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The Impact of Mindfulness Training on Schoolchildren's Academic Performance

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The Impact of Mindfulness Training on Schoolchildren's Academic Performance

By

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ABSTRACT

Schools have adopted a number of different approaches in an attempt to promote good emotional health amongst children and young people. One particular approach that has shown potential to benefit children in a school setting is mindfulness training. Early findings suggest that mindfulness may enhance psychological wellbeing and resilience, as well as improving academic performance. However, few studies have evaluated the effectiveness of mindfulness training in comparison with other comparative interventions.

This thesis explored the impact of mindfulness training on schoolchildren's academic performance. A systematic review was conducted to explore, evaluate and describe the literature on the psychological effects of mindfulness practise among children and adolescents. A total of 42 studies were reviewed, the findings of which suggest that mindfulness practise impacts cognitive function, psychological distress, and emotional health. The results of the review were used to inform the research hypotheses.

A quasi-randomised controlled trial design with comparisons between an experimental group, (mindfulness training) and two active controls, (study skills and progressive muscle relaxation) was utilised to explore the impact of mindfulness training on school children's academic performance. Allocation was at class level, and achieved using a randomly-generated allocation sequence in Microsoft Excel. Each intervention was delivered for approximately 40 minutes, over a nine week period. Outcome measures were administered prior to, after, and three months following delivery of the interventions, and consisted of mindfulness, wellbeing, resilience, anxiety, attention, and academic performance. Three empirical studies were conducted on 201 Year 10 schoolchildren, across three separate schools, to test the following hypotheses: H1: Teaching mindfulness to schoolchildren in an inclusive school environment will lead to significantly increased levels of mindfulness, and subsequently, significantly

increased levels of resilience and wellbeing, compared to controls; H2: Teaching mindfulness to schoolchildren in an inclusive school environment will have a significant impact on academic outcomes, compared controls; H3: Teaching mindfulness to schoolchildren in an inclusive school environment will lead to significantly increased levels of attention compared to controls; H4: Teaching mindfulness to schoolchildren in an inclusive school environment will lead to significantly reduced levels of anxiety compared to controls.

The results of the first study, which tested hypotheses one and two, indicated that exposing students (n = 49) to mindfulness training, resulted in a significant increase in levels of mindfulness, (p = .02) but did not result in any significant differences in levels of well-being, resilience or academic performance. The results of the second study also testing hypotheses one and two, indicated that exposing students (n = 150) to mindfulness training, did not result in any significant changes to levels of mindfulness (p = 0.88). While the results from the third, which tested all four hypotheses, indicated that exposing students (n = 17) to mindfulness training, did not result in any significant changes to levels of mindfulness (p = 0.16).

Collectively the findings of this thesis suggest that mindfulness training as delivered in this study, had no more potential to impact Year 10 schoolchildren's academic performance or levels of well-being, resilience, anxiety or attention, than a relaxation intervention or study skills program. However, whilst the results of this thesis don't suggest that mindfulness is any more efficacious than comparative controls, further research is required in order to obtain evidence of the circumstances in which mindfulness may be efficacious.

CHAPTER 1

1. Introduction to the research

Chapter Overview

This chapter will introduce the focus of the thesis, which is to evaluate the impact of mindfulness training on schoolchildren's performance on the basic skills of literacy and mathematics, and to understand some of the social, emotional and behavioural factors which may exist between mindfulness training and academic outcomes. This chapter will then explain the rationale for the research, and will outline the aims and objectives, before concluding with a brief overview of the remaining chapters of the thesis.

1.1 Background to the research

Schools are under increasing pressure to improve students' academic performance (OECD 2016). Academic performance is evidenced by grades and exam scores, and tends to be the main measure of an individual's success at school. Consequently, a key focus for educators tends to be preparing students for tests and examinations in key curricular areas such as English and mathematics. However, student wellbeing is closely associated with academic outcomes, and can predict future academic progression and engagement in school children (Trockel, Barnes, & Egget 2000). Research has demonstrated that positive emotional behaviour is predictive of academic attainment (Gutman, & Vorhaus 2011); students who can manage stress, set goals and use problem solving to overcome obstacles do better academically. Moreover, pupils with better emotional wellbeing at age seven had a value-added Key Stage 2 score 2.46 points higher than pupils with poorer emotional well-being (equivalent to more than one term's progress)(Brookes 2014: 6). Furthermore, social and emotional competencies have

been found to be a more significant factor of academic attainment than IQ (Brooks 2014: 6). The Department for Education (DfE) recognises that schools have a role to play in supporting students to achieve good mental health, wellbeing and resilience (DfE, 2014). The DfE launched the social and emotional aspects of learning (SEAL) initiative in 2005; a scheme to support the development of personal and social skills in children and young people in the following areas; self-awareness, managing feelings, empathy, social skills and motivation. SEAL is not a structured program but a framework that is designed to help schools promote and engage this aspect of student development. Schools have the freedom to explore different approaches to implementing SEAL.

Research suggests that school-based approaches aimed at establishing good emotional health can be effective (Bywater, and Shaples 2012), & Elliott 2002). The school environment is a prominent social context for social and emotional learning, given that children spend a considerable amount of time there. It provides a setting where they can develop socially and emotionally (Gutman, & Vorhaus 2012), fostering pro-social behaviour and emotional regulation (Durlak, Weissberg, Dymnicki, Taylor, & Schellinger 2011), both necessary for effective learning, positive behaviour and positive emotional health and wellbeing (Bywater, & Shaples 2012). The National Institute for Health and Care (NICE) encourages support for schools in the UK to adopt whole school approaches to promoting and teaching social and emotional wellbeing to students. UK schools have adopted a number of different approaches in an attempt to promote social and emotional development amongst children and young people. One particular approach that has shown potential to benefit children in a school setting is mindfulness training (Napoli et al. 2005).

Mindfulness is a secularised meditation stemming from Buddhist traditions, which is characterised by the deliberate focus of attention to thoughts, emotions and physical sensations as they evolve in the present moment, in an accepting and a non-judgemental way (Kabat-Zinn

1994). Mindfulness-based interventions (MBI's) are used in clinical settings to manage a number of disorders, including chronic pain management, (Kabat-Zinn 1994), depressive relapse (Segal, Williams, & Teasdale 2002), and more recently, mood disorders (Ree, & Craigie 2007). Research findings demonstrate that such interventions are efficacious, well-tolerated and do not appear to have any adverse effects (Segal et al. 2002). In addition they are evidence-based, and recommended for the treatment of depression and anxiety by the National Institute for Health and Care Excellence (NICE).

The use of MBI's and subsequent research have essentially been undertaken in adult populations. However, there is growing interest in the application of MBI's in child and adolescent populations, initially from a clinical perspective, for example, with regard to pain management (Thompson, & Gauntlett-Gilbert 2008), depressive relapse prevention with adolescents (Allen 2006), and anxiety in school-aged children (Semple et al. 2005). More recently, mindfulness interventions with children have taken a broader and less clinical focus (e.g. the ".b" programme in schools in the UK, and the *Mind Up* program in schools in both the UK and the USA).

Research carried out to examine the effects of mindfulness on 25 school aged children's levels of anxiety, behaviour and attention problems observed a reduction in attention problems in those children who had completed a 12-week mindfulness based cognitive therapy program for children (MBCT-C), in comparison to wait list controls. The researchers also reported a significant reduction in symptoms of anxiety in those children that had reported higher than average levels of anxiety at pre-test (Semple, Rosa, & Miller 2010). The study consisted of children that were enrolled in a university based remedial reading program. The children were referred to the study by the clinic's educational psychologist, they were regarded as having significant reading problems, with most of them also displaying some indicators of associated stress and anxiety. The research used a cross-lag design with two randomly allocated groups.

The first group of children participated in the program in the spring of the year, followed by the second group in the following winter, this allowed for comparisons to be made between the two groups. A further study, examining the effects of mindfulness on attention, test anxiety and social skills in 228 school aged children observed significant improvements in teacher rated selective attention, significant reductions in student self-rated test anxiety and significant reductions in teacher rated ADHD behaviours in those children who had completed a 24-week mindfulness-based program in comparison to controls (Napoli et al. 2005). The study reported using a randomised controlled trial, with participants being assigned to either the experimental group, the Attention Academy Program, or the control group, no treatment. The sample consisted of 228 children between the ages of six and nine years that were recruited from two schools in a Southwest city in the USA.

The findings from these studies provide evidence that mindfulness may have the potential to impact positively on children's emotional, behavioural and cognitive outcomes, as well as some aspects of attention. Attention is understood to play an important role in the process of learning (St Clair-Thompson, & Gathercole 2006), with research suggesting that children with attention problems are at increased risk of lower academic achievement (Polderman, Boomsma, Bartels, Verhulst, & Huizink 2010).While these findings are encouraging, some caution should be applied when interpreting the results as a number of limitations were noted in each of the studies. In the first study, the design incorporated a wait-list control. While the use of wait-list controls is an effective and ethical method of comparing data, it does have its problems. Participants enrolled in a study, where they know they will receive treatment at some future point, may be less inclined to improve or move forward of their own volition, choosing instead, whether consciously or not, to wait for help in the form of the wait-for treatment or intervention (Cunningham et al. 2013). It is not clear whether or

not the participants in the first study were aware that they would also undergo the MBCT-C program, which may have influenced the results.

With regard to the second study, the outcomes measures were captured using self-rated reports. While the use of self-rated questionnaires is a popular method of capturing data, as it is both cost and time effective, it can also be problematic. Social desirability is a common bias associated with self-rated questionnaires, participants may be inclined to answer questions in a way that they think is correct, or in a way that may please the researcher. There is also the risk that participants may not understand the question, or that questions may be misunderstood, in which case the reliability of a scale is lowered. By their design self-rated scales lack flexibility, forcing participants to answer in a way that offers no real choice. Research demonstrates that some participants may even have a rating style, with some preferring to stay in the middle of a questionnaire, while others are more inclined to answer around the edge (McDonald 2008). However, while there are problems associated with self-rated questionnaires, their practicality and ease means they are a useful and valuable way of collecting data. If they are chosen correctly, according to instructions many of the issues mentioned above can be minimised. For example, response bias can be reduced by using measures that include reverse items, or when this is not possible, reassuring participants that their answers are anonymous. In addition, the use of age appropriate and topic relevant measures should minimise the misunderstanding and confusion associated with self-rated instruments. A further critique of the second study is that it is not clear whether or not the sample included children with a clinical diagnosis of either attention deficit disorder (ADD) or attention deficit hyperactivity disorder (ADHD). The researchers utilise a measure which is typically used to assess attention deficit disorder (ADD) in children, the ADD-H Comprehensive teachers Rating Scale (ACTeRS), but state that they have chosen it for its utility to be used with non-ADHD populations. The authors also state that they are only interested in using the measure to assess classroom behaviours and evaluating

individual student's behaviour before and after the mindfulness program. However, they appear to report on the reduction of teachers ratings of students' ADHD behaviours. A further point worth noting about the ACTeRS is that it is medicine sensitive (Ullman, & Sleator 1986). The concern here is that if a child has an attention disorder for which they are medicated, the absence of medication on a test measures day could result in a low score, which could possibly become inflated at pre-test if the student on this occasion has been medicated, which may affect the overall result. A further point in regard to both studies is that neither incorporated a comparator, the absence of which makes it difficult to determine if any of the observed effects are due entirely to the mindfulness aspect of the interventions or are merely a result of other factors, possibly relaxation which my occur as a side effect.

A randomised controlled trial comparing mindfulness meditation to hatha yoga, and a waitlist control group, in a sample of 198 adolescents, observed a significant improvement in working memory capacity in those participants that had been exposed to mindfulness in comparison to the hatha yoga and wait-list control groups. The findings from this study offer further support for the assertion that mindfulness is capable of achieving positive changes. The inclusion of an active control, hatha yoga, allows for comparisons to be made between mindfulness and another intervention which may be equally capable of asserting change. Thus ruling out the contention that any changes that have occurred are due to factors other than mindfulness. However, on the contrary, the authors did not report any differences between the groups on measures of stress or anxiety.

Similarly, other research, this time undertaken in adult populations to compare the effects of mindfulness with relaxation interventions on measures of psychological distress, positive mood states, rumination and distractive thoughts, did not report any differences between the groups on measures of distress or positive mood. The authors reported that participants in both groups experienced a statically significant decrease in distress as well as

an increase in positive mood. These findings suggest that such changes in psychological distress and mood may not be due specifically to mindfulness, as has been reported in a number of studies ((Kabat-Zinn et al. 1992; Shapiro, Schwartz, & Bonner, 1998; Speca, Carlson, Goodey, & Angen 2000; Teasdale, 2000; Speca et al. 2000; Carmona 2014), but occur instead due to a relaxation effect or a relaxation response. The 'relaxation response' (RR) (Benson 1975) is a physical state, which is contrary to the fight or flight response, and is characterised by decreased oxygen consumption, increased exhaled nitric oxide and reduced psychological distress (Dusek et al. 2008). RR can be elicited in a number of ways including yoga, progressive muscle relaxation, bio feedback, guided imagery as well as meditation. Like mindfulness, RR is used in a number of conditions that result because of, or are exacerbated by, stress (Dusek et al. 2008). On the other hand, the study did report that on measures of rumination and distractive thoughts, that participants in the mindfulness group demonstrated a significantly greater decrease in comparison to those in the relaxation group (Jain et al. 2007), proposing that mindfulness may after all be eliciting something that goes beyond mere muscle relaxation.

1.1.2. Conclusion

Social and emotional development is an important aspect in the lives of children and young people, and is an important part of the national curriculum. Not only is it crucial to the development of good mental health, but it also provides a good framework for the development of strong academic attainment. Schools need to be able to provide an environment where children can develop these skills. They need to provide learning situations that are accessible to all children, cost effective and yield the desired results. There is evidence to suggest that mindfulness training may have the potential to impact positively on children's emotional and behavioural outcomes, as well as influence cognitive and attentional processes. In addition, mindfulness programs are usually straightforward in terms of whole school delivery, which makes them easy to administer as well as cost effective. Despite the emerging evidence that

mindfulness-based interventions have the potential to positively impact children, these studies do have limitations. In addition, while there is evidence that mindfulness interventions are capable of eliciting some positive responses in children, there is little evidence to suggest that they are any more beneficial than other equally straightforward interventions, which may be equally capable of eliciting similar outcomes, for example, relaxation programs.

1.2. Rationale

Schools are recognising the importance of children's well-being and mental health in terms of learning and development, acknowledging that children need to have good mental health if they are to learn effectively. The application of mindfulness-based programs in schools is becoming increasingly popular, not only as a means of enhancing and protecting children's mental health and wellbeing (Kuyken 2013), but also in helping students to deal with the stress and anxiety that is associated with exams (Shapiro et al. 1998). It is important therefore, to understand if such programs are effective in achieving these goals, but also to identify what psychological effects they are having on children. The rationale for this research is to investigate how mindfulness training may impact on schoolchildren's academic attainment as well as their social and emotional development. Crucially, this thesis will explore how the outcomes of mindfulness training compares to that of other programs that potentially could achieve the same effects, such as those designed to improve academic skills and those aimed at developing social and emotional wellbeing.

1.3. Aims and Objectives

The main focus of this research was to evaluate the impact of mindfulness on school children's performance on measures of literacy and mathematics (i.e. basic skills), and to understand some of the social, emotional and behavioural factors which may exist between mindfulness training and academic outcomes. A further focus of the research was to determine whether any findings that occurred were in fact a result of the mindfulness training and not due

to any other related factors, such as students feeling more relaxed due to participating in the mindfulness intervention, or feeling more confident and encouraged as a result of receiving extra attention from staff. Consequently this study was designed as a comparison study which included two active controls: a relaxation intervention (progressive muscle relaxation - PMR) and a study skills program (SS). PMR provided an opportunity to compare the results of mindfulness training on the various measures to the effects of relaxation, ruling out the possibility that mindfulness was achieving change through a process of merely relaxing the students. Similarly the study skills programme allowed comparisons to be made between the mindfulness training results and a programme which offered the same amount of tutor contact but which also explicitly targeted academic skills. It was predicted that those children who received the mindfulness intervention would show greater improvement on the psychological and academic measures compared to those in the two active control groups.

1.3.1. Original and unique contribution to research

The research detailed in this thesis provides a unique contribution to how mindfulness affects children's and young people's academic attainment, and social and emotional outcomes on a number of levels.

Firstly, this is the first study that has utilised two equivalent active controls as a comparison to mindfulness. While the effects of mindfulness have been compared to relaxation in adult populations, to the best of the researcher's knowledge this is the first study to directly compare the effects of a mindfulness program with a relaxation intervention in a child and adolescent population in order to directly test whether mindfulness is more than mere muscle relaxation. Equally, the inclusion of the study skills program allows for comparisons to be made between mindfulness and SS, again allowing the researcher to determine if the results are due to mindfulness or merely a result of participants receiving additional teaching attention.

Secondly, this is the first study to assess the effects of a mindfulness intervention on measures of attention alongside other psychological measures and in addition to academic measures at the same time. This provides the researcher with the opportunity to consider not only how mindfulness compares to other interventions, but also to observe any underlying associations that may exist between academic performance, attention and social and emotional outcomes.

A further unique contribution of this thesis is the research contained in chapter six, which exclusively examines the effects of a mindfulness intervention on educational outcomes, in an all-female sample. While there is research to support claims that females taught in a single-sex environment fare better than their female counterparts taught in a co-educational environment (Lee & Bryk, 1986), there is not any research, to the best of the researcher's knowledge, which examines how mindfulness may impact this.

In addition, this is the first study to test the effects of a mindfulness intervention on academic outcomes using a standardised measure of basic numeracy and maths skills. While other studies (Verity 2012), have measured the impact of mindfulness on academic outcomes, they have done s using national curriculum data.

1.4. Hypotheses

This thesis proposed the following hypotheses, based on the results of known research at the outset of the project.

