. A smaller proportion negatively evaluated the yoga intervention as unenjoyable alongside barriers such as length of programme and duration of sessions as too long and the location as un conducive to yoga practice, thus contributing to the theme of Critical Evaluations.

Two further themes emerged from the qualitative synthesis; Physical Practice and Impact on Other Areas of Life. Within the theme of Physical Practice students most

often spoke about enjoying the posture work, whilst some indicated that yoga was either not physically challenging enough or conversely was too demanding. Students also identified that practicing yoga had beneficial knock on effects in other physical pursuits. Only females were found to express a preference for yoga over PE compared with males and both sexes tended to have pre-conceived ideas of what yoga is, which could influence engagement. Within the 'Impact on Other Areas of Life' theme, students from only one of the reviewed studies did not think that yoga could impact favourably on addiction. Students from across a small proportion of studies did highlight that the teachings from yoga 'on the mat' could be generalised and applied to other areas of their lives. Finally, only one student identified that yoga could directly impact upon their learning, with the majority of favourable observations arising from teacher observation and feedback, a higher proportion of students did not make the link between yoga's impact on their academic attainment or learning.

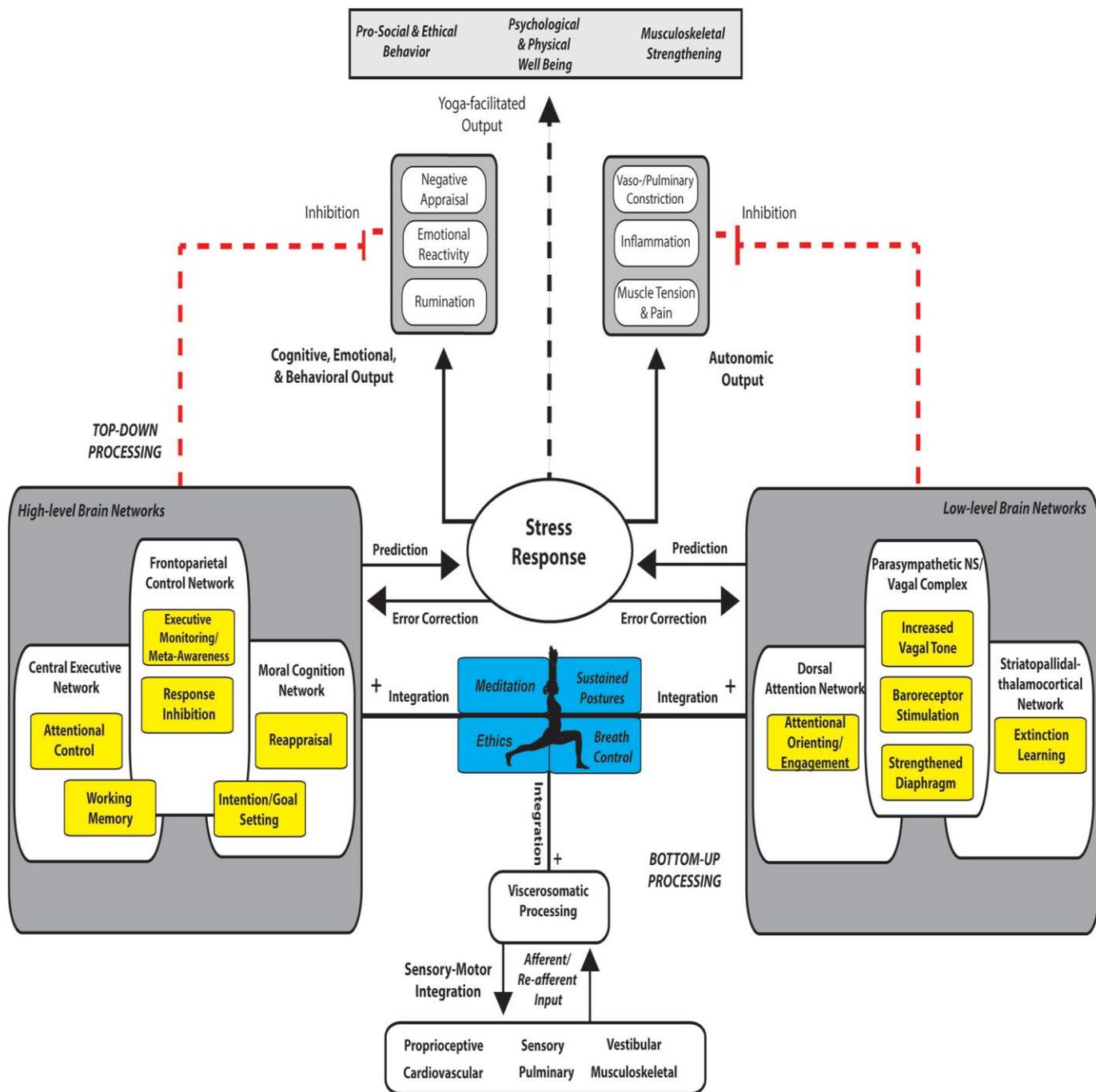
To summarise, the qualitative synthesis generally identified that yoga could be a beneficial practice to support self-regulation and interpersonal skills which could be enjoyable to practice and which may support physical ability. This may help to strengthen the notion that yoga impacts favourably on outcomes which may support positive mental health despite the quantitative aspect of this review failing to detect a specific significant favourable impact of yoga when compared directly to PE on mental health outcomes. It may be that both work to support mental and physical health in the general population, yet that different groups may respond more favourably to one than the other. Specifically, that yoga may be more beneficial than PE in supporting factors underlying mental and physical health in female and/or less physically able students, than in male and/or more physically able students.

4.2. Theoretical Model of the Self-Regulatory Mechanisms of Yoga (Gard et al 2014)

Health bodies such as the WHO (2004) have worked to move away from definitions which polarise mental illnesses and mental health. These considerations have helped to conceptualise poor mental health as part of the same continuum as positive mental health and highlight the link between physical and mental health, in that poor physical health can lead to poor mental health, which is of interest as yoga is a mind-body practice essentially targeting both physical and mental health simultaneously. The Gard et al Model (2014) depicted below (Figure 14) outlines how four core yoga practices; meditation, ethics, sustained postures and breath work may affect top-down neurocognitive and bottom-up neurophysiological regulatory processes which serve to inhibit the stress response, which it is argued have beneficial effects on physical and mental health. Indeed, there are overlaps between Gard et al's model (2014) and Galderisi et al's (2015) conceptualisation of mental health with both highlighting the importance of self-regulation, social skills and the relationship between the body and mind as important components for modulating stress and maintaining positive mental health more generally "Mental Health is a dynamic state of internal equilibrium which enables individuals to use their abilities in harmony with universal values of society. Basic cognitive and social skills; ability to recognise, express and modulate one's own emotions, as well as empathise with others; flexibility and ability to cope with adverse life events and function in social roles; and harmonious relationship between body and mind represent important components of mental health, which contribute in varying degrees, to the state of internal equilibrium." (Galderisi et al, 2015, P.231)

Within Gard et al's (2014) model, internal physiological responses to stress are outlined alongside the yoga practices which may best mediate them, such as sustained postures and breath-work, which are hypothesised to impact the stress response in a predominantly neurophysiological bottom-up manner. Running alongside these neurophysiological processes, are top-down neurocognitive self-regulatory processes, more heavily activated by yogic practices such as meditation and the teaching of ethics through yogic philosophy including the yamas of which ahimsa (nonviolence) towards self and others is commonly taught. It is hypothesised by Gard et al (2014) that yoga practice including these core components supports the integration between top down and bottom up self-regulatory processes, which enhances self-regulation in response to stress and which may be beneficial to mental health.

Figure 14 Theoretical Model of the Potential Self-Regulatory Mechanisms of Yoga (Gard et al 2014)



4.3 Interpretation of the findings using the Gard et al (2014) framework

The findings generated from this systematic review shall be interpreted employing Gard et al's (2014) theoretical model as a guiding framework. Consideration shall be given to whether the findings of the current review align with the neurophysiological and neurocognitive self-regulatory processes hypothesised by the Gard model as the underlying mechanisms via which yoga works to help mediate the stress response and support emotion regulation. Furthermore, the notion that improved emotion regulation may support self-regulation within social interactions and enhance prosocial behaviors shall be explored.

4.3.1 Neurophysiological Practices

Physical Practice (Asanas)

Part of yoga practice relates to physical postures and students' ability to engage with the physical practice, students watch a teacher demonstrate a posture or sequence of postures alongside listening to teaching points, repetition of these postures gives students the opportunity to practice them and show greater physical control, flexibility, strength and ultimately awareness of their physical body. They learn how to control or regulate their body within these postures in the first instance. The teacher will simultaneously direct students to the breath and to focusing their mind on their body or breath within the posture. However, there is a process involved in the trajectory of yoga practice whereby beginners will usually focus their attention on moving their body into the pose before they are able to incorporate the breathing and mindfulness techniques offered by the yoga teacher. The physical practice of yoga

therefore acts as the primary stage of self-regulation or self-control, with other elements layered and embedded within the physical practice.

The qualitative synthesis found that participants often spoke about enjoying engaging with the postures, with some suggesting that they liked yoga more than they enjoyed PE and highlighting that improvements in their physical practice promoted self-confidence. A minority did however, report that yoga was not physically challenging enough or that yoga was too physically challenging. Two students had reported injuries including overstretching of the foot and more seriously temporary vision loss. In general, females were more likely to express a liking of the physical practice and a preference to yoga over PE, whereas males did not report this preference. Participants also spoke about yoga having improved their flexibility and balance which helped during dance classes and other sports and that they could apply skills and techniques learned in yoga to boost their performance and help prevent injury e.g stretching more. As such, the qualitative data in the most part supports the notion that yoga may impact favourably on physical health and wellbeing, yet that there may be gender differences around preferences of yoga over PE, specifically with some females preferring yoga to general PE.

This finding is in line with previous research which has shown that yoga supports physical fitness, including improvements in neuromuscular coordination and strength, balance, flexibility and respiratory function (Abel, Lloyd and Williams 2013, Raub 2002) and provides some partial evidence in support of the Gard et al (2014) model which outlines that yoga practices help to strengthen and support an awareness of the proprioceptive and musculoskeletal systems. A few of the studies included in this review incorporated measures of physical health and appraisals of their physicality, though all used different measures which made it challenging to

compare findings across studies to allow for triangulation between quantitative and qualitative data (Beets and Mitchell, 2010, Cox et al, 2017, Fishbein et al, 2015).

Breathing Practices (Pranayama)

The qualitative synthesis found that a high proportion of students identified that the yoga classes provided an opportunity within the school day, to release tension and stress in order to feel more relaxed which at times translated into their home environment. Youth identified using various yoga practices to help manage feelings of stress and to emotionally regulate with the vast majority of students across studies identifying using breathing practices more than other yoga techniques, including posture work or meditation. It is plausible that the quantitative findings on measures of emotion regulation are relatively weaker because students were noticing subtle, event-specific changes in their emotional state too transitory to create significant findings on general measures of emotion regulation.

The propensity of participants to state that yoga helps them to emotionally regulate, with the majority identifying breathing techniques adds some weight to the explanatory power of Gard et al's (2014) model. Breathing practices primarily work in a bottom-up way, whereas meditation or the aspects of cognitive appraisal discussed below are higher-level brain (top-down) processes. It is important that we pay attention to what students are taking from their yoga practice and choosing to implement more of. They are not utilising the postures as frequently to manage their emotions, with posture work aligning more closely to other forms of physical education. Rather at times of stress and emotional dysregulation, students appear to be communicating via their selection and implementation of breathing practices

during stressful situations, that these physiological bottom-up types of regulation are preferential to other key components. The discrete and discreet nature of segmental breathing practices compared with postures make them a more accessible form of bottom-up self-regulatory practice than postures, which are ultimately less easily implemented in a real world stressful situation. This bottom-up regulation may support their cognitive higher-level brain functions which enable them to consider, think or speak about stressful or emotional experiences.

This idea that people require bottom-up types of regulation before they are able to access higher order top down forms of regulation, is in line with recent trauma-focused work by Perry (2006), who outlines the neuro-sequential model which advocates a bottom up approach to helping dysregulated children and adolescents to re-engage; 1) Regulate, 2) Relate 3) Reason. In order to regulate, Perry outlines that children require sensory-based activities which help to regulate the fight-flight-freeze response. He identifies that this needs to happen before the young person can begin to relate and interact with other people around them and that only once regulated, the young person can access higher-order processes such as reasoning and talking through a problem. In this way, yoga may be supportive in teaching young people bottom-up approaches, specifically breathwork which can be used to help support their levels of physiological arousal prior to engaging with higher order brain processes such as mindfulness, meditation and the cognitive appraisal of their thought processes.

Studies reviewed do not appear to have included questionnaires pertaining to the use of breathing techniques, quality of breath before or after a yoga class or physiological measures of the breath which precludes triangulation between the qualitative findings of this research to quantitative findings.

4.3.2 Neurocognitive Practices

Yoga and Mindfulness

Yoga has been theorised by a number of researchers to facilitate certain aspects of cognition including greater awareness of thought, being able to notice and observe one's thoughts, greater inhibition of unhelpful thinking processes such as rumination which serve to maintain the stress response and the adoption of a compassionate attitude towards self and others (Brisbon & Lowery 2011; Cope, 2006 and Gard, 2014). These cognitive processes may be conceptualised under the umbrella of mindfulness and map onto the strands of yoga practice outlined by Patanjali as Dharana (Concentration) and Dhyana (Meditation). Mindfulness has been argued by some researchers to be a key function of yoga practice (Daly, 2014; White, 2012), yet some previous research has been less fruitful in identifying increased mindfulness (Daly et al, 2015; Hagins et al, 2014; White 2012).

The outcome of mindfulness was not formally explored as part of this review due to time constraints and the desire to prioritise the most frequently measured outcomes across studies. The findings shall be considered here however, in light of the qualitative findings that arose. Despite a number of researchers having theorised that yoga may help to support the development of mindfulness in its practitioners, only 3/13 quantitative studies reviewed, included a mindfulness measure with none reporting significant findings. (Cox et al, 2017; Fishbein et al, 2015; Noggle et al, 2012). Nevertheless, both the Cox (2017, n=43) and Noggle (2015, n=51) studies used very small samples, with Noggle et al (2012) detecting trends in the data which highlighted enhanced mindfulness in the yoga group post-intervention. The reduced power from small sample sizes to capture statistically significant effects may lead to

non-significant findings even when a relationship between variables might exist and as such this construct should be further investigated employing larger sample sizes. The Fishbein et al (2015, n=85) study, despite using a larger sample, incorporated an adult measure of mindfulness which may not adequately capture mindfulness in children and adolescents. White (2012) outlines that there may be distinct differences between the developmental mindfulness capabilities of adults, adolescents and children which it may be reasonably argued necessitates the utilisation of measures designed for use with CYP e.g The Child and Adolescent Mindfulness Measure (Greco et al, 2011).

The qualitative synthesis demonstrated that students reported a number of cognitive benefits such as improved concentration and the experience of yoga creating 'mental space'. They identified having developed greater introspection, being more aware of their own thoughts and of the difference between thinking and observing one's thoughts. Finally, they highlighted that they now had an understanding that there was a difference between reacting and responding to the environment and of how understanding your thinking in any given moment can help you to respond rather than to react. The findings from the qualitative synthesis are congruent with the development of 'mindfulness' and provide some support for Gard et al's (2014) theoretical model. Specifically, they align with the attentional processes outlined in the model under the central executive network, including being more aware of their own thinking and the concept of 'meta-awareness' largely influenced by the fronto-parietal control network.

Another theme which emerged pertains to students' awareness of the interconnectedness between the mind, body and the breath imparted by yoga. Students talked about focusing on the breath and the present moment, yoga as

helping to feel physically and mentally relaxed, developing connectedness between the physical and mental, of being able to pause in order to think before reacting and of using the breath combined with visualising a 'safe place' to regulate emotions. This finding is supportive of Gard's conceptualisation that there is an integration between the neurophysiological and neurocognitive processes involved in self-regulation. A person's capacity to be mindful is often underpinned by physiological exercises which have a regulatory impact on physiological arousal, allowing them to access neurocognitive processes and integrate the two.

In an attempt to explain the lack of significant findings from the quantitative data, compared with the promising findings from the qualitative beyond methodological limitations such as sample size and use of adult measures, it is possible that students are developing an understanding of the concept of mindfulness, yet that this is an emerging, not embedded skill, still too subtle to be captured by the current mindfulness measures employed. Conversely, it is possible that students may be relaying conceptualisations that they have learnt from yogic teachings within an intervention, yet may not be at the level where they have internalised this skill and are applying it consistently within their lives for it to be detected by mindfulness measures.

4.3.3 The Impact of Yoga on Stress and Emotion Regulation

Stress

RQ 1 What are the quantitative findings from studies exploring the impact of secondary school-based yoga interventions in adolescence?

Five of 6 RCT's utilised the Perceived Stress Scale to assess levels of perceived stress pre-post intervention, however only Beets and Mitchell (2010) found levels of stress to decrease significantly more for yoga, than for the PE control which likewise decreased, suggesting that PE may also impact positively on the stress response. Trends in the data however do suggest that yoga had a favourable impact on perceived stress with yoga decreasing perceived stress across studies and where decreases were found for both yoga and PE they were greater for the yoga condition. As aforementioned, a secondary meta-analysis for the outcome of stress was not possible due to the lack of effect sizes or difference means reported by some studies (Weaver, 2019; Noggle, 2012) and the failure of the Beet and Mitchell (2010) study data to converge with the random effects model generated.

The Beets and Mitchell (2010) study had an effect size of 0.89 which was of much greater magnitude than the effect sizes reported for the other studies.

Methodological differences between this study and the other studies include the fact that it adopted a crossover design, whereby classes were randomised to either treatment sequence 1- regular PE classes followed by yoga classes or treatment sequence 2- yoga classes followed by PE. Only the data from the first treatment sequence was used in the meta-analysis to avoid any distal effects of yoga impacting on the findings. The methodology also differed in that the dosage of yoga was high at 4 sessions per week, so 8 sessions over the 2 weeks which may have enhanced the impact of yoga on stress. Furthermore, students were only expected to attend the yoga intervention for a maximum of two weeks, which may have protected against students feeling as though they were losing out on valuable PE time and therefore feeling less stressed by losing something that they enjoyed and feeling more open to immerse themselves in the practice of yoga.

Frank et al (2014) found significant effects on all measures of stress employed, yet the findings are less robust due to the lack of a control condition. Ramadoss and Bose (2010) found significant within condition pre-post effects complete with dosage effect, yet did not analyse between conditions despite having employed a control.

This finding contrasts with the previous review by Li and Goldsmith (2012) who found that 25 of 35 clinical studies explored, showed a significant positive impact of yoga on stress and anxiety. There are key differences between this review and that by Li and Goldsmith (2012) who explored the impact of yoga on adult practitioners experiencing clinical levels of stress and/or anxiety compared with this review which investigated school-based yoga interventions on stress in adolescents. In addition, studies in the current review most often utilised a PE control, with PE also seemingly impacting on the stress response in a beneficial way.

The only other finding approaching significance ($p < 0.10$) from the RCT studies came from Fishbein et al (2015) who incorporated a physiological measure of stress reactivity 'skin conductance'. Higher skin conductance occurring acutely during a stressful task is considered a measure of an orienting response to allocate resources needed to process relevant incoming information. Therefore, although counterintuitive the non-significant increase for the yoga group and significant decrease for the control is positive, suggesting that students in the yoga group were more able to direct their attention and respond appropriately to the stressful task administered than those in the control. However, Fishbein et al (2015) incorporated a 'class-as-usual' rather than a PE control. Fishbein et al's (2015) finding is in line with previous research, which found a positive impact of yoga on physiological measures associated with the stress response (Innes, Vincent & Taylor, 2007; Pascoe & Bauer, 2015; Purdy, 2013; Ross & Thomas, 2010; Thirthalli et al, 2013; Naveen et al, 2016;

Harris et al, 2015 and Ramler et al, 2015). The findings however fail to support the specific impact of yoga on stress reduction above other forms of physical activity.

RQ 2 What are the qualitative findings from studies exploring the experiences of students who engaged with secondary school-based yoga programmes on mental health?

RQ 2a Are there any gender differences in the experiences of secondary school-based yoga intervention participants?

The qualitative synthesis found that students across all 8 studies were reported to speak about yoga as being stress reducing/relaxation inducing, the fact that this was reported by all 8 studies strengthens the reliability of this finding and is interesting despite the weak quantitative findings reported. With regard to gender differences, the qualitative synthesis uncovered that females were reported to speak about how yoga reduces feelings of stress and induces feelings of relaxation more often than males, with the contributing data arising from a number of studies. In comparison, two teachers from two different studies reported that their male student felt less stressed and more relaxed after yoga, yet teachers did not report this for females. It is difficult to surmise what has led to this finding without risk of sounding gender stereotypical, but it is possible that males were less likely to speak about feelings of stress as opposed to males feeling and dealing with less stress (Powell & Potter, 2010; Weaver, 2015). Females may be more likely to articulate their feelings with regard to feeling stressed, compared with their male counterparts and teachers or researchers, may have felt that they would like to illumine changes witnessed in male students rather than female students who may have more readily discussed this and highlighted it for themselves.

Emotion Regulation

RQ 1 What are the quantitative findings from studies exploring the impact of secondary school-based yoga interventions in adolescence?

The quantitative element of this study focused on the outcomes of emotion regulation and emotion dysregulation rather than on the multi-faceted outcome of self-regulation due to the heterogeneity of measures used to assess this.

Out of 3 RCT's exploring emotion regulation only Frank et al (2017) found a statistically significant effect favouring the yoga condition, however this was in comparison with a 'classes-as-usual' control. Trends in the data demonstrated that Butzer et al (2017) also found increases in emotion regulation for the yoga group and decreases in emotion regulation for the control condition. Of interest, Butzer et al (2017) incorporated measures of emotion dysregulation alongside measures of emotional self-control and discovered increases in emotion dysregulation for both conditions, with larger increases for the yoga condition than for the PE control. This apparent paradoxical finding is in line with previous findings such as that by White (2012) and Haden (2014) who argued that part of the journey of yoga and mindfulness is firstly developing an awareness of one's feelings including those of stress and anxiety coupled with developing strategies to support emotion regulation such as 'letting go' or 'observing with compassion' or 'breathing through difficult feelings' to enable a shift in those emotional states that they are becoming more aware of or tuned into.