1. Teaching mindfulness to Year 10 schoolchildren in an inclusive school environment will lead to significantly increased levels of mindfulness, and subsequently significantly increased levels of resilience and wellbeing, compared to children who receive alternative controls (PMR and SS).

2. Teaching mindfulness to Year 10 schoolchildren in an inclusive school environment will also have a significant impact on academic outcomes, specifically measures of reading, reading comprehension, spelling and maths computation, compared to children who receive alternative controls (PMR and SS).

3. Teaching mindfulness to Year 10 schoolchildren in an inclusive school environment will lead to significantly increased levels of attention compared to children who receive alternative controls (PMR and SS).

4. Teaching mindfulness to Year 10 schoolchildren in an inclusive school environment will lead to significantly reduced levels of anxiety compared to children who receive alternative controls (PMR and SS).

In order to test these hypotheses three separate studies were conducted in three separate schools.

Study one: The first study tested the first two hypotheses and was conducted in a co-educational school with a small cohort (n = 49) of students.

Study two: The second study also tested the first two hypotheses, although this time with a larger cohort (n = 150) and an all-female sample.

Study three: The third study was carried out on a much smaller sample (n = 17). The sample in this study were from a co-educational school that had a higher than average number of students with special educational needs. Study Three differed from the first two as it was the only study to test all four hypotheses.

The findings from each of the empirical studies included in this thesis consistently showed that mindfulness training had no more potential to impact Year 10 schoolchildren's academic performance or levels of well-being, resilience, anxiety or attention, than a relaxation intervention or study skills program,

1.5. Outline of thesis chapters

This thesis is presented in eight chapters. The current chapter provides an introduction to the research. The other chapters are summarised below.

Chapter two defines the concept of mindfulness. It considers mindfulness from an Eastern perspective, examining its role in a Buddhist context. It then goes on to consider mindfulness from a Western perspective, including a discussion on where and when mindfulness first appeared in a Western secular context. It provides a discussion and critique of its application in a therapeutic context and it's more recent assent into other disciplines.

Chapter three provides a systematic review of the psychological effects of mindfulness practice among children and adolescents. The basis of the review will provide the focus for the empirical chapters in this thesis. In particular, this review will provide the justification for the methodological approaches taken in this thesis to address the research question.

Chapter four presents and justifies the methodology and methods that were used in this thesis. It discusses the design approach taken to answer the research question, a description of the participants that were involved in the studies, as well as the schools in which the research was carried out. It outlines the interventions that were used in the thesis, as well as the measures that were utilised to capture the data across all three studies. Finally, it discusses the analytical approach taken in the thesis.

Chapter five presents the first of the three empirical studies that were undertaken as part of the thesis. This first study was conducted in a co-educational school in the West Midlands. The study was designed to test the first two hypotheses, on a small number (n = 49) of typical children.

Chapter six is a presentation of the second empirical study. Like study one, this study was also conducted to test hypotheses one and two, however, this study utilised a larger sample size (n = 150), and was conducted in an all-female school.

Chapter seven is the third and final empirical study. This study, like the previous two was conducted to test hypotheses one and two, but in addition to also test hypotheses three and four which are set out above. The sample size in this study was also considerably smaller than the first two studies (n = 17), and in addition it also contained a slightly higher than average number of students with special educational needs in comparison to studies one and two.

Chapter eight. This final chapter summarises the findings from each of the three studies and provides a general discussion based on the findings. It then addresses limitations to the research and highlights possible directions for future research.

CHAPTER 2

2. Defining the Concept of Mindfulness

Chapter Overview

This chapter will provide an introduction and critical view of the concept of mindfulness. Mindfulness has its origins in Buddhism, thus to understand secular mindfulness it is essential to have an understanding of mindfulness in a Buddhist context. The chapter will begin with a brief introduction to early Buddhism, outlining its framework and philosophy. It will then discuss the role of mindfulness in Buddhism. This will be followed by a discussion of secular mindfulness, including its conception and uses in Western contexts. The chapter will then conclude by considering whether any of the essential elements of mindfulness were lost in its translation from Buddhism. While the aim of this chapter is to provide an understanding of the concept of mindfulness, it is acknowledged in this thesis that mindfulness is both complex and intricate in nature, thus to provide an in-depth discussion of the origins and meaning of mindfulness is beyond the scope of this thesis.

2.1. Mindfulness in a Buddhist context

2.1.1. An introduction to Buddhist philosophy

Mindfulness is an English word which is used to describe the Buddhist term, *sati*. While mindfulness is considered a translation of the word sati, Buddhists have a different understanding and usage of the term mindfulness compared to Western psychology.

Buddhism began 2,500 years ago in India with the teachings of Siddhartha Gautama, who later became known as the Buddha. While there are a number of different branches of

Buddhism, for the purpose of this thesis, I shall restrict this discussion to early Buddhism, the Theravada school of Buddhism. The aim of Buddhism was to achieve liberation or enlightenment, to experience reality as it really is (Bohdi 2000). Buddha believed that every individual had the potential to experience enlightenment. He further believed that in achieving it, people would be able to live their lives free of suffering and reach their full potential. He believed that people had become stuck in emotional states of mind that came about because of how we see and interact with the world, and that these emotional states prevent us from achieving enlightenment and awakening. However, he also believed there was a solution.

Buddhist philosophy is built on a conceptual framework consisting of four key elements, collectively referred to as the four noble truths; that life is suffering (*Dukkha*) that suffering is caused by greed, desire and aversion, that suffering can be overcome, and finally that to overcome suffering one must observe a particular path (Shonin et al. 2015). Buddha presented the four noble truths as guides to action, rather than a doctrine or a religion to be followed blindly. He argued that neither religion, scripture, tradition nor philosophy should be taken at its word and heeded simply because it was accepted, but instead should be experienced first-hand. If through experience a practise was found to enhance wellbeing and dispel suffering, then it may be accepted (Shonin et al. 2015).

The first noble truth is that there is suffering, 'dukkha'. This does not imply that all of life is suffering, but merely that there is suffering (Shonin et al. 2015). Dukkha conveys a variety of experiences, including physical pain, emotional pain, and can include the emotional distress we experience in response to weariness or existential unease. Suffering is not specific, it is not just about chronic pain, or depression, but about suffering. There are three types of 'dukkha'. Dukkha which is caused by pain, dukkha which is caused by the formations, or causal conditioning, and dukkha that occurs due to change (Bohdi 2000).

Dukkha-dukkha, is obvious and ordinary suffering. It is the physical or emotional pain that arises from injury or disease, or from having to experience situations we find unbearable. Dukkha does not arise in response to ordinary suffering as it is a fundamental aspect of life, instead it is the relationship that we have to the pain that causes the suffering. The Buddha referred to this as the two arrows of suffering, the initial pain we feel and the pain that occurs in response to it. For example, when we experience physical pain we become emotionally distraught, thus not only do we have physical pain but also mental pain. If we were able to relate to the pain without attaching emotion to it, the pain would pass more quickly and we would experience less suffering. While we cannot control physical pain we can control how we respond to it (Teasdale et al. 2002).

Viparinama-dukkha is the suffering that is caused by change. Change is an inevitable part of experience, nothing remains the same for ever. Experiences, objects and relationships change or end eventually. The amount of attachment that is held for the mental or physical phenomena undergoing change relates directly to the amount of suffering that is experienced. Change or impermanence, referred to in Pali as *anica,* is not necessarily a problem, it only becomes a problem, when we are unable to let go of our desire for it not to happen (Kuan 2008). An example here might be the loss of a loved one, although we are aware of the fact that people grow old and die, or that they may become ill and die unexpectedly, we still suffer immense grief when this happens. Or another example might be when something comes to an end, the children that grow and leave the parents in older adulthood. *Viparinama-dukkha* also arises when a phenomenon is craved for and never achieved, for example, a promotion at work, or the desire to be a certain type of person; successful or well-travelled (Hayes et al. 2004).

S*ankhara-dukkha*, is the suffering of fabrication. This type of suffering is subtle and experienced because our connection to the world is constructed by a conditioned, fabricated mental process. We do not see the world as it really is, impermanent, changing and

indeterminate, but exist instead in a conditioned, fabricated state of illusion (Kuan 2008). This unreliability and conditionality of experience in itself does not cause suffering, however, when we do not want to experience reality as it is, then we experience suffering. In order to attain what we desire, we must establish a sense of control and predictability over our internal and external worlds. The only way we can do this is to reduce the complexity of the world. In other words rather than seeing the world as it really is, complicated, dynamic and constantly changing, we try instead to see it in terms of independent existing entities, that have reliable, fixed and lasting qualities (Bohdi 2000). This results in our incorrect tendency to perceiving impermanent experience as permanent; 'I am sad' instead of 'I experience sadness', and to identify it with a sense of self (Wallace 2011).

Each of the four noble truths were accompanied by a specific instruction of action. For dukkha, the instruction was that it should be fully understood; it is not enough to know about suffering intellectually or conceptually, it can only be understood by getting directly acquainted with it from experience, by opening up to the suffering and sense of dissatisfaction we experience in our lives. By investigating our experience of suffering, we are able to discover the origins of dukkha, the principle focus of the Second Noble Truth.

The second noble truth is concerned with the origins of suffering; '*dukkha samudaya',* which is '*tanha'*, meaning thirst or craving, which has an essence of being unquenchable. *Tanha* is the desire to hold onto pleasant experience while avoiding unpleasant experience; a craving or desire for things to be other than they are. There are three aspects to *tanha*, sense craving, craving to be and craving not to be. Sense craving is the desire to seek out sense pleasure as a way of creating a feeling or sense of happiness. This in itself is not problematic, but the desire for this state to be permanent creates suffering. The second aspect; the desire to be or to become has two elements, the desire to exist, to be alive and the desire to be a particular someone, for example, a someone that is loved, or a someone that is successful. Again while it

is not a problem to want to be, it is the inability to see and accept that what is that causes the suffering in this aspect of *tanha*. The final aspect, the craving not to be is the desire to escape unpleasant experience. When we experience pain, it is not the pain itself that causes the suffering but how we relate to it 'I don't want this pain, why does it keep happening to me'. It is our perception of the pain and our relationship to it that cause the suffering. Thus if we are able to understand that the origin of suffering is not the pain itself but our desire to avert it, then we can alleviate the suffering, which is the focus of the third noble truth.

The third noble truth is that suffering can be overcome and that contentment and happiness can be achieved. Buddhism posits that when we stop craving and can live our lives one day at a time, able to enjoy it without the relentless desire to experience something else, only then will we be liberated and awakened. The Buddha believed that the way to end desire, and thus suffering, was to free oneself from emotional and physical attachment. Doing this would put an end to greed, delusion, and hatred. He maintained that doing this would result in the attainment of Nirvana, a state of profound spiritual joy without negative emotions and fears, and lead to enlightenment.

The fourth noble truth describes an integrated program which is called the noble eightfold path. If the path is followed then suffering will cease and enlightenment will follow. The eightfold path, consists of eight elements which are mutually inclusive. Each of the elements is divided further into one of three broad components wisdom, ethics and meditation (see Table 2.1). Wisdom comprises two factors, right view or understanding and right intention (Shonin et al. 2015). Ethics, sometimes referred to as wholesome lifestyle, has three factors, right action, right speech and right livelihood. Meditation, also with three factors, right effort, right mindfulness and right concentration (Shonin et al. 2015). Each of the eight factors is prefixed with 'right', which is taken from the Pali translation of the term *samma*, which derives from music theory meaning harmonious. They are right in the sense of being attuned to each

other, and are understood as meaning skilful or authentic (Singh 2015). Each of the components coexist and are of equal importance, and can only be realised when an individual becomes aware, or put in a different way, mindful. Mindfulness is achieved through meditation: *anapanasati* - an awareness of breathing meditation; and *satipatthana* - an awareness of the four foundations, body, feelings, states of consciousness and mental phenomena. It is the element of right mindfulness, which unifies and informs all of the other seven and makes the four noble truths possible. From a Buddhist perspective mindfulness can be seen as a related component in an overall process of transformation, it is regarded as a way of being, a state of mind.

Table 2.1. The Eightfold Path

WISDOM	Right Understanding
	Right Aspiration
MORALITY	Right Speech
	Right Action
	Right Livelihood
CONCENTRATION	Right Effort
	Right Mindfulness
	Right Concentration

2.1.2. Mindfulness in a Buddhist context

As mentioned earlier, the word mindfulness is an English term, which has been translated from the Pali word *sati*, and etymologically means recollection or memory (Nyaniponika, 1973). However, Pali is an ancient Indian language and one of the problems encountered when trying to translate and understand the meaning of certain words, like mindfulness, is that terms or words can have a number of different meanings, depending on the context in which they are used. In the context of Buddhism, *sati* has a number of meanings.

While it is still associated with remembrance, it is more generally regarded as meaning attentiveness or awareness, a type of skilful awareness that is good and right (Wallace 2011). In the context of consciousness, mindfulness means presence of mind, and in a meditative context, mindfulness means the attention, or awareness that enables us to maintain our attention on a familiar object without distraction (Bodhi 2000). *Sati* is also combined with *patthana; satipatthana* which is translated as meaning foundation of mindfulness. However, it is thought that the original combination would have been *upatthana*, resulting in *satiupatthana*, which means establishment of mindfulness. While these may be interpreted as having different meanings; beginner as opposed to established, it is likely that both are essentially referring to the cultivation of mindfulness (Bodhi 2000).

While it is clear that the role of mindfulness on the path to enlightenment, in a Buddhist context is central, what is less clear is the exact role that mindfulness plays in this process. The early texts of Buddhism identify four main characteristics of mindfulness; simple awareness, protective awareness, introspective awareness and the deliberately forming conceptions (Kuan 2008).

Simple awareness is mindfulness that is characterised by a moment-to-moment awareness of bare attention. It refers to the awareness we have of something prior to identifying or conceptualising it. It is bare because the object of awareness is without concept or language. An example of bare attention is when we allow the mind to settle in its natural state as in beginning meditation. The awareness that is experienced is non-judgmental and free of value judgments; it is present awareness of experience without descriptive interference from past or anticipated future. Because experience is free from language and concept, as well as habitual judgements and projections, it provides a more direct experience. This type of awareness trains moment to moment concentration, and leads to the realisation that experience is impermanent, an essential realisation on the path to enlightenment (Nyanaponika Thera 1954).

Mindfulness as protective awareness refers to a kind of awareness that acts as a gatekeeper to the six senses. The body is analogised as a city of which the six senses are six gates. The city is seen as being under threat from the outside world and mindfulness acts as a protector. Mindfulness evaluates whether a particular experience of the sense modalities; eye, ear, nose, tongue, and touch and mind, is either skilful or unskilful, leading to happiness of suffering respectively. Skilful states comprise helpful emotions, such as kindness and generosity, and as such are encouraged in the pursuit of enlightenment. While unskilful states comprising unhelpful emotions (e.g. anger, greed and hatred) are not acted upon (Rhys Davids & Stede, 1999). Here mindfulness is related to wisdom, experience and intelligence and involves recognising experience, learning from it and discerning whether it is skilful or unskilful. The third characteristic of mindfulness is introspective awareness. This type of awareness works to explore and evaluate the various internal mental states that occur. It has three functions, to understand what is going on, to identify why it is going on, and finally to understand if it should be happening. Its role is to locate and understand any unskilful states that may have escaped the gatekeeper of awareness that could, if left unchecked, potentially lead to suffering.

The fourth dimension of mindfulness involves deliberate conceptualising. This involves deliberately conceptualising certain subjects that are considered spiritually wholesome and of benefit according to the statements set out in the doctrine of Buddhism, which may be Buddhist teaching, or ethical conduct. A good example of mindfulness as functioning to deliberately conceptualise is loving kindness meditation, whereby practitioners consciously develop a loving kindness which is directed to all living beings which is boundless and without discrimination. This type of altruistic awareness is practised to develop the practitioner's ethical attitude (Stanley 2015). While each of these four aspects of mindfulness are distinctive and unique in character, they are each related to and supportive of one another. The

development of simple mindfulness lays the way for protective and introspective mindfulness, by opening the emotional and cognitive space required to recognise and change unskilful states, thus allowing for the deliberate construction of skilful states.

In summary, mindfulness and its practise are considered the essence of enlightenment, a key and necessary aspect on the path to awakening. Mindfulness is described as '….. the unfailing master key for *knowing* the mind, and is thus the starting point; the perfect tool for *shaping* the mind, and is thus the focal point; the lofty manifestation of the achieved *freedom* of the mind, and is thus the culminating point'. (Nyanaponika Thera, 1954: 25). Mindfulness is regarded as a way of being that functions in harmony with the other seven factors on the eight fold path. It is regarded as an inseparable aspect of a broader system. In Buddhism, mindfulness does not exist as a single entity; it exists only as part of a broader unique framework that is designed to bring about the cessation of suffering (Hwang & Kearney 2015).

Mindfulness then, from a Buddhist perspective, can be realised as the knowing, shaping and freeing of the mind in readiness for the achievement of enlightened awakening. While the concept of mindfulness originated in Buddhism, it has evolved and progressed into other domains where it has become detached from its Buddhist roots. The next section of this chapter considers how mindfulness has been developed and is understood in a secular context.

2.2. Mindfulness in a secular Westernised context

2.2.1. The development of secular mindfulness

The earliest translation of the Pali term *sati* into the Western concept of mindfulness was in an academic context, in 1881 by Rhys Davids. While Davids initially offered a number of different words to describe *sati*; 'mental activity' and 'simply thought', by 1910 he was consistently using the term mindfulness. The word became an accepted and established

translation of the term *sati*, in the early twentieth century, and was being used by a number of academic authors in the translation of significant Buddhist texts (Gethin 2011).

By the mid twentieth century, the concept of mindfulness was gaining attention in the context of popular culture. Mindfulness and the practice of mindfulness meditation were being presented as a 'method of training the mind for its daily tasks and problems as well as for its highest aim: minds own unshakable deliverance from greed, hatred and delusion' (NyanaponikaThera 1954: 7). In his book 'The Heart of Buddhist Meditation', Nyanaponika Thera (1954), explained that mindfulness was a key element in the attainment of enlightenment. Nyanaponika (1954) was clear to point out that mindfulness was not a single factor, but part of a framework that worked together to create positive change. Mindfulness was claimed to be accessible to all persons regardless of religious affiliations, and intended as a practise capable of transforming an individual from a place of mental suffering to a state of contentment and wellbeing (Hwang & Kearney 2015). An aspect of mindfulness that received considerable attention by Nyanaponika was the concept of bare attention, which he described as:

> '…. *the clear and single-minded awareness of what actually happens to us and in us, at the successive moments of perception. It is called "bare," because it attends just to the bare facts of a perception as presented either through the five physical senses or through the mind* … (Nyanaponika Thera 1954: 30).

Bare awareness, as mentioned above, is the simple awareness that is characterised as being non-judgmental. It is free of value judgements, and is without interference from past or the future imageries. In addition it is not shaped by language or conception, but through direct experience (Hwang & Kearney 2015). Bare awareness was contrasted with the Western habit of mind whereby the individual tended to judge experience from a point of self-interest that was tied to preconceived judgments of self, others and experience. Bare awareness develops the skill of concentration, which is the beginning point of awakening that will eventually lead

to experiencing reality as it is (Gethin 2011). Although bare awareness was presented as a facet of mindfulness in the broader context of the Buddhist framework, it proved influential and can be seen in a number of contemporary definitions of mindfulness.

2.2.2. The development of modern mindfulness

From its initial conception in an academic context, through to its advent in popular culture, the interest in secular mindfulness has continued to grow, receiving renewed interest from the academic domain (Shonin et al. 2015). In this context, mindfulness is no longer understood from a Buddhist perspective, as an element in the path to enlightenment together with other factors. Rather, it is viewed as a single entity in its own right encompassing these other factors. The primary interest in mindfulness in a modern context is its potential to 'deliver mental and physical health benefits' (Shonin et al., 2015: 220). This shift in the use of mindfulness is reflected in how it is defined (Hwang & Kearney 2015). For example, the awareness that emerges through 'paying attention in a particular way: on purpose, in the present moment, and nonjudgmentally (Kabat-Zinn, 2004: 4); 'a receptive attention to and awareness of present events and experience' (Brown & Ryan, 2007: 212); 'the self-regulation of attention so that it is maintained on immediate experience, allowing for increased recognition of mental events in the present moment' as well as 'adopting a particular orientation toward one's experience in the present moment, an orientation that is characterized by curiosity, openness, and acceptance' (Bishop et al. 2004: 232). Mindfulness, in this context, has the potential to be applied across a diverse range of disciplines, including hospitals, prisons and schools.

2.2.3. The application of modern mindfulness

Some of the earliest applications of mindfulness in this newly conceptualised form, were as therapeutic interventions in the treatment of psychological disorders. Acceptance and commitment therapy (ACT) uses mindfulness techniques as part of its therapeutic approach in

order to teach clients how to observe their internal worlds so that they can learn to mindfully (i) diffuse themselves from unhelpful thoughts, (ii) accept painful feelings, and (iii) be in contact with the present moment. These skills are not taught experientially through meditation, but through cognitive behaviour therapy (Hayes et al. 2012). Mindfulness-based interventions including mindfulness-based stress reduction (MBSR) and mindfulness-based cognitive therapy (MBCT), use mindfulness meditation to cultivate mindfulness for the treatment of pain management (Kabat-Zinn 1984); recurring depression (Williams et al. 2004); and eating disorders (Kristella et al. 2006). There is an increase in the application of mindfulness meditation in prison where it is used as a method of helping prisoners to deal with the stress associated with being incarcerated. The justification for the use of mindfulness in this context is that teaching inmates' mindfulness is likely to have the effect of reducing reactive behaviour, which in turn enables them to manage anger and thus decrease the likelihood of reoffending in the future (Kabat-Zinn, 1994). Mindfulness is also used in educational settings where it supports children in many ways, from teaching them how to focus their attention (Napoli et al. 2005), remain calm in stressful situations, as well as interacting with others (Semple, Rosa & Miller 2010); all life skills that are useful both in and outside of the classroom. Delivering mindfulness to students in the classroom is associated with a number of positive benefits, including improved academic function (Bakosh et al. 2016), reduced stress, increased wellbeing and improved social and emotional learning (Schonert-Reichl & Lawlor, 2010; Kuyken 2013). In addition, it has also been shown to be a useful tool in classroom management, beneficial to students and teachers alike (Napoli 2005). Secular mindfulness has many applications across a number of diverse disciplines. In a Western context, it is perceived as a stand-alone skill or technique. The primary interest in mindfulness in a psychological context is its potential to 'deliver mental and physical health benefits' (Shonin et al., 2015, p.220). However, as yet, there is not an agreed theory on the effects of mindfulness in Western

psychology. Mindfulness is approached as a secularised technique which is learnt and practised for the purpose of cultivating mental balance and well-being. It is this approach to mindfulness that has resulted in the development of a number of clinical interventions that use mindfulness as a core element.

2.2.4. The use of mindfulness in a clinical context

Mindfulness based-interventions (MBIs) were initially conceived to be used in a clinical context with adults. Mindfulness meditation was originally adapted to develop the mindfulness based stress reduction program (MBSR) as an intervention for pain management in clinical settings (Kabat-Zinn 1994). MBSR was delivered over a ten week period, to 51 patients, who had not shown improvements with traditional medical care. Patient's symptoms were categorised into back, neck, shoulder, and facial pain, including headaches, as well as angina and non-coronary chest pain. Sixty-five percent of patients showed a 33% reduction in pain symptoms at the end of the program (Kabat-Zinn 1982). Similar findings have been demonstrated in more recent studies. Bantha & Ardebil (2015) reported a significant reduction in back pain in those patients who had undergone an MBSR program in comparison to those who received usual medical care. While Rosenzweig et al (2010) reported a significant improvement in pain symptoms in patients with arthritic pain, as well as those with back and neck pain, following an eight week MBSR program. Using the basic tenants of MBSR, Segal, Williams and Teasdale (2002) developed a mindfulness based cognitive therapy program (MBCT). The program was specifically designed as an intervention for individuals who suffered from repeated episodes of depression. Initially it was the attentional aspect of MBSR that was of interest (Segal et al 2002). Rumination is a universal symptom of depression, and in most cases sufferers are not aware that they are ruminating. Segal et al (2002) proposed that if individuals were more aware of their thoughts, more attentive to them, then they might be able to prevent negative feelings from progressing into rumination and spiralling into a full

blown depressive relapse. Clinical trials supported the efficacy of MBCT as an intervention in the treatment of depressive relapse (Williams and Kuyken 2012). Furthermore, research has also demonstrated that MBCT is an effective intervention in psychosis. Participants exposed to an eight week MBCT program, scored significantly higher on their ability to respond mindfully to stressful internal events in comparison to controls (Langer et al 2012). From the initial application, the clinical use of MBIs has grown exponentially over the last ten years. Mindfulness is now recommended by the National Institute for Health and Care Excellence (NICE) as a way of preventing further episodes of depression in individuals who have previously experienced depression, and who are at risk of relapsing, as well as for a wide range of other stress related disorders (National Institute for Health and Care Excellence 2016).

2.2.5. Mindfulness in a non-clinical context

Mindfulness-based interventions have also been used effectively in non-clinical populations. McGarrigle & Walsh (2011) observed a significant decrease in stress symptoms in social workers following an eight week mindfulness training program. Similarly, smokers from a non-clinical sample demonstrated a significant reduction in tobacco use in comparison to controls, after participating in a four week mindfulness training course (Brewer et al. 2012). Given that there is sufficient evidence to support the use of MBIs with adults in both clinical and non-clinical settings, it is not surprising that their potential as a treatment for clinical disorders, as well as a preventative measure in the promotion of good mental health and well-being among children and adolescents has been recognised (Semple et al. 2010; Singh et al. 2009).

2.2.6. The use of mindfulness-based interventions with children and adolescents

The use of mindfulness with children and adolescents is becoming increasingly popular, with a number of mindfulness-based interventions being specifically developed for use with

this age group. Initial interventions were based on the already existing programs designed for adults and adapted for use with children; mindfulness-based cognitive therapy for children (MBCT-C) which is an adaptation of MBCT (Segal, Williams & Teasdale 2002), and mindfulness-based stress reduction for children (MBSR-C) which is an adaptation of MBSR (Kabat-Zinn 1995). Similar to adults, mindfulness-based interventions with children were used initially in clinical samples (Lee et al. 2008), but have moved more recently into non-clinical settings (Singh et al. 2009; Kuyken 2013). This is reflected by an increase in the development of a number of mindfulness-based programs designed to be used with children in a non-clinical context. One such program is Mind-Up, which was developed by an American charity, the Hawn foundation. The program is delivered over 15-weeks, and can be delivered to large groups of children in non-clinical settings; it is designed to fit into a school's curriculum. Similarly, the mindfulness in schools project (MISP), a charity based in the UK, has developed a nine session program, which has been designed specifically to fit into the school curriculum. Research shows that both of these programs are efficacious and well tolerated by children (Kuyken et al. 2013; Hennelly 2011; Schonert-Riechl et al. 2007).

MBIs have been used successfully to improve some of the disruptive behavioural elements in children and adolescents with attention deficit hyperactivity disorder (ADHD) (Weijer-Bergsma et al. 2012). After completing a 12-week MBI, children with ADHD exhibited more compliant interactions with their parents (Singh et al. 2009). Furthermore, research examining the effects of mindfulness on children's levels of anxiety, and attention and behaviour problems in a non-clinical sample found that children who scored high on measures of anxiety at pre-test showed a significant decline in symptoms post intervention, which was significantly associated with a decline in problem behaviour. Moreover, a relationship between attention and behaviour was also observed - a reduction in attention problems resulted in a reduction in behavioural problems (Semple et al. 2010), suggesting that mindfulness may have

the potential to improve behaviour in children. Mindfulness-based interventions have also been used as a way of improving levels of stress and depression in non-clinical samples. Children who completed a nine week mindfulness program showed significantly lower levels of depression post intervention and at three month follow up in comparison to controls, in addition they also exhibited lower levels of stress and greater wellbeing at follow up (Kuyken et al. 2013), which suggests that mindfulness may be useful in the management of stress and anxiety in non-clinical samples. Overall, there is evidence to support the use of mindfulness-based interventions with children and adolescents, they appear to be well tolerated and in addition seem potentially capable of effecting positive change.

2.3. Mechanisms of mindfulness

While the research examining the effects of mindfulness in various contexts continues to emerge (Kabat-Zinn 1994; Segal, Williams & Teasdale 2002; Thompson & Gauntlett-Gilbert 2008; Allen 2006; Williams & Kuyken 2012), research that explains *how* it works is less apparent. In an effort to address this issue, a number of theoretical frameworks have been proposed, each outlining possible mechanisms through which mindfulness may impact an individual's psychology and behaviour (Shapiro et al. 2006; Brown et al. 2007; Holzel et al. 2011).

One approach to understanding the psychological effects of mindfulness is to view it in terms of its impact on, and role in, executive function. Executive functions are the cognitive or mental processes that enable us to control impulses, filter distractions and process information. They are made up of a number of interrelated processes that can be broadly separated into three domains: inhibition, working memory and cognitive flexibility. Inhibition is the regulatory domain, and is also referred to as self-control. It comprises a number of functions including: emotional regulation, monitoring of internal and external stimuli, initiation of action, initiation and inhibition of context specific behaviour. Working memory is an organisational domain, it

refers to our ability to hold onto as well as manipulate distinct pieces of information over short periods of time. Cognitive flexibility, is also regarded as an organisational domain, it enables us to sustain or shift attention in response to situational demands. While each domain is responsible for different functions, they overlap and are related in a number of processes including self-regulation, mental flexibility and attention. The evidence related to some of these processes are reviewed in turn.

2.3.1. Attention

A number of theories (Wenk-Somaz 2005; Jha, Krompinger & Baine 2007; Van den Hurk et al. 2010) posit that change occurs through the mechanism of attention. Mindfulness meditation involves learning to bring ones attention to present moment experience. Participants are taught to focus their attention by concentrating on their breathing, they are also instructed to acknowledge distractions as they arise, and then to return their attention back to their breath. It is this practice that is thought to develop and strengthen an individual's attention. Attention, as referred to in this thesis, consists of three functionally distinct neural networks: selective or focused attention, also referred to as orienting, divided or alternating attention which is also referred to as conflict monitoring, and sustained attention or alerting attention (Triesman & Gelade 1980). A number of studies using self-report measures have shown that mindfulness may have the potential to impact several aspects of attention (Wenk-Somaz 2005; Jha, Krompinger & Baine 2007; Van den Hurk et al. 2010).

Mindfulness is argued to improve the ability to focus and sustain attention, as well as increasing the ability to inhibit automatic, habitual responding (Moore & Malinowski 2009). Research examining the effect of mindfulness meditation on attentional processes, compared a group of Buddhist meditators with a group of naive meditators. The researchers observed a significant reduction in Stroop interference, as well as improved scores on the d2 test of attention (Moore & Malinowski 2009). Other studies have demonstrated similar findings;

researchers looking to establish if differences existed between meditators and non-meditators in attentional systems found that experienced meditators had better functionality in conflict monitoring compared to naive and non-meditators. In addition, naïve meditators showed improved orienting performance relative to non-meditators, while experienced meditators demonstrated improved alerting in comparison to both naive and non-meditators (Jha, Krompinger & Baine 2007).

Furthermore, the amount of time spent meditating also seems to impact attention. Experienced meditators perform better at tasks involving sustained, focused attention relative to less experienced meditators (Valentine & Sweet 1999; Moore & Malinowski 2008), suggesting the potential of mindfulness to improve attention long term. While the amount of time spent engaging in mindfulness is likely to determine how successful it is in effecting change, research demonstrates that mindfulness used for a short period of time also has the potential to benefit attention. Following a brief mindfulness program, participants' ability to supress interfering information in the Stroop task was reduced in comparison to controls (Wenk-Somaz 2005). Furthermore, after an intense, but relatively short period of mindfulness training, three months, naive participants showed a reduction in the size of attentional blink relative to controls (Moore & Malinowski 2009). Attentional Blink is the lapse of attention which occurs when disengaging attention from one focus, and engaging it in another. It is momentary, usually not lasting more than a second. Any stimuli that occurs during attentional blink is not perceived. Any activity which reduces attentional blink, should in theory benefit attention (Raymond et al. 1992).

While the initial focus of this thesis is to explore the psychological impact of mindfulness, it is worth noting that a number of physiological changes in relation to attention have also been observed. Mindfulness has the potential to affect structural changes in regions of the brain associated with attentional processing. Research has found that meditators had

increased cortical thickness in brain regions associated with attention in comparison to controls, and a positive relationship was found between the amount of experience meditators had and cortical thickness (Grant et al. 2013). Furthermore a negative correlation was observed in the control group between cortical reduction and age, a trend which was not seen in the meditating group (Lazar et al. 2005), suggesting that mindfulness may lessen cortical thinning, and that it may also have a protective influence on attention. Consequently, it seems worthwhile mentioning that cortical thinning is considered a predictable anatomical marker for ADHD, a psychiatric disorder typically characterised by inattention (Narr et al. 2009). Furthermore, widespread cortical thinning has been observed in regions of the brain associated with attentional processes in children and adolescents with ADHD, compared to age and sex-matched controls. Overall there is some evidence to suggest that mindfulness may have the potential to affect positive change on attentional processes.

While there is evidence to suggest that mindfulness asserts change through a mechanism of attention; studies have demonstrated its potential to improve sustained and focused attention, as well as increased inhibition and habitual responding ((Moore & Malinowski 2009). Equally there is research to suggest that this may not be the case. A study comparing the effects of MBSR training on similar measures of attention; sustained attention, attention switching, inhibition and non-directed attention, failed to detect any improvements (Anderson et al. 2007). The main difference between these two studies is that the former compared Buddhist meditators with naive meditators. While mindfulness is an important aspect of Buddhism, as was mentioned earlier on in the chapter, it is just that, an aspect of it. There may well be other factors associated with being a Buddhist that may have a greater influence on attentional processes other than mindfulness. Of course this is only speculation and future research would be needed to explore this.

A methodological limitation that was present in each of the studies examining the effect of mindfulness on attention, is that none of them compared other similar approaches. The inclusion of a similar intervention, for example, a relaxation program, would have allowed the researchers to attribute any findings specifically to the mindfulness interventions, ruling out other possible confounding variables. Research that has compared the effects of mindfulness meditation to progressive muscle relaxation (PMR) on attentional processes, did not observe any differences between the two groups (Rutschman 2004).

2.3.2. Cognitive flexibility and decentring

As well as attention, mindfulness training has also been purported to affect change in cognitive flexibility, through a process of mental set shifting. One of the central tenets of mindfulness is the emphasis on paying attention to present moment experience, non-judgementally. Participants are taught to experience internal stimuli - thoughts, feelings and emotions - as transitory mental events rather than a true permanent reflection of the self. They learn that they do not need to change the content of internal stimuli only their relationship to it, as a result stimuli are perceived objectively. This shift in perspective creates an awareness that allows an individual to respond to experience with a clarity that is free from automatic, habitual responding, a process which is referred to as *decentring* (Safran & Segal 2002). When a person is able to decentre, they are able to detach themselves from the subjectivity of emotions and feelings (Safran & Segal 1990). Mindfulness practice develops and strengthens a person's ability to decentre (Brown et al. 2007; Holzel et al. 2011), therefore facilitating insight into internal stimuli, consecutively discouraging automatic, and habitual thought patterns. This allows a person to choose their response to stimuli, rather than to react to it. For example, feeling sad can be seen as a normal transitory emotion, rather than something that is abnormal and problematic (Holzel et al. 2011).