RQ 1a Are there any gender differences in the impact a secondary school-based yoga intervention has on mental health outcomes?

Two of four studies uncovered some differences on how yoga impacts on emotion regulation and impulsivity by gender. Butzer et al (2017) found a significant 3-way gender-condition-time interaction, with separate analyses indicating that females in the yoga group showed increases in emotional control whereas males did not. Females were also found to be significantly less impulsive (lack of premeditation) after participating in a yoga intervention. Conversely, males in the PE group showed increases in emotional control whereas females did not. This finding appears to suggest a specific benefit of yoga in increasing emotional and impulse control for females, above and beyond that of PE. However, the data also suggests that there is a specific favourable effect of PE on emotion control in boys compared with yoga.

The quantitative findings from the studies reviewed on the impact of yoga to support stress and emotional regulation above and beyond that of PE are weak and by proxy so too are any recommendations which suggest the practice of yoga to support stress and emotion regulation.

RQ 2 What are the qualitative findings from studies exploring the experiences of students who engaged with secondary school-based yoga programmes on mental health?

However the qualitative experiences of yoga practitioners do provide some support for the Gard et al (2014) model whereby the majority of students spoke about how yoga had helped them to emotionally regulate in difficult situations both in school and outside of school, with the minority identifying that they used postures to help them to emotionally regulate, some citing using 'yoga' yet not mentioning a specific practice and the majority as stating that they employed breathing techniques above and beyond other yoga practices.

4.3.4 Yoga and Interpersonal skills

RQ 2 What are the qualitative findings from studies exploring the experiences of students who engaged with secondary school-based yoga programmes on mental health?

RQ 2a Are there any gender differences in the experiences of secondary school-based yoga intervention participants?

The themes of 'Social Communication and Connection' and 'Self-Regulation Within Relationships' emerged from the qualitative synthesis suggesting that yoga may be beneficial to interpersonal skills. Students spoke about being able to modify their thinking along with an enhanced ability to consider other people's perspectives or of using yoga techniques to modulate their emotions towards others which helped them behave differently within social interactions. Sometimes students simply acknowledged changes in their behavioural responses since practicing yoga, for example being in fewer physical altercations and arguments without fully understanding how this had happened. Fewer students however did not feel that yoga could help to modify actions or responses to others. Of interest, is that both males and females reported improved self-regulation after practicing yoga in response to other people.

Participants also noted improvements in social interaction and communication skills which included becoming more 'friendly' and initiating and engaging in more conversations, along with treating people more compassionately and of forming connections with others along with a sense of group belonging. These findings are in line with previous qualitative research by Conboy et al (2013) who reported that

students had suggested that yoga could help to support social cohesion with friends and family.

Quantitative improvements in social confidence and communication with teachers and peers and increases on the prosocial subscale of the SDQ have been observed in previous research (Cohen et al 2018, Powell and Potter 2010). However other studies have not reported positive findings in this area (Mendelson et al 2010).

Powell and Potter (2010) replicated the earlier findings of Powell et al (2008) on student and teacher measures of social communication and confidence and found increases on the prosocial subscale of the SDQ in their older sample where Powell et al (2008) had not.

Of interest, only females were reported to have identified how yoga provided a space for students to feel interconnected, whereas males had not identified this in themselves, or at least did not talk about this, despite the qualitative data coming from mixed gender studies (Berezowski et al 2015 and Butzer et al 2017).

Conversely, teachers were reported to identify that males showed improved social communication and interaction, yet not for females. It is possible that this finding also aligns with gender differences whereby females may prioritise social connection or feel comfortable talking about their need for social connection more than males do. In addition, teacher observations regarding improvements in social communication for males may have been more easily observable than in females who may be more able to mimic social communication skills and minimise any difficulties (Sauter, Heyne and Westenberg 2009; Weiner, Suveg and Kendall 2006; DCSF, 2008). Furthermore these changes in male social communication may have arisen, not just because of the yoga intervention in isolation, yet due to the passage

of time and of them becoming more familiar with their peers as the school year progressed.

The findings appear to offer some support for Gard et al's (2014) model, whereby yoga practice may support self-regulation in its practitioners which has a beneficial impact on prosocial and ethical behaviour and is line with Perry's (2006) concept that self-regulation impacts on a person's ability to relate with others.

4.4 The Impact of Yoga on Depression and Anxiety

RQ 1 What are the quantitative findings from studies exploring the impact of secondary school-based yoga interventions in adolescence?

Previous research has suggested that prolonged stress may contribute to the development of mental health conditions such as anxiety and depression (Dantzer et al, 2008, 2012; Maes, 2008; Mazure, 1998; Monroe et al, 1991). This could mean therefore, that if yoga is effective in helping its practitioners to regulate their stress and emotional responses, this could decrease their chances of developing depression or anxiety. Only 1/5 studies detected a significant finding on the tension-anxiety subscale of the POMS (Noggle et al, 2012) when compared with a PE control. Of the 2 non-RCT's, only Frank et al (2017) in their uncontrolled study, found a significant finding pre-post-intervention for the yoga condition, on the anxiety subscale of the BRUMS, yet not for the somatisation subscale. Both Noggle et al (2012) and Khalsa et al (2012) employed the tension-anxiety subscale of the POMS, with Noggle finding a significant decrease in anxiety for the yoga condition compared with the PE condition, where Khalsa et al (2012) did not. Noggle et al (2012) drew attention to the fact that slightly different yoga interventions were used, that there was a smaller sample size in the Noggle et al (2012) study which was implemented

in the Spring term compared with the Winter term, as considerations for why replicability was not achieved.

Trends in the data showed that scores generally decreased more often and by a greater magnitude for the yoga conditions compared with the PE controls. However the secondary meta-analyses using Stata (Version 17) generated a non-significant θ value of 0.20, at best interpreted as a small effect size for the impact of yoga on anxiety (Cohen, 1988) Khalsa (2012) uncovered somatisation scores which decreased more for the control condition. It is possible that somatisation, the physical manifestation of anxiety, responds more effectively to the higher physical demands of a P.E class and that using the body more vigorously was useful in dispersing feelings of somatisation. Trends demonstrated increases for anxiety in both conditions for the Butzer et al (2017) research, yet more so for the control.

This review was unable to add weight to the argument that yoga may ameliorate depression as suggested by previous research (Broot & Dhir 1990; Pilkington, Kirkwood, Rampes & Richardson, 2005; da Silva, Ravindran & Ravindran 2009).

None of the 5 RCT's found significant differences between yoga and the PE control on measures of depression. Both of the non-RCT studies (Frank et al, 2014; Felver et al, 2015) demonstrated improvements on measures of depression, yet one was uncontrolled and the other demonstrated decreases for both conditions, albeit a greater decrease for yoga. Trends in the data demonstrated decreases on scores of depression for the yoga group on all but one measure in the Butzer et al (2017) study. The control groups showed increases on measures of depression except from the Felver (2015) study which showed a decrease. The secondary meta-analysis for the outcome of depression in isolation using Stata (Version 17) generated a non-significant θ value of 0.22, again a generous interpretation might be that yoga has a

small impact on the mental health outcome of depression when compared with a PE control (Cohen, 1988). Previous research such as that by Khalsa et al (2012) and Noggle (2012) has highlighted that sometimes, whilst yoga may not be shown to specifically significantly decrease adverse mental health outcomes such as stress and depression when compared to a P.E control, it may help to prevent an increase on such outcomes.

Schulte (2015) found significantly lower scores on the CES-D measure of depression for yoga compared with the PE control on measures taken 5 months post intervention yet not on proximal post measures. This finding diverges with that of Butzer (2017) who did not find any differences between the yoga and control groups at 6 months or 1 year post-intervention. It is possible that young people involved with the Schulte (2015) study were still implementing yoga practices into their everyday lives post-intervention and that such practices had a cumulative effect on depression in young people, furthermore the students may have sought out further yoga classes which was not examined or reported by Schulte (2015). If yoga is able to support a decrease in the stress response which may ameliorate depression (Dantzer et al, 2008; Dantzer, 2012; Maes, 2008; Mazure, 1998; Monroe et al, 1991), it is plausible that that this may occur over a longer time period once the practices have had time to embed.

RQ 1a Are there any gender differences in the impact a secondary school-based yoga intervention has on mental health outcomes?

In their RCT study Butzer et al (2017) found an increase on measures of anxiety and depression across both conditions, alongside the finding that emotion control increased in the PE condition for male students. Students were randomly assigned

to either a P.E or yoga class for two terms, they had volition over whether they participated in the research yet not over whether they attended regular PE or yoga. The researchers identified that sampling bias, whereby more females than males signed up may have been introduced due to the misinterpretation by boys that not signing up for the research meant that they did not have to engage with yoga instead of PE. The RCT method in this case, whilst designed to eliminate risk of bias may have unwittingly negatively biased findings due to the ill feeling created in students by lack of autonomy and loss of PE classes. This research highlights the importance of empowering students to have autonomy over the activities that they engage in and the choices they make to support their own mental health and wellbeing.

It appears that yoga operationalised universally within schools may have marginal non-significant benefits above and beyond that of PE and that there may be certain subgroups which demonstrate a more favourable response to yoga when it is implemented within the PE curriculum, these groups include female students and students of a lower physical aptitude. Previous research which has shown an enhanced benefit of yoga on symptoms of depression and anxiety has generally used a clinical or targeted sample of individuals presenting with anxiety and depression, as opposed to a non-clinical universal sample (Hall, Ofei-Tenkorang, Machan and Gordon, 2016; Khalsa, 2013; Li and Goldsmith, 2012; Thirthalli et al, 2013). In this sense it may be that school-based yoga may be operationalised to help support these conditions by offering it as a low intensity therapy to the following subgroups, female students, those less likely or able to engage in traditional P.E and/or those experiencing anxiety and depression. Where individuals were experiencing clinical conditions, yoga could be implemented as a targeted rather than universal intervention as part of a wider treatment package following the

stepped care approach outlined by NICE (2013, 2019). Plausibly it could be offered for mild conditions where a period of watch and wait is outlined in the NICE guidances, the impact of yoga on levels of anxiety or depression could then be evaluated for a response and if no improvement or a worsening of symptoms is seen, care could be raised to the next step outlined in the stepped care approach and a referral to CAMHS made. Furthermore, it could be a welcome adjunct to a treatment plan or for students who are on the wait-list for other therapeutic intervention as long as students express an interest in participation, have volition over their involvement and their response to the intervention is monitored using appropriate evaluative tools. The evidence fails to suggest that yoga may support anxiety and depression when implemented universally in the school system particularly when implemented as part of the PE curriculum, with some male students and some students highly motivated by PE, not reacting favourably to interventions which reduce their PE time and for which they do not have autonomy over their engagement.

4.5 Yoga Versus PE in Supporting Mental Health in Students

RQ 1 What are the quantitative findings from studies exploring the impact of secondary school-based yoga interventions in adolescence?

The findings do not provide support for the specific impact of yoga above and beyond PE suggesting that they may both work to support mental health. It is plausible that there may be some overlap on the mechanisms via which they work, therefore it continues to be important to parse out differences between the two. Yoga may specifically work on mindfulness and the breath embedded within a physical practice, which necessitates the consistent incorporation of such measures to

assess the impact of yoga above that of PE on these specific outcomes (Ferreira-Vorkapic, 2015).

RQ 2 What are the qualitative findings from studies exploring the experiences of students who engaged with secondary school-based yoga programmes on mental health?

The qualitative review identified that the majority of students talked about using the breathing practices learnt during the yoga program more so than postures which arguably overlap with traditional PE more. One crucial difference is that yoga explicitly teaches students to generalise teachings and practices learnt “on the mat” to their everyday lives. Teaching of discrete breathing practices which can be used in stressful situations is commonplace. Physical education whilst at times comparable or only marginally weaker than yoga on self-regulatory and mental health outcomes explored post-intervention, does not have easily segmented practices which can be generalised into their everyday lives away from the wider exercise, activity or game. It may be that general post-intervention effects on stress and emotion regulation are comparable yet that yoga equips young people with breathing practices which can be discretely and discreetly used within future stressful situations.

Gard et al (2014) and others (Field, 2016; Innes et al, 2007; Ross & Thomas, 2010) have suggested that practicing yoga helps to down-regulate the sympathetic nervous system and upregulate the parasympathetic. It might be that there are subtle differences on how regular physical exercise and yoga mediate the stress response via the nervous system. One hypothesis is that regular PE classes help to expend the energy from an overactive sympathetic nervous system which in turn allows engagement of the parasympathetic nervous system, which is possibly why PE

exerts a greater influence over somatisation (a physical manifestation of anxiety triggered by an overactive sympathetic nervous system) compared with yoga (Khalsa et al, 2012; Frank, 2014). Whereas yoga, as a gentler form of exercise incorporated with breathing practices, may work more directly on the parasympathetic nervous system, which could help to explain the specific findings favouring yoga over PE in improving feelings of fatigue and promoting sleep (Van der Kolk, 2014; Felver et al, 2015; Khalsa et al, 2012; Porges, 2011). Alternatively, the increase on somatisation measures for the yoga group may be due to enhanced awareness and attunement to their physical feelings developed by the teaching of mindful awareness and instructions to support students feeling more 'embodied' during yoga classes. The challenge will be to find ways of measuring these subtleties, particularly in a nonclinical educational setting. Yoga may be more effective in increasing longer-term feelings of relaxation, sleep, good digestion and immunity associated with the parasympathetic nervous system and mindful awareness of physical feelings than PE. Whereas both may be equally good in decreasing the immediate feelings of stress associated with the sympathetic nervous system. This might help to explain the findings of Schulte (2015) and Bergen-Cico (2015) who found that yoga may specifically support distal effects on emotion regulation and depression possibly due to yoga's proposed impact on the activation of the parasympathetic nervous system, the effect of which may take longer to manifest and measure.

RQ 1a Are there any gender differences in the impact a secondary school-based yoga intervention has on mental health outcomes?

The results from the Butzer et al (2017) study suggest that yoga may impact more favourably on emotion regulation in females than PE and vice versa. Alternatively,

males may have experienced benefits had they not lost out on PE. sessions to engage with yoga. Indeed, the operationalisation of the Butzer et al (2017) study may have exacerbated possible gender differences due to the ill-feeling generated in male students.

A promising finding to have been detected by the quantitative synthesis arose from the Cox et al (2017) study, which utilised PE classes consisting of students who were less able in PE, with a female majority. They found some significant evidence to suggest that yoga may help to lessen an individual's tendency to think about their body from another person's perspective (body surveillance) compared to PE, with the magnitude of the effect increasing when they analysed the female data alone. Furthermore, by isolating the female data they found a further significant increase on physical self-worth in the yoga condition. This finding is partly in line with previous research by Daly et al (2012) who found increases in positive body awareness across genders after engaging with a yoga program, which they found to be associated with improved self-regulation. Daly et al (2015) did not however analyse separately for males and females, which may have been useful.

The data appear to suggest that in a climate when standards of beauty and physical ideals are constantly delivered via social media to young people, yoga may help to support a decrease in body self-consciousness in males and females alongside an increase in physical self-worth for females alone. Indeed, the findings from the Good Childhood (2019) report for the UK suggested that the gap between boys and girls' unhappiness with their appearance was decreasing, suggesting that boys were becoming less happy with their appearance and highlighting the importance of a practice that has potential to decrease body self-consciousness across genders.

4.6 Yoga Interventions in the UK; A Scarce Evidence Base

One of the current study's aims was to explore the evidence base generated within the UK school system. It was hypothesised that along with the growth in implementation of yoga programmes that researchers would have simultaneously been investigating and evaluating their impact. Unfortunately this was not the case, only 5 relevant studies were retrieved, all of low methodological quality and 2 awaiting publication. Due to the lack of reported information available and/or low methodological quality, data from 4 of them was not included in the overall syntheses. As has been discussed the evidence base generated from quantitative studies predominantly based in the US is relatively weak despite some promising qualitative findings.

There are however differences within the UK and USA based school systems which may impact on the effects of a school based yoga programme and therefore generalisability of results. These include: differences between the structure of UK and USA based education including tiering, differences in the value and operationalisation of SEL interventions, differences in the impetus given to academic and SEMH drivers with students in the UK sitting examinations in both Years 11 and 13 compared to just in Year 13 in the USA which may impact levels of stress, differences in the funding and provision of mental health services accessible to students in school, community and clinical settings and variation between manualised yoga programmes and teacher trainings between the two countries. Therefore it would still be prudent for UK based research to be undertaken.

4.7 The Implementation of Yoga Interventions

RQ 2 What are the qualitative findings from studies exploring the experiences of students who engaged with secondary school-based yoga programmes on mental health?

RQ 2a Are there any gender differences in the experiences of secondary school-based yoga intervention participants?

This section discusses the potential challenges involved in implementing a yoga intervention within secondary schools. Both males and females were found to have pre-conceived ideas of what yoga may entail, with one female thinking that yoga would not be physically challenging enough and one male that yoga was “for girls”. Indeed evidence from Conboy et al (2013) found that males sensed a ‘peer pressure’ against engaging with yoga. Therefore, it may be useful to address preconceptions through taster sessions. The Butzer (2017) study uncovered a degree of self-consciousness at practicing yoga in front of members of the opposite sex which may impact on engagement, a good approach when considering implementation may be to ask students to complete questionnaires assessing acceptability of practicing in a mixed-sex class, prior to operationalising one.

Participants identified a number of barriers to practicing yoga which included: issues with noise levels and available space and time to engage with home practice and adequate space to do so. Some students felt that the program did not go on for long enough, conversely, a minority suggested that the intervention went on for too long, though the data for this came from the Butzer et al (2017) study alone, which covered two terms. It may be useful to deliver sessions of one hour, over one term

as others reported unfavourable findings when individual sessions were too long (e.g 90 mins; Haden et al, 2014)

Further critique centred around student selection and group dynamics, with one teacher observing that students participating in a targeted intervention were separated from their peers and felt singled out or that they missed out on whole class activities.

4.8 Strengths and Limitations

This study focused on a few outcomes to explore the strength of evidence across studies in a bid to limit bias, a fundamental purpose of systematic reviews and a strength of this research. It was planned to evaluate the evidence base and draw inferences about the strength and appropriateness of recommending universal yoga interventions to support specific mental health outcomes. To buffer against the potential to focus on significant findings alone, outcomes to be explored were selected by the frequency that they were tested. This contrasts with previous reviews such as those by Serwacki and Cook-Cottone (2012), Weaver and Darragh (2015) and Khalsa et al (2012) who whilst critically appraising for bias, reported more widely on the findings of each study, did not consider the findings according to a theoretical lens and encapsulated more of the significant findings across studies rather than interrogating the evidence for a select few. Consequently, a weakness of this study is that the deep dive into a few outcomes across studies, meant that significant findings for other outcomes were not fully considered or reported which may underplay the potential impact of yoga on other mental health outcomes.

One important area which warrants discussion here is that the qualitative synthesis found that some students spoke about how yoga helped them to fall asleep,

improved their sleep and of using breathing techniques to actively induce sleep, although a smaller proportion did not think yoga had impacted upon their sleep at all. This finding is convergent with the quantitative findings from Khalsa et al (2012) and Felver (2015) who found that yoga had a specific significant impact upon fatigue compared with PE. The notion that yoga may aid relaxation and improve sleep may support the theory that yoga actively engages the parasympathetic branch of the nervous system and that improved sleep and relaxation in turn support positive mental health and wellbeing (Gard et al, 2014; Perry, 2006; Porges et al, 2011; Van Der Kolk, 2014)

Both Felver et al (2015) and Khalsa (2012) also found improvements on measures of anger post yoga compared to PE. The fact that there is replicability across these two studies that yoga supports decreases in anger and improves fatigue above and beyond the effects of PE increases reliability. It is plausible that these measures are reflective of yoga's impact on the sympathetic (anger) and parasympathetic (sleep) nervous systems respectively. It would be useful if future research further considered these outcomes and included parent/teacher report and physiological measures to triangulate with self-report findings. Dosage effects and time frames for when such changes start to take place warrant further consideration, for example does anger start to decrease prior to the onset of improved sleep or do these changes take place simultaneously.

This review included non-RCT studies as it was hypothesised that school-based researchers may employ observational studies more often, however this was not found to be the case. The majority of quantitative studies employed an RCT design however these RCTs were often downgraded due to small sample sizes, cluster randomisation, inconsistency in findings and imprecision. The GRADE approach

meant that, had large scale observational studies been conducted, the quality of their evidence could have been up-graded had large effect sizes been found unexplained by confounding variables. School systems are complex with researchers challenging the fruitfulness of implementing RCT designs when in reality the intervention will be delivered much differently, therefore reducing generalisability of findings to the real world context (Bagshaw & Bellomo, 2008; Biesta, 2010; Cook et al, 2008; Konnerup & Kongsted, 2012; Tellings, 2017). It may be useful for future research to employ larger scale non-RCT designs, more sensitive to the school ecosystem in conjunction with careful consideration of effect sizes and confounding variables.

Previous systematic reviews such as that by Khalsa et al (2012) and Ferrira-Vorkapic et al (2015) highlighted the need for future research to implement measures other than self-report to triangulate findings and strengthen their validity, it was anticipated that more researchers would have operationalised this recommendation. Researchers had started to incorporate physiological and teacher/parent reports yet not routinely enough for this review to assess data across studies. It would therefore be useful for future research to increase implementation of such measures.

A strength of the qualitative strand of this research is that it considered data across studies and that, as such, themes were generated giving some idea of how yoga may be experienced when implemented more generally in a school system, not tied into the experiences within one single school, which may add to the generalisability of findings. However an obvious limitation of secondary qualitative data analysis pertains to the applied framework used by primary studies to analyse data, including predetermined codes, which undoubtedly filtered through into the current synthesis. Furthermore, this research is bound by the particular quotations that the primary

researchers opted to report. This is of particular concern when considering the present synthesis by gender, as there was less available data and a disparity in the amount of data identifiable as male or female. One can only be confident that males or females were more often reported through a researcher's lens to make certain comments or hold certain views. Further, qualitative research into the different experiences of adolescent male and female yoga practitioners should be conducted, particularly as there do appear to be some possible differences emerging.