Similarly, Shapiro et al. (2006) propose that decentring, or *reperceiving* as they term it, is central to the transformative outcomes of mindfulness. They posit that the construct of mindfulness can be understood by breaking it down into three core components: Intention, Attention and Attitude (IAA). The components are based on the definition of mindfulness according to Kabat-Zinn (1985), 'paying attention, in a particular way: on purpose, in the present moment and non-judgmentally', and correspond accordingly; *on purpose* (intention), *paying attention* (attention) and *in a particular way* (attitude). The model posits that the action of intentionally attending with the correct attitude produces a significant shift in perspective (reperceiving), which is seen as a predominant meta-mechanism under which other more direct mechanisms sit (self-regulation, values clarification, exposure and cognitive, emotional and behavioural flexibility), and as a result function more efficiently. These variables are seen as interrelated and as having the potential for other outcomes such as psychological symptom reduction and improved wellbeing (Shapiro et al. 2006). The ability to shift the experiential perspective from within one's subjective experience onto that experience is an essential human skill, which researchers argue has the potential to impact mental health (Kabat-Zinn 1984; Williams et al. 2004). Depressed patients who are taught to decentre show lower rates of relapse compared to controls (Williams et al. 2004), while patients experiencing chronic pain show a reduction in negative affect (Kabat-Zinn 1984). These findings lend support to the assertion that mindfulness may assert change through a process of decentring.

However, research designed to test the prediction of Shapiro et al. (2006), that decentring or *reperceiving* as they termed it, was central to the transformative changes brought about through mindfulness, failed to detect any relationship between decentring and psychological outcomes. Instead they posited that rather than decentring being the mechanism through which mindfulness facilitated change, it was more likely that it was a construct, which

overlapped with mindfulness, and which was equally capable of change with participation in mindfulness meditation (Carmody et al. 2009).

2.3.3. Self-regulation

A further possible mechanism through which mindfulness is reported to assert change is self-regulation (Arch & Craske 2006). Increased self-regulation has been associated with mindfulness training (Blair & Diamond 2008), and in particular, emotional regulation. Emotional regulation is the ability to adjust emotional responses in order to fit with social and situational demands. It is an important factor for a variety of outcomes including task performance, school and work success, as well as good mental health and adjustment (Baumeister & Vohs 2007). Emotional regulation can be automatic or controlled, conscious or unconscious (Gross & Thompson 2006). It is the awareness of emotional states as they occur and the recognition of their transient nature which is thought to foster emotional regulation following mindfulness training (Hayes et al. 1999).

Research suggests that mindfulness increases willingness to experience negative emotions, lessens their negative impact as well as reducing the time it takes to recover from them (Hayes et al. 1999); suggesting that mindfulness has a regulatory potential which may be associated with adaptive emotional regulation (Shapiro et al. 2006; Jiminez 2010). Arch & Craske (2006) demonstrated the positive effects of mindfulness on emotional regulation by exposing 60 undergraduates to a number of negatively valenced picture slides over a period of 15 minutes. Participants were randomly allocated to one of three experimental conditions, focused breathing (based on MBSR), unfocused breathing, or a worry condition. In each of the conditions participants were required to listen to a 15 minute recorded induction, depending on which experimental condition they had been assigned to. Participants were tested prior to and following exposure to the picture slides on a number of self-report measures including, anxiety and depression, social desirability confound, emotional responding, and finally a behaviour

measure. In addition, participants were also required to complete a manipulation check, this was to give some insight into the extent to which they had followed the recorded instructions received in their induction. Participants in the mindfulness group, displayed a greater positive response compared to those in either of the control groups. These findings demonstrate the positive effects of mindfulness, and in addition suggest that brief exposure to mindfulness can have a positive impact on self-regulation.

In addition to the psychological research which has demonstrated an association between mindfulness and self- regulation, there are also a growing number of studies from the field of neuropsychology (Newberg and Iverson 2003; Farb et al 2007; Holzel et al 2008; Ives-Deliperi et al 2011). Research indicates that experienced meditators have greater activation in areas of the brain associated with emotional regulation. Differences have been found between meditators and non-meditators in grey matter concentration in the hippocampal region of the brain, an area which plays a crucial role in emotional regulation (Holzel et al 2011). Further, studies exploring the effects of mindfulness in long term meditators, a minimum of four years, also reported significant changes in regions of the brain associated with emotion regulation. Ives-Deliperi et al., (2011) observed a pronounced decrease in activity in midline cortical structures (dorsolateral prefrontal cortex, anterior cingulate cortex, orbitofrontal cortex, and amygdala), associated with interception (the objective accuracy a person has in detecting internal bodily sensations). While a significant signal increase was observed in the right posterior cingulate cortex. These areas of the brain are involved in the processing of emotions as an interface between emotion and cognition. These findings suggest that mindfulness may be asserting change through the process of decentring. The positive emotional regulation effects are likely to be due to changes in the relationship an individual has to their emotions, a realisation of the subjective nature of them, as well as an awareness of emotions as they unfold. It is this change that is likely to facilitate some of the transformative changes brought about

through mindfulness training. Further research by Farb et al (2007), also observed differences in the midline cortical structures following mindfulness training. A greater reduction in the medial prefrontal cortex, an area of the brain associated with extended self-reference (the facet of self-reference that links experience across time) and momentary self-reference (the aspect of self-reference that is centred on the present) was observed in experienced meditators; those who had attended an 8-week mindfulness program, in comparison to naïve meditators. In addition the authors also observed a strong coupling between the two distinct facets of self-reference in naïve meditators, which was not observed in experienced meditators, which they argue is suggestive of an essential neural dissociation between the two distinct forms of self-reference. These findings, similar to the previous study suggest that mindfulness may be asserting change through the process of decentering. The neural dissociation is illustrative of the individual's ability to experience present moment awareness (momentary self-reference), in the absence of extended self-reference. Furthermore, mindfulness has been found to facilitate changes in emotional regulation in naïve meditators following brief exposure to mindfulness. Other research, (Newberg and Iverson 2003) which conducted an exploratory study to investigate the effects of short term exposure to meditation on previously naïve meditators, found significant changes in the left hippocampus, a region of the brain implicated in emotion regulation, following participation in an 8 week MBSR course compared to controls. These findings suggest that even short exposure to mindfulness may have the capacity to affect emotional regulation.

Changes in other brain structures have also been observed following mindfulness training (Taren et al. 2013). The amygdala plays a central role in activating the fight or flight response and is implicated in gating stress responses associated with fear during times of high stress (Cannon 1936). It is larger in those individuals who experience post-traumatic stress disorder, anxiety and panic disorder individuals who have less emotional regulation (Taren et

al. 2013). Using self-measures and volumetric analysis Taren et al. (2013), found a correlation between state mindfulness and reduced amygdala grey matter, suggesting that mindfulness may be associated with a smaller amygdala and greater emotional regulation.

While there is evidence to support the assertion that self-regulation is a possible mechanism through which mindfulness may bring about change, the literature is limited. The study by Arch & Craske (2006), although suggesting possible evidence of the positive effects of mindfulness, had a number of methodological limitations and so caution should be applied before any inferences are made. One limitation being that while the study incorporated two active controls; a worry condition and an unfocused breathing condition, they offered limited comparison with the mindfulness group. If comparisons are to be made, they would be better to include a condition that rules out possible confounders, rather than a condition that is the opposite of the experimental condition. In addition, the study also used self-report measures, which as discussed earlier on in the thesis (chapter 1), can result in low reliability, social desirability bias (although the authors did include a social desirability scale) and in addition can be limited in the data they capture. Especially when they are administered in the short form, which was the case in this study. Finally, the authors included a manipulation check in the design of the study, the results of which suggested that participants had not placed much effort on following the instructions given in the induction. However, if the participants did not follow the instructions they were given. For example, in the mindfulness condition, to concentrate on the breath. Then it is difficult to infer that any changes which may have occurred, were attributable to mindfulness.

2.4. Summary

Buddhist philosophy posits that *sati* (mindfulness) is a key aspect in the attainment of enlightenment. Buddhism is constructed on a conceptual framework consisting of the Four-Noble Truths; life is suffering (Dukkha), suffering is caused by craving and aversion, suffering

can be overcome, to overcome suffering involves the adherence of a specified path, the Noble Eightfold path. The path comprises eight mutually inclusive elements; wisdom, ethics and meditation, of which the key aspect is mindfulness. Following the Eightfold path will result in the cessation of suffering and the achievement of enlightened awakening. Mindfulness does not operate as a single entity in Buddhism, but as part of a broader framework, designed to bring about the cessation of suffering. Mindfulness is regarded as a way of being that functions in harmony with the other factors on the eight fold path, and as such is regarded as an inseparable aspect of that broader system. From a Buddhist perspective mindfulness is realised as a way of being that allows us to know the mind, shape the mind and free it in readiness for the attainment of enlightenment. Mindfulness and its practise are considered the essence of Buddhism, a key and necessary aspect on the path to awakening.

Secular mindfulness is regarded as more of a skill or technique, rather than a way of being. It is learned to alleviate physical and emotional pain. Mindfulness in a secular form has its origins in a scholastic context, where it was initially conceived to translate the term *sati* from Buddhist texts in the late nineteenth century. It gained recognition in popular culture as a method of 'training the mind for its daily tasks and problems', as well as delivering it from greed, delusion and hatred. More recently mindfulness has become established in research and applied settings across a diverse range of disciplines, including medicine, psychology and education. Secular mindfulness is not perceived in a Buddhist context; as co-existing with a number of mutually interactive elements on the path to enlightenment. Instead it is regarded as a single entity in its own right which encompasses a number of other factors. The primary interest in mindfulness in a modern context is its potential to 'deliver mental and physical health benefits'.

While the use and consequent research of secular mindfulness continues to grow, the process through which these benefits are achieved is still to be determined. While a number of

different theoretical explanations have been proposed, attention, self-regulation and decentring, it is unlikely that a single unitary mechanism is responsible for the outcomes that are attributed to mindfulness. It is however, more likely that mindfulness asserts change through a number of mechanisms which incorporate these processes. For example, when individuals become more attentive they are more likely to have the capacity to perceive experience objectively (decentre), and thus may be less reactionary and more responsive, or put another way, have more self-regulatory control. The research regarding how mindfulness asserts change is still in its infancy, and as such is rather limited, further studies are needed to expand this area of research.

This chapter has provided a discussion on the concept of mindfulness from both an Eastern and Western perspective. It has provided a brief discussion on the origins of secular mindfulness, as well as its application in a therapeutic context and it's more recent assent into other disciplines, including educational settings. The next chapter is a systematic review of the literature on the psychological effects of mindfulness on children and adolescents.

CHAPTER 3

3. Systematic Review

The Psychological Effects of Mindfulness Practice among Children and Adolescents

Chapter Overview

This chapter presents a systematic review of the literature on the application of mindfulness-based techniques to children and adolescents. Emerging evidence demonstrates that mindfulness has a wide range of applications, and has been used successfully in clinical and non-clinical settings with both adults and children (see Chapter 2). The aim of Chapter 3 is to explore, evaluate and describe the literature on the psychological effects of mindfulness practice among children and adolescents. A systematic search of relevant databases was conducted in January 2014, followed by a limited update search in January 2016. Studies were included in the review if they were randomised controlled trials (RCTs), including cluster RCTs, non-randomised controlled trials (nRCTs or quasi experimental design) and single group pre-post-test experimental design. Only studies that incorporated some form of mindfulness practice with children and adolescents of school age (between the ages of 4 and 18 years) were included. A total of 42 studies, 20 RCTs, 10 nRCTs and 12 pre-post-test design were included. Results suggest that mindfulness practise impacts executive function, especially attentional processes, self-regulation, emotional health, and clinical symptoms. This represents the first systematic review to look exclusively at the psychological effects of mindfulness practises among children and adolescents. Results suggest that mindfulness has the potential to benefit children within this age group.

3.1. Background & aim

The research reviewed in Chapter two demonstrates that the use of mindfulness with children and adolescents is increasing (Hennelly 2011; Kuyken 2013; Huppert 2010). Although its initial application was primarily from a treatment perspective, it is increasingly being regarded as a potential preventative intervention in the promotion of mental health, particularly in school contexts. There is substantial research exploring and demonstrating the therapeutic values of mindfulness; that is, how it is that it achieves such salutatory effects in a treatment context. There is, however, less research which considers the use of mindfulness with children and adolescents from a protective and preventative framework. If mindfulness-based interventions are to be used in this way; as a universal, school-based, preventative intervention, then it is important to understand if such programs are effective in achieving these goals, but also to identify what psychological effects they may have on children.

This chapter presents a systematic review of the existing literature on the psychological effects of mindfulness on children and adolescents outcomes, and proposes a theoretical framework from which we may understand its effects. To our knowledge there is no published systematic review exploring the psychological effects of mindfulness practices among children and adolescents in a generalised context.

3.2. Method

3.2.1. Eligibility criteria

In order to ensure a transparent and replicable study, this review has been reported using the Preferred Reporting Items for Systematic Reviews and Meta-Analysis (PRISMA) (Liberati, et al. 2009). The research question and subsequent bibliographic search was constructed using the Participants, Interventions, Comparisons, Outcomes and Study Design (PICOS) strategy.

3.2.1.1. Participants

Literature was accessed with participants who were children of school age and young adults up to the age of 20. We defined school age as being no younger than four years, although compulsory school age begins at the start of the term following a child's fifth birthday, children can start from the age of four onwards. In addition we defined young adults as up to the age of 20. Although this is a year older than the world health organisation regards 'adolescent' (up to 19 years), we considered 20 a reasonable cut off ensuring that we did not miss any studies with adolescents in the review. We were aware that due to some of the terms in our search, classroom and academic, that studies would be returned that did not meet the inclusion criteria of the review, for example, studies may have been returned where the participants were undergraduate students on nursery age children, however, rather than set age limiters and risk omitting studies from our search, we instead dealt with studies that did not meet criteria at the coding stage of the study. In addition we did not distinguish between clinical and non-clinical studies during the search phase, again we were more concerned with missing studies, and we therefore, decided it was better to omit unsuitable research at the coding stage than miss relevant research in the searching phase.

3.2.1.2. Interventions

Studies were included in the review if they employed a mindfulness-based intervention (MBI), mindfulness program or any activity where we deemed formal mindfulness meditation to be an active component. We did not distinguish studies based on the duration of participant's exposure to mindfulness. It was included regardless of whether it was delivered in single or multiple sessions, over a single day or a number of days or weeks. Mindfulness was characterised as any intervention, program or activity, standardised or not, that aimed to teach participants how to cultivate present moment awareness, with a quality of non-judgemental openness. Where interventions were not standardised they were only included if they utilised

typical mindful meditation practises such as mindful breathing, mindful movement and mindful yoga. In addition we did not discriminate on how mindfulness was delivered, all interventions that met the above criteria were included regardless of how they were delivered.

3.2.1.3. Comparators

We included studies that incorporated active controls, waitlist controls and no controls. While the inclusion of studies without controls is not ideal. It was felt that because the use of mindfulness with children and young people was still such an emerging area of research, that to include these studies would increase the number of included studies so much so that our chances of answering the research question would be improved somewhat. Studies that compared different types of meditation with mindfulness were excluded, as any observed outcomes could not clearly be attributed to mindfulness.

3.2.1.4. Outcomes

As we were looking to explore the impact of mindfulness on children and adolescents we did not have a prior criterion regarding outcomes other than that they measured a psychological construct. In addition we set no criteria in regards to how measures were collected; researcher administered, self-report and teacher/parent reports were all included. Outcomes could be measured using standardised and non-standardised instruments. Pre and post-score measures were a minimum requirement, with studies incorporating follow-up measures also included.

3.2.1.5. Study designs

Studies were included if they were randomised controlled trials (RCTs), including cluster RCTs, Quasi or controlled non-randomised clinical trials (nRCTs) and single subject experimental design, also referred to as single case research design (with-in groups design

without a comparator). Although studies with a pre-post-follow up test design are preferable when attempting to ascertain the immediate and sustained impact of an intervention, studies with a pre-post-test design were included in the study.

3.3. Search strategy

3.3.1. Electronic searches

A systematic search strategy was employed to locate published studies, unpublished studies and grey literature. Studies were identified by scanning reference lists of reviews and any located relevant studies, and by searching the following electronic databases; PsycINFO, Medline, Academic Search Complete, Scopus, Science Direct. PubMed, Sage, Web of science, British Library and ProQuest. Each database was searched from January 1975, where possible, any earlier would have been prior to the start of mindfulness being used as an intervention, up to and including January 2014. A limited update search was performed in January 2016. Reference lists of all studies that met the inclusion criteria were scanned for any relevant studies that had been missed in the initial search. Where studies could not be located authors were contacted.

3.3.2. Search terms

The following terms and there derivatives were used in order to collate relevant studies; mindfulness AND children OR adolescents OR school children OR young people. Mindfulness based cognitive therapy AND children OR adolescents OR young people OR school children. MBIs AND children OR adolescents OR school children OR young people. MBSR AND children OR adolescents OR school children OR young people. This primary search yielded 1288 studies.

3.4. Study selection

3.4.1. Inclusion criteria

The inclusion criteria were that studies should be original research articles, dissertations, or reports. In addition, the participants in the studies had to be children or adolescents, and the studies needed to use mindfulness meditation at some level. Studies were also required to have reported at least one numerical, psychological outcome. Finally in order to be included in this review studies needed to fall into one of the following criteria; they were either a randomised controlled trial (RCT), a quasi-experimental design (controlled but not randomised), or pre-post design.

3.4.2. Screening

Titles and abstracts located during the search were screened. This involved reading the titles and abstracts of all retuned records to determine if they met the inclusion criteria. Once this was complete, twenty percent of the original returned records, chosen at random, were read by a member of the supervisory team. Any disagreements that arose between them regarding eligibility were resolved by discussion. In instances where it was unclear if an article met the inclusion criteria it was considered eligible and retrieved for further review.

All remaining texts were further screened, read in full to determine whether they met the inclusion criteria. As in the initial screening process, twenty percent of the included studies were chosen at random to be read by a member of the supervisory team. Again as in the initial screening process, any disagreements that arose regarding eligibility were resolved by discussion.

3.4.3. Secondary searches

Following the screening process, the reference lists of all the studies identified in the primary search were scanned to ensure that no eligible studies had been missed in the primary

search. In addition the following professional websites were searched to locate any further relevant papers, the mindfulness in schools project (MISP) and the Oxford mindfulness centre (OMC). During this process a further four studies were identified that qualified for inclusion (see figure 3.1 flow diagram of search results). One apparent reason these additional studies from the secondary search were not captured in the primary search appears to be different terms referring to population. For example, the study by Napoli, Krech and Holley (2005) referred to 'school students' as opposed to children in the title. However, a repeat of the literature search using the term 'students' did not return any additional studies to be reviewed.

3.5. Data collection and analysis

3.5.1. Data extraction

Data from each eligible study was coded using a structured coding sheet, which was developed using the Cochrane Consumers and Communication Review Group's data extraction template. It was initially trialled on four studies, resulting in changes that were made prior to commencement of data extraction (see Appendix F). Data were independently coded by two reviewers (MDV and TL), any disagreements were resolved through discussion.

The data that were extracted from each study was based on: (1) characteristics of study participants, the age and number of participants, as well as any information that was given on special educational needs (SEN) status; (2) type of intervention, including the MBI approach taken (if standardised) or detailed description of the program if not, duration and frequency of sessions and length of course as well as facilitators experience; (3) type of outcome measure and the time intervals at which they were collected; (4) study design, including type of statistical analysis, findings, conclusions and limitations (see Table 1 for study characteristics).

3.5.2. Assessment of risk of bias in included studies

Along with a member of the supervisory team, the researcher independently assessed included studies meeting inclusion criteria for risk of bias. The Cochrane Collaboration "Risk of Bias" tool was used for randomised controlled trials, and assessed the following 6 domains: selection bias, performance bias, detection bias, attrition bias, attrition bias, reporting bias and other bias. Studies were coded either low risk, high risk or unclear. Any disagreements regarded risk were resolved by discussion.

For non-randomised studies the Cochrane Collaboration "Risk of Bias in Non-randomised Studies – of Interventions (ROBINS-I) was used. The ROBIN-S assessed the following seven domains: confounding bias, selection of participant's bias, classification of interventions bias, bias due to deviations from intended interventions, bias due to missing data, bias in measurement of outcomes and selection bias of the reported result. Studies were coded as one of the following; low risk, moderate risk, serious risk or critical risk. Studies that lacked relevant information were coded as no information. Any disagreements that arose during coding were resolved through discussion.

3.5.3. Synthesis

The data from all of the included studies, 42 in total, was synthesised using a narrative approach.

3.6. Results

3.6.1. Search results

A search of multiple electronic databases, specialist websites and other sources returned a total of 1288 references. Following the removal of duplicate records (n = 61), the remaining 1227 references were scanned by title and abstract against the inclusion criteria, resulting in the removal of a further 1115 studies. 112 studies were retrieved and the text read in full by the researcher and a member of the supervisory team (TL), of which 63 did not meet the inclusion criteria, three we were unable to locate, and four were reviews. From an initial 1288 references 42 studies passed the screening process, meeting the criteria for inclusion in this study. The results of the search are summarised in the flow diagram in Figure 1.

3.6.2. Included studies

The 42 studies that met criteria for inclusion in this review consisted of 20 randomised controlled studies (RCT), 10 non-randomised controlled studies (nRCT) and 12 pre-post design studies (PPD). A total of 12 different psychological outcomes were measured across these studies which resulted in the emergence of a number of different but related themes. The outcome synthesis has been structured in line with these themes. The characteristics of each of the included studies can be seen in Table 1.

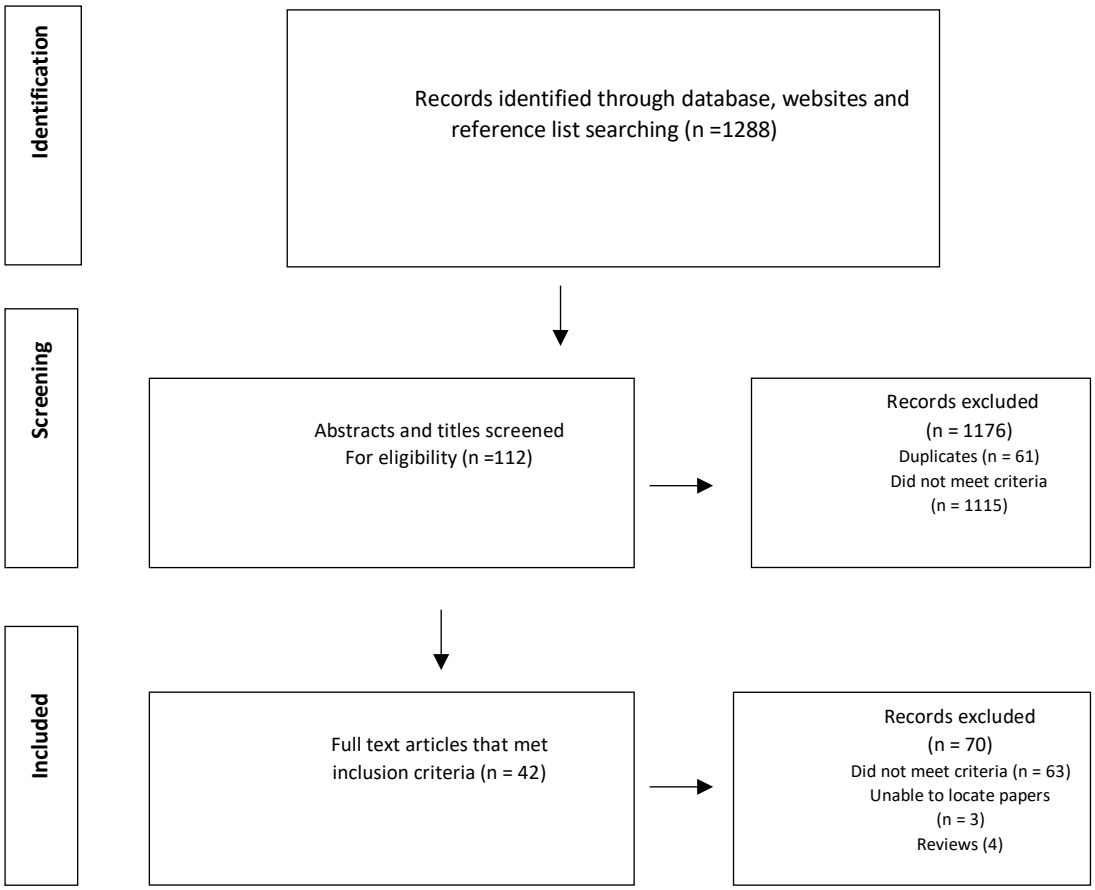


Figure 3.1. Flow diagram of search results

3.6.3. Excluded studies

Of the 70 studies that were excluded, three could not be located, while a further four were reviews. The remainder (n = 63) were excluded because they did not meet the inclusion criteria for this review. A full list of the excluded studies and the reasons for exclusion are shown in Table 2

3.6.4. Participants

Across the 42 studies there were 4608 participants. Participants' ages ranged between four and 20 years of age. All of the 42 studies were conducted in a school setting, one during a summer camp and one after school at a local university. In 38 of the studies participants were recruited from both genders, with three additional studies focussing on female students, and a

further three focussing on male students only. Of the 42 studies, five reported on children who had a special educational need; two with ADHD, one with conduct disorder, one with anxiety, and one study did not specify the nature of the need.

Table 3.1. Study characteristics

Study	Study design	Sample size	Student age	Program description	Program duration	Control condition
Anand & Sharma (2014)	PPD	33	Mean 14.2	MBSR	40 minutes 1x week for 8 weeks	n/a
Beauchemin (2008)	PPD	35	Mean 16.6	Mindfulness training	1 single 45-min session followed by 5-10 mins daily practise for 5-weeks	n/a
Bei (2013)	PPD	62	13-15 years	Mindfulness training	90 mins 1x week for 6 weeks	n/a
Bergen-Cico (2015)	RCT	142	Mean 11.4	Mindful Yoga	4 minutes 3x week for 1 academic year.	Wait list
Bluth (2015)	RCT	23	17 years	Learning to breath program	50 minutes 1x week for 1 term/semester	Evidence based substance abuse class
Britton (2014)	RCT	100	Mean 11.8	Mindfulness meditation	Between 3 -12 minutes 1x week for 6 weeks	School as usual, with the addition of a building activity
Broderick (2009)	nRCT	121	Mean 16.9	Learning to breath program	30-40 minutes 2x week for 5 weeks	School as usual
Carboni (2013)	PPD	4	8 years	Mindfulness intervention	45 minutes 2x week for 5 weeks	n/a
Carmona (2014)	PPD	84	12 years	Mindfulness program	30 minutes 1x week for 4 weeks	n/a
Campbell (2015)	nRCT	438	16 years	.b Mindfulness program	9 lessons of approximately 45 mins	Not clear
Desmond & Hanich (2010)	RCT	40	Mean 11.5	Wellness works mindfulness program	Between 25-45 minutes 1x week for 10 weeks	Not clear

Table 3.1. Continued

Study	Study design	Sample size	Student age	Program description	Program duration	Control condition
Edwards (2014)	PPD	20	12-17 yrs.	MBSR	50 minutes 1x week for 5 weeks	n/a
Flook et al. (2010)	RCT	64	Mean 8.2	Mindful awareness practise	2x week for 8 weeks	Silent reading
Flook et al. (2015)	RCT	66	Mean 4.7	Mindfulness practise	30 minutes 2x week for 12 weeks	Wait list
Huppert (2010)	nRCT	155	Mean 14.5	MBSR	4 40 minute sessions over a week	Not clear
Joyce (2010)	PPD	120	10-12 years.	Mindfulness program	45 minutes 1x week for 10 weeks	n/a
Klatt (2013)	PPD	61	8 years	Move into learning mindfulness program	45 minutes 1x week for 8 weeks	n/a
Kuyken (2013)	nRCT	522	Mean 14.8	.b Mindfulness program	9 lessons of approximately 45 minutes	School as usual
Lau (2011)	nRCT	48	Mean 15.8	Mindfulness based program adapted from MBSR	2 hrs 1x week for 6 weeks	Not clear
Lier & Diaz (2010)	RCT	18	Mean 9.5	Mindfulness intervention	10 minutes 1x day for 2 weeks	Health education

Table 3.1. Continued

Study	Study design	Sample size	Student age	Program description	Program duration	Control condition
Lee & Semple (2008)	RCT	25	9-12 years.	MBCT-C	90 minutes 1x week for 12 weeks	Wait list
Mendelson (2010)	RCT	82	Mean 9.5	Mindfulness intervention	45 minutes 4x week for 12 weeks	Wait list
Metz (2013)	nRCT	216	Mean 16.5	Learning to breath program	Between 15 – 25 minutes 1x week for 16 weeks	School as usual
Naploi (2008)	RCT	194	6-8 years.	Mindfulness exercises	45 minutes 12 sessions over 24 weeks	Reading
Parker (2014)	RCT	111	10 years	Master mind program	15 minutes daily for 4 weeks	Wait list
Potek (2012)	RCT	30	15 years	Learning to breath program	40 minutes 1x week for 6 weeks	Wait list
Quach (2014)	RCT	103	12-17 years	Mindfulness meditation intervention based on MBSR	45 minutes 2x week for 4 weeks	Hatha yoga and wait list
Raes (2013)	RCT	357	13-20 years	Mindfulness intervention based on MBSR and MBCT	100 minutes 1x week for 8 weeks	School as usual
Razza (2015)	RCT	29	4 years	Mindful yoga	40 hours over 25 weeks	School as usual
Ricarte (2015)	RCT	45	6-13 years	Adapted version of the Mindfulness emotional intelligence program	15 minutes a day for 8 weeks	Wait list
Salustri (2010)	PPD	7	17 years	MBSR	45 minutes 2x week for 8 weeks	n/a

Table 3.1. Continued

Study	Study design	Sample size	Student age	Program description	Program duration	Control condition
Schonert-Reichl (2010)	nRCT	246	Mean 11.4	Mindfulness education program	40 minutes 1x week for 10 weeks	School as usual
Schonert-Reichl (2015)	RCT	99	Mean 10.2	Mind up	12 40-50 minute lessons 1x week	School as usual
Sibinga (2013)	RCT	41	Mean 12.5	MBSR	50 minutes 1x week for 12 weeks	Health education program
Sibinga (2016)	RCT	300	12 years	MBSR	50 minutes 1x week for 12 weeks	Health education program
Singh (2007)	PPD	3	12 years	Soles of Feet mindfulness intervention	15 minutes 3x week for 4 weeks	n/a
Tharalsden (2012)	nRCT	81	17 years	Conscious coping program- CBT with mindfulness	30 minutes 2x week for 6 weeks	School as usual
Van de Weijer-Bergsma (2014)	nRCT	199	8-12 years.	Mindful kids	30 minutes 2x week for 6 weeks	School as usual
Viafora (2015)	nRCT	48	11-13 years.	Mindfulness program based on MBSR	60 minutes 1x week for 8 weeks	School as usual
White (2012)	RCT	155	Mean 9.5	MBSR	1hour 1x week for 8 weeks	Wait list
Wisner (2008)	PPD	35	15-17 years.	Mindfulness meditation	9 minutes 2x week for 8 weeks	n/a
Worth (2013)	PPD	17	11-15 years	Mindfulness awareness program	30 minutes daily for 8weeks	n/a

Table 3.2. Excluded studies and reasons for exclusion

Study	Reason for exclusion
Anglin, Pirson, & Langer (2008)	Not an intervention study
Arias et al. (2011)	Could Not Locate in English
Bakosh 2013	Mixed sample of students and teachers
Bakosh 2013	Mixed sample of students and teachers
Bakosh 2015	Did not measure psychological outcomes
Barnes 2004	Not a mindfulness intervention
Barnes 2008	Qualitative
Barnes et al. 2003	Not a mindfulness intervention
Beaumont et al. 2005	Not a mindfulness intervention
Black 2014	Not a clear comparison study
Bluth 2010	Not an intervention study
Bogels et al. 2011	Meta-analysis
Burgon, H.L 2014	Qualitative study
Burke (2010)	REVIEW
Burke et al. (2012)	REVIEW
Campion & Rocco 2011	Qualitative
Carboni 2014	Did not measure psychological outcomes
Deuskar 2007	Not a mindfulness intervention
Felver	Observation study
Fossati, Feeney, Maffei, & Borroni (2011)	Not an intervention study
Glück & Maercker (2011)	Not an intervention study
Gordon et al. 2008	Not a clear comparison study
Gould 2012	Qualitative
Greco, Baer, & Smith (2011)	Not an intervention study
Gregoski 2011	Did not measure psychological outcomes
Groom 2014	Not a mindfulness intervention
Haden 2014	Not a mindfulness intervention
Hanley, Palejwala, Hanley, Canto, & Garland (2015)	Not an intervention study
Holstein 2015	Not a mindfulness intervention
Jennings, Frank, Snowberg, Coccia & Greenberg (2013)	Did not meet age criteria
Joyce 2011	Not a mindfulness intervention
Justo 2011	Did not meet age criteria
Kemper & Khirallah (2015)	Not an intervention study
Khalsa 2012	Not a mindfulness intervention
Kim 2001	Not a mindfulness intervention
Kim et al. 2014	Not a mindfulness intervention
Kobusch (2014)	Could Not Locate in English
Koeing 2012	Not a mindfulness intervention
Lam, Lau Lo, & Woo (2014)	Qualitative
León, Benito (2008)	Could Not Locate in English
Marks, Sobanski, & Hine, (2010)	Not an intervention study
Mehta 2011	Not a mindfulness intervention
Mehta 2012	Not a mindfulness intervention
Meiklejohn et al. (2012)	Teachers were included in the sample
Miller 1999	Not an intervention study
Miller 2014	Qualitative
Noggle 2012	Did not use mindfulness meditation
Oberle et al. (2012)	Physiological measures
Oberle et al. 2012	Measured cortisol
Oberski, Murray, Goldblatt, & DePlacido (2015)	Not an intervention study
Peck 2005	Not a mindfulness intervention
Powell 2008	Not a mindfulness intervention
Radel (2009)	Not a study on effects of mindfulness
Ramadoss 2010	Not a mindfulness intervention

Table 3.2. Continued

Study	Reason for exclusion
Reid & Miller	Mixed age range that did not meet criteria
Ricard 2013	Not a mindfulness intervention
Roeser & Zelazo (2012)	REVIEW
Rommel 2012	Not a mindfulness intervention
Salustri 2012	Not an intervention study
Semple 2005	Did not meet age criteria
Semple et al. (2010)	Did not meet age criteria
Shapiro et al. (2006)	REVIEW
Smith 2014	Not a mindfulness intervention
Steiner 2013	Not a mindfulness intervention
Stillman et al. (2014)	Did not meet age criteria
Wick &Walden (2013)	Did not measure psychological outcomes
Wick 2013	Did not measure psychological outcomes
Wisner 2013	Qualitative
Zahn 2008	Not a mindfulness intervention

3.6.5. Intervention characteristics

The studies included in the review examined a range of mindfulness-based interventions. There were six programs specifically designed for use with children; Mind up, Master Mind program, MBCT C, Mindful Kids, .b. and Learning to Breath, and were used in 12 of the studies. MBSR was used in another 13 of the studies. Two studies employed Mindful yoga, while a further one used mindfulness-based loving kindness meditation. Sixteen of the studies delivered a program that was based on mindful awareness, while Soles of the Feet mindfulness was used in one study. The studies ranged in duration of between four and twenty-five weeks, while sessions lasted between five and ninety minutes.