4.9 Implications for Future Research

The findings from this systematic review have highlighted a number of areas that future research could further investigate. It would be beneficial to explore the impact of school-based yoga interventions specifically targeted to students experiencing mental health conditions such as anxiety and depression to explore whether individuals with clinical symptomatology may show an enhanced response to yoga compared with individuals without a presentation approaching clinical significance, in line with previous research in clinical populations (Broota and Dhir, 1990; da Silva, Ravindran & Ravindran, 2009; Harris et al, 2015; Kuttner et al, 2006; Li and Goldsmith, 2012; Naveen et al, 2016; Pilkington, Kirkwood, Ramler et al, 2015; Rampes & Richardson, 2005; Telles and Srinvas, 1998; Thirthalli et al, 2013). This may necessitate the use of measures that are designed to explore clinical levels of anxiety and depression. It might be useful to explore four treatment conditions, one employing the traditional treatment outlined by NICE in isolation (NICE, 2013; NICE, 2019), one with school-based yoga as an adjunct to traditional treatment (as above), one school-based yoga only wait-list control condition and one wait-list control condition, should ethical considerations permit this type of methodological design.

In addition, exploration of the differential impact of universal yoga on other subgroups of students is recommended, primarily the execution of comparison studies designed to explore differences in the responses of females and males and students who enjoy and/or excel in PE from students who either do not enjoy and/or find regular PE challenging. It would also be useful to trial the impact of universal yoga interventions on such subgroups when implemented during different areas of the curriculum, for example offering it as an optional module during either PSHE or PE to consider the impact that it may have when students have some autonomy over when they are able to engage with the intervention and during which lesson.

This review like other reviews, found that the vast majority of measures utilised by the primary studies were self-report measures, despite other reviewers including Khalsa et al (2016) highlighting the need to include parent and teacher report measures, combined with those that monitored the physiological impact of yoga with which to triangulate the findings from self-report measures and add to the validity of findings. Therefore it is still imperative that future yoga-related research incorporates a range of such measures. It would be useful to use a range of physiological measures which may help to shed light on the activation of the sympathetic and parasympathetic nervous systems. The qualitative component of this review highlighted that students often spoke about using breathing exercises to support their emotion regulation, yet none of the reviewed studies included measures which explored the breath. It may be useful to include physiological measures designed to measure the quality of the breath, for example oxygen saturation levels and the length of the breath, alongside questionnaires devised to explore how often individuals used breathing exercises for and the feelings that arose before and after practicing them. Indeed, a possible future research design could employ three

conditions to explore whether yoga as a multi-component programme works synergistically as espoused by Patanjali's 8 limbed path of yoga, compared with a condition where students have been taught breathing practices in isolation to the other core components taught in yoga classes in comparison with a control condition.

This review highlighted that despite mindfulness and body awareness commonly being cited as self-regulatory mechanisms via which yoga exerts its effects to mediate stress or support emotion regulation, measures to explore them were less often implemented. It would be useful for future research to explore mindfulness using questionnaires designed for adolescents as opposed to adults and to include measures which explore body awareness.

Finally, there was some replication between studies exploring somatisation (Frank, 2014; Khalsa et al, 2012), somatisation increased for the yoga condition yet decreased for the PE condition where a control was employed. Two other studies found a decrease on measures of anger and an increase in fatigue for the yoga condition (Felver, 2012; Khalsa et al, 2012) It would be useful for further studies to explore these differences to see if these findings can be further replicated to assess their reliability and strengthen the interpretation of these results.

4.10 Implications for EP practice

As a practicing EP and in view of the fact that this research was conducted as part of the qualification of Doctor in Child, Adolescent and Educational Psychology, it is important to consider how this research could inform practice in the field of Educational Psychology, the following bullet points offer a brief summary of this:

- EPs may incorporate yogic breathing practices into individual and group based therapeutic activities, for example, to complement top down therapeutic practices such as Cognitive Behaviour Therapy and Acceptance and Commitment Therapy.
- They may advocate body-based therapeutic practices such as yoga during consultation with school staff to support positive mental health as an adjunct to other therapeutic activities with a more robust evidence base. This may equip the student with another 'tool' for their mental health 'tool box'. Students' views on participation should always be sought and a range of tools should be used to monitor for potential impact.
- They may encourage schools to offer yoga as a module to students embedded within the PE/PSHE curriculum and suggest that they offer taster sessions to introduce young people to yoga and to manage preconceptions. Offering yoga as a PE option may be a more desirable form of exercise to some girls and/or those students of lower PE ability. Offering it as a PSHE option may mean that those students less likely to choose it as a PE module (e.g some males and/or those of higher PE ability) still have the option to practice it without losing out on valuable PE time.
- EPs should advocate that schools listen to student views about practicing yoga in mixed or same sex classes and that they listen to student feedback about length and duration of classes.
- Educational psychologists may be well placed to support schools to evaluate and monitor the implementation of yoga programmes, amongst other SEMH interventions and where possible to co-ordinate data collection across schools for analysis in order to support research into this area.

4.11 Conclusion

In conclusion, the quantitative aspect of this review, including statistical meta-analysis, did not detect a significant favourable impact of yoga on the mental health outcomes of stress, anxiety, emotion regulation and depression, above and beyond that of PE. The quality of evidence across studies was assessed as being of very low to low methodological rigour and therefore any recommendations made about yoga to support those outcomes are weak. However trends in the data appear to suggest that yoga demonstrates a marginally increased benefit compared with PE for the majority of outcomes assessed

The qualitative synthesis found that the majority of students spoke about the benefit of yoga to support self-regulation including aspects of stress reduction, emotion regulation, cognitive modifiability and the integration of the mind, the body and the breath alongside favourable reports of yoga as helpful in the development of interpersonal skills, including social communication and self-regulation within relation to others.

The idea that yoga may support self-regulation and improve prosocial behaviour is in alignment with Gard et al's (2014) model. The qualitative data also suggested some support for this model in that yoga may impact on neurophysiological and neurocognitive self-regulatory processes, specifically on the use of breathing practices to support bottom-up regulation and in developing mindfulness (a top-down regulatory process) in practitioners.

Some gender differences were uncovered from the quantitative synthesis namely that yoga may be more beneficial than PE in supporting emotion regulation, body surveillance and physical self-worth in females whereas PE may be more beneficial in supporting emotion regulation in males. Caution should be exercised in the interpretation of these results however as they were generated from two studies, which necessitates further research to consider replicability and assess reliability of the findings. The qualitative findings highlighted that females more often reported feeling less stressed and more relaxed after yoga, that they preferred yoga to PE and that yoga improved their sense of connectedness with others. Teachers were more often reported to observe male students as being more relaxed and of noticing an increase in their social communication skills than they were for females.

Future research must continue to parse out differences between how yoga and PE may impart their effects on mental health outcomes and via which mechanisms, with this research suggesting the incorporation of different measures to assess mindfulness and the breath as possibilities which may support this process.

5 References

Aggleton P, Hurry J, Warwick I. *Young people and mental health*. Chichester: John Wiley, 2000

Abel, A.N., Lloyd, L.K. and Williams, J.S. The effects of regular yoga practice on pulmonary function in healthy individuals: a literature review. *Journal of Alternative and Complementary Medicine*, 9(3), 185-190. 2013

Bagshaw, S. M., & Bellomo, R. (2008). The need to reform our assessment of evidence from clinical trials: A commentary. *Philosophy, Ethics, and Humanities in Medicine*, 3(1), [23]. <https://doi.org/10.1186/1747-5341-3-23>

British Broadcasting Society. (2019). Yoga in schools has 'profound impact' on behaviour. Retrieved at <https://www.bbc.co.uk/news/av/uk-england-norfolk-47489958>

Beets, M. W. and E. Mitchell (2010). "Effects of yoga on stress, depression, and health-related quality of life in a nonclinical, bi-ethnic sample of adolescents: A pilot study." *Hispanic Health Care International* 8(1): 47-53.

Benson, H; Beary, J; Carol, M.(1974) The Relaxation Response. *Psychiatry; Washington, Vol. 37, Iss. 1,*

Benson, H. (1985). *Beyond the relaxation response: How to harness the healing power of your personal beliefs* . New York, NY: Berkley Books.

Berezowski, K. A., et al. (2017). "A Mindfulness Curriculum: High School Students' Experiences of Yoga in a Nova Scotia School." *Learning Landscapes* 10(2): 45-58.

Bergen-cico, D., et al. (2015). "Fostering Self-Regulation Through Curriculum Infusion of Mindful Yoga: A Pilot Study of Efficacy and Feasibility." *Journal of Child and Family Studies* 24(11): 3448-3461.

Berger DL, Silver EJ, Stein RE. Effects of yoga on inner-city children's well-being: a pilot study. *Altern Ther Health Med*. 2009 Sep-Oct;15(5):36-42. PMID: 19771929

Bhaskar, R. (1978). *A realist theory of science*. Brighton, UK: Harvester Press.

Bhaskar, R. (1986). *Scientific realism and human emancipation*. London, UK: Verso

Biesta, G. J. J. (2010a). *Good education in an age of measurement: Ethics, politics, democracy*. Boulder, Co: Paradigm Publishers.

Braun, V. and Clarke, V. (2006) Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3 (2). pp. 77-101

Brefczynski-Lewis, J.A., Lutz, A., Schaefer, H.S, Levinson, D.B. and Davidson, R.J. (2007) Neural correlates of attentional expertise in long-term meditation practitioners.

Proceedings of the National Academy of the Sciences of the United States of America: vol. 27 pg 11483-8

Brisbon, N. M and Lowery G.A (2011) Mindfulness and levels of stress: A comparison of beginner and advanced Hatha yoga practitioners. *Journal of Religion and Health*, 50, 931-941.

Broota, A., Dhir, R., 1990. Efficacy of two relaxation techniques in depression. *J. Pers. Clin. Stud.* 6 (1), 83-90.

Brown, R. P., & Gerbarg, P. L. (2005a). Sudarshan Kriya yogic breathing in the treatment of stress, anxiety, and depression: Part I—Neurophysiologic model. *Journal of Alternative and Complementary Medicine*, 11, 189–201.

Buijs, R.M., (2013) The autonomic nervous system: a balancing act. *Handbook of Clinical Neurology* 117.

Butzer, B., Bury, D., Telles, S. & Khalsa, S.B.S (2016) Implementing Yoga Within the School Curriculum: A Scientific Rationale for Improving Social-Emotional Learning & Positive Student Outcomes. *Journal of Children's Services Complete!!*

Butzer, LoRusso, Shin and Khalsa 2017 Butzer, B., et al. (2017). "Evaluation of Yoga for Preventing Adolescent Substance Use Risk Factors in a Middle School Setting: A Preliminary Group-Randomized Controlled Trial." *Journal of Youth and Adolescence* **46**(3): 603-632.

Butzer, B., LoRusso, Windsor, Frame, Khalsa and Conboy (2017). "A Qualitative Examination of Yoga for Middle School Adolescents." *Advances in School Mental Health Promotion* **10**(3): 195-219.

Card, N. (2016). *Applied Meta-Analysis for Social Science Research*. United States, NY: The Guildford Press.

Carter, O.L., et al (2005) Meditation alters perceptual rivalry in Tibetan Buddhist monks. *Curr Biol* 15:R412–R413

Catalano, R., Bergland, L., Ryan, J., Lonczak, H and Hawkins, D. (2002). Positive Youth Development in the United States: Research Findings on Evaluations of Positive Youth Development Programs. *Prevention and Treatment* 5(15).

Children's Society (2012) The Good Childhood Report: Annual Review. (Google Scholar)

Children's Society (2014) The Good Childhood Report: Annual Review. (Google Scholar)

Children's Society (2019) The Good Childhood Report: Annual Review. <https://www.understandingsociety.ac.uk/research/publications/525853>

Cohen, Samantha, Harvey, Danielle, Shields, Rebecca, Shields, Grant, Rashedi, Roxanne, Tancredi, Daniel, et al. (2018). Effects of Yoga on Attention, Impulsivity, and Hyperactivity in Preschool-Aged Children with Attention-Deficit Hyperactivity Disorder Symptoms. *Journal of Developmental & Behavioral Pediatrics*, 39, 200-209. <https://doi.org/10.1097/DBP.0000000000000552>

Collishaw S, Maughan B, Goodman R, Pickles A.(2004). Time trends in adolescent mental health. *Journal of Child Psychology and Psychiatry*.45:8:1350–1362.

Conboy, L., Noggle, J., Frey, J., Kudesia, R. and Khalsa, B (2013) Qualitative evaluation of a high school yoga program: Feasibility and perceived benefits. *Explore* 171-180.

Cook, B., Buysse, V., Klinger, J., Landrum, T., McWilliam, R, Tankersley, M, and Test, D. (2015). CEC's Standards for classifying the evidence base of practices in special education. *Remedial and Special Education*, 36(4)

Cope,S.(2006). *The Wisdom of Yoga*. NewYork: Bantam

Cox, A. E., et al. (2017). "A pilot yoga physical education curriculum to promote positive body image." *Body Image* 23: 1-8.

Daly, L., Haden, S., Hagins, M., Papouchis, N. and Ramirez, P. (2015). Yoga and Emotion Regulation In High School Students: A Randomised Controlled Trial. *Journal of Evidence Based Complementary Alternative Medicine*. doi: 10.1155/2015/794928. Epub 2015 Aug 19

Dancey, C., & Reidy, J. (2017). *Statistics without maths for psychology*. United States, NY: Pearson Education, Limited.

Dantzer, R., et al., 2008. From inflammation to sickness and depression: when the immune system subjugates the brain. *Neuroscience*. 9 (1)

Dantzer, R., 2012. Depression and inflammation: an intricate relationship. *Biol. Psychiatry* 71 (1)

Dariotis, J. K., et al. (2016). "'The Program Affects Me 'Cause it Gives Away Stress': Urban Students' Qualitative Perspectives on Stress and a School-Based Mindful Yoga Intervention." *Explore: The Journal of Science and Healing* 12(6): 443-450.

da Silva T.L, Ravindran L.N, Ravindran A.V. Yoga in the treatment of mood and anxiety disorders: A review. *Asian Journal of Psychiatry* 2009;2:6-16.

Department for Children, Schools and Families (DCSF). (2008). *Targeted Mental Health in Schools (TaMHS) project*. London: DCSF Publications.

Department for Education (DfE). (2016). *Mental health and behaviour in schools*. London: DfE Publications.

Department of Health (DH). (2011a). No health without mental health: A cross-government mental health outcomes strategy for people of all ages. Supporting document – the economic case for improving efficiency and quality in mental health. Retrieved May 9, 2012, from http://www.dh.gov.uk/prod_consum_dh/groups/dh_digitalassets/documents/digitalasset/dh_123993.pdf

Department of Health. (2019). United Kingdom Drug Situation 2019: Summary. London: Her Majesty's Government Publications. Retrieved April 2021: <https://www.gov.uk/government/publications/united-kingdom-drug-situation-focal-point-annual-report/uk-drug-situation-2019-summary>

Durlak, J., Weissberg, R., Dymnicki, A., Taylor, R and Schellinger, K. (2011) The Impact of Enhancing Students' Social and Emotional Learning: A Meta-Analysis of School-Based Universal Interventions. *Child Development*: 82(1)

Early Intervention Foundation. (2020) Adverse childhood experiences: What we know, what we don't know, and what should happen next. Retrieved at <https://www.eif.org.uk/report/adverse-childhood-experiences-what-we-know-what-we-dont-know-and-what-should-happen-next>

Evans, S., Cousins, L., Tsao, J. C., Sternlieb, B., & Zeltzer, L. K. (2011). Protocol for a randomized controlled study of Iyengar yoga for youth with irritable bowel syndrome. *Trials*, 12(1), 1–15.

Everly, G, S and Lating, J, M. (2013) *A clinical guide to the treatment of the human stress response*. New York: Springer.

Felitti, V.J., Anda, R.F., Nordenberg, D. et al. (1998). Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACE) Study. *American Journal of Preventative Medicine*, 14(4), 245–58.

Felver, J., et al. (2015). "Yoga in Public School Improves Adolescent Mood and Affect." *Contemp School Psychol* **19**(3): 184-192.

Ferreira-Vorkapic, C., J. Feitoza, M. Marchioro, et al. (2015). Are there benefits from teaching yoga at schools? A systematic review of randomized control trials of yoga-based interventions. *Evid. Based Complement. Alternat. Med.* **2015**: 345835, 1–17.

Field, T. (2011) Yoga clinical research review, *Complementary Therapeutic Clinical Practice*. 17.

Field, T (2016) Yoga Research Review. *Complementary Therapies in Clinical Practice*, 24, 145-161

Fishbein, D., et al. (2016). "Behavioral and Psychophysiological Effects of a Yoga Intervention on High-Risk Adolescents: A Randomized Control Trial." Journal of Child and Family Studies **25**(2): 518-529

Frank, J. L., et al. (2014). "Effectiveness of a School-Based Yoga Program on Adolescent Mental Health, Stress Coping Strategies, and Attitudes Toward Violence: Findings From a High-Risk Sample." Journal of Applied School Psychology **30**(1): 29-49.

Frank, J. L., et al. (2017). "Effectiveness of a School-Based Yoga Program on Adolescent Mental Health and School Performance: Findings from a Randomized Controlled Trial." Mindfulness **8**(3): 544-553

Galderisi, S., Heinz, A., Kastrup, M., Beezhold, J. and Sartorius, N. (2015) Toward a New Definition of Mental Health. *World Psychiatry*, 14: 231-233.

Gard, T, Noggle, J., Park, C, Vago, D and Wilson A. (2014) Potential self-regulatory mechanisms of yoga for psychological health. *Frontiers in Human Neuroscience* **8**

Gellhorn, E. (1964). Motion and emotion: The role of proprioception in the physiology and pathology of the emotions. *Psychological Review*, *71*(6), 457–472.
<https://doi.org/10.1037/h0039834>

Goldberg, J., Sklad, M., Elfrink, T., Schreurs, K., Bohlmeijer, E., & Clarke, A. (2019). Effectiveness of interventions adopting a whole school approach to enhancing social and emotional development: A meta-analysis. *European Journal of Psychology of Education*, *34*(4), 755-782.

Greco, L., Baer, R. A., & Smith, G. T. (2011). Assessing mindfulness in children and adolescents: Development and validation of the child and adolescent mindfulness measure (CAMM). *Psychological Assessment*, *23*, 606-614

Green, H., McGinnity, A., Meltzer, and Goodman, R. (2004) Department of Health. Mental Health of Children and Young People in Great Britain. Office for National Statistics. Basingstoke: Palgrave Macmillan.

Greenberg, M.T, Weissberg, R.P, O'Brien, M.U, Zins, J.E, Fredericks, L., Resnick, H *et al* (2003) Enhancing school-based prevention and youth development through coordinated social, emotional, and academic learning. *American Psychologist*, *58* (), pp. 466-474

Greenberg, M., & Harris, A. (2012). Nurturing mindfulness in children and youth: Current state of the research. *Child Development Perspectives*, *6*, 161–166.

Greig, Mackay, Roffey and Williams (2016) Guest Editorial: The changing context for mental health and behaviour in schools. *Educational and Child Psychology*, *33*(2)

Gough D (2007) Weight of evidence: a framework for the appraisal of the quality and relevance of evidence In J. Furlong, A. Oancea (Eds.) Applied and Practice-based Research. Special Edition of *Research Papers in Education*, 22, (2), 213-228

Gough, D., Oliver, S. & Thomas, J. (2017). Introducing systematic reviews. In D. Gough, S. Oliver & J. Thomas (Eds.), *An introduction to systematic reviews* (2nd edition, pp. 1–18). London: Sage

Gough, D., (2019) Systematic Review Lecture. IOE-UCL

Guyatt, G.H., Oxman, A. D, Vist, G. E., Kunz, R., Falck-Ytter, Y., Alonso-Coello, P., et al.(2008) GRADE: an emerging consensus on rating quality of evidence and strength of recommendations *BMJ* ; 336 :924

Haden, S.C., L. Daly & M. Hagins. 2014. A randomised controlled trial comparing the impact of yoga and physical education on the emotional and behavioural functioning of middle school children. *Focus Altern. Complement. Ther.* **19**: 148–155.

Hagins,M., Haden, S. C., & Daly, L. A. (2013). A randomized controlled trial on the effects of yoga on stress reactivity in 6th grade students. *Evidence-Based Complementary and Alternative Medicine*.

Haidich A. (2010). Meta-analysis in medical research. *Hippokratia*, 14 (1), 29–37.

Hall A, Ofei-Tenkorang NA, Machan JT, Gordon CM. Use of yoga in outpatient eating disorder treatment: a pilot study. *J Eat Disord.* 2016 Dec 9;4:38. doi: 10.1186/s40337-016-0130-2. PMID: 27980773; PMCID: PMC5148831

Hargreaves, D. H. (1996). *Teaching as a research based profession: possibilities and prospects*. London, Teacher Training Agency

Harris, A., Jennings, P., Katz, A., Abenavoli, R. and Greenberg,M.(2015). Promoting Stress Management and Wellbeing in Educators: Feasibility and efficacy of a school-based yoga and mindfulness intervention. *Mindfulness*, 7, 143-154

Higgins JPT, Green S. (2013) *Cochrane Handbook for Systematic Reviews of Interventions*, Version 5.1.0. The Cochrane Collaboration.

Innes, K. E., Vincent, H. K., & Taylor, A. G. (2007). Chronic stress and insulin resistance-related indices of cardiovascular disease risk, part 2: A potential role for mind-body therapies. *Alternative Therapies in Health and Medicine*, 13, 44–51

Iyengar, B.K.S. (2002). *Light on the Yoga Sutras of Patanjali*. UK:Harper-Collins

Jha AP, Krompinger J, Baime MJ. Mindfulness training modifies subsystems of attention. *Cogn Affect Behav Neurosci.* 2007 Jun;7(2):109-19. doi: 10.3758/cabn.7.2.109. PMID: 17672382

Joseph Rowntree Foundation. (2020) UK Poverty 2020/21. <https://www.jrf.org.uk/report/uk-poverty-2020-21>

Kabat-Zinn, J. (2003) Mindfulness-Based Interventions in Context: Past, Present, and Future. *Clinical Psychology: Science and Practice*, 10, 144-156.
<http://dx.doi.org/10.1093/clipsy.bpg016>

Khalsa, S. B. S., Hickey-Schultz, L., Cohen, D., Steiner, N., & Cope, S. (2012). Evaluation of the mental health benefits of yoga in a secondary school: A preliminary randomized controlled trial. *Journal of Behavioral Health Services and Research*, 39, 80–90.

Khalsa, S. B. S., Butzer, B., Shorter, S. M., Reinhardt, K. M., & Cope, S. (2013). Yoga reduces performance anxiety in adolescent musicians. *Journal of Alternative Therapies*, 19, 34–45.