3.6.6. Risk of Bias

Out of the 42 studies 20 were assessed using the Cochrane risk of bias tool for randomised controlled trials. In general there appeared to be a low risk of selection, detection and attrition bias in the studies. The highest potential risk appeared to be for performance bias (i.e. that the studies did not report that either participants or assessors were blind to study aims); 13 out of the 20 studies scored highly on this risk. The risk of reporting bias overall was unclear,

none of the included studies had a protocol which we were able to locate and therefore it was difficult to determine whether all originally intended data and analysis were reported.

Ten of the 42 selected studies were assessed for bias using the Cochrane risk of bias tool for non-randomised studies. Studies were assessed on the following criteria. Bias due to confounding, selection bias, classification of intervention bias, and attrition bias.

For confounding bias, nine studies were rated as low to moderate. That is, either there was no risk of confounding, or any potential confounders were controlled for, the remaining study was rated as high. Selection bias was low to moderate, with only one of the ten studies rated as a serious risk. Classification of intervention bias, was rated low to moderate in nine studies, with two posing a high risk. Attrition bias was unclear overall as the majority of studies did not include these data or make reference to it. Measurement of outcomes was comparable for intervention and control groups in all studies resulting in a low risk across all for bias in this aspect. Again, similar to the RCT studies, we were unable to locate research protocols for the non-randomised controlled studies in this review and therefore cannot comment on risk of bias in terms of reporting results.

3.6.7. Quality assessment

Studies that used a pre-post-test design were assessed for quality using the Effective Public Health Practise Project. Ten of the 12 studies were rated as moderate on selection bias, all of the studies were rated as a moderate on study design due to the pre-post-test design of them. Four studies were rated a serious in regards to confounders, while the remaining eight were rated as moderate. Most of the studies were rated moderate for blinding, attrition bias, and data collection methods.

3.6.8. Outcome measures

The studies included in this review utilised a number of different measures to investigate the effect mindfulness training was having on children and adolescents. Studies were grouped into categories to reflect the different psychological constructs that were identified, resulting in the emergence of a number of different but inter-related themes. While some studies measured a single outcome, others measured more than one. Where a study has measured more than one outcome it has been included accordingly. For example, if a study has measured wellbeing and depression, it will have been included in both study categories, thus the number of studies discussed in the following section will exceed the actual number (42) of studies included in the review.

3.6.8.1. Impact of mindfulness on cognitive functions. Twenty of the included studies in this review reported on one of the following measures of cognitive function; executive function, attention and self-regulation. A further study measured academic outcomes.

3.6.8.1.1. Executive function. Six studies in this review investigated executive function, they all utilised an RCT design, with mixed results. The first study (Quach 2014), investigated the effect of mindfulness training on working memory. 103 adolescents ranging from 12 to 17-years old underwent a four week MBSR program, which was delivered twice a week for a duration of 45-minutes. Significant improvements were observed in the students working memory capacity, as measured by the Automated Operational Span Task (Turner & Engle 1989), in comparison to students who had undertaken a four week Hatha yoga program. The second study (Parker 2014), compared the effects of a four week mindfulness program on inhibition, using the Flanker Task (Eriksen & Eriksen 1970) as a measure of inhibitory control. The authors reported a significant improvement in inhibitory control in the experimental group following a daily mindfulness intervention, in comparison to wait-list controls. However, a further four studies failed to report any significant finding. Schonert-Reichl (2015), also using

the Flanker Task as a measure of inhibitory control, failed to detect any significant changes between the experimental and control group following a 12-week Mind-Up training program. (Flook et al. 2010), which investigated the impact of a 12-week mindfulness program on inhibitory control did not report any significant changes between the experimental group and wait list controls. Similarly, Potek (2010) and Desmond & Hanich (2010) also failed to detect any significant findings between the experimental group and controls following mindfulness training. Interestingly in the two studies where significant changes were reported in the experimental groups, the length of the mindfulness training is shorter in comparison to the studies that did not detect any differences. Note that this may or may not have contributed to the negative findings.

The six studies that investigated the impact of mindfulness training on executive function were combined to calculate an average effect size. Using sample size as weighting, Cohen's d weighted mean effect size was calculated (d = 0.42), indicating an upper small to medium effect size. The combined effect size is representative of the studies as a whole as there was little variation across the six studies (see Table 3.3).

Table 3.3 Cohen's d weighted mean effect size for executive function

Author	Cohen's d	n
Desmond & Hanich (2010)	0.59	40
Flook et al (2010)	0.45	64
Parker (2014)	0.42	111
Potek (2012)	0.32	30
Quach (2014)	0.55	103
Schonert-Reichl (2015)	0.21	99
Sample size weighted mean effect size	**0.42**	

3.6.8.1.2. Attention. Attention was measured in three studies in this review, two (Napoli 2008; Carboni 2013) of the studies reported that mindfulness training significantly improved children's attention, while the third (Ricarte 2015) demonstrated mixed results. One randomised controlled study (Napoli 2008), which measured levels of attention in 6-8 year olds using the Test of Everyday Attention for Children (TEA-Ch) (Robertson, Ward, Ridgeway & Nimmo-Smith, 1996), reported an increase in students' scores of selective attention following a 24-week mindfulness training program that was significantly higher than levels observed in a reading comparison group. Additionally, the author's noted teacher reports of a decrease in attention problems. One pre-post design study (Carboni 2013), again investigating the effect of mindfulness on the behaviour of children with ADHD, reported an increase in the percentage of intervals of on-task behaviour. Similar to the previous study, parents and teachers also reported a decrease in problematic hyperactive behaviour. However, one of the studies (Ricarte 2015), a well-designed RCT which investigated the impact of mindfulness on attention and concentration had mixed results. While they did not find any statistical differences between children who had received mindfulness training and wait-list controls on some measures of attention; trail making test and Perception of differences test-face, they did on others; digital span test. Worth noting is the diversity in sample sizes in each of the three studies to observe significant differences, while the first had 194 students, the latter two had smaller numbers, 17 and four respectively, suggesting that mindfulness may be effective at improving attention regardless of being delivered in small or large groups.

Two of the three studies that investigated the impact of mindfulness training on attention were combined to calculate an average effect size. Using sample size as weighting, Cohen's d weighted mean effect size was calculated (d = 0.53), indicating a medium effect size (see Table 3.4). The effect size could not be obtained for the third study (Carboni 2013).

Table 3.4 Cohen's d weighted mean effect size for attention

Author	Cohen's d	n
Naploi (2008)	0.49	194
Ricarte (2015)	0.72	45
	Sample size weighted mean effect size 0.53	

3.6.8.1.3. Self-regulation. Eleven studies in this review measured the effect of mindfulness training on self-regulation. Ten of these studies reported that mindfulness training had a significant impact on self-regulation. Four of the studies (Parker 2014; Flook et al. 2015; Bergen-Cico 2015; Razza 2015) were randomised controlled trials and reported an improvement in self-regulatory behaviour in the mindfulness groups that was significantly higher than that observed in waitlist controls. A further controlled study (Metz 2013) which was not randomised, reported that children who received mindfulness training had better self-regulatory skills in comparison to those children who had attended classes as usual. Another study which also incorporated a non-randomised design (Broderick 2009), found that children with high rates of disruptive classroom behaviour were more academically engaged and exhibited less off-task behaviour following participation in a brief mindfulness training program, in comparison to controls. Three studies which utilised a pre-post design (Wisner 2008; Klatt 2013; Worth 2013), reported an improvement in children's regulatory behaviour, as measured by the Conner's Teachers Rating Scale (Conner, 1969) and the Behavioural and Emotional Rating Scale (Epstein, 2004) prior to and following a mindfulness training program. Finally, a study which investigated the effect of mindfulness training on the behaviour of three students who were engaged in aggressive and bullying conduct (Campbell 2015), reported a reduction in negative behaviour following mindfulness training, suggesting that mindfulness may be effective in modulating anti-social behaviour. Improvements were still apparent a year after completing the training.

Of the eleven studies included in this review that measured self-regulation, one of the studies did not find any differences to suggest that mindfulness had a significant impact on self-regulation. A well designed controlled study that was not randomised (Singh 2007), failed to find any differences in children's emotional regulation following mindfulness training.

Nine of the eleven studies that investigated the impact of mindfulness training on self-regulation were combined to calculate an average effect size. Using sample size as weighting, Cohen's d weighted mean effect size was calculated (d = 0.40), indicating an upper small to medium effect size, which is consistent with each of the single studies (see Table 3.5). Effect sizes could not be obtained for the remaining two studies (Campbell 2015; Singh 2007).

Table 3.5 Cohen's d weighted mean effect size for self-regulation

Author	Cohen's d	n
Bergen-Cico (2015)	0.44	142
Broderick (2009)	0.09	121
Flook et al (2015)	0.25	68
Klatt (2013)	0.22	61
Metz (2013)	0.40	216
Parker (2014)	0.56	111
Razza (2015)	0.20	29
Wisner (2008)	0.85	35
Worth (2013)	2.07	17
	Sample size weighted mean effect size 0.40	

3.6.8.1.4. Academic outcomes. One of the studies included in this review explored the impact of mindfulness training on children's academic outcomes (Flook et al. 2015). In a controlled trial of 68 children, researchers reported a difference in scores (d = .54), indicating a medium effect, for students who had completed a 12-week mindfulness based program in comparison to waitlist controls.

3.6.8.2. Impact of mindfulness on psychological distress. Twenty four of the studies included in this review reported on one or more of the following measures of psychological distress; anxiety, depression, stress and rumination.

3.6.8.2.1. Anxiety. Eight studies measured anxiety, five of which reported that mindfulness training significantly reduced children's levels of anxiety. Of these five studies, two randomised controlled studies (Sibinga 2013; Lier & Diaz 2010) reported that mindfulness was significantly more effective in reducing levels of anxiety in children than a health education program. While a further two (Ricarte 2015; Potek 2012), also RCT's reported a significant improvement in anxiety in comparison to wait-list controls. The fifth (Beauchemin 2008) a pre-post design study, observed an improvement in adolescents self-reported levels of anxiety after an initial 45 minute mindfulness meditation session followed by short (five minutes) daily practise. However, three of the eight studies did not find any differences in student's levels of anxiety following mindfulness training. Two RCT studies (Lee & Semple 2008; Britton 2014) found no differences between the experimental groups and wait-list controls, while a pre-post design study (Bei 2013), failed to detect any differences in anxiety following a six week mindfulness program.

Seven of the eight studies that explored the impact of mindfulness on anxiety were combined to calculate an average effect size. Using sample size as weighting, Cohen's d weighted mean effect size was calculated (d = 0.43), indicating an upper small to medium combined effect size (see Table 3.6). The effect sizes ranged from small d = 0.02 (Sibinga 2013), to large, for example d = 0.96 (Lier & Diaz 2010). Effect sizes could not be obtained for the remaining study (Beauchemin 2008).

Table 3.6 Cohen's d weighted mean effect size for anxiety

Author	Cohen's d	n
Bei et al (2013)	0.02	62
Britton (2014)	0.18	100
Lier & Diaz (2010)	0.96	18
Lee & Semple (2008)	0.40	25
Potek (2012)	0.85	30
Ricarte (2015)	0.72	45
Sibinga (2013)	0.79	41
	Sample size weighted mean effect size 0.43	

3.6.8.2.2. Depression. Five of the included studies measured depression with mixed results. Three studies found mindfulness to be significantly beneficial in reducing children's self-reported levels of depression. Among them one RCT study (Raes 2013) observed that children had lower levels of depression following an 8-week MBSR program in comparison to students who had attended classes as usual. Similarly, two non-randomised studies (Kuyken 2013; Lau 2011) reported a significant improvement in levels of anxiety among adolescents following mindfulness training, in comparison to those who had attended regular school classes. The remaining two studies (Mendelson 2010; Lee & Semple 2008), each of which utilised a randomised controlled trial did not observe any significant differences between the experimental and control groups following the mindfulness interventions.

The five studies that investigated the impact of mindfulness training on depression were combined to calculate an average effect size. Using sample size as weighting, Cohen's d weighted mean effect size was calculated (d = 0.22), indicating a small effect size. There was variation in effect sizes across the five studies. Two of the studies (Kuyken 2013; Mendelson 2010) showed a small effect, while the remaining three (Lau 2011; Lee & Semple; Raes 2013) showed an upper small to medium effect (see Table 3.7).

Table 3.7 Cohen's d weighted mean effect size for depression

Author	Cohen's d	n
Kuyken (2013)	0.14	522
Lau (2011)	0.49	48
Lee & Semple (2008)	0.40	25
Mendelson (2010)	0.13	82
Raes (2013)	0.31	357
	Sample size weighted mean effect size 0.22	

3.6.8.2.3. Stress. Ten studies in this review measured stress, of which six reported that mindfulness training was effective in reducing self-reported levels of stress in children and adolescents. One randomised controlled study (Sibinga 2016) reported a significant reduction in females stress levels following a 12-week MBSR program in the comparison to females whom had been engaged in a 12-week health education program. A further three non-randomised studies reported similar results (; Kuyken 2013; Campbell 2015; Metz 2013). Two pre-post design studies (Edwards 2004; Joyce 2010), observed significant reductions in levels of stress in adolescents following mindfulness training. However, four studies included in this review did not report any differences in levels of stress following mindfulness training. One non-randomised study did not find any significant reductions in participant's levels of stress (Lau 2011). A further two studies (Mendelson 2010; White 2012) which utilised a randomised controlled trial did not observe any significant differences between the experimental and control groups following the mindfulness interventions. Similarly, a pre-post design (Carmona 2014), did not report any significant differences in participants levels of stress after taking part in an eight week mindfulness program.

Eight of the ten studies that investigated the impact of mindfulness training on stress were combined to calculate an average effect size. Using sample size as weighting, Cohen's d weighted mean effect size was calculated (d = 0.33), indicating a small effect size (see Table

3.8). Effect sizes could not be obtained for two of the ten studies (Campbell 2015; White 2012).

Table 3.8 Cohen's d weighted mean effect size for stress

Author	Cohen's d	n
Carmona (2014)	0.90	84
Edwards (2014)	0.59	20
Joyce (2010)	0.38	120
Kuyken (2013)	0.14	522
Lau (2011)	0.49	48
Mendelson (2010)	0.83	82
Metz (2013)	0.40	216
Sibinga (2016)	0.24	300
	Sample size weighted mean effect size 0.33	

3.6.8.2.4. Rumination. A single non-randomised study (Broderick 2009) investigated the impact of a five week Learning to Breath mindfulness program on rumination in 16-year old females did not report any significant differences between the experimental group and wait-list controls, (d = 0.27) indicating a small effect.

3.6.8.3. Impact of mindfulness on improved psychological health. Fourteen of the included studies in this review reported on measures of wellbeing and resilience.

3.6.8.3.1. Wellbeing. Thirteen studies measured wellbeing, nine of which reported that mindfulness training had a significant impact on levels of self-reported wellbeing. Among them, one randomised controlled study (Schonert-Reicht 2015) observed a significant improvement in levels of wellbeing among 10-year old children following a 12-week Mind-Up program, in comparison to controls who attended regular school lessons. A further three studies (Anand & Sharma 2014; Bluth 2015; Salustri 2010) each utilising a pre-post design, reported an improvement in participants levels of wellbeing following a mindfulness training program in comparison to pre intervention levels. Furthermore, five non-randomised studies

reported an improvement in participant's levels of wellbeing in the mindfulness training groups that was significantly higher than that observed in the comparison groups (Broderick 2009; Schonert-Reicht 2010; Kuyken 2013; Lau 2011; Tharalsden 2012). However, the four remaining studies (Campbell 2015; Van de Weijer-Bergsma 2014; Huppert 2010; Viafora 2015), did not observe any differences statistically between those participants in the experimental conditions in comparison to those who had attended classes as usual. Interestingly, while the age range among the fourteen studies tends to be similar overall, the number of participants in each study sample tends to differ somewhat with the biggest numbers being amongst those studies that did not report any statistical differences between the groups.

Eleven of the thirteen studies that investigated the impact of mindfulness on well-being were combined to calculate an average effect size. Using sample size as weighting, Cohen's d weighted mean effect size was calculated (d = 0.30), indicating a small effect size (see Table 3.9). There was quite an amount of variation in the studies with effect sizes ranging from very small (Van de Weijer-Bergsma 2014) to very large (Viafora 2015). Effect sizes could not be obtained for two of the eleven studies (Bluth 2015; Campbell 2015).

Table 3.9 Cohen's d weighted mean effect size for well-being

Author	Cohen's d	n
Anand and Sharma (2014)	1.50	33
Bluth (2015)	0.30	23
Broderick (2009)	0.02	121
Huppert (2010)	0.34	155
Kuyken (2013)	0.14	522
Lau (2011)	0.49	48
Schonert-Reichl (2010)	0.20	246
Schonert-Reichl (2015)	0.48	99
Tharaldsen (2012)	0.50	81
Van de Weijer-Bergsma (2014)	0.01	199
Viafora (2015)	2.72	48
	Sample size weighted mean effect size 0.30	

3.6.8.3.2. Resilience. One study in this review reported on the impact of mindfulness on levels of resilience. The study (Huppert 2010), was a non-randomised trial which was conducted on a sample of all male adolescents, between the ages of 14 and 15 years. There were no statistical differences between the experimental group and control group following a four week MBSR training program, (d = .34) indicating a small effect size. This study used the Ego Resilience Scale (Block & Kremen, 1996) to measure resilience.

3.6.8.4.. Studies by design. Cohen's d weighted mean effect size was also calculated for studies by design, using sample size as weighting. However, some of the studies have been included more than once as they have measured more than one outcome. For example, Parker (2014) measured self-regulation and executive function, thus it has been counted twice. Of the twenty-five studies that utilised a randomised controlled trial (RCT) effects sizes were obtained from twenty-four studies. The combined effect for these studies was a small effect size (d = 0.39) (see Table 3.10.). Twelve studies utilised a non-randomised controlled trial (nRCT), the effects sizes were obtained from eleven of these studies. The combined effect for studies that employed an nRCT design was small (d = 0.27) (see Table 3.11.). Finally, of the twelve studies that employed a pre-post design (PPD) effect sizes were obtained from eight. Cohen's d weighted mean effect size was calculated (d = 0.61), indicating a medium effect size (see Table 3.11) see Table 3.12.