Khalsa, S.B.S. and Butzer, B. (2016) Yoga in school settings: a research review. *Annals of the New York Academy of Sciences: Meditation*, 1-12.

Kiecolt-Glaser, J. K., Christian, L., Preston, H., Houts, C. R., Malarkey, W. B., Emery, C. F., & Glaser, R. (2010). Stress, inflammation, and yoga practice. *Psychosomatic Medicine*, 72(2), 113–121.

Kongsted, H. C., & Konnerup, M. (2012). Are more Observational Studies Being Included in Cochrane Reviews? *BMC Research Notes*, 5(570).
<https://doi.org/10.1186/1756-0500-5-570>

Kuttner, L., Chambers, C. T., Hardial, J., Israel, D. M., Jacobson, K., & Evans, K. (2006). A randomized trial of yoga for adolescents with irritable bowel syndrome. *Pain and Research Management* 11, 217– 223

Lakoff, George. 1987. *Women, fire, and dangerous things: What categories reveal about the mind*. Chicago: University of Chicago Press.

Lazar SW, Kerr CE, Wasserman RH, Gray JR, Greve DN, Treadway MT, McGarvey M, Quinn BT, Dusek JA, Benson H, Rauch SL, Moore CI, Fischl B. Meditation experience is associated with increased cortical thickness. *Neuroreport*. 2005;16:1893–1897. [[PMC free article](#)] [[PubMed](#)] [[Google Scholar](#)]

Li, A.W and Goldsmith,C.A (2012).The effects of yoga on anxiety and stress. *Altern.Med.Rev.* 17, 21–35.

Lyons, S. (2020 Beacon House Therapeutic Services and Trauma Team) Developmental Trauma Close Up retrieved 14/09/2020
<https://beaconhouse.org.uk/wp-content/uploads/2020/02/Developmental-Trauma-Close-Up-Revised-Jan-2020.pdf>

Maes, M., (2008a). The cytokine hypothesis of depression: inflammation, oxidative & nitrosative stress (IO&NS) and leaky gut as new targets for adjunctive treatments in depression. *Neuroendocrinology* 29 (3)

Malathi, A., & Damodaran, A. (1999). Stress due to exams in medical students: Role of yoga. *Indian Journal of Physiology and Pharmacology*, 43, 218–224.

Mazure, C. M. (1998). Life stressors as risk factors in depression. *Clinical Psychology: Science and Practice*, 5, 291–313

McCall, T. (2007). *Yoga as Medicine: The Yogic Prescription for Health and Healing*. New York: Bantam.

McLean, C. P., Asnaani, A., Litz, B. T., & Hofmann, S. G. (2011). Gender differences in anxiety disorders: Prevalence, course of illness, comorbidity and burden of illness. *Journal of Psychiatric Research*, 45(8), 1027.

Mehling W. E., Price C., Daubenmier J. J., Acree M., Bartmess E. (2012). The Multidimensional Assessment of Interoceptive Awareness (MAIA). *PLoS ONE*

Mendelson, T., M.T. Greenberg, J.K. Dariotis, *et al.* 2010. Feasibility and preliminary outcomes of a school-based mindfulness intervention for urban youth. *J. Abnorm. Child Psychol.* **38**: 985–994.

Mendelson, T., Dariotis, J. K., Feagans Gould, L., Smith, A. S. R., Smith, A. A., Gonzalez, A. A., & Greenberg, M. T. (2013). Implementing mindfulness and yoga in urban schools: a community–academic partnership. *Journal of Children's Services*, 8(4), 276–291.

Mental Health Foundation (1999). *Bright futures: Promoting children and young peoples' mental health*. London: Author.

Michalsen, A., Grossman, P., Acil, A., Langhorst, J., Ludtke, R., Esch, T., ... Dobos, G. J. (2005). Rapid stress reduction and anxiolysis among distressed women as a consequence of a three month intensive yoga program. *Medical Science Monitor*, 11, 555–561

Moher D, Liberati A, Tetzlaff J, Altman DG, The PRISMA Group (2009). Preferred Reporting Items for Systematic Reviews and Meta-Analyses: The PRISMA Statement. *PLoS Med* 6(7): e1000097. doi:10.1371/journal.pmed1000097

Monroe, S. M., Simons, A. D., & Thase, M. E. (1991). Onset of depression and time to treatment entry: Roles of life stress [Research Support, U.S. Gov't, P.H.S.]. *Journal of Consulting and Clinical Psychology*, 59, 566–573.

Moore, D., Richardson, M., Gwernan-Jones, R., Thompson-Coon, J., Stein, K., Rogers, M., Garside, R., Logan, S. and Ford, T. (2019). Non-Pharmacological Interventions for ADHD in School Settings: An Overarching Synthesis of Systematic Reviews. *Journal of Attention Disorders*, 23(3), 220-233.

Naveen, G, Varambally, S., Thirthalli, J., Rao, M., Christopher, R. and Gangadhar, B. (2016) Serum cortisol and BDNF in patients with major depression—effect of yoga, *International Review of Psychiatry*, 28:3, 273-278

Nelson, J. and C. Campbell, 2017. Evidence-informed practice in education: Meanings and applications. *Educational Research*, 59(2): 127-135. Available at: <https://doi.org/10.1080/00131881.2017.1314115>.

Noggle, Steiner, Minami and Khalsa (2012) Benefits of yoga for psychosocial well-being in a US high school curriculum: A preliminary randomized controlled trial. *Journal of Developmental Behavioural Paediatrics*. 33: 193-201

National Institute for Clinical Excellence (2013) Social Anxiety Disorder: recognition, assessment and treatment. Clinical Guideline CG159.

<https://www.nice.org.uk/guidance/cg159/ifp/chapter/treatment-for-children-and-young-people>

National Institute for Clinical Excellence (2019) Depression in Children and Young People. Clinical Guideline NG134. <https://www.nice.org.uk/guidance/NG134>

Nuffield Foundation. Social trends and mental health: Introducing the main findings. London: Nuffield Foundation; 2013.

O'Brien, B., Harris, I., Beckman, T., Reed, D., & Cook, D. (2014). Standards for reporting qualitative research: A synthesis of recommendations. *Academic Medicine*, 89, 1245– 1251. <https://doi.org/10.1097/ACM.0000000000000388>

OCEBM Levels of Evidence Working Group*. "The Oxford 2011 Levels of Evidence". Oxford Centre for Evidence-Based Medicine.

<http://www.cebm.net/index.aspx?o=5653> * OCEBM Table of Evidence Working Group = Jeremy Howick, Iain Chalmers (James Lind Library), Paul Glasziou, Trish Greenhalgh, Carl Heneghan, Alessandro Liberati, Ivan Moschetti, Bob Phillips, Hazel Thornton, Olive Goddard and Mary Hodgkinson

Office for Raising Standards in Education, Children's Services and Skills. (2014). Strategic Plan 2014-2016 retrieved

https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/379920/Ofsted_20Strategic_20Plan_202014-16.pdf

Parker, A. E., Kupersmidt, J. B., Mathis, E. T., Scull, T. M., & Sims, C. (2014). The impact of mindfulness education on elementary school students: Evaluation of the *Master Mind* Program. *Advances in school mental health promotion*, 7(3), 184–204. <https://doi.org/10.1080/1754730X.2014.916497>

Pascoe, M. and Bauer, I. (2015) A systematic review of randomised control trials on the effects of yoga on stress measures and mood. *Journal of Psychiatric Research*, 68, 270-282.

Patalay, P., Deighton, J., Fonagy, P., & Wolpert, M. (2015). The relationship between internalising symptom development and academic attainment in early adolescence. *PLoS One*, 10, e0116821v

Patalay, P., Fitzsimons, E. (2018) Development and Predictors of Mental Ill Health and Wellbeing from Childhood and Adolescence. *Social Psychiatry Psychiatric Epidemiology*. 53 1311-1323.

Pawlow, L. and Jones, G. (2005) The Impact of Abbreviated Progressive Muscle Relaxation on Salivary Cortisol and Salivary Immunoglobulin A (sIgA). *Applied Psychophysiology and Biofeedback*, 30, 4.

Pawson, R., Boaz, A., Grayson, L., Long, A. & Barnes, C. (2003) Types and quality of knowledge in social care. Knowledge review 3 (London, Social Care Institute of Excellence).

Perry, B. D. (2000). Traumatized children: How childhood trauma influences brain development. *Journal of the California Alliance for the Mentally Ill*, 11(1), 48–51.

Perry, B. D. (2006). Applying principles of neurodevelopment to clinical work with maltreated and traumatized children: The neurosequential model of therapeutics. In N. B. Webb (Ed.), *Working with traumatized youth in child welfare* (pp. 27–52). New York: Guilford Press.

Peterson, C., & Seligman, M. E. P. (2004). **Character strengths and virtues: A handbook and classification**. Washington, DC: American Psychological Association

Petticrew, M. and Roberts, H. (2006). *Systematic Reviews in the Social Sciences: A Practical Guide*. Oxford: Blackwell.

Pilkington, Kirkwood, Rampes and Richardson (2005) Yoga for depression: the research evidence. *Journal of Affective Disorders*. 89 (1e3).

Porche, M. V., Costello, D. M., & Rosen-Reynoso, M. (2016). Adverse family experiences, child mental health, and educational outcomes for a national sample of students. *School Mental Health*.

Porges, S. (2011) *The Polyvagal Theory: Neurophysiological Foundations of Emotions, Attachment, Communication, and Self-regulation*: Norton and Company

Porges SW (2018) Yoga Therapy and Polyvagal Theory: The Convergence of Traditional Wisdom and Contemporary Neuroscience for Self-Regulation and Resilience. *Front. Hum. Neurosci.* 12:67. doi: 10.3389/fnhum.2018.00067

Powell, L., M. Gilchrist & J. Stapley. 2008. A journey of self-discovery: an intervention involving massage, yoga and relaxation for children with emotional and behavioural difficulties attending primary schools. *Eur. J. Spec. Needs Educ.* **23**: 403–412

Powell, L., (2010). Report on an intervention involving massage and yoga for male adolescents attending a school for disadvantaged male adolescents in the UK. *International Journal of Special Education* **25**(2): 48-54

Price, S. (2008). YoPlay: Yoga-based Play Therapy as a Model for Early Intervention for Inner City Children at Risk: Massachusetts School of Professional Psychology: ProQuest.

Public Health England.(2014). The Mental Health of Children and Young People in England. Retrieved
https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/575632/Mental_health_of_children_in_England.pdf

Purdy, J. (2013). Chronic physical illness: A psychophysiological approach for chronic physical illness. *Yale Journal of Biological Medicine*, 86, 15–28.

Ramados, R. & B. Bose. 2010. Transformative life skills: pilot study of a yoga model for reduced stress and improving self-control in vulnerable youth. *Int. J. Yoga Therap.* 1: 73–78.

Ramler, T., Tennison, L., Lynch, J and Murphy, P. (2015) Mindfulness and the College Transition: The Efficacy of an Adapted Mindfulness-Based Stress Reduction Intervention in Fostering Adjustment among First-Year Students. *Mindfulness*, 7, 179-188

Raub, J. A. (2002). Psychophysiological effects of hatha yoga on musculoskeletal and cardiopulmonary function: a literature review. *The Journal of Alternative and Complementary Medicine*, 8, 797 – 812.

Ross, A., & Thomas, S. (2010). The health benefits of yoga and exercise: A review of comparison studies. *Journal of Alternative and Complementary Medicine*, 16(1), 3–12.

Ryan R (2013) Cochrane Consumers and Communication Review Group. 'Cochrane Consumers and Communication Review Group: data synthesis and analysis'.
<http://cccr.org>

Sackett DL.(1986) Rules of evidence and clinical recommendations on the use of antithrombotic agents. *Chest*.Feb;89(2 Suppl):2S-3S..

Sauter, F. M., Heyne, D., & Westenberg, P. M. (2009). Cognitive Behaviour Therapy for anxious adolescents: Developmental influences on treatment design and delivery. *Clinical Child and Family Psychological Review*, 12, 310–335.

Sauter, F., Heyne D., Westenberg, P. (2009) Cognitive behavior therapy for anxious adolescents: developmental influences on treatment design and delivery. *Clinical Child and Family Psychology Review*;12:310–335

Schulte, E. C. (2016). Yoga and adolescent psychological health, depressive symptoms, and flourishing. Dissertation Abstracts International Section A: Humanities and Social Sciences 76(10-A(E)): No-Specified

Seligman, M. E. , Steen, T. A. , Park, N. & Peterson, C. (2005). Positive Psychology Progress. *American Psychologist*, 60 (5), 410-421.

Serwacki, M. L., & Cook-Cottone, C. (2012). Yoga in the schools: a systematic review of the literature. *International Journal of Yoga Therapy*, 22, 101–109.

Shonkoff, J. P., & Richmond, J. B. (2008, June 26). The science of child development and the future of early childhood policy. Presentation at the National Symposium on Early Childhood Science and Policy, Cambridge, MA

Siegel 2014 *Brainstorm: The power and purpose of the teenage brain*. New York: Penguin Putnam

Srinivasan N, Baijal S (2007) Concentrative meditation enhances preattentive processing: a mismatch negativity study. *Neuroreport* 18:1709–1712

Sunderland, Margot. (2019). Trauma-informed practice. SecEd. 2019. 10-10. 10.12968/sece.2019.7.10.

Teicher, M., Anderson, S., Polcari, A., Anderson, C. and Navalta, C. (2002) Developmental neurobiology of childhood stress and trauma. *Psychiatr Clin North Am.* 2002 Jun;25(2):397-426, vii-viii. doi: 10.1016/s0193-953x(01)00003-x. PMID: 12136507

Teicher, H., Andersen, L., Polcari, A., Anderson, C., Navalta, C., Kim, D. (2003) The neurobiological consequences of early stress and childhood maltreatment, *Neuroscience & Biobehavioral Reviews*, Volume 27, Issues 1–2,

Teicher, Martin H, Samson, Jacqueline A, Anderson, Carl M, and Ohashi, Kyoko. "The Effects of Childhood Maltreatment on Brain Structure, Function and Connectivity." *Nature Reviews. Neuroscience* 17.10 (2016): 652-66. Web

Telles, S., Srinivas, R. B. (1998) Autonomic and respiratory measures in children with impaired vision following yoga and physical activity programs. *International Journal of Rehabilitation and Health*, 4, 117–122

Tellings, A.(2017) Evidence-Based Practice in the social sciences? A scale of causality, interventions, and possibilities for scientific proof. *Journal of Theory and Psychology*, 27(5), 581-599

Thirthalli, Naveen, J., Rao, M, Varambally, S., Christopher¹, R. and Gangadhar, B. (2013) Cortisol and antidepressant effects of yoga. *Indian Journal of Psychiatry*, 55.

Treanor, M. 2016. The Effects of Financial Vulnerability and Mothers Emotional Distress on Child Social, Emotional and Behavioural Well-Being: A Structural Equation Model. *Sociology*, 50, 673-694

UNICEF. (2007). *Child poverty in perspective. An overview of child well-being in rich countries* (Report Card 7). Florence: UNICEF Innocenti Research Centre.

UNICEF. (2013). *Child poverty in perspective: An overview of child well-being in rich countries* (Report Card11). Florence: UNICEF Innocenti Research Centre.

Van der Kolk, B. A. (2014). *The body keeps the score: Brain, mind, and body in the healing of trauma*. Viking

Vostanis, P., Humphrey, N., Fitzgerald, N., Deighton, J. & Wolpert, M. (2013). How do schools promote emotional wellbeing among their pupils? Findings from a national scoping survey of mental health provision in English Schools. *Child and Adolescent Mental Health, 18*(3), 151–157.

Wang, D. and M. Hagins (2016). "Perceived Benefits of Yoga among Urban School Students: A Qualitative Analysis." Evidence - Based Complementary and Alternative Medicine 2016

Weaver, L and Darragh, A (2015) Systematic review of yoga interventions for anxiety reduction among children and adolescents. *AOTA* 69, 6.

Weaver, L. L. (2019). "Yoga for anxiety reduction in children and adolescents: A mixed methods effectiveness study." Dissertation Abstracts International: Section B: The Sciences and Engineering Vol.80(3-B(E)),2019, pp. No Pagination Specified

Weil, J. (1974). *A neurophysiological model of emotional and intentional behavior* . Spring field: Charles C. Thomas.

Weiner, C., Suveg, C. & Kendall, P. (2006). Identifying Anxiety in the School: A Role for School Nurses. *Nasn School Nurse. 21*. 21-22. 10.1177/104747570602100208.

White, L. (2012) Reducing stress in school age girls through mindful yoga. *Journal of Paediatric Healthcare*, p45-56.

WHO (2004). Promoting Mental Health: Concepts, Emerging evidence, Practice. Geneva, WHO. https://www.who.int/mental_health/evidence/en/promoting_mhh.pdf. Accessed 02/03/21.

6 Appendices

Appendix 1

Protocol

A Systematic Review of the Effects of Yoga Interventions on the Mental Health of Secondary School Students.

Introduction

There has been a recent national focus on the incidence and apparent escalation of mental illness in children and young people. With this apparent rise, have come government initiatives to drive the promotion of wellbeing and positive mental health and the reduction of mental illness in a bid to address the problem. The latest guidance received by schools comes in the form of the non-statutory mental health guidance for schools (DfE 2016) which attempts to outline how schools can promote wellbeing and identify and best support those children at risk of developing or already presenting with mental illnesses. It has been argued that this advice focuses more narrowly on within child mental illness and disorder and the targeted and specialist interventions to treat them than it does on an ecological understanding of mental illness and the broader universal and preventive approaches to support mental health and well-being.

Yoga is a mind-body practice and yoga classes and interventions have been growing in popularity in UK schools with the enthusiasm for such interventions having swept across from the USA. Preliminary studies have demonstrated that implementing a yoga intervention within a school system can have positive effects on stress reduction, anxiety management, depression, self-esteem and self-regulation and

other elements which feed into cultivating good mental health, plus numerous physical health benefits (Conboy 2013, Ferreira-Vorkapic et al 2016, Greenberg and Harris 2012, Khalsa et al 2012, Khalsa and Butzer 2016, Mendelson et al 2013, Parker 2014 Weaver-Darragh 2015). Indeed, yoga philosophy recognises that the body and mind are not dichotomous but rather, they are inextricably linked and that in order to be healthy one must work with both the body and the mind simultaneously. This protocol outlines the rationale for the proposed piece of research, briefly examines the evidence base for implementing yoga interventions to support mental health and explores how a systematic review may be best place to examine the effects of a school based yoga intervention prior to proposing the steps involved in the review process in the methods section.

Working Terminology

This section highlights the definitions for terms that will be frequently used during this protocol.

Mental Health

The World Health Organisation defines Mental Health as “a state of wellbeing in which an individual realises his or her own abilities, can cope with the normal stresses of everyday life, can work productively and is able to make a contribution to his or her community.”

They do not offer a definition of mental illness but refer to poor mental health as being “associated with rapid social change, stressful work conditions, gender discrimination, social exclusion, unhealthy lifestyle, physical ill health and human

rights violations.”. This is useful as poor mental health may be conceptualised as being a part of the same continuum as positive mental health.

They do provide a definition for mental disorders, though they do not appear to place these on the mental health spectrum:

“Mental disorders comprise a broad range of problems with different symptoms. However, they are generally characterized by some combination of abnormal thoughts, emotions, behaviour and relationships with others. Examples are schizophrenia, depression, intellectual disabilities and disorders due to drug abuse. Most of these disorders can be successfully treated.”

The WHO definition has been praised for moving away from a construct of mental health as being solely the absence of mental illness yet criticised for over simplifying positive mental health (Galderisi et al 2015). They explain that including wellbeing as a key aspect of positive mental health negates those instances in which it is mentally healthy to not be ok or to not be experiencing feelings of wellbeing and that actually to be experiencing feelings of wellbeing during these times may be considered mentally unhealthy. They give examples of a person at war experiencing feelings of wellbeing as mentally unhealthy and a person who may have lost their job and is experiencing desperation as mentally healthy.

They offer the following definition “Mental Health is a dynamic state of internal equilibrium which enables individuals to use their abilities in harmony with universal values of society. Basic cognitive and social skills; ability to recognise, express and modulate one’s own emotions, as well as empathise with others; flexibility and ability to cope with adverse life events and function in social roles; and harmonious

relationship between body and mind represent important components of mental health, which contribute in varying degrees, to the state of internal equilibrium.

Throughout this proposal mental health shall be viewed as a continuum with positive mental health and poor mental health being a part of this continuum and mental illnesses/disorders also viewed as part of this continuum, not as discrete abnormal phenomena. I will use the terminology mental health condition when referring to a mental disorder to reinforce the narrative that mental ill health/illness and disorders actually lie on the mental health continuum and form a part of human experience. Wellbeing may or may not be experienced as part of positive mental health though it is likely that striking the wellbeing balance contributes to positive mental health more generally.

Stress

The term stress was first coined by Hans Selye in 1926, he used the term *stress* to describe “the sum of all nonspecific changes (within an organism) caused by function or damage” which could also be considered as “the rate of wear and tear” within the body (Selye 1956). Selye later re-worked this definition into stress as “the nonspecific response of the body to any demand” (Selye 1974). A more modern interpretation of stress is offered by Aldwin (2007) as ‘the quality of experience, produced through a person-environment transaction that, through either overarousal or underarousal, results in psychological or physiological distress’.

The role of cognitive appraisal in the stress response is highlighted in much of the research e.g waiting for a bus that is late may or may not be interpreted as stressful depending on what else the person has planned for that day with the stress response only activated if this event is interpreted in a negative manner (Everly and Lating 2013,

Gard 2014, McCall 2007). Furthermore, chronic stress arousal is implicated in leading to disease or dysfunction (Everly and Lating 2013, Dantzer et al 2008, Dantzer 2012, Maes, 2008, Mazure 1998 and Monroe et al 1991). Although stress is largely afforded negative attributions, it can be functionally positive, e.g stress can serve as an innate preservation mechanism during times of threat and may well have helped humankind to overcome challenges which threatened survival. Finally, stress may be treated prior to the onset of illness, meaning that if stress is treated early enough, it can be possible to offset illness. (Everly and Lating 2013, Selye 1974).

Yoga

Yoga is an ancient mind-body practice widely used to help reduce stress and promote physical and mental health. The first system of yoga was recorded by Patanjali sometime between 200-500 BC. His framework, entitled the 'Eightfold Path of Yoga', is used by modern day teachers to guide the practices that they incorporate into a class and give structure to the class (Iyenger 2002). A well-rounded class will incorporate the following aspects of Patanjali's framework:

- 1) the postures (asanas) that often spring to mind when people think of yoga.
- 2) the breathing practices (pranayama)
- 3) relaxation, centring and grounding practices which help people to move within and reduce sensory input from the outside world (pratyahara)
- 4) teaching concentration (dharana) which is usually interweaved throughout the first three practices
- 5) the practice of meditation including relaxation practices as the building blocks for meditative practices (dhyana).

Rationale and implications for Educational Psychology

In the most recent government paper 'Mental Health and Behaviour in Schools: Advice for school staff' (2016) which contains information pertaining to the various clinical conditions that may be encountered by schools Greig et al (2016) draw attention to the fact that 'the role of the educational psychologist is reduced to one line of one page, thus failing to recognise the key position the profession holds'. This is despite an earlier suggestion by the Mental Health Foundation (1999) that 'schools and Educational Psychologists should have a role in the multi-disciplinary support system to combat the mental health problems besetting the youth of our culture'.

The risk with highlighting the various clinical conditions and child mental ill health issues alongside targeted mental health interventions to schools is that mental ill health is predominantly focused on as a within-child dilemma. Indeed, in a study by Vostanis et al (2013) exploring interventions used by schools to support children and young people with mental health problems found that schools did not focus on prevention and were not using an evidence-based approach.

Greig et al (2016) do highlight the fact that the advice (Mental Health and Behaviour in Schools 2016) does provide a framework for implementing a level of proactive systemic approaches which may facilitate a preventative strategy. These include; a committed school management team to take forward mental health issues, training for school staff on causes for concern and curriculum flexibility amongst others. There is however little mention of how educational psychologists embedded within the school system may help to facilitate this preventative, systemic approach to mental health. It has been suggested that educational psychologists must use their expertise and their voices to negotiate their role in enhancing child and adolescent mental health within

schools. Their expertise may be increasingly relevant as mental health statistics soar and CAMHs become increasingly difficult to access.

It is educational psychology's duty to explore and evaluate interventions that may be used preventatively and universally as Tier 1 interventions within the school system in combination with offering other therapeutic interventions such as Cognitive Behavioural Therapy, which though predominantly 'within child', are often tailored by educational psychologists to include systemic elements. It is suggested that yoga may be a valuable universal and preventative intervention which could help to reduce stress and increase relaxation and therefore possibly help mediate against the development of a mental health condition or help a young person to manage an existing condition.

Yoga is already being used by some schools and is implemented by one school identified as an exemplar by the Mental Health guidance (2016) for promoting mental wellbeing. However, there is a distinct lack of research into yoga within the UK school system. Educational psychologists must keep abreast of new therapeutic possibilities in order to fulfil their role within the field of mental health and mental wellbeing. Educational psychologists are equipped with the research skills necessary to carefully evaluate interventions and are in a good position to advise parents and schools about the efficacy of an intervention such as yoga to help with mental health and whether it is worth financial backing.

Finally, the following protective factors guarding against mental ill health, which may potentially be enhanced through a yoga program are: experience of success and achievement, faith or spirituality, capacity to reflect, a whole school approach to promoting good mental health, a sense of belonging, positive peer influences and a range of sport and leisure activities as outlined by the Mental Health Guidance (2016)

The importance of focusing on the impact of a yoga intervention during adolescence

Adolescence is a period of great transition, conceptualised by Siegel (2014) as the negotiation of 2 key changes in a child's life 1) puberty and 2) the separation away from parents in favour of increased bonding with peers. It is often experienced as an exciting yet stressful period in one's life. An individual is impacted by the change in hormones as they evolve through puberty and their effect on the brain. This is in conjunction with a shift in the value placed by the adolescent on peer relationships away from the importance on familial relationships. This in itself necessitates a change from the comfort and security of close family bonds to the investment of time in new and dynamic relationships with peers which can lead to feelings of insecurity (Siegel 2014)

Collishaw (2015) highlights the role of societal changes in family life such as separation and divorce as stressful life events which may be implicated in the development of mental health conditions. Greig, Mackay, Roffey and Williams (2016) identify the added pressure on today's youth of being tested and categorised with increased expectations coupled with limited opportunities for work in the long term. They further raise the impact of social media on levels of adolescent stress, with young people gaming excessively, being open to the opinions of an increasing number of people, being exposed to photoshopped idealistic images against which they measure themselves and being at risk of online bullying. Lastly, they consider the role of alcohol and substance abuse as playing a possible mediating role in coping with stress and being implicated in the development of mental ill health.

With these added stresses, changes in relationships and the impact of fluctuating and increasing hormones, adolescence also sees a rise in levels of depression and the onset of a range of other mental health difficulties such as eating disorders, deliberate self-harm and substance misuse (Aggleton, Warwick and Hurry 2000). The DH report 'No Health Without Mental Health' report projects that half of all life-long mental health conditions are present at 14 years of age and 75% at 18. This highlights the critical need for intervention at an early age to equip our young people with the tools they need to maintain positive mental health during the adolescent period and the transition into adulthood.

The following sections will explore the evidence base of yoga interventions which may help students to more effectively manage their stress and promote mental health which may conversely minimise the risk of mental illness.

Brief Scoping Review of the Literature

The Effects of a Yoga Intervention on the Mental Health of Young People in Settings Outside of the Education System

Yoga can be suitably modified for adolescents including modified versions of body postures and exercises geared toward strength and flexibility, breathing techniques, mental and emotional awareness, and self-regulation skills. These practices are hypothesized to elicit adaptive neural and mental responses that can result in improved behaviour and emotion regulation (Greenberg & Harris, 2012).

White (2012) conducted research into a yoga program informed by MBSR (Kabat-Zinn 1990) in 4th and 5th grade girls who were invited to attend the yoga program away from their school setting. Interestingly, an increase in perceived stress

correlated with an increase in coping strategies for the yoga group post intervention. They rationalised the findings by suggesting that part of the trajectory of mindfulness may be an increasing awareness of the stress reaction to better cope with stress. The possibility that children of this age may not yet be cognitively able to observe their stress reaction whilst adopting a 'non-judgmental and compassionate' attitude which could be a large component of the therapeutic practice was also explored (White 2012, Kabat-Zinn 1990).

Weaver and Darragh (2015) conducted a systematic review to examine the evidence base for yoga interventions addressing anxiety among children and adolescents across a range of settings. The review included 6 Randomised Control Trials, 2 non-randomised pre-post control group studies, 7 uncontrolled pre-post intervention studies and one case study. Overall, they found positive results suggesting that yoga may be an effective intervention to reduce anxiety and anxiety related symptoms or behaviours in children and adolescents. They highlighted that there may be a dose dependent effect of the ability of a yoga intervention to reduce anxiety whereby they found that studies offering more sessions 2-3 times per week generated larger effect sizes (Stueck and Gloeckner 2005, Noggle et al 2012, Khalsa et al 2012 and Mahashananda et al 2012) Furthermore, studies which targeted a specific type of anxiety such as eating disorder or music performance anxiety also found large effects, which may indicate that specific yoga programs tailored to specific anxieties may be more effective than general programs offered universally to all.

In consideration of the limitations of the available research they raised the issue that only 5 of the 16 studies reviewed used a manualised program and none had considered how to measure fidelity to the program within their study, which would be

useful to help draw comparisons of results across studies. They suggest that future research should analyse dose-response relationships in order to establish specific recommendations for intervention length and intensity. Another recommendation involved investigating the physiological and psychological mechanisms that may underlie change after a yoga intervention which may be measured using biomarkers, measures of physical and psychological change and participant perspectives which can then be used to triangulate results. Furthermore, they highlighted that it may be useful to consider qualification and experience of the yoga teacher on the impact of the intervention. Lastly, they suggested a need to include qualitative data to expand knowledge of children and adolescents' perceptions, needs and outcomes.

The Evidence Base for School-Based Yoga Interventions

In a systematic review of the research on school-based yoga interventions Khalsa and Butzer (2016) included 47 publications. Forty-one of these studies had been conducted since 2010 with 30 taking place in America and 15 in India. Half of the studies took place in elementary schools and 62% implemented a structured school-based yoga program. They reported high variability in overall duration of the intervention and duration and number of sessions per week. They concluded that the publications suggest that yoga in the school setting is a viable and efficient strategy for improving child and adolescent mental health. When effect sizes were calculated on the individual outcomes of mood, tension, anxiety, self-esteem and memory the results favoured yoga compared to the other conditions. They highlighted the following methodological limitations; limited sample size and relatively weak research designs with 57% being Randomised Control Trials (RCT's) and 19% of the studies being uncontrolled.

Mendelsohn et al (2010) in their school-based yoga intervention study of 4th and 5th grade girls across four schools in Baltimore found a reduction in involuntary stress reactions. They interpreted this as an increase in self-regulation capacities. In their research into a mindfulness intervention which included developmentally appropriate yoga poses Parker et al (2014) found it to also be associated with improvements in self-regulatory skills which they suggested were a modifying factor against substance abuse. In high-school based studies exploring a yoga intervention compared with a P.E. control positive effects on aspects of mental health such as anger control, fatigue/inertia, improved self- image and stress reduction were found (Khalsa et al 2012, Conboy et al 2013). Conboy et al (2013) reported the following qualitative findings; most students wanted to continue yoga and would if it were to be offered in school; positive reports included 'a greater kinaesthetic awareness' and 'greater respect for the body', negative reports were concerned with gender with males sensing peer pressure against practising yoga; many reported using yoga to manage negative emotions; they thought it could help increase social cohesion and in line with Parker et al (2014) students reported that they thought yoga and mindfulness could reduce interest in drug and alcohol use.

In a further systematic review by Ferreira-Vorkapic, Feitoza, Marchioro, Simoes and Kozasa and Telles (2015) significant effect sizes were found for reduced tension and anxiety and increased perception of self-esteem as measured by the Profile of Mood States inventory (POMS) across two studies (Khalsa et al 2012 and Noggle 2012). Out of the 6 RCT studies included in their systematic review, 3 of the primary studies demonstrated significant effects on measures of psychological wellbeing. Khalsa et al (2012) demonstrated significant effects over time on measures of anger control and fatigue/inertia. Noggle et al (2012) observed a reduction in anxiety and negative

effect in the yoga group and Ramadoss and Bose (2010) found that only the yoga condition showed a slight decrease in stress whilst maintaining self-control. Ferreira-Vorkapic et al (2015) highlighted the contrasting evidence found by Haden et al (2014) and (White 2010) whose findings suggested that the yoga group had experienced a significant increase in perceived stress in the yoga group compared with the P.E and control groups. Furthermore, White (2010) found that both the yoga and control group demonstrated significantly greater self-esteem and self-regulation over time. Lastly, Hagins et al (2013) did not find a difference in the impact of yoga on stress reactivity when compared with a P.E control after introducing them to a stressor. To rationalise the negative effect findings and insignificant effects found in studies with children and adolescent populations compared with positive effects found in studies of adult populations Ferreira-Vorkapic et al (2015) suggest that the adaptation to becoming mindful (a mechanism of yoga) may be more cognitively demanding in children/may increase their perception of stress in the first instance, that poorer attentional control in children and adolescents whose frontal lobes are still maturing and the inadequacy of the adaptations to the yoga practice (e.g shorter sessions for children and adolescents tend to yield more beneficial results) may lead to these differences in results between studies of adult populations and those of adolescent/children populations.

Previous Systematic Reviews

When considering the appropriateness of conducting a systematic review it is important to explore whether any systematic reviews have previously taken place and whether there is a rationale for using this methodology. There have been a number of systematic reviews exploring a variety of different aspects of the evidence base of yoga interventions. Some of which were uncovered through prior scoping

reviews of the literature and two of which were found more recently using the following terms 'Systematic Review' AND 'Yoga' AND 'Schools' via UCL Explore and Google. Appendix 1 contains a table which demonstrates key information from those reviews.

In summary, a preliminary search of the literature, uncovered a number of systematic reviews exploring the evidence base of yoga interventions. The majority of which were published in 2016 and before (Gould et al 2016, Ferreira-Vorkapic et al 2015, Khalsa and Butzer 2016, Serwacki-Cotton 2012, Weaver-Darragh 2015). One systematic review by Chung was conducted in 2018 though it has been challenging to access the full paper.

The majority of these reviews did not retrieve and include UK based studies of school-based yoga interventions, only one review included one UK based study, most likely because at this time no others had been conducted. (Serwacki and Cottone 2012). It is plausible that as the popularity for school-based yoga interventions has grown, research into such interventions may also have. This warrants a further review to incorporate such studies which may have been conducted since those reviews took place in order to analyse the effects of a yoga intervention implemented within a UK school system in comparison with other school systems.

The following paragraph provides an overview of the primary focus' of these reviews and of their key findings. The Weaver and Darragh (2015) review focused on the effect of yoga interventions on anxiety in children and adolescents across a variety of clinical and community settings finding positive results overall that yoga interventions may help to reduce anxiety or anxiety related behaviours. Serwacki and Cottone

(2012) conducted the first review investigating the impact of a yoga intervention within schools, they included studies on typically developing populations as well as those on children with special educational needs and disabilities across a range of academic, cognitive and psychosocial outcomes and concluded that yoga programs appear to be beneficial for the most part. Ferreira-Vorkapic et al (2015) also explored the effects of yoga interventions within schools on children from 5-18 across cognitive, academic and psychosocial outcomes. They conducted a meta-analysis on the reported effect sizes across similar measures of the same variable, e.g mood, tension, anxiety, self-esteem and memory. The forest plot showed divided results, with half of the studies favouring yoga and the other half favouring the control. The overall effect was not significant, which they attributed to the heterogeneity of the variables. Ferreira-Vorkapic et al (2015) found that 3 out of 6 studies reported significant positive effects on measures of psychological wellbeing, but drew attention to studies which had found conflicting results, finding an increase in perceived stress after a yoga program yet an increase in self-control and coping mechanisms and the nonspecific effects of yoga on stress reduction when compared with P.E (White 2012, Haden et al 2014, Hagins et al 2013). Khalsa and Butzer (2016) explored the evidence base for yoga interventions within schools but excluded studies on students with SEN. They investigated a variety of student outcomes assessed by using a variety of self-report, teacher report and objective measures such as academic results and physiological markers. They also included studies with qualitative methodologies. Results from student self-reports indicated positive outcomes on measures of mood, self-regulation, pro-social and anti-social behaviours, health, self-esteem and working memory capacity. Four qualitative studies uncovered benefits in the ability to focus, control behaviour under stress,

enhance a sense of calm, and increase self-esteem; also noted was greater kinaesthetic awareness, mood management, stress reduction, and social cohesion; improved stress management; and focus, perseverance, and positive relationships. This led the researchers to highlight that, overall, there appears to be a positive benefit on psychosocial wellbeing. Teacher rated outcomes indicated positive effects on classroom behaviour and social emotional skills, performance impairment, concentration, mood, ability to function under pressure, hyperactivity, social skills and attention. Finally, objective data collected from school records and academic tests were found to show postintervention improvements in student grades and academic performance. Other objective measures of physiological and cognitive outcomes reported in a few of the studies reviewed by Khalsa and Butzer (2016) have found decreased cortisol concentrations and improvements in cognitive planning and execution, micronutrient absorption, flexibility, grip strength, abdominal strength, respiratory muscle strength, heart rate variability and stress reactivity as determined by skin conductance responses. From consideration of the abstract from Chung's systematic review in 2018, this review focused on the effects of school-based yoga or meditation interventions delivered within the education system across a range of academic, cognitive and psychosocial child and adolescent outcomes. Results from this review suggest that positive effects were reported across outcomes in the majority of studies yet there were also some negative findings and adverse effects reported e.g false memory with mindfulness meditation.

An important systematic review which approached the literature from a different angle than previous systematic reviewers was that by Gould et al (2016) whose main purpose was to review the science involved in studies researching yoga and mindfulness interventions with regard to fidelity of intervention (FOI). They identified

a useful framework to assess the fidelity with which an intervention is implemented and highlighted the importance of the relationship between degree of fidelity to a program and the impact that an intervention may have on expected or hypothesised outcomes. They concluded that fewer than 10% of studies outlined potential core program components or referenced a formal theory of action, fewer than 20% referenced any aspect of FOI beyond participant dosage and 37% did not assess any dimensions of FOI.

The following table provides an overview of the key limitations and recommendations observed by these reviewers which will be used to plan the direction of the present review.

Limitations	Review(s)	Recommendations	Review(s)
Not all studies reported effect sizes so meta-analyses not performed.	Weaver and Darragh	To explore idea that tailored programs for specific anxieties are more effective than general.	Weaver and Darragh
Statistical ambiguities which prevented meta-analyses	Serwacki-Cooke		
Only 5 studies used a manualised yoga program	Weaver and Darragh	Studies to explore dosage	Weaver and Darragh
Lack of measures re fidelity to intervention	Weaver and Darragh	Other measures of wellbeing/occupational performance should be included to consider whether reduction in anxiety has been beneficial to daily life	Weaver and Darragh
Lack of detail re intervention	Khalsa and Butzer		
Lack of recording of potential core components of interventions and logic models	Serwacki and Cooke		

	Feagans-Gould		
Self-report subjective measures used by studies	Khalsa and Butzer	An understanding of the physiological and psychological mechanisms that underlie change to triangulate results across multiple levels of data.	Weaver and Darragh
The review only focused on students and student outcomes not on teachers and teacher outcomes	Khalsa and Butzer	Distal and Proximal Measures should be used particularly in light of negative effects on stress perception and the 'adaptation' process of mindfulness.	Ferreira-Vorkapic
Studies are generally of low-moderate methodological rigour	Khalsa and Butzer	Yoga sessions/intervention should be tailored especially for children in light of the developmental differences between the attentional control capacities of adults, adolescents and children.	Ferreira-Vorkapic
e.g lack of blindness and follow up, lack of randomisation	Serwacki and Cooke		
	Ferreira-Vorkapic		
	Chung		
Many studies are conducted within elementary schools	Khalsa and Butzer	Studies may benefit from using a yoga group, a P.E control and a further control group who do not do physical exercise	Ferreira-Vorkapic
Studies generally have low sample sizes	Khalsa and Butzer	Where studies use P.E controls measures which explore different underlying mechanisms of yoga and P.E should be incorporated e.g mindfulness/self-awareness	Ferreira-Vorkapic
	Serwacki and Cooke		
	Feagans-Gould et al		
Many studies did not use control groups and approx. half did not use a randomised design	Khalsa and Butzer	A need to understand the mechanisms of success of a school-based yoga intervention	Serwacki-Cooke

	Serwacki and Cooke		
Studies do not report optimal dosage in terms of frequency and duration	Khalsa and Butzer	Studies should be devised with greater methodological rigour	Serwacki-Cooke
	Serwacki and Cooke		
Lack of distal measures	Khalsa and Butzer	Clearly define core program components	Feagans-Gould
Many of the positive results reported in fact appear as trends (e.g., $P < 0.1$) rather than statistically significant (i.e., $P < 0.05$) changes	Khalsa and Butzer	Clearly articulate core process components (Teacher modelling)	Feagans-Gould
In the controlled studies it is not uncommon to find no positive effects on many outcomes or no significant changes	Khalsa and Butzer	Assess and report multiple dimensional of FOI	Feagans-Gould
Some studies have reported counterintuitive increases in negative mood state and perceived stress with the yoga intervention.	Khalsa and Butzer	Develop observational assessment systems and common FOI measures	Feagans-Gould
	Ferreira-Vorkapic		
Effect sizes calculated across measures according to common variables however heterogeneity of variables lead to insignificant effect sizes.	Ferreira-Vorkapic	Build common FOI language and frameworks	Feagans-Gould
Heterogeneity			
	Chung		
Standards used to assess methodological rigour were designed for clinical research not school based	Serwacki-Cooke		

Risk of bias	Chung
FOI assessment and evaluation is based on journal articles which may have under-reported extent of FOI work done due to word limits.	Feagans-Gould
Review only focused on North America and there are researchers in other countries investigating FOI in mindfulness research	Feagans-Gould

The researcher has emailed Chung (2018) to ask to be granted access to her paper 'Yoga and meditation in youth education: a systematic review' and will follow this up in order to read this paper and ensure that the focus of the present review will adequately add to the knowledge base. NB This did not turn out to be a paper but rather a presentation summary, Chung (2018) did not respond and the library confirmed that this was not a paper.

Philosophical Stance

Pragmatism

Methods

This study will adopt a systematic review methodology, this is appropriate for a number of reasons

- 1) The Coronavirus pandemic has made it an exceptionally challenging time to conduct primary research within schools due to the school closures..
- 2) There have been a number of primary studies into the evidence base of yoga interventions within school settings and a number of systematic reviews.

However, the majority of reviews were conducted in 2016 or before and at this time there had been only a couple of studies in the UK.

- 3) Yoga has become increasingly popular in the UK and a number of schools have started to incorporate yoga either into the school day or as an extra-curricular activity. It would be useful to conduct a further review in order to reflect any research that may have been conducted in the UK education system since those reviews were undertaken.
- 4) The previous reviews highlighted a number of limitations and recommendations for future research and researchers may now have had the opportunity to reflect this in subsequent studies.
- 5) It will be useful if additional primary studies have not been conducted or are not retrieved by this review to collate, synthesise and analyse the findings from previous systematic reviews or to include the findings from previous reviews and additional primary studies in the synthesis.

What are systematic Reviews?

'Systematic literature reviews are a method of making sense of large bodies of information, and a means of contributing to the answers to questions about what works and what does not – and many other types of question too. They are a method of mapping out areas of uncertainty, and identifying where little or no relevant research has been done, but where new studies are needed. Systematic reviews also flag up areas where spurious certainty abounds. These are areas where we think we know more than we do, but where in reality there is little convincing evidence to support our beliefs..... Reviews are important because the results of single studies are generally given much greater credence than they merit. There are few studies that are so methodologically sound, whose results are so generalizable and that leave us so certain that the results represent a good approximation of the "truth," that we should accept their findings outright. This is not to deny that single

studies with dramatic and important results do exist; but most research can only be understood in context—and a key part of that context consists of the results of other studies that tested the same hypothesis, in similar populations. (Petticrew and Roberts 2006)

Systematic Review Steps (Petticrew and Roberts 2006)

Writing in Italics has been copied from Petticrew and Roberts to help guide the methodological process

Step 1 Define the question

Clearly specify the question that the review aims to answer. If it is a review of the effects of an intervention then specify the intervention, the population, the subpopulations, outcomes of interest, the time period within which you are interested, and the cultural or other context within which the intervention is delivered.