Table 3.10. Cohen's d weighted mean effect size for randomised controlled trials (RCT's)

Author	Cohen's d	n
Bergen-Cico (2015)	0.40	142
Bluth (2015)	0.30	23
Britton (2014)	0.18	100
Desmond & Hanich (2010)	0.59	40
Flook et al (2010)	0.45	64
Flook et al (2015)	0.54	68
Flook et al (2015)	0.25	68
Lier & Diaz (2010)	0.96	18
Lee & Semple (2008)	0.40	25
Mendelson (2010)	0.13	82
Mendelson (2010)	0.83	82
Naploi (2008)	0.49	194
Parker (2014)	0.42	111
Parker (2014)	0.20	111
Potek (2015)	0.85	30
Potek (2015)	0.32	30
Quach (2014)	0.22	103
Raes (2013)	0.31	357
Razza (2015)	0.10	29
Ricarte (2015)	0.72	45
Schonert-Reichl (2015)	0.21	99
Schonert-Reichl (2015)	0.48	99
Sibinga (2013)	0.79	41
Sibinga (2016)	0.24	300
	Sample size weighted mean effect size 0.39	

Table 3.11 Cohen's d weighted mean effect size for non-randomised controlled trials (nRCT's)

Author	Cohen's d	n
Broderick (2009)	0.27	121
Broderick (2009)	0.09	121
Broderick (2009)	0.02	121
Huppert (2010)	0.34	155
Kuyken (2013)	0.14	522
Lau (2011)	0.49	48
Metz (2013)	0.40	216
Schonert-Reichl (2010)	0.20	246
Tharaldsen (2012)	0.50	81
Van de Weijer-Bergsma (2014)	0.01	199
Viafora (2015)	2.72	48
	Sample size weighted mean effect size 0.27	

Table 3.12 Cohen's d weighted mean effect size for pre-post design (PPD)

Author	Cohen's d	n
Anand and Sharma (2014)	1.50	33
Bei et al (2013)	0.02	62
Carmona (2014)	0.90	84
Edwards (2014)	0.59	20
Joyce (2010)	0.38	120
Klatt (2013)	0.22	61
Wisner (2008)	0.85	35
Worth (2013)	2.07	17
	Sample size weighted mean effect size 0.61	

3.7. Discussion

The aim of this review was to understand what psychological impact mindfulness was having on children and adolescents. In order to answer this question a total of 42 studies that comprised randomised and non-randomised controlled trails and pre-post design studies, were reviewed, from which the following findings were observed. The reviewed studies suggested that mindfulness meditation may have the potential to impact some higher order cognitive functions specifically inhibitory control, working memory, attention, self-regulation and

academic outcomes in children and adolescents. There was also evidence to suggest that mindfulness may have the ability to influence psychological health.

Available studies demonstrated that mindfulness had a significant impact on inhibitory control; participants who received mindfulness training showed greater performance on response inhibition tasks in comparison to wait-list controls. It might be anticipated that mindfulness would affect inhibitory control given that the central tenants of mindfulness are learning to focus attention on present moment awareness, while at the same time learning not to be distracted by other stimuli that is competing for attention. In addition the findings also suggest that working memory is influenced by mindfulness. Children exposed to training exhibited greater performance on automated span tasks in comparison to children who had done hatha yoga. When we become distracted during mindfulness meditation, we need to be able to return to our focal point quickly. Working memory maintains information in an accessible state in service of goal directed behaviour. However, it is susceptible to interruption, so to be efficient it must be capable of maintaining active goal representation in the event of interference; other stimuli competing for our attention (Erikkson et al. 2015). The studies that reported the influence of mindfulness training on executive function; inhibitory control and working memory were combined and resulted in an upper small to medium effect size which was illustrative of the included studies.

Findings also suggest that mindfulness training may have the capacity to improve children's attention. Children who underwent mindfulness training had better scores of attention post intervention in comparison to waitlist controls. Furthermore, children exposed to mindfulness did significantly better on attention tasks than children in a reading control group. Where possible the studies that explored the impact of mindfulness training on children's attention were combined and resulted in a medium effect size. As attention is involved throughout the process of mindfulness meditation, it is not unusual to find that it is impacted

by mindfulness. Improvements in attention as a result of mindfulness might be anticipated, given that it plays a key role in determining what information is processed in working memory (Kane & Engle 2002), in addition models of attention overlap with working memory and inhibitory control (Barkley 1996). There was also evidence to suggest that mindfulness has the potential to impact some educational outcomes. This might be expected given the evidence demonstrating the benefits of mindfulness on higher cognitive functions.

In contrast, there was no evidence to suggest that mindfulness training increased cognitive flexibility. This is mentioned for a number of reasons. Firstly the lack of evidence was not consistent with other mindfulness research in this area, albeit conducted in adult populations. Secondly, it seems counter-intuitive given the nature of mindfulness; training involves learning to become aware of thoughts, feelings and sensations on a moment to moment basis, whilst also learning to acknowledge, but not get caught up in distractions. For example, going onto autopilot, or getting caught up in maladaptive thinking cycles. In essence developing the capacity to transition from one way of thinking; present moment awareness, to another; autopilot or rumination, a process of mental set shifting. The more practised an individual is at being able to switch, or shift their thinking from one dimension to another, the greater their level of cognitive flexibility.

In addition to executive function and attention, there was evidence to suggest that mindfulness training has the potential to influence self-regulation. A total of eleven studies included in the review measured some aspect of self-regulation. Ten of which demonstrated that mindfulness training had the potential to improve self-regulatory factors, with a combined upper small to medium effect size. Children who received mindfulness training demonstrated bigger improvements in self-regulatory behaviour in comparison to wait-list controls, as well as greater improvements in self-reported levels of emotional regulation. Improvements in self-regulation may occur indirectly as a result of improvements in other high order cognitive

processes. For example, better inhibitory control may benefit self-regulation by lessening impulsive or habitual maladaptive thinking like rumination. Alternatively, it may be that mindfulness is capable of eliciting the relaxation response; a physical state of relaxation, capable of influencing the bodies fight or flight response, which may be in a heightened state of alert in times of stress and anxiety. In summary, while the effects of mindfulness on higher order cognitive functions are mixed, there is evidence to suggest that training has the ability to positively impact on some aspects of executive function, attention and self-regulation in children and adolescents.

In addition to improved cognitive function, the studies included in this review suggested that mindfulness training may have the potential to impact psychological health in children and adolescents, in two ways. Firstly, by reducing psychological distress specifically; anxiety, depression and stress, and secondly by increasing positive psychology, in particular wellbeing and resilience. In regards to psychological distress children exposed to mindfulness training had significantly lower levels of self-reported anxiety in comparison to waitlist controls, with further research demonstrating that mindfulness practise was significantly better in reducing anxiety when compared to a health education program. The combined effect size for studies reporting on the impact on mindfulness training and anxiety was small to medium. It was also effective in reducing depression; lower levels of self-reported depression was seen in children who had undergone mindfulness training in comparison to those who had attended regular classes, with combined studies resulting in a small effect size. Mindfulness training also had an impact on stress; significantly lower levels of stress were observed in children following a mindfulness intervention in comparison to waitlist controls, with a combined study small moving towards a medium effect.

As well as reducing psychological distress there was evidence to suggest that mindfulness training may potentially increase psychological health. Fourteen studies included

in this review measured some aspect of wellbeing or resilience, twelve of which demonstrated a significant increase in children's self-reported levels of wellbeing following a mindfulness intervention, in comparison to controls, with a small effect size.

Effect sizes were also obtained for studies according to their design. Those that utilised a randomised controlled trial showed an upper small to medium effect, while those that employed a non-randomised controlled trial showed a small effect. The largest combined effect size was seen in those studies that used a pre-post design, d = 0.61., indicating a medium to large effect size.

It is likely that the observed benefits to children's psychological health are a result of having more present moment awareness that results from mindfulness practise. Becoming more aware allows individuals to experience their thoughts and feelings more directly, to an extent that they are able to recognise thoughts as mental events and feelings as transitory, thus enabling them to recognise when they are getting caught up in behaviour and thinking patterns that are not helpful. Accordingly, there is a suggestion that mindfulness training may reduce psychological distress, and improve mental wellbeing and resilience in children and adolescents by means of improved self-regulation, most likely as a result of improved cognitive function

3.7.1. Summary and critique of the literature.

This review aimed to investigate the psychological impact of mindfulness training on children and adolescents. While research in this area is still emerging, there was sufficient literature to demonstrate that using mindfulness with children and adolescents is beneficial. Among the studies that were reviewed there was evidence of improvements in two core areas of executive function, namely working memory and inhibitory control, as well as improved

function in attention and self-regulation, and in addition some academic outcomes Moreover, children and young people who received mindfulness training demonstrated a reduction in psychological distress, and an improvement in psychological health. However, while these findings are encouraging there were a number of limitations within the literature.

Of the research that explored the impact of mindfulness on executive function, the sample used in the study examining the effects of mindfulness on attention (Quach 2014), were from a school that was situated in a low socioeconomic community. Research demonstrates that students from low socioeconomic backgrounds score lower on measures of academic outcome and attention in comparison to students from more advantaged backgrounds (Noble et al. 2005). In addition, research also shows that students who perform lower on these measures show the greatest improvements following pedagogical interventions (Bradley & Corwyn 2002). It is possible that the participants in this study began with lower scores and particularly benefited from the intervention to an extent which may have been reflected in the results. In addition the research exploring the effects of mindfulness on inhibitory control (Parker 2014), used a wait-list control. As has been mentioned previously, the disadvantage of using this type of control is that participants may be inclined to think that they are not personally capable of achieving positive change, and thus wait until they receive treatment. Furthermore in the research that explored the impact on mindfulness on attention (Worth 2013), one of the studies used a pre-post design. This prevented the researchers from being able to rule out the possibility that any changes in attention were a result of maturation and not attributable to the mindfulness intervention.

In the research examining the impact of mindfulness on children's self-regulation, a number of the studies reporting significant findings contained an amount of methodological limitations. In one study (Razza 2013), the authors did not test for group differences before delivering the mindfulness intervention. Thus it is possible that any group differences, were

merely a result of pre-existing differences, which existed between the groups prior to the mindfulness training. In addition, a further study again, exploring the effects of mindfulness on self-regulation (Bergen-Cico 2015), collected data using self-report measures. In addition to the usual problems associated with using this type of measure, for example, social desirability bias, or a lack of understanding by the participant to some of the items included in the measure, there is also the issue of sample control. Previously when participants completed measures it was in the presence of the researcher, however, with the increasing use of online measures, as was the case in this study, there is the possibility that the person filling in the survey is not the same person whose ID is being entered. For example, participants do on occasion get measure fatigue, whereby they get to a point where they are no longer interested in completing measures. It is less easy to monitor against this with online surveys, and thus it is difficult to know for certain that the findings are a true result of the intervention.

A further study which incorporated a non-randomised control design, used a non-comparative control to make comparisons (Broderick 2009). The authors compared the results of mindfulness training on measures of self-regulation in senior students to junior students who had not had any training. The lack of equivalence amongst these two groups makes any findings from this study considerably less robust, than they might have been, had they used a more equivalent control. Finally, in regards to self-regulation a number of the studies utilised a pre-post design (Klatt 2013; Wisner 2008; Worth 2013). With this type of design it is difficult to rule out the effects of maturation on children's ability to self-regulate which goes through considerable change in childhood (Vogler et al. 2008). The single study which measured academic outcomes, although a well-designed study, was limited in its finding as a result of relying on students regular grades as a measure of improvement. While student grades are an indication of progress they are not always specific enough to determine

how a particular intervention may be affecting progress. In addition the absence of a standardised instrument makes it difficult for future researchers to replicate this study.

In addition to executive function, there were also a number of limitations present in the research examining the impact of mindfulness on psychological distress. In one of the studies that measured anxiety (Lier & Diaz 2010), the researchers included an active control to act as a comparison to mindfulness. However, while reference is made in the study to participants playing games in the mindfulness intervention, there is no such mention of games being played in the health education intervention. In contrast, the authors state that the health education intervention consisted of standard lessons which covered the importance of activity, healthy food and stress management. Thus, the researcher cannot determine for certain that changes in children's levels of anxiety, were a result of mindfulness training, and not the consequence of stress relief, brought about by attending lessons involving playing games and relaxing. Of course this is merely speculation, and future studies would need to be conducted in order discount this possibility. However, it does emphasises the importance for studies comparing the effects of mindfulness on children to incorporate controls that are equivalent in such a way as to allow for other variables, in this case playing games and having fun, to be ruled out. Finally, of the studies that reported on the benefits of mindfulness to improve psychological health, none of them included a control with which to compare their findings. This limits the research, making it difficult to know if in fact the findings are attributable to mindfulness or are a result of some other variable that has occurred as a consequence of being exposed to the interventions.

The studies that were included in this review contained a number of limitations, the most consistent being either the absence of a control group or the lack of an equivalent control group. In addition while standardised instruments were used to measure the various outcomes in the included studies, this was not the case in the research exploring the effects of

mindfulness on academic outcomes. Nonetheless, there was evidence to suggest that mindfulness has the potential to benefit children and adolescents. Consequently more research, and in particular research which is designed to address the limitations that were emphasised in this review, is required to explore the potential use of mindfulness with children and adolescents further.

3.7.2. Proposed theoretical framework

While the number of studies investigating the effects of mindfulness in this age group is growing, there is still a scant amount of research overall that attempts to explain *how* it is that mindfulness training asserts such positive change and transformation. Thus the following framework is proposed as an approach to understanding how mindfulness may work. The framework is based on the following propositions, which are themselves based on the results of reviewed evidence in Chapters two and three. First, mindfulness heightens awareness through a process of engaging, developing and strengthening the three core components of executive function; inhibition, switching and updating. Second, increased capability in executive function, as well as heightened awareness, impacts the individual in the following two ways; it fosters change in self-regulatory behaviour, which is capable of influencing psychological health, in addition it leads to greater metacognition, providing an opportunity to experience stimuli, in an objective and non-evaluative manner, providing further benefit to psychological health (see Figure 3.2.). The proposed framework is discussed in detail below.

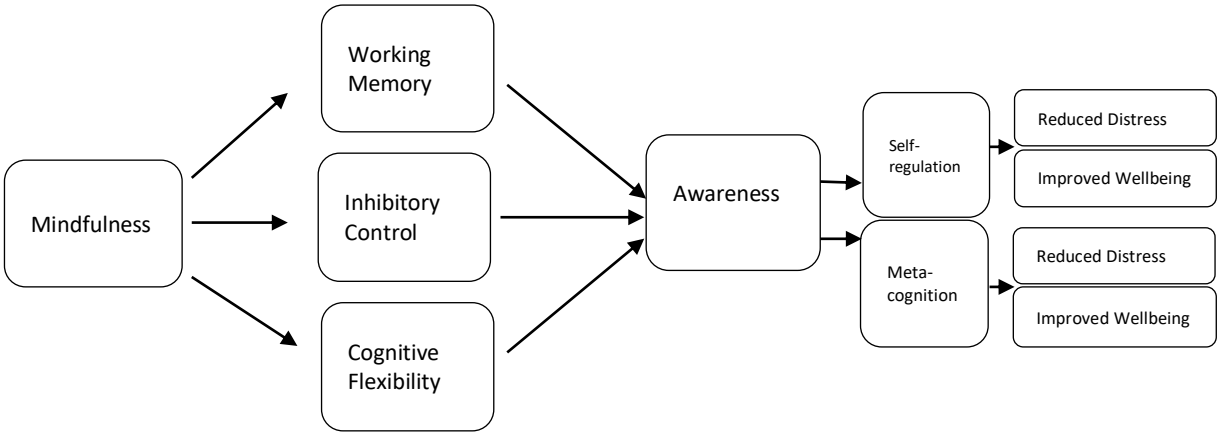


Figure 3.2. Diagrammatic representation of proposed theoretical framework of how mindfulness asserts change.

The first proposition of this model, or theory of change is that mindfulness training potentially engages the three core aspects of executive function: working memory, inhibitory control and cognitive flexibility

Working memory. The goal of mindfulness meditation is to maintain attentional focus on the body, which is usually achieved by focusing on the breath as it enters and leaves the body, or alternatively by focusing on different physical sensations as they evolve in the body. Working memory is a limited resource, with research demonstrating that only a small number of items can be held in focus simultaneously (Vogel et al. 2001). The role of attention is to maintain and update task-relevant information, it influences working memory by biasing the encoding of information, so that only those items that are relevant to the present processing goals are held in focus. When we focus attention on the breath, we engage working memory by means of attentional processes. The continued focus of the breath, develops focused attention to an extent that the more we meditate the greater our capacity to hold the goal *breath* in sight. Mindfulness meditators perform better on the Operational Span Task, a measure of the updating function of working memory, compared to non-meditators (Quach 2016).

Inhibitory control. While the goal of mindfulness is to maintain focus, becoming distracted is an inevitable part of meditation. Through practice we become more adept at realising when we have become distracted, and more efficient at being able to acknowledge the distraction and refocus our attention, in essence we become more skilled in the practice of deliberately inhibiting distracting stimuli. Inhibitory control is engaged during mindfulness when we deliberately inhibit dominant, prepotent, automatic responses. Continued practice of inhibiting competing stimuli is reflected in the speed at which we are able to recognise distraction. Experienced meditators perform better in Stroop tasks, a measure of inhibitory control, compared to naive meditators (Wenk-Somaz, 2005).