Discuss the proposed review with stakeholders during this process.

Primary Question

- 1) *What are the effects of a school-based yoga intervention on mental health outcomes in adolescence?*

Secondary Questions

- 2) *What are the differences in the effects of yoga when implemented as a targeted intervention compared with a universal intervention?*
- 3) *Does the evidence base suggest that yoga may be more effective in older adolescents compared with younger adolescents?*
- 4) *Does yoga impact differentially on females compared with males and if so how?*
- 5) *What is the current picture of UK based research into yoga interventions?*

Refined Questions according to actual evidence base retrieved and time constraints:

RQ 1 What are the quantitative findings from studies exploring the impact of secondary school-based yoga interventions in adolescence?

RQ 1a Are there any gender differences in the impact a secondary school-based yoga intervention has on mental health outcomes?

RQ 2 What are the qualitative findings from studies exploring the experiences of students who engaged with secondary school-based yoga programmes on mental health?

RQ 2a Are there any gender differences in the experiences of secondary school-based yoga intervention participants?

RQ 3 What is the current picture of UK based research into yoga interventions within secondary schools?

Population= adolescents who have engaged with a school-based yoga intervention

Outcomes of interest

- 2) Stress management/reduction
- 3) Anxiety and anxiety management
- 4) Psychological wellbeing
- 5) Self-esteem and confidence
- 6) Mindfulness and self-acceptance
- 7) Body awareness
- 8) Fidelity of Intervention measures

9) Systemic facilitators and barriers to implementing yoga interventions in secondary school settings

Time period

2010-2020

Cultural or Context

Focus on Western school systems e.g North America, Australia and other European countries as more applicable to the UK school system that this review may inform and any UK based studies which may not have been included in previous reviews

Step 2

Steering/advisory group

Speak to practitioner, somebody who funds it, a service user (may be difficult at this time), a researcher who may have previously evaluated it, a statistician and an economist. They may be able to advise on the review protocol.

Time constraints do not allow for this step in the process, though it may be helpful to speak to a PSHE/SEL/Pastoral lead about what they would like to know about a possible intervention to help them in their decision-making process.

Step 3 Write a protocol and have it reviewed

It is essential to write a protocol stating the review question, the methods to be used, the study types and designs which the reviewer intends to locate, and by what means, and how these studies will be appraised and synthesized. It is good practice to have the protocol reviewed by people who are likely to know something about the

topic area – for example, this could include topic experts as well as the intended users.

Step 4. Carry out the literature search

Having decided the question, and discussed it with your advisory group, you will know what sort of studies you need to answer the review question. The next step is to find them, most probably searching electronic databases, bibliographies, book chapters and conference proceedings, and contacts with experts (including your advisory group).

Incorporate qualitative data as the experience of a yoga practice is very personal, people will experience even different poses in a variety of ways, therefore their lived experience of the whole practice may vary considerably from person to person. This may be lost when looking at groups of participants together and calculating effect sizes.

Please see appendix 2 which will be employed as an aid.

Step 5. Screen the references

The literature search retrieves hundreds, or thousands of references, often with abstracts. These need to be sifted to identify which ones are needed for further review.

Step 6. Assess the remaining studies against the inclusion/exclusion criteria

After the clearly irrelevant studies are excluded (keeping a detailed note of the number of studies included and excluded at each stage) there are still likely to be many studies left – sometimes several hundred. Some can be confidently excluded

after further examination of the abstract, but full copies of the rest of the papers may need to be obtained. These are examined to determine whether they meet the review's inclusion and exclusion criteria.

Inclusion criteria:

- Studies between 2010 and 2020
- All to include yoga postures, breath practices, relaxation/meditation
- Secondary schools and colleges
- Adolescents between the ages of 11-19
- RCT's, non-randomised control studies, pre-post non-comparison studies, quasi-experimental and qualitative studies.
- Young people with and without mental health conditions
- All to include measures assessing mental health/qualitative to include participant views on how the practice has impacted their mental health

Exclusion criteria:

- Studies outside of 2010-2020
- Studies which do not include yoga postures, breath practices, relaxation/meditation in combination.
- Primary schools and universities and other non-educational settings e.g clinical, community.
- Participants under 11 or over 19.
- Children and young people with SEN other than SEMH
- Studies which do not include measures of mental health or investigate the participants views on how the yoga intervention may have impacted their mental health.

Step 7. Data extraction

Systematic reviews adopt a formal, systematic approach to extracting relevant information from primary studies; this often involves developing a data extraction form, which the reviewer completes for every study in the review. This outlines the population, details of the intervention (if any), outcomes of interest, and relevant methodological and other information.

This method is intended to ensure consistency and objectivity. Data extraction also involves drawing up a detailed table describing every study that is reviewed in detail (not every study that was located in the review – only those studies that meet all the inclusion criteria).

Please also see Appendix 2

Step 8. Critical appraisal

Every study in the review that meets the inclusion criteria needs to be assessed with respect to its methodological soundness. This process helps to identify any important biases. It also helps the reader interpret the data. The results of the critical appraisal are used when synthesizing the results of the primary studies.

It will be useful to research standards which may be better applied to assessing the methodological rigour of school-based studies as opposed to standards devised for clinical settings, due to the complexity and specific challenges of conducting school based research. The standards used to assess rigour of quantitative studies will be different from frameworks best placed to assess qualitative research and therefore it will be necessary to locate two different frameworks.

Step 9. Synthesis of the primary studies

The included studies need to be integrated, taking into account variations in population, intervention (if any), context and setting, study design, out-comes, and the degree to which they are affected by bias. This integration can be done statistically (meta-analysis), and/or narratively – by systematically describing, reporting, tabulating, and integrating the results of the studies. Graphical displays (such as Forest plots) of quantitative data are also helpful in achieving this synthesis.

From prior knowledge of the evidence base into the effects of a school-based yoga intervention there have been a number of quantitative studies with much fewer mixed methods and qualitative designs being employed. From a brief scoping review it would seem that studies incorporated into systematic reviews thus far are too heterogeneous with regard to methodologies, outcomes used and variables being measured. The degree of heterogeneity will likely rule out a meta-analysis of the data but this will be considered once the systematic review has been conducted and the studies have been uncovered. The inclusion of both qualitative and quantitative data would indicate a graphical and narrative synthesis of the data possibly including a thematic analysis across studies.

The synthesis of data and subsequent analysis will incorporate both quantitative and qualitative data as informed by the processes outlined by Petticrew and Roberts (2006) and The Cochrane Users and Review Group paper on Data Synthesis and Analysis (Ryan 2013)

Step 10. Consider the effects of publication bias, and other internal and external biases

It is known that issues such as study size, study quality, source of funding, and publication bias can affect the results of primary studies. This can have a major

impact on the conclusions of a systematic review of quantitative studies; at worst, a review may over-represent the true size of the effect in question. For quantitative studies, the effects of such a bias can be explored graphically (for example, using funnel plots) or narratively.

- In an attempt to minimise publication bias, grey literature such as theses and dissertations will also be included.
- Grey literature will also be included to capture any new studies awaiting to be peer-reviewed prior to publication.
- A graphical exploration of effect sizes will be considered once studies have been retrieved in consultation with my research supervisors.

Step 11. Writing up the report

For many reviews, the final output is a report or journal article. In some cases it first involves producing an electronic version of the review (for example, Campbell or Cochrane reviews are made available on the Web and/or on CD). The final version of the review needs to include details of the full search, and the “flow” of studies through the review process, including how many studies were excluded at each stage, and why. Providing this information (for example, in a flow chart) is a prerequisite for publication in some journals. Some health journals also require the authors to follow the QUORUM (QUality Of Reporting Of Meta-analyses – see 286 guidelines for reporting systematic reviews.

This review will write the report up according to both the PRISMA (2009) Preferred reporting items for Systematic Reviews and Meta-Analyses and UCL-IOE guidance on thesis writing.

Step 12. Wider dissemination

At the start of the review, you will have defined clearly who you expect the audience for the review to be, and perhaps will have developed a plan in advance for disseminating your review's findings to them, and helping them to interpret and use them. Now you have to implement that plan. This may involve producing summaries or other versions of the review for decision-makers and non-research audiences, but may also involve working with users to implement the results, and helping potential users to understand the implications of the review's findings for policy, practice, and future research, where appropriate. Conferences, briefings of groups and individuals, seminars, public meetings, public inquiries, the media, the Web, and many other outlets may play a role. You should also consider assessing the impact your review has on relevant outcomes. This may involve measuring either social or health outcomes, or process outcomes (such as how the review was perceived, and used, and whether it in fact made any contribution to decision-making). The ability of a reviewer to do any of these wider dissemination tasks is, of course, highly dependent on time, resources, and the length of their research contract.

Challenges and how they will be addressed

- Time consuming: possibility of colleagues helping to sift references according to inclusion/exclusion criteria.
- Possible lack of UK studies...Why? Look at the barriers and extend searches to grey literature including theses, extend search to include tier 2 and 3 interventions if this will help to incorporate more UK studies?
- Data reported by studies may limit the questions that the review is able to answer.

Potential ethical issues

Less about data collection but in considering how information from this review may be utilised or actioned. Ethical issues will be considered in the application for ethical approval. Please see ethical application form.

Timeline

Steps in the process	Time Frame	Deadline	Completed
Petticrew and Roberts (2006) Step 1 Define the question, Step 2 Steering Advisory Group and Step 3 Write a protocol and have it reviewed (Write the proposal) Ethics Application	16/04/2020-01/06/2020	1 st June	1 st June
Stage 4 Carry out the Literature Search	1 st June- 10 th July		
Stage 5 Screen the References	1 st June- 10 th July		
Stage 7 Data Extraction	6 th July – 10 th August		
Stage 8 Critical Appraisal	6 th July – 10 th August		
Stage 9 Synthesis of the primary studies	10 th August-10 th September		
Stage 10 Consider the effects of publication bias, and other internal and external biases	10 th August-10 th September	10 th September	
Stage 11 Writing up the report/ Thesis First Draft First Draft Submission	10 th September-10 th October	10 th October	
Writing of Second Draft of thesis Second Draft Submission	24 th October-24 th November	24 th November	
Final Draft Writing Thesis Submission	1 st December-9 th December	9 th December	

Appendix 2

Taken from Gough's lecture handout 2019

Planning your Search for Information

This planner will assist in undertaking a systematic approach to researching a topic, identifying key search concepts, information sources and material relevant to your research.

1. Write your research question (or issue or problem) in the box below bearing in mind PICO(T) – population/problem, intervention, comparison/control/outcome (and timeframe):

What are the effects of a school-based yoga intervention on mental health outcomes in adolescence?

2. List the main concepts derived from the question into the table below.
3. Find the synonyms of those words, alternate spelling, and the words you wish to exclude and insert in the column below.
4. Combine searches (Boolean searching using **AND, OR, NOT**)
5. Identify controlled vocabulary (thesaurus terms).
6. Keep a systematic log of recorded database searches:

	Concept 1	Concept 2	Concept 3	Concept 4
Main concepts from the above summary	Yoga	School	Mental Health	Adolescence
Keywords	Yoga	School	Mental Health	Adolescence
Alternate search terms Using Truncation* and Wildcards?	Yoga AND	School AND	Mental Health AND	Adolescence

Synonyms (alternate words, alternate spelling)		Education	Stress Relaxation Mental Illness	Teenagers
Excluded concepts	Mindfulness alone Meditation alone Breathing practices alone	Primary/elementary schools/colleges/universities	Physical health and wellbeing alone	Yp under 11 and over 19 Adults
Controlled vocabulary Thesauri, Medline etc.				
Limit by: Time period Geographical region Age group Language Other	2010-2020 USA and Western countries unless not enough studies then will widen this parameter 11-19			

Information Sources

Information can be found in various formats including print, electronic and multimedia. There is no single comprehensive source that will fulfil all research needs; therefore it will be necessary to consult a number of different sources. To keep current with sources (e.g. databases, websites, journal TOCS etc.), identify them first and then set up alerts. This must include key scholarly sources such as peer-reviewed articles, conference papers, reports, books and systematic reviews conducted on your topic or related areas. Key unpublished formats may include grey literature e.g. working papers, government reports, conference posters, blogs, etc.)

Make a note of these as you progress with your search.

Key Scholarly Formats (e.g. peer-reviewed journal articles, conference papers, reports, books, systematic reviews etc.

Key unpublished formats (e.g. grey literature, working papers, government reports, conference posters, blogs etc.)

Theses and Dissertations (NB theses and dissertations have opposite meanings in N. America)

Key Authors

Recording your search strategies: It is important to record search strategies when reporting your future findings

SRs attempt to minimise effects of BIAS (and this should be demonstrable which is why you need to describe **how you searched** and **where you searched**, show **what you have included and excluded** from your search both in terms of the terms used and sources found.). NB: much research is never published (e.g. conference papers); positive results are more likely to be published and not all journals are indexed or indexed by a particular database which is why you need to use a range of different databases; newer studies take time to get published in peer-reviewed journals.

Key databases for psychology are listed here: http://metalib.ucl.ac.uk/V/?func=find-db-1-category&mode=category&category=Psychology&sub_cat=ALL&format=001&restricted=all

NB: Click on the ‘i’ to get information on the scope of the database, i.e. what years and subjects it covers. Use the template below to keep a track of your searching.

Appendix 3 Example of the Systematic Search Strategy Within one Database

Date	Database Name	Search Strategy	Results: No. of Hits
			Relevant?
			Full text found?
			Created an alert to receive updates?
08/06/2020	ASSIA	Yoga AND School AND Mental Health AND Adolescence	106 hits 23 included and 83 excluded by title 8 more excluded by abstract, therefore 15 included and 91 excluded Included at this stage = 15

15/06/2020	ASSIA	Yoga AND Education AND Mental Health AND Adolescence	97 hits After reading title and abstract 11 included 86 excluded 11 incs
16/06/2020	ASSIA	Yoga AND School AND Stress OR Relaxation OR Anxiety OR Depression OR Mental Wellbeing OR Mental Illness	83,000+ hits
		Yoga AND School AND stress OR relaxation OR Anxiety OR Depression	65,580 hits
		Yoga AND School AND Stress	
		Yoga AND School AND Stress AND adolescence	430 hits
			97 results
			15 repetitions
			82 exclusions
		Yoga AND School AND Relaxation AND Adolescence	0 new inclusions = this search is exhausted

41 hits

Yoga AND school AND
mental illness AND
adolescence

9 Repetitions

32 exclusions

52 hits

5 repetitions

1 inclusion

46 exclusions

Search terms
exhausted

1 incs

Appendix 4: Excerpt from ‘How to Grade’ by the Cochrane Collaborative (Ryan and Hill 2016)

CCCG Supplementary author advice

How GRADE works

The GRADE system rates the quality of evidence **for each outcome**, from a rating of HIGH to VERY LOW.

See **section 2.1** for an overview of GRADE and **section 3** for additional sources of information.

GRADE starts with a baseline rating of HIGH for RCTs, and LOW for non-RCTs.

This baseline rating can then be adjusted (downgraded or, less commonly, upgraded) after considering 8 assessment criteria and making a judgement about quality based on these.

Reasons to downgrade the evidence quality

1. Risk of Bias
2. Inconsistency
3. Indirectness
4. Imprecision
5. Publication Bias

For these **5 criteria**, if

- no serious concern exists, do not downgrade quality from the baseline quality (e.g. high for RCTs)
- serious concern exists, downgrade the evidence one level, e.g. from high to moderate (-1)
- very serious concern exists, downgrade the evidence two levels, e.g. from high to low (-2)

Reasons to upgrade the evidence quality (usually not used for evidence from RCTs)

- 6. Large Magnitude of Effect
- 7. Dose Response
- 8. Effect of all plausible confounding factors would be to reduce the effect (where an effect is observed) or suggest a spurious effect (when no effect is observed)

For **criteria 6 to 8**, decide if the evidence should be upgraded once (+1) or twice (+2).

Remember RCT evidence quality is very rarely upgraded.

Decisions to down- or up-grade are not all or nothing, and they rely on your judgement. Sometimes there may be some serious concern but not enough to downgrade by a level of evidence. In such cases, you can decide not to downgrade but should indicate why. In other cases, you may decide that there is some serious concern with 2 or more criteria which adds up to downgrading by a level of evidence.

Based on your assessments, you will decide on a final level of evidence for each outcome, including both meta-analysed and narratively synthesised outcomes. Use this to assign a value for the Quality of evidence.

Table 1: Moving from risk of bias assessments to overall judgements about limitations

Risk of bias across studies	Considerations	GRADE assessment
Most information is from studies at low risk of bias	Plausible bias unlikely to seriously alter the results	No serious risk of bias, do not downgrade.
Most information is from studies at low or unclear risk of bias.	Plausible bias unlikely to seriously alter the results.	No serious risk of bias, do not downgrade.
	Plausible bias likely to seriously alter the results.	Serious risk of bias, downgrade one level.
The proportion of information from studies at high risk of bias is sufficient to affect the interpretation of results.	Crucial risk of bias for one criterion, or multiple criteria, and likely to seriously alter the results.	Serious risk of bias, downgrade one level.
	Crucial risk of bias for one criterion, or multiple criteria, and likely to very seriously alter the results.	Very serious risk of bias, downgrade two levels.

** Table adapted from Table 12.2.d, The Cochrane Handbook

Factors that affect the strength of a recommendation

Factor	Examples of strong recommendations	Examples of weak recommendations
Quality of evidence	Many high quality randomised trials have shown the benefit of inhaled steroids in asthma	Only case series have examined the utility of pleurodesis in pneumothorax
Uncertainty about the balance between desirable and undesirable effects	Aspirin in myocardial infarction reduces mortality with minimal toxicity, inconvenience, and cost	Warfarin in low risk patients with atrial fibrillation results in small stroke reduction but increased bleeding risk and substantial inconvenience
Uncertainty or variability in values and preferences	Young patients with lymphoma will invariably place a higher value on the life prolonging effects of chemotherapy than on treatment toxicity	Older patients with lymphoma may not place a higher value on the life prolonging effects of chemotherapy than on treatment toxicity
Uncertainty about whether the intervention represents a wise use of resources	The low cost of aspirin as prophylaxis against stroke in patients with transient ischemic attacks	The high cost of clopidogrel and of combination dipyridamole and aspirin as prophylaxis against stroke in patients with transient ischaemic attacks

Appendix 6 Critical Appraisal Across Quantitative Studies by Outcome

Mental Health Outcome	Studies Included	Quality of Evidence and Reasons	Strength of Recommendation
Anxiety	RCT's		Weak
	Butzer et al (2017) Frank et al (2017) Khalsa et al (2012) Noggle et al (2012) Weaver (2015)	Very Low ●Serious risk of bias due to small sample sizes, randomisation by group, majority measures self-report and lack of blinding ●Serious inconsistency, one study found significant results favouring the yoga group others did not and one study found anxiety to increase post yoga and P.E	

		<ul style="list-style-type: none"> ● Serious imprecision due to small sample sizes and lack of reporting of effect sizes and confidence intervals 	
	Non-RCT's		
	Frank et al (2014) Felver et al (2015)	Very Low <ul style="list-style-type: none"> ● Serious risk of bias- lack of control in one study, small sample sizes, lack of counterbalancing for repeated measures design, high attrition, possible statistical bias ● Some inconsistency, one found between group significant effects ● Some imprecision- small sample sizes and lack of reporting of confidence intervals 	
Depression	RCT's		Weak
	Beets and Mitchell (2010) Butzer et al (2017) Khalsa (2012) Noggle (2012) Schulte (2015)	Low <ul style="list-style-type: none"> ● Serious risk of bias- Lack of blinding, randomisation by cluster sampling bias and attrition, small sample sizes 	

		<ul style="list-style-type: none"> ● Serious risk of imprecision- small sample sizes, no confidence intervals reported 	
	Non RCT's		
	Frank et al (2014) Felver (2015)	Very Low <ul style="list-style-type: none"> ● Very serious risk of bias, one study uncontrolled, lack of counterbalancing for repeated measures design, small sample sizes, quite high attrition for one yoga group ● Serious risk of imprecision from small sample sizes and lack of reported confidence intervals 	
Stress	RCT's		Weak
	Beets and Mitchell (2010) Butzer et al (2017) Fishbein et al (2015) Khalsa et al (2012) Noggle et al (2012) Weaver (2015)	Very Low <ul style="list-style-type: none"> ● Serious risk of bias due to sampling bias, lack of blinding and cluster randomisation. ● Very serious Imprecision - small sample size, reducing confidence in effect size and lack of reported means 	
	Non-RCT's		
	Frank et al (2014) Ramadoss and Bose (2010)	Very Low <ul style="list-style-type: none"> ● Very serious risk of bias due to lack of control group, lack of 	

		<p>between groups analysis in other study, possibility of selective reporting of analyses or lack of justification for why these did not occur/confirmation bias?</p> <ul style="list-style-type: none"> ● Imprecision – no confidence intervals reported, plus lack of other data e.g means/mean differences. ● Large effect sizes, though dose response likely affected by bias due to uncontrolled nature of study. 	
Emotion Regulation	RCT's		Weak
	Butzer 2017 Fishbein 2015 Frank 2017	<p>Very Low</p> <ul style="list-style-type: none"> ● Serious risk of bias, group randomisation, sample not representative of pop in one study, lack of blinding ● Serious inconsistency- Butzer found an increase in emotional dysregulation and an increase in emotional self-control. ● serious imprecision- small sample size and no confidence intervals reported. 	

Appendix 7

TAPUPAS adapted from 'Types and Quality of Knowledge in Social Care' (SCIE Pawson et al 2003)

Transparency

Principle: the process of knowledge generation should be open to outside

scrutiny. For knowledge to meet this standard, it should make plain how it was generated, clarifying aims, objectives and all the steps of the subsequent argument, so giving readers access to a common understanding of the underlying reasoning.

Examples:

- A record of the case notes of a mental health practitioner – does it give the reasoning behind a recommended course of action?
- A qualitative research report on adoption – does it give full details of how the study was conducted, who was involved and what techniques were used in the analysis?

Accuracy

Principle: all knowledge claims should be supported by and faithful to the events, experiences, informants and sources used in their production. For knowledge to meet this standard, it should demonstrate that all assertions, conclusions, and recommendations are based on relevant and appropriate information.

Examples:

- A group produces a report that purports to convey users' experiences of home care services – are the users' perspectives merely asserted, or is their voice clearly reported in the data and reflected in the analysis?
- A policy document is produced that claims to be a comprehensive review of existing legislation on adoption – is the coverage and analysis of previous legislation selective or all-inclusive?

Purposivity

Principle: the approaches and methods used to gain knowledge should be appropriate to the task in hand, or 'fit for purpose'. For knowledge to meet this standard, it should demonstrate that the inquiry has followed the apposite approach to meet the stated objectives of the exercise.

Examples:

- A local authority publishes a strategy that claims to measure changes in take-up resulting from a new residential care services regime – is an audit using standardised participation indicators applied before and after the change more appropriate than a satisfaction survey or practitioner case notes?
- A policy development team commissions a report to improve the implementation details of community sentencing – would a process evaluation fit the bill more readily than an academic 'think piece' or an inspection report?

Utility

Principle: knowledge should be appropriate to the decision setting in which it is intended to be used, and to the information need expressed by the seeker after knowledge. For knowledge to meet this standard it should be 'fit for use', providing answers that are as closely matched as possible to the question.

Examples:

- Practitioners are looking for knowledge on how to help firstgeneration immigrant families suffering from alcohol-related problems – do they need to consider just the disorder or should they also call on information sensitive to the background, history, culture and context of the clients?
- A senior child care manager is considering the balance between

residential and community-based services over the next decade – would a Green/White Paper or the report of an influential think tank be more useful than the results of Best Value reviews or the results of user surveys?

Propriety

Principle: knowledge should be created and managed legally, ethically and with due care to all relevant stakeholders. For knowledge to meet this standard, it should present adequate evidence, appropriate to each

Towards a quality standards framework

Knowledge Review 3: Types and quality of knowledge in social care point of contact, of the informed consent of relevant stakeholders. The release (or withholding) of information should also be subject to agreement.

Examples:

- A carer's group shares information about members with other organisations – has there been consent from all the members concerned?
- A government department consults regularly with the same community – has it considered or used results from previous exercises, and can this be demonstrated?

Accessibility

Principle: knowledge should be presented in a way that meets the needs of the knowledge seeker. To meet this standard, no potential user should be excluded because of the presentational style employed.

Examples:

- A research team produces a report on autism aimed at parents – is it too long, too dense and too prone to technical language, or is it patronising to the point of insult?
- The Department of Health produces guidelines on charging for the residential care of elderly people – are they clear and unambiguous, comprehensive or selective?

Specific standards for different types of knowledge

Important as they are, it is clearly insufficient to rely solely on generic standards. Each piece of knowledge also needs to pass muster in its own field, against the standards operating there. Having identified the diverse sources that comprise social care knowledge, the key ambition of this exercise is to draw together best practice from these contrasting domains. In order to explore similarities and differences, the construction of standards in each domain is followed through the sequence of issues illustrated in **Figure 4**.

Some of the social care knowledge sources are much more thickly populated with standards than are others and, in many cases, these do not relate directly to the quality assessment of knowledge. The descriptions that follow take into account the future practical use of the framework, and include some preliminary thoughts on how existing (or latent) standards might be adapted for knowledge assessment purposes. Despite the diversity of the knowledge sources, there are certain parallels to be drawn, and reading *across* the five sources can create added value.

Appendix 8 Illustrating the Critical Appraisal of Studies Using TAPUPAS (Pawson, Boaz, Grayson, Long and Barnes SCIE 2003)

TAPUPAS Framework

Study	Transparency: Is it open to scrutiny?	Accuracy: Is it well grounded?	Purposivity: Is it fit for purpose?	Utility: Is it fit for use?	Propriety: Is it legal and ethical?	Accessibility: Is it intelligible?	Specificity: Does it meet source specific standards?
Berezowski 2017 1st	<p>Only 4 participants which allows for depth. Elective yoga p's and therefore possibly 'best case scenario' data.</p> <p>Transparency of interview process and sample q's included</p> <p>Sampling, processing of data and analysis described.</p>	<p>Narrative inquiry used to capture participants' experiences or the program.</p> <p>Noticing an paying attention to the p's experience is fitting for the phenomenom being studied.</p> <p>Positionality outlined and supervisor role to aid with analysis outlined.</p> <p>Bottom up and top down analysis used</p>	<p>Yes the methods suit the research q to be answered e.g what their experiences were though generalisations about the implications of yoga on other people's health cannot be made</p>	<p>Some bias inherent in the questions used....</p> <p>e.g Can you tell me a story about how yoga helped you when you were outside of your <i>Yoga 11</i> class?</p>	<p>Yes</p> <p>Research Ethics Board of Saint Francis Xavier University plus informed consent, children's assent was inferred unless they actively chose not to be interviewed.</p>	<p>Yes yoga terms and philosophy explained.</p>	<p>Adequate description of Yoga 11 curriculum</p> <p>Ashtanga yoga Eightfold path well described and used to guide parallel analysis upon noticing themes from bottom up data that could be interpreted using this framework.</p>

TAPUPAS Framework

Study	Transparency: Is it open to scrutiny?	Accuracy: Is it well grounded? incorporating 8 limbed path. Direct quotes used, parallel analysis using 8 fold path framework may have influenced 'bottom up' analysis might have been useful to have asked an impartial coder to have analysed the bottom up material to ensure it really was narrative (they argued it had become part of their experience through the yoga teachings).	Purposivity: Is it fit for purpose?	Utility: Is it fit for use?	Propriety: Is it legal and ethical?	Accessibility: Is it intelligible?	Specificity: Does it meet source specific standards?
Bergen-Cico, Razza and	Lack of student anonymity may have introduced bias.	Explanation re analysis and coding intervention teacher read and coded and	Yes, the qualitative feedback at the end of the year	Questions were balanced and fit for use.	Student feedback was not anonymous.	Yes accessible, yoga terminology explained.	Mindful yoga 'yokids' explained +

TAPUPAS Framework

Study	Transparency: Is it open to scrutiny?	Accuracy: Is it well grounded?	Purposivity: Is it fit for purpose?	Utility: Is it fit for use?	Propriety: Is it legal and ethical?	Accessibility: Is it intelligible?	Specificity: Does it meet source specific standards?
Timmins 2015 1st	Parents were asked to respond and questions posed were reported. The teacher provided weekly logs re practices, time and feedback	primary researcher's also coded to triangulate analysis and high consistence was reported Some qualitative data tallied by intervention teacher but not triangulated, e.g helpful/not helpful.	exploring students receptivity was fit for purpose as part of the wider study	Questionable use of analysing qualitative data numerically.	Parents and children given option to opt out Human Subjects IRB		implementation and dosage etc.
	6 th grade year 7	Positionality/researcher bias not espoused possibly due to mixed methods nature..... Direct quotes and examples given to support themes and					

TAPUPAS Framework

Study	Transparency: Is it open to scrutiny?	Accuracy: Is it well grounded? both positive and negative quotes illustrated	Purposivity: Is it fit for purpose?	Utility: Is it fit for use?	Propriety: Is it legal and ethical?	Accessibility: Is it intelligible?	Specificity: Does it meet source specific standards?
Butzer, LoRusso, Windsor et al 2017 1st	<p>Sampling and method reported well</p> <p>Used a questionnaire to assess whether interviewees were representative of the sample.</p> <p>Explanation given re direct q's and open questions which lead to pre-determined and emergent themes</p>	<p>Anthropological exercise to consider biases of coders.</p> <p>Emergent themes analysed first, bottom up e.g narrative experience q's asked first in interview sequence.</p> <p>Direct anonymised quotes and examples given.</p> <p>Sampling bias may have been inherent in</p>	Yes, second stage of a wider well thought out quantitative study	Yes, and is the first study to explore experiences of children of this age	Reviewed and Approved by a review board.	Yoga jargon broken down and research methods explained	Explanation of intervention Kripalu yoga in the schools, dosage and duration.

TAPUPAS Framework

Study	Transparency: Is it open to scrutiny?	Accuracy: Is it well grounded?	Purposivity: Is it fit for purpose?	Utility: Is it fit for use?	Propriety: Is it legal and ethical?	Accessibility: Is it intelligible?	Specificity: Does it meet source specific standards?
	16 participants	<p>the interviews e.g the experiences of students not consenting to participating in the study yet still engaging with the yoga program may have been far less favourable...</p> <p>Distinctions clearly reported e.g pre-determined themes labelled as such and emergent themes labelled.</p> <p>Encouraged coders to code negative and positive codes/themes.</p>					

TAPUPAS Framework

Study	Transparency: Is it open to scrutiny?	Accuracy: Is it well grounded?	Purposivity: Is it fit for purpose?	Utility: Is it fit for use?	Propriety: Is it legal and ethical?	Accessibility: Is it intelligible?	Specificity: Does it meet source specific standards?
Dariotis 2016 1st	Mean age 11 8 grade 5, 14 grade 6. The 22 students were a subset of a the yoga program participants, teacher's selected them according to demographics etc, teacher bias inherent? Description of focus groups process and sample questions Inner-city	Inductive/Emergent thematic analysis described and process outlined for when inconsistencies arose Direct quotes given to illustrate themes.	Yes, use of focus groups to arrive at a shared conceptualisation of how youth perceive stress and how the mindful yoga intervention worked was appropriate	Yes attempting to understand how youth perceived stress and how the intervention may help answered their research questions. However there were some leading questions e.g Have you used what you learned	A charity offered this intervention.	Some yoga jargon not defined e.g sun salutation	Description of yoga program used

TAPUPAS Framework

Study	Transparency: Is it open to scrutiny?	Accuracy: Is it well grounded?	Purposivity: Is it fit for purpose?	Utility: Is it fit for use? in the program outside the program to help you with stress?“).	Propriety: Is it legal and ethical?	Accessibility: Is it intelligible?	Specificity: Does it meet source specific standards?
Frank, Kohler, Peal and Bose 2017 2nd	The free writing questions which gave rise to qualitative data, were not outlined under the measures section so it is difficult to assess whether the q’s were leading or whether there was bias....it would also be difficult to replicate	The study is predominantly a quantitative study with the inclusion of some free-writing q’s. it is well grounded on the quantitative side yet the qualitative component is lacking, the free-writing answers are analysed quantitatively in that percentages of students who responded with similar answers are reported yet individual quotes are not incorporated	The quantitative component is yet the qualitative part in enabling students’ space to write their views seems lacking	Allowing the individuals space to describe their views is useful yet not reporting on the questions used or analysing them qualitatively is not	Yes it meets this criteria	Yes jargon is limited, measures are well described as is yoga and the science behind it. However within the results section they outline using gender as a covariate in their ANCOVA yet do not explicitly report “no significant gender effects” One must assume this from	Implementation schedule used to ensure fidelity Yoga teachers qualification and intervention TLS outlined/sample of curriculum overview reported

TAPUPAS Framework

Study	Transparency: Is it open to scrutiny?	Accuracy: Is it well grounded?	Purposivity: Is it fit for purpose?	Utility: Is it fit for use?	Propriety: Is it legal and ethical?	Accessibility: Is it intelligible? the lack of reporting.	Specificity: Does it meet source specific standards?
Khalsa et al 2012 2nd	Possibility of statistical bias e.g no adjustments for intention to treat or multiple pairwise comparisons. The qualitative responses were anecdotal comments or observations made by the yoga teachers or comments made by the students that teachers had recorded...there is likely to be bias for these reasons	Secondary quotes are given in that they are reported by the yoga teacher to researchers. It would have been useful to capture this data in a questionnaire or interview directly. Also positionality and bias not discussed as part of a wider quantitative study	The overall study is but the method for capturing student voice/feelings is inadequate	The quantitative element certainly and keeping field notes was useful to explore anecdotal findings	Yes although passive consent was gained via an opt out approach	Yes, yoga well defined and report is reader friendly.	The intervention included dosage is well outlined along with teacher qualification
Noggle et al 2012	Included an open-ended comments box to glean	Direct quotes are offered but not for each theme though	Yes as part of a wider study it was useful but	Yes it allows for students to express	Yes	Analysis is clearly described and	The intervention Kripalu yiga for schools is well

TAPUPAS Framework

Study	Transparency: Is it open to scrutiny?	Accuracy: Is it well grounded?	Purposivity: Is it fit for purpose?	Utility: Is it fit for use?	Propriety: Is it legal and ethical?	Accessibility: Is it intelligible?	Specificity: Does it meet source specific standards?
1st	<p>qualitative information about students views and feelings re the yoga intervention, this was contained within the yoga evaluation questionnaire.</p> <p>The methods are well described and open to scrutiny</p>	<p>this is likely due to reporting limitations.</p> <p>Again positionality not discussed.</p> <p>They reported both negative and positive comments</p>	<p>would not have been adequate if the study's purpose was to explore student experiences</p>	<p>their thoughts, feelings etc should they so wish</p>	<p>There was however an incidence where a student with an unknown eye condition went temporarily blind after a yoga inversion.</p> <p>This highlights the necessity to ensure medical forms are used and pre-intervention and that teachers are qualified to ensure safe</p>	<p>appropriate for the audience.</p> <p>Yoga jargon kept to a minimum, though possibly an more in depth description warranted</p>	<p>defined plus teacher qualification etc.</p>

TAPUPAS Framework

Study	Transparency: Is it open to scrutiny?	Accuracy: Is it well grounded?	Purposivity: Is it fit for purpose?	Utility: Is it fit for use?	Propriety: Is it legal and ethical?	Accessibility: Is it intelligible?	Specificity: Does it meet source specific standards?
					practice and modification where necessary. The majority of studies do not report that they completed medical forms?? So this is difficult to appraise across studies.		
Powell and Potter 2010	Transparency re sampling method and criteria	Creation of their own questionnaire not assessed for reliability or validity	Obtaining the qualitative feedback in this way was likely not fit for purpose due to the literacy diffs and challenges	As an exploratory pilot study yes....	Coventry university ethics board approved	Yes meets this criteria.	The room that the school was able to provide was not big enough to use yoga mats which may have reduced comfort
1st	Multi-component intervention so difficult to attribute	Sample open ended q's given			Consent forms		

TAPUPAS Framework

Study	Transparency:	Accuracy:	Purposivity:	Utility:	Propriety:	Accessibility:	Specificity:
	Is it open to scrutiny?	Is it well grounded?	Is it fit for purpose?	Is it fit for use?	Is it legal and ethical?	Is it intelligible?	Does it meet source specific standards?
	favourable effects to yoga	P's with literacy diffs gave informal feedback related to written q's informally on own and in SDP group to researcher which opens it to bias	with school work, interviews would have been better in this instance		included yp assent		and experience however chair based relaxations were given which may be useful in school settings were there may be a lack of space.
	Process adequately described	Tutor monitoring forms also used.					
	qualitative data were collected using open questions on the follow-up questionnaires (i.e. immediately on completion of the SDP), tutor -monitoring forms that were completed by the tutors for the duration of the SDP, and meeting with each group of pupils on completion of the SDP to gain feedback regarding their views	Lack of direct quotes given or the type of analysis used for qualitative data					The yoga teacher was not qualified

TAPUPAS Framework

Study	Transparency: Is it open to scrutiny? and experience of taking part in the SDP.	Accuracy: Is it well grounded?	Purposivity: Is it fit for purpose?	Utility: Is it fit for use?	Propriety: Is it legal and ethical?	Accessibility: Is it intelligible?	Specificity: Does it meet source specific standards?
Ramadoss and Bose 2010 2nd	They reported teacher and student qualitative feedback but there is no indication of how this was gathered.	They have reported some direct quotations in the discussion not results section, yet no context for how these came about. Lack of explanation for why between groups dosage effects were not conducted?	Yes the study as a whole is but the manner in which qualitative data was collected was not and may have been incorporated post-hoc	The questions that they had posed were answered by the methods they used, the focus was not on the qualitative data	Yes	Sanskrit terms are given along with their English counterpart	It outlines the program used and dosage etc

TAPUPAS Framework

Study	Transparency: Is it open to scrutiny?	Accuracy: Is it well grounded?	Purposivity: Is it fit for purpose?	Utility: Is it fit for use?	Propriety: Is it legal and ethical?	Accessibility: Is it intelligible?	Specificity: Does it meet source specific standards?
Schulte 2015 2nd	Interviews and written answers to open ended question used Head, P.E department and one willing teacher selected the classes to be used so not random sampling process described weel along with methodology. Once classes were identified a coin was flipped to decide which class would do yoga and which P.E.	Quant and qual used to compare and triangulate findings. In an attempt to off-set potential bias there is a section on postionality and reflexivity plus a set of quality standards which the researcher adhered to, however this was not enough to offset the social desirability bias that may have affected student responses due to the dual yoga teacher/interviewer roles that Schulte played.	The methods were fit for purpose e.g interviews to compare and converge findings yet content analysis used explored frequencies of themes with less focus on depth and richness of individual stories.	Qualitative content analysis was questionably used to explore the deeper understanding of the individual experiences of the students in the yoga and PE classes.	University of Missouri– Saint Louis Institutional Review Board. Plus informed consent gained from yp A section on confidentiality included also	Yes the jargon is reduced and the word count enables the rsearcher to fully explain theory and methods/analysis used.	Limited description of what the classes entailed e.g which postures etc but other elements covered e.g themes.

TAPUPAS Framework

Study	Transparency: Is it open to scrutiny?	Accuracy: Is it well grounded?	Purposivity: Is it fit for purpose?	Utility: Is it fit for use?	Propriety: Is it legal and ethical?	Accessibility: Is it intelligible?	Specificity: Does it meet source specific standards?
	5 students chosen at random to be interviewed 3 x throughout program	Numerous direct quotes given to illustrate themes					
	Researcher was also the yoga teacher.....?						
	Researcher was known to students.						
Wang and Hagins 2015	Reference made to differences in each of the four schools implemented the classes due to structure and timetabling differences.	Focus groups were conducted by a person not affiliated to the yoga.	Yes the methods were appropriate. There was one study focusing on quantitative and this focusing on student views and experiences.	Social desirability and true confidentiality may have impacted on what students felt able to say.	Yes Long Island University and New York City Department of Education Institutional Review Boards. Somina	Yes it is accessible...limited jargon	Curriculum focuses on mindfulness and yoga exercises
Ist		Preliminary codes used which were generated from theory and					Very brief description of yoga/mindfulness

TAPUPAS Framework

Study	Transparency:	Accuracy:	Purposivity:	Utility:	Propriety:	Accessibility:	Specificity:
	Is it open to scrutiny?	Is it well grounded?	Is it fit for purpose?	Is it fit for use?	Is it legal and ethical?	Is it intelligible?	Does it meet source specific standards?
	1 school group randomised by English class the others reported practical assignment based on scheduling on non-randomised/arbitrary scheduling.	research until grounded in the literature....no bottom up analysis conducted first. Numerous examples given to verify themes.	This method allowed for a larger number of pupils to be interviewed but it may have been harder for students to talk about negative experiences or feelings re mental health in front of the group	So whilst this was fit for use it is useful to bear the context in mind	foundation offered health and wellness classes to 4 schools		s classes and no sample class given. Teachers were qualified and exposed to further training and observation
	Sample focus group questions included	The questions were somewhat unbalanced e.g what aspects of the program did you like best but not a question exploring the opposite					
	Transparency re method of analysis constant comparative method	And Can you tell me some of the immediate benefits you					

TAPUPAS Framework

Study	Transparency: Is it open to scrutiny?	Accuracy: Is it well grounded? felt from the yoga? Rather than were there any immediate benefits? What were they? Positionality/reflexivity not outlined	Purposivity: Is it fit for purpose?	Utility: Is it fit for use?	Propriety: Is it legal and ethical?	Accessibility: Is it intelligible?	Specificity: Does it meet source specific standards?
Weaver 2019 1st	Yes very detailed due to being a doctoral thesis not research report Process of analysis outlined and positionality discussed All students whi had been randomised into the yoga group were interviewed	Yoga students attended group interviews by year group 4 Teachers were also interviewed Parents were approached but did not respond	Qualitative component designed to be formal part of study Such empirical qualitative studies will be used in main analysis.....there will be a secondary analysis of other studies including	Yes this approach answers the questions posed by the researcher	Yes students were also formally asked for their assent	Many terms defined and explained due to the length of the report	Yes yoga intervention outlined

TAPUPAS Framework

Study	Transparency:	Accuracy:	Purposivity:	Utility:	Propriety:	Accessibility:	Specificity:
	Is it open to scrutiny?	Is it well grounded?	Is it fit for purpose?	Is it fit for use?	Is it legal and ethical?	Is it intelligible?	Does it meet source specific standards?
	along with a sample of involved teachers	Triangulation afforded....	anecdotal evidence if time permits				
	Long relationship researcher had with school may have worked in reverse e.g made people inclined to respond positively. Weaver did not teach this program but did teach before and after so some bias possible	Interview questions were designed to explore constructs related to the standardised measures which may have constrained responses but helps to triangulate findings plus sample interview schedule not given to assess quality if q's	This study does perform some numerical analysis of qualitative data which will not be considered within the synthesis of this review				
		Direct quotes and samples of q's given					

TAPUPAS Framework

Study	Transparency: Is it open to scrutiny?	Accuracy: Is it well grounded?	Purposivity: Is it fit for purpose?	Utility: Is it fit for use?	Propriety: Is it legal and ethical?	Accessibility: Is it intelligible?	Specificity: Does it meet source specific standards?
Cox et al 2017 9 th -12 th grade students	Yes A fitness only P.E class was selected as the intervention group, usually do not participate in school sports etc A younger yet similarly able comparison class was selected (similar curriculum) 18 of 20 females in yoga class 13 of 23 in comparison Non-RCT	possible bias e.g best case scenario results due to selection of the intervention group Small sample size Some differences between the comparison and control conditions eg higher number of females in the yoga class Measures good internal consistency	Measures good internal consistency and well-founded selection Pilot study methods fit for purpose	Yes the methods and measures answer the research questions posed	Parent consent obtained, did not request consent from youth for participation as it was in line with standard educational practice; e.g a P.E class. University Review Board approved.	Yes different forms of mindfulness are well explained. Where Sanskrit is used the English is given (most of the time yet not all) Some jargon in the analysis section yet to be expected for an academic journal and for replicability	Teacher qualified Anusara yoga teacher 12 week intervention focusing on mindfulness of the body Length and dosage of class outlined

TAPUPAS Framework

Study	Transparency: Is it open to scrutiny?	Accuracy: Is it well grounded? and well-founded selection	Purposivity: Is it fit for purpose?	Utility: Is it fit for use?	Propriety: Is it legal and ethical?	Accessibility: Is it intelligible?	Specificity: Does it meet source specific standards?
Butzer, LoRusso, Shin and Khalsa 2017	The methods and randomisation strategy are well described. Analysis of data well outlined	Of the 407 students and their parents approached by the study only 211 consented to participating and as such there is a high risk of sampling bias, of these 2011 63% were female and the authors suggested that male students may have thought that opting out of the study would mean that they would not have engage with the yoga intervention which was not the case.	Yes, this study was fit for purpose e.g quant measures to assess impact and sister study to explore experiences.	It may have been more appropriate to have implemented this study in a school with students more at risk of using substances, this school was akin to a grammar school whereby students had to pass an exam in order	Yes by the Brigham and Women’s Hospital Institutional Review Board They asked for written child assent as well as parental consent. Possibly not ethical in that students had no choice over whether	It is clearly written and results presented clearly. Except from inadequate description fo the constructs that the measures used were assessing.	Yes they used a manualised yoga program

TAPUPAS Framework

Study	Transparency: Is it open to scrutiny?	Accuracy: Is it well grounded?	Purposivity: Is it fit for purpose?	Utility: Is it fit for use?	Propriety: Is it legal and ethical?	Accessibility: Is it intelligible?	Specificity: Does it meet source specific standards?
		<p>Researcher and social desirability bias minimised by using a laptop for students to answer measures</p> <p>Lack of choice and length of time that yoga intervention students went without P.E likely impacted on the results of this study.</p>		<p>to be accepted.</p>	<p>they engaged in yoga or P.E and in P.E although they would have to participate in activities not of their choosing it's doubtful that a certain activity would last more than a term</p> <p>The yoga intervention lasted for approx 6 months</p>		

Appendix 9 PRISMA Checklist

Section/topic	#	Checklist item	Reported on page #
Risk of bias across studies	15	Specify any assessment of risk of bias that may affect the cumulative evidence (e.g., publication bias, selective reporting within studies).	
Additional analyses	16	Describe methods of additional analyses (e.g., sensitivity or subgroup analyses, meta-regression), if done, indicating which were pre-specified.	
RESULTS			
Study selection	17	Give numbers of studies screened, assessed for eligibility, and included in the review, with reasons for exclusions at each stage, ideally with a flow diagram.	
Study characteristics	18	For each study, present characteristics for which data were extracted (e.g., study size, PICOS, follow-up period) and provide the citations.	
Risk of bias within studies	19	Present data on risk of bias of each study and, if available, any outcome level assessment (see item 12).	
Results of individual studies	20	For all outcomes considered (benefits or harms), present, for each study: (a) simple summary data for each intervention group (b) effect estimates and confidence intervals, ideally with a forest plot.	
Synthesis of results	21	Present results of each meta-analysis done, including confidence intervals and measures of consistency.	
Risk of bias across studies	22	Present results of any assessment of risk of bias across studies (see Item 15).	
Additional analysis	23	Give results of additional analyses, if done (e.g., sensitivity or subgroup analyses, meta-regression [see Item 16]).	
DISCUSSION			
Summary of evidence	24	Summarize the main findings including the strength of evidence for each main outcome; consider their relevance to key groups (e.g., healthcare providers, users, and policy makers).	
Limitations	25	Discuss limitations at study and outcome level (e.g., risk of bias), and at review-level (e.g., incomplete retrieval of identified research, reporting bias).	
Conclusions	26	Provide a general interpretation of the results in the context of other evidence, and implications for future research.	

FUNDING		
Funding	27	Describe sources of funding for the systematic review and other support (e.g., supply of data); role of funders for the systematic review.

	(*for student projects, your supervisor should be identified as the PI)	
6	Position held	Professor
7	Faculty/Department	Department of Human Psychology- Institute of Education/UCL
9	Contact Details Email: Telephone:	j.hurry@ucl.ac.uk
10	Provide details of other Co-Investigators/Partners/Collaborators who will work on the project. Note: This includes those with access to the data such as transcribers.	
	Name: Helen Upton Position held: DEdPsy Professional and Academic Tutor Faculty/Department: Psychology and Human Development Location (UCL/overseas/other UK institution): IOE-UCL Email: h.upton@ucl.ac.uk	Name: Position held: Faculty/Department: Location (UCL/overseas/other UK institution): Email:
	If you do not know the names of all collaborators, please write their roles in the research.	

11	If the project is funded (this includes non-monetary awards such as laboratory facilities)	
	Name of Funder	N/A
	Is the funding confirmed?	N/A

12	Name of Sponsor
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The Sponsor is the organisation taking responsibility for the project, which will usually be UCL. If the Sponsor is not UCL, please state the name of the sponsor.

13 If this is a student project

Name	Julie Gibbons
Faculty/Department	Psychology and Human Development
Position Held (please tick)	<input type="checkbox"/> Undergraduate/Bachelor project (if so, provide course title/number: _____) <input type="checkbox"/> Master's project (if so, provide course title/number: _____) <input checked="" type="checkbox"/> PhD (DEdPsy) <input type="checkbox"/> staff led research project which may involve one or more students
Contact details	Julie.gibbons.16@ucl.ac.uk

Section B: Project details

The following questions relate to the objectives, methods, methodology and location of the study. Please ensure that you answer each question in lay language.

14 Provide a *brief* (300 words max) background to the project, including its intended aims.

Yoga is a mind-body practice and yoga classes and interventions have been growing in popularity in UK schools with the enthusiasm for such interventions having swept across from the USA. Preliminary studies have demonstrated that implementing a yoga intervention within a school system can have positive effects on stress reduction, anxiety management, depression, self-esteem and self-regulation and other elements which feed into cultivating good mental health, plus numerous physical health benefits (Conboy 2013, Ferreira-Vorkapic et al 2016, Greenberg and Harris 2012, Khalsa et al 2012, Khalsa and Butzer 2016, Mendelson et al 2013, Parker 2014 Weaver-Darragh 2015). Indeed, yoga philosophy recognises that the body and mind are not dichotomous but rather, they are inextricably linked and that in order to be healthy one must work with both the body and the mind simultaneously.

This piece of research aims to conduct a systematic review into the evidence base of yoga interventions within secondary school settings. The primary question that the review intends to address is 'What are the effects of a school-based yoga intervention on mental health outcomes in adolescence?'. The findings from primary studies and previous systematic reviews will be synthesised, critically appraised and analysed and may find commonalities or differences across studies which serve to either strengthen or weaken initial findings and may help to reduce the risk of bias inherent in primary research.

Findings from this review may be used to inform educational settings about evidence base for implementing yoga interventions within their setting and contribute to the decision making process about which mental health interventions may be a useful addition to the universal provision of interventions to support mental health.

15	Methodology & Methods (tick all that apply)
<input type="checkbox"/> Interviews* <input type="checkbox"/> Focus groups* <input type="checkbox"/> Questionnaires (including oral questions)* <input type="checkbox"/> Action Research <input type="checkbox"/> Observation Participant Observation <input type="checkbox"/> Documentary analysis (including use of personal records) <input type="checkbox"/> Audio/visual recordings (including photographs) <i>*Attach copies to application (see below).</i>	<input type="checkbox"/> Collection/use of sensor or locational data <input type="checkbox"/> Controlled Trial <input type="checkbox"/> Intervention study (including changing environments) <input checked="" type="checkbox"/> Systematic review <input checked="" type="checkbox"/> Secondary data analysis – (See Section D) <input type="checkbox"/> Advisory/consultation groups <input type="checkbox"/> Other, give details:
16a	<p>Provide – <u>in lay person’s language</u> - an overview of the project; focusing on your methodology and including information on what data/samples will be taken (including a description of the topics/questions to be asked), how data collection will occur and what (if relevant) participants will be asked to do. This should include a justification for the methods chosen. (500 words max)</p> <p>Please do not attach or copy and paste a research proposal or case for support.</p> <p>A systematic review will be conducted using a variety of data bases such as pschinfo, web of science and ERIC, along with google searches and hand searches to uncover grey literature using terms such as ‘Yoga’ AND ‘Schools’ AND ‘Mental Health’. Retrieved articles will be considered against the inclusion and exclusion criteria and a flow chart created to demonstrate systematicity according to PRISMA guidelines and the stages outlined by Petticrew and Roberts (2006) for undertaking a systematic review. All data will be derived from the public domain, there will be no personally identifiable or raw data used. It is most likely due to heterogeneity of methodologies and outcomes that a meta-analyses will not be performed but there may be some statistical analysis of data exploring the effect sizes if the generated data permits this, this data will be used for similar purposes as the original studies. Most likely, analysis will be narrative, with graphic representations and thematic analysis of qualitative data across studies.</p>
16b	Attachments

	If applicable, please attach a copy of any interview questions/workshop topic guides/questionnaires/test (such as psychometric), etc and state whether they are in final or draft form.
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17	Please state which code of ethics (see Guidelines) will be adhered to for this research (for example, BERA, BPS, etc).
	BPS

Location of Research	
18	<p>Please indicate where this research is taking place.</p> <p><input checked="" type="checkbox"/> UK only (Skip to 'location of fieldwork')</p> <p><input type="checkbox"/> Overseas only</p> <p><input type="checkbox"/> UK & overseas</p>
19	<p>If the research includes work outside the UK, is ethical approval in the host country (local ethical approval) required? (See Guidelines.)</p> <p style="text-align: right;">Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If no, please explain why local ethical approval is not necessary.</p> <p>If yes, provide details below including whether the ethical approval has been received.</p> <p>Note: Full UCL ethical approval will not be granted until local ethical approval (if required) has been evidenced.</p>
20	<p>If you (or any members of your research team) are travelling overseas in person are there any concerns based on governmental travel advice (www.fco.gov.uk) for the region of travel?</p> <p style="text-align: right;">Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>Note: Check www.fco.gov.uk and submit a travel insurance form to UCL Finance (see application guidelines for more details). This can be accessed here: https://www.ucl.ac.uk/finance/secure/fin_acc/insurance.htm (You will need your UCL login details.)</p>

	Note: This should include reference to how you will identify and approach participants. For example, will participants self-identify themselves by responding to an advert for the study or will you approach them directly (such as in person or via email)?
Informed Consent	
27a	Describe the process you will use when seeking to obtain consent. Note: This should include reference to what participants are being asked to consent to, such as whether their contribution will be identifiable/anonymous, limits to confidentiality and whether their data can be withdrawn at a later date. <i>(An annotated template information sheet and consent form have been provided for your use.)</i>
27b	Attachments Please list them below: <i>Ensure that a copy of all recruitment documentation (recruitment emails/posters, information sheet/s, consent form/s) have been attached to the application.</i>
27c	If you are not intending to seek consent from participants, clarify why below:
28	How will the results be disseminated (including communication of results with participants)?

Section D: Accessing/Using Pre-collected Data

Access to data	
29	If you are using data or information held by third party, please explain how you will obtain this. You should confirm that the information has been obtained in accordance with the General Data Protection Regulation 2018. Data that is already in the public domain will be used, e.g data included in publications or grey literature.
Accessing pre-collected data	
30	Does your study involve the use of previously collected data?

	<p>No <input type="checkbox"/> Move to Section E.</p> <p>Yes <input checked="" type="checkbox"/> Complete all parts of this Section. Note: If you ticked any boxes with an asterisk (*), ensure further details are provided in Section E: Ethical Issues.</p> <p>I will not be applying to access previously collected data but will be synthesising and analysing previously collected data that is already in the public domain.</p>
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31	Name of dataset/s: N/A	
32	Owner of dataset/s (if applicable): N/A	
33	<p>Is the data in the public domain? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p> <p>If not, do you have the owner's permission/license? Yes <input type="checkbox"/> No* <input type="checkbox"/></p>	
33	<p>Is the data anonymised? Yes <input checked="" type="checkbox"/> No <input type="checkbox"/></p> <p>If not:</p> <p>i. Do you plan to anonymise the data? Yes <input type="checkbox"/> No* <input type="checkbox"/></p> <p>ii. Do you plan to use individual level data? Yes* <input type="checkbox"/> No <input type="checkbox"/></p> <p>iii. Will you be linking data to individuals? Yes* <input type="checkbox"/> No <input type="checkbox"/></p>	
34	Is the data sensitive?	<p>Yes* <input type="checkbox"/></p> <p>No <input checked="" type="checkbox"/></p>
35	<p>Will you be conducting analysis within the remit it was originally collected for?</p> <p>The data will be explored in a similar vein e.g considering the effects of a yoga intervention on mental health outcomes but across studies in a bid to reduce bias or pick up effects that a primary study did not. There may be slight differences in that if the data allows I would like to consider gender differences but still within the remit of the primary study e.g mental health outcomes.</p>	<p>Yes <input checked="" type="checkbox"/></p> <p>No* <input type="checkbox"/></p>
36	If not, was consent gained from participants for subsequent/future analysis?	<p>Yes <input type="checkbox"/></p> <p>No* <input type="checkbox"/></p>

Section E: Ethical Issues

Ethical Issues

37 Please address clearly any ethical issues that may arise in the course of this research and how they will be addressed. Further information and advice can be found in the guidelines.

Note: All ethical issues should be addressed - **do not leave this section blank**. All projects give rise to ethical issues. If you think there are no ethical issues, you need to provide an explanation as to why.

The only ethical issues that I can foresee are about the possible conclusions formed from this piece of research and how recommendations may be used in the decision-making process schools use to select which mental health interventions they might implement and therefore spend funds on. This will be handled sensitively and through consultation with my research supervisors.

Risks & Benefits

38 Please state any *benefits* to participants in taking part in the study (this includes feedback, access to services or incentives),

39 Do you intend to offer incentives or compensation, including access to free services)?

Yes No

If yes, specify the amount to be paid and/or service to be offered as well as a justification for this.

40 Please state any *risks* to participants and how these risks will be managed.

41 Please state any *risks* to you or your research team and how these risks will be managed.

Section F: Appropriate Safeguards, Data Storage & Security

Please ensure that you answer each question and include all hard and electronic data.

42	<p>Will the research involve the collection and/or use of personal data?</p> <p>Yes <input type="checkbox"/> No <input checked="" type="checkbox"/></p> <p><i>Personal data is data which relates to a living individual who can be identified from that data OR from the data and other information that is either currently held, or will be held by the data controller (the researcher).</i></p> <p><i>This includes:</i></p> <ul style="list-style-type: none"> – any expression of opinion about the individual and any intentions of the data controller or any other person toward the individual. – sensor, location or visual data which may reveal information that enables the identification of a face, address, etc (some postcodes cover only one property). – combinations of data which may reveal identifiable data, such as names, email/postal addresses, date of birth, ethnicity, descriptions of health diagnosis or conditions, computer IP address (if relating to a device with a single user). <p>If you do not have a registration number from Legal Services, please clarify why not:</p>
43	<p>Is the research collecting or using</p> <ul style="list-style-type: none"> – special category data as defined by the General Data Protection Regulation and/or – data which might be considered sensitive in some countries, cultures or contexts. <p>If yes, state whether explicit consent will be sought for its use and what data management measures are in place to adequately manage and protect the data.</p> <p>No</p>

44	<p>All research projects using personal data must be registered with Legal Services before the data is collected, please provide the Data Protection Registration Number:</p> <p>If you do not have a registration number from Legal Services, please clarify why not:</p> <p>Not collecting personal data.</p>
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During the project (including the write up and dissemination period)

45	<p>State what types of data will be generated from this project (i.e. transcripts, videos, photos, audio tapes, field notes, etc).</p> <p>How will data be stored, including where and for how long? This includes all hard copy and electronic data on laptops, share drives, usb/mobile devices.</p> <p>Who will have access to the data, including advisory groups and during transcription?</p>
46	<p>Do you confirm that all personal data will be stored and processed in compliance with the General Data Protection Regulation (GDPR 2018).</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If not, please clarify why.</p>
47	<p>Will personal data be processed or be sent outside of the European Economic Area (EEA)?*</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If yes, please confirm that there are adequate levels of protection in compliance with the GDPR 2018 and state what the arrangements are below.</p>

After the project	
48	<p>What data will be stored and how will you keep it secure?</p> <p>Where will the data be stored and who will have access?</p> <p>Will the data be securely deleted? Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If yes, please state when this will occur:</p>

49	<p>Will the data be archived for use by other researchers? Yes <input type="checkbox"/> No <input type="checkbox"/></p> <p>If yes, please provide further details including whether researchers outside the European Economic Area will be given access.</p>
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<p>Section G: Declaration to be Signed by the Principal Researcher</p> <p>I confirm that the information in this form is accurate to the best of my knowledge.</p>
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<u><i>For staff project:</i></u>	
Signature	
Date	
<u><i>For student project:</i></u>	
I have met with and advised the student on the ethical aspects of this project design.	
Signature	
Date:	

<p>Signature of your Head of Department (or Chair of your Departmental Ethics Committee or Departmental Ethics Lead)</p>

<p>Part A</p> <p>I have read the ‘criteria of minimal risk’ as defined on page 3 of the Guidelines (http://ethics.grad.ucl.ac.uk/forms/guidelines.pdf) and I recommend that this application be considered by the Chair of the UCL REC.</p> <p>Yes <input type="checkbox"/> No <input type="checkbox"/></p>
<p>Part B</p> <p>I have discussed this project with the principal researcher who is suitably qualified to carry out this research and I approve it. I am satisfied that** (highlight as appropriate):</p> <p>1. Data Protection registration:</p> <ul style="list-style-type: none"> ▪ has been satisfactorily completed

- has been initiated
- is not required

2. A risk assessment:

- has been satisfactorily completed
- has been initiated

3. Appropriate insurance arrangements are in place and appropriate sponsorship [funding] has been approved and is in place to complete the study.

Yes No

4. A Disclosure and Barring Service check(s):

- has been satisfactorily completed
- has been initiated
- is not required

Note: Links to details of UCL's policies on the above can be found at: <http://ethics.grad.ucl.ac.uk/procedures.php>

****If any of the above checks are not required please clarify why below.**

Name:	
Signature:	
Date:	

Updated March 2019

Appendix 11 An Excerpt From the Bottom-Up Coding of Qualitative Data

Sixth grade male "Sometimes I argue with people I don't want to argue with, students and family members"	Prior to yoga students highlighted more arguments
A sixth grade female described how she would fight back after being physically assaulted by peers: "I react in a fight ... because she[peer]got me so mad 'cause she hit me" (School 2).	Prior to yoga students would react in physical altercations
Fifth grade male "If you were stressed out because you didn't want to fight, but they were trying to force you to fight, you would get real angry. Do deep breathing" (School 1).	Youth recommended breathing practices to help calm angry reactions towards other people
Sixth grade male "When somebody tells you something and like you just don't think it through and just start a fight ... like they taught us how to think about it and breathe ...I know people that were picking on me and I calmed down before ... yeah. I was breathing in and out" (School 1).	Yoga helped to pause, breathe and think before reacting.
a sixth grade male remarked: "the program affects me 'cause it gives away stress" (School 2).	The yoga program helped to reduce stress.

Sixth grade male who reported: "The program makes you actually think about things twice, twice before you start to yell and stuff ... get mad ... tantrum"

Yoga helped to think before reacting and enabled self-regulation

"So they [classmates] was being annoying and I was sitting down and I was doing them [poses in his chair].... They stopped. They stopped it. It made me feel relief"

Yoga poses to distract from others and emotionally regulate

, a fifth grade female reacted to sibling conflict by focusing on her breath and going to her room: "When I get mad at my sister ,I breathe. I go in my room'

Being able to regulate feelings of anger from altercations with siblings in order to respond in a better way.

"Yeah so I got mad, then I started using the breathing exercises. Started using the breathing exercises to calm down .I wasn't mad no more" (fifth grademale)

Using the breath to regulate feelings of anger

Using the breath to regulate feelings of anger

"Like if I want to let out my anger I don't but I just like deep breathe" (fifth grade female, School1).

Yoga postures combined with breathing practices to help calm down

"Like if I'm mad, the Breath of Fire. It helped me by deep breathing. It helped me do deep breathing. The sunrise for like waking up and getting mad when things happen. 'Cause when you stretch it calms you down when you're doing it and also deep breathing" (fifth grade female,School1).

Youth recommended breathing practices to help calm angry reactions towards other people

"I would tell them if they're having trouble ... with breathing and anger ... why don't you just come to yoga ... it will teach you how to learn, how to do the right breathing exercise" (fifth grade male)

Yoga has helped to reduce the reasons a student might get into a fight

Fifth grade male noted: "Yeah, now I only get in, I only get in, get in fights like for certain things"

Yoga can help you to shift your attention from other people or problematic situations to reduce stress

For example, a fifth grade male reported that when stressed "you can just like block people out and like, uhh, like anything that you have problems with, you can just use like the things you got taught in yoga to help you" (School 3).

Being able to let go of past events and re-focusing thoughts on something positive

fifth grade female noted: "And you put that behind you and then think of something positive"

Breathing to focus the mind and calm down during altercations to enable a different behavioral response

a sixth grade female "Yeah, breathing. Sometimes if they[peers] say some- thing, sometimes I might say something back ["I tell them to be quiet."]. But, sometimes I just focus on it and I just breathe ... I just sit down and try to calm myself down ... I just walked away .I walked away and kept on breathing in and out and then I came back" (School 3).

Using the breath and visualising a place they like to be helps to feel powerful and regulate emotions

“Sometimes when I get mad, I just breathe deep. I just, like I picture me being in a certain place I like, and I just thought I could just overcome everybody and then I just stop being mad” (sixth grademale, School 3)

Helped with the physiological aspects of stress
e.g relaxing muscles.

Sixth grade male “Different things that were stressing me, it helped me with my muscles stretch out a little bit”

Yoga can help with the cognitive aspects of stress

A fifth grade male “It’s good like if you lost your memory, if you going through stress, depressed It’ll wake you up, like you stretch”

Did not remember doing any poses which would help with stress.

“Its just hard to walk away if they do something. ... I mean I don’t remember doing any like poses or anything for stress”

Younger adolescents do not really have stress but the practices would come in handy when they did.

Another student noted that children of his age should not (and, in his experience, did not) experience stress, but that the program skills would be helpful in the future when more stress is likely to occur.

Appendix 12 Photographic Evidence for the Thematic Analysis from Codes, into Sub-Themes, Themes, Themes and the Superordinate Theme of Self-Regulation.