Cognitive flexibility. As well as focusing attention and inhibiting distractions, mindfulness training also involves switching attention between different mental sets;

focus; *pay attention to the breath*,

distraction; *acknowledge stimuli that is competing for attention,* and

back to focus; *return your attention to the breath.*

Shifting between mental sets unconsciously is typical in mindfulness meditation, especially for those new to it. However, as we become more practised in mindfulness, and thus more aware, we become more adept at recognising when our attention has shifted from conscious engagement to automatic processing, and equally more competent at shifting again. Mindfulness was associated with increased cognitive flexibility, using lower Stroop interference scores (Alexander et al. 1989). Mindfulness meditation may heighten awareness through a process of engaging, developing and strengthening the three core components of executive function; inhibition, switching and updating.

The second proposition of this model, is that mindfulness training fosters change in self-regulation, and leads to greater meta-cognition, both of which are capable of influencing psychological health.

Increased capability in executive function, as well as enhanced awareness, fosters change in self-regulatory behaviour, which is capable of influencing psychological health. Employing Hoffmann, Schmeichel & Baddeley's (2012) proposition that self-regulation is supported by the core aspects of executive function, it is proposed that working memory enables active representation of self-regulatory standards, as well as down-regulation of rumination and negative affect. Inhibition prevents impulsive, habitual reactions that may threaten standards, while cognitive flexibility facilitates task switching; abandoning sub-optimal means of goal pursuit in favour of alternative, optimum means. Improvements in higher order cognitive processing facilitates better self-regulation, fostering greater emotional and behavioural regulation. This results in reduced negative affect, which is likely to account for the observed reductions in depression, anxiety and stress that are reported by participants following mindfulness training, and improved positive affect, again likely to account for the increased resilience and wellbeing that emerges following mindfulness practise.

The cumulative effect of improved higher order cognitive function and heightened awareness provides an opportunity to develop metacognitive processes, especially metacognitive awareness, becoming aware of one's awareness, essentially increasing awareness. Metacognitive awareness facilitates objective awareness, developing a person's capacity to experience internal and external stimuli objectively, to the extent that thoughts, feelings and sensations are identified as transitory events and not a part of the self, a process of decentering (Safran & Segal 1990). The ability to decenter, and the extent to which an individual can, is thought to have an impact on psychological health.

Based on the propositions of this theoretical framework it might be reasoned that the combination of reduced distress and improved wellbeing in students may potentially put them in a better position to engage academically. For example a student who is not concerned with mental health issues, and who is feeling well in general may find it easier to concentrate at school, and potentially be more motivated to engage in the learning process. In addition how an individual feels may affect how they approach a task, a distressed student may be more inclined to give up earlier on a task, compared to a student who is experiencing good levels of wellbeing and resilience.

In summary, this proposed theory of change suggests that mindfulness training asserts positive change and transformation by improving higher order cognitive processes, specifically working memory, inhibitory control and cognitive flexibility, which in turn heightens awareness. Improved executive function, and heightened awareness then leads to greater metacognition, and changes in self-regulatory behaviour, which subsequently results in reduced psychological distress, and improved wellbeing and resilience.

3.7.3. Strengths and limitations

This review was conducted using a systematic methodology as advised in the PRISMA guidelines of systematic reviews. Inclusion of studies in this review was independently assessed by two authors. Because this is an emerging field of research a decision was made to include papers that had a pre-post design as well as RCT's and nRCT's. While a comprehensive search of the literature was carried out, the majority of the studies included in this review consist of journal articles.

3.7.4. Future research

The effects of mindfulness training on children and adolescents is an emerging field. A number of well-designed studies have indicated that teaching children to be more mindful may

improve cognitive function and in addition enhance mental health. In order to further understand the benefits of mindfulness training, future studies could incorporate comparative interventions into their design to allow for comparisons to be made between mindfulness and other interventions, which may be equally capable of achieving the same cognitive and emotional benefits as mindfulness. For example, the inclusion of a program designed to elicit relaxation in participants, would allow researchers to compare the effects of mindfulness with relaxation. This would determine if any of the reported changes that are being attributed to mindfulness are indeed a result of mindfulness, or merely occur because an individual is more relaxed. In addition, the inclusion of a program that contains some educational aspects might allow researchers to establish if mindfulness is entirely capable of eliciting the changes that have been alleged, or if mindfulness programs inadvertently contain some pedagogical aspects that are contributing to the changes which are being attributed to mindfulness.

3.7.5. Conclusion

The aim of this review was to explore the psychological effects of mindfulness practise on children and adolescents, and using the subsequent findings, propose a theoretical framework from which these effects could be understood. The results of the review suggest that mindfulness training may have the potential to impact some higher order cognitive process, as well as influence psychological health in children and adolescents. The proposed framework suggests that this may be achieved through a process of increased capability in executive function, heightened awareness, greater meta-cognition and changes in self-regulation. The result of which is improved psychological health. It was postulated that a combination of reduced psychological distress and improved wellbeing might have the potential to influence schoolchildren's academic performance in the following way. Firstly by improving general wellbeing, which may enable students to engage more, and secondly, by changing approach to task which may impact task outcome.

3.7.6.. Summary

This chapter presented the systematic review that was conducted as part of the thesis and in doing so has provided the rationale and justification for undertaking this research. The next chapter is a detailed presentation of the methods that were used in this thesis.

CHAPTER 4

4. Methodology

Chapter Overview

This chapter provides a detailed discussion and justification of the methods used in the thesis, as well as a justification for the decisions that have been taken methodologically. It discusses the design approach taken to answer the research question, the sampling process, the interventions used in the study, the choice of measures, study procedure, and finally the analytical approach taken in the thesis.

4.1. The research question

This thesis aimed to evaluate the impact of mindfulness training on schoolchildren's performance on measures of basic skills (literacy and mathematical computation), and to understand some of the social, emotional and behavioural relationships that may exist between mindfulness training and academic performance. A further aim of this research was to determine whether any positive effects of the intervention, if observed, were as a result of mindfulness training specifically and not attributable to other possible interpretations, such as merely inducing a relaxed state of mind, or time spent with members of the research team in an intervention setting.

4.2. Research hypotheses

The following four hypotheses were proposed to answer the research question.

1. Teaching mindfulness to Year 10 schoolchildren in an inclusive school environment will lead to significantly increased levels of mindfulness, and

subsequently significantly increased levels of resilience and wellbeing, compared to children who receive alternative controls (PMR and SS).

2. Teaching mindfulness to Year 10 schoolchildren in an inclusive school environment will also have a significant impact on academic outcomes, specifically measures of reading, reading comprehension, spelling and maths computation, compared to children who receive alternative controls (PMR and SS).

3. Teaching mindfulness to Year 10 schoolchildren will lead to significantly increased levels of attention compared to children who receive alternative controls (PMR and SS).

4. Teaching mindfulness to Year 10 schoolchildren will lead to significantly reduced levels of anxiety compared to children who receive alternative controls (PMR and SS).

4.3. Rationale

Much of the research examining the effect of mindfulness on children is conducted using a pre-post design or a randomised controlled design, with either a waitlist or a 'business as usual' control in which the children in the control groups receive no alternative intervention, but merely engage with whatever they would usually do whilst at school during the intervention period. While these studies have progressed our understanding in regards to how mindfulness may impact children, it is not always clear if the findings are due to the mindfulness training or are the result of other factors. For example, mindfulness meditation involves following the breath as it enters and leaves the body, while participants are instructed not to alter their breath whilst meditating, directed instead to let it occur naturally, it is difficult, certainly for beginners not to slow their breathing down. When the breath is slowed there is a possibility that relaxation

inadvertently occurs due to activation of the parasympathetic nervous system, which is known as the relaxation response (Herbert 1975). It is difficult, therefore, to know if children are experiencing mindfulness as a form of relaxation, which may be the reason for the purported changes that occur due to mindfulness training. Research that compared the effects of a mindfulness intervention with a relaxation program in medical students on measures of psychological distress and positive mood states, observed a significant decrease in participants levels of distress in both groups and a significant increase in positive mood states, again in both groups. Demonstrating that both interventions were equally capable of affecting psychological states (Jain et al. 2007). In addition, many of the mindfulness programs that are delivered to children in an educational context, for example, the Mind Up and .b programs have been designed purposely for that reason, so consequently contain an element of pedagogy. Again it is not possible to rule out the possibility that it may be these instructional aspects of the mindfulness programs that affect change and not the mindfulness itself. Finally, it is possible that the use of business as usual controls, rather than active controls, limit the interpretation of findings, as it is possible that observed benefits are attributable to Hawthorne effects (i.e. participation in the intervention, and the associated close contact with third party researchers, may cause the children to change their behaviour or motivation to learn).

4.4. Research design

To accomplish the aims of the research, this study used a quasi-randomised controlled trial design with comparisons between the experimental group, the mindfulness intervention and two active controls, namely a study skills program and a progressive muscle relaxation intervention. While the inclusion of a no treatment control group would have allowed for comparisons to be made, between children who were exposed to the three interventions with those who attended school as usual, this was not feasible. The reason for this was that the researcher was responsible for delivering all of the measures that were used in this thesis and

logistically was not able to administer any further measures. While a true randomised controlled trial (where children were allocated to conditions randomly) would have been the most appropriate choice of study to answer the research question, this was not possible on a practical level as the classes that were the focus of the research were already intact and it was not possible to randomise at pupil level. As a result, randomisation was conducted at the whole class level.

The study employed nine outcomes measures of mindfulness; wellbeing, resilience, anxiety, attention, spelling, maths word reading and reading comprehension, these were delivered prior to, immediately after and three months following the delivery of the interventions. Classes were allocated to the intervention arms of the trial using a randomly-generated allocation sequence in Microsoft Excel. The research was initially designed as a single study with the intention of combining the data across all three studies into a single data set. However, due to differences in sample sizes, a decision was taken to treat each school as a separate study. Thus, to test the research hypotheses, three separate studies were conducted across three separate schools. The first and second study tested the first two hypotheses, while the third study tested all four.

4.5 Sampling

A total of 27 schools in the Coventry area were approached and invited to participate in the study. The schools were chosen from the Coventry City Council schools website by accessing the 'schools and their contacts' category page and further accessing the sub category of secondary schools. All school types within the sub category were contacted by an initial letter of invitation to school heads via email (see Appendices A). Recruitment was focussed in a single geographical region in order to lessen travel between schools in anticipation of recruiting more than one school to the project. Out of the 27 schools approached, nine responded with interest. Following initial meetings to discuss the research, five schools agreed

to take part. A final three schools were chosen on the basis that they met the eligibility criterion. The eligibility criterion was that all Year 10 pupils were given the opportunity to take part in the research. Year 10 pupils were targeted for this study as they were considered to be at an age that would most benefit from taking part in the study; they were in the first year of GCSE study, and any benefits that resulted from participating may impact positively on school outcomes. Following agreement from the school head, a subsequent invitation was then extended to all Year 10 students.

Participants were included in the research on a voluntary basis, once parental consent had been given. A total of 201 students from across three schools participated in the three studies reported in this thesis. To the best of the researcher's knowledge none of the schools that participated had been involved in any similar research previously.

Pupils were given a recruitment pack which contained an information sheet explaining the study and relevant background to the research, and an informed consent sheet, (see Appendix B and C) Students were told that there was a four week time frame in which they must return the informed consent sheet with both their own and parental/guardian consent in order to take part in the research. Only those students who returned their consent forms within the four week deadline were permitted to take part in the study. Participants were given a de-brief sheet, informing them of the nature of the research on completion of the final measures (see appendix D).

Each of the three empirical studies (chapters five, six and seven) contains a methods section where there is a more detailed discussion regarding participants, participant schools and the location of the schools.

4.6. Interventions

4.6.1. Mindfulness. Mindfulness training was delivered to the participants using a standardised mindfulness program called .b (pronounced "dot b"). The .b program was chosen for this research for a number of reasons. Firstly, it was designed specifically for use with children and young people in a school setting. Secondly, it was designed by teachers, which was thought to be a benefit due to their first-hand experience of delivering mindfulness in a school setting. Also the program was standardised and manualised which ensured replication of the research. Finally, the format was relatively simple to learn and equally simple to deliver. The .b (Stop-Breath Be) mindfulness curriculum was created by The Mindfulness in Schools Project (MiSP). The course was designed to introduce students aged 11 to 18 years-old to the concept of mindfulness. The .b curriculum is an introduction to mindfulness, and comprises a set of nine lessons, each of which teaches a distinct mindfulness skill and is designed to do so in a way that engages young minds. .b strives to help the young people that experience it to overcome difficulties, thrive and flourish (Mindfulness in Schools Project n.d.). It is aimed at helping students to experience greater wellbeing, fulfil their potential and improve concentration and focus, as well as helping them to work with difficult mental states such as anxiety and rumination and to cope with everyday stresses such as exam anxiety (Mindfulness in Schools Project n.d.).

Although the .b curriculum was designed to be delivered over ten weeks, it was delivered over nine weeks in this research due to time restraints set by each of the schools participating in the studies, thus the introductory session was incorporated into the first lesson.

The introductory session introduced students to the concept of mindfulness, in a way that was relevant to them. Lesson one introduced them to the concept of attention and how it could be directed and trained. Lesson two explored different mind states and how anchoring or fixing attention in the body could be calming. Lesson three taught students how to recognise

worry and techniques to deal with it. Lesson four taught students how to respond rather than react to internal and external stimuli. In lesson five, students were taught how to move mindfully, and were encouraged to do some mindful walking. In lesson six, students were shown different ways to relate to their thinking, while lesson seven involved dealing with difficult emotions. Lesson 8 was about gratitude, were students were encouraged to focus on what was good in their lives. The final lesson was a consolidation lesson, designed to bring all of the previous sessions together. The program also encouraged students to engage in home practise. The home practises were usually an extension of what the students have learnt that week, for example, in lesson five where they had been taught mindful walking that week's home practice was to engage in some mindful walking. Each of the nine lessons lasted for approximately 40 minutes.

To deliver the .b program the Mindfulness in Schools Project (MISP) stipulate that an individual needs to be either a fully trained classroom teacher, (as well as qualified to deliver .b), or to work with a fully trained teacher, (again as well as being qualified to deliver .b). This ensures that teaching time is spent delivering the intended mindfulness content, as opposed to classroom management. Thus, because the intervention was not taught by a qualified teacher, in each of the 3 schools a fully qualified teacher was present throughout the delivery of the mindfulness intervention so that the intervention was delivered as intended. The .b intervention was delivered by the researcher, who was trained and approved to teach the '.b' element of the Mindfulness in Schools curriculum and who, in addition, is a qualified adult teacher of mindfulness. While it would have been preferable to have the intervention delivered by someone who was not involved in the research, due to time and money constraints this was not an option. For an overview of the topics covered in each of the mindfulness sessions see Appendix G. For a more detailed explanation of the .b program and the 9-lessons, please refer

to the Mindfulness in Schools Project website which can be found at the following (https://mindfulnessinschools.org).

4.6.2. Progressive Muscle Relaxation. The Progressive Muscle Relaxation technique (PMR; Jacobson 1922) (see Appendix H) was used as an active control intervention. PMR is a method for learning how to monitor tension in each of the specific muscle groups throughout the body by deliberately inducing tension in each muscle group. Tension is then released, with attention paid to the contrast between tension and relaxation. The technique is thought to help individuals bring their nervous system back into balance by producing a relaxation response. The relaxation response is regarded as a mentally active process that leaves the body relaxed, calm, and focused. The PMR technique has been used to alleviate minor stress and anxiety. The sessions were delivered over nine weeks, with each session lasting for approximately 40 minutes. The sessions were delivered at the same time each week and involved the students being in a seated position and following a set of instructions. Examples of the instructions given to participants include "tighten the muscles in your forehead by raising your eyebrow as high as you can. Hold for 10 seconds if that is ok, then release and feel the difference" or "moving onto the muscles in your lower leg I want you to tighten the muscles by tensing your calf. Hold for ten seconds if it is ok to do so, now release and notice how different it feels when the muscle is not tense".

Since this intervention was being used as an active control to compare the benefits of mindfulness with an equivalent intervention and to rule out the possibility that any findings were not merely a result of muscle relaxation, it would have been preferable to have it delivered by an individual who was both expert in PMR and yet had no knowledge of mindfulness. While this was possible in one of the studies, study three, where the intervention was led by a Coventry University doctoral researcher who is a qualified occupational therapist, expert in the delivery of progressive muscle relaxation, and who in addition had very little knowledge of

mindfulness, it was not possible across all three studies. Therefore, in studies one and two the intervention was led by a senior lecturer from Coventry University who is a trained adult mindfulness teacher, who in addition has an understanding of PMR. While the decision to use an individual who is expert in mindfulness to deliver PMR seems counterintuitive, the decision was made based on the following assumptions. Someone who is familiar in the delivery of experiential mindfulness may have the advantage of being able to deliver an intervention which although may seem similar in structure, is very different in principle. Understanding the differences between the two interventions should ensure that PMR was delivered entirely as a relaxation intervention and did not inadvertently contain any aspects of mindfulness.

For reasons of parity it would have been preferable to use the same person to deliver the PMR intervention across all three studies. However, due to time constraints imposed by the schools, as well as the individual's own time constraints, this was not an option and is therefore acknowledged as a flaw in the design of this research. To ensure equivalence across all three studies the second researcher was instructed in the delivery of the PMR program by the lead researcher as the previous researcher had been. In addition, the new researcher met with the previous researcher to clarify that they had the same understanding of how the program should be delivered. In each of the schools where PMR was delivered the researchers were accompanied by a member of staff, who was responsible for classroom management for each of the nine sessions. This ensured that the teaching environment was the same in each of the three interventions. PMR was chosen as an active control to counter any changes that may have occurred in the experimental group as a result of possible relaxation which may be a side effect of mindfulness training.

4.6.3. Study Skills. The second active intervention was a study skills program (see appendix I), which was designed by the researcher, with the help of teaching experts. This was a nine week program intended to deliver a number of different study skills to the students that

would be useful to their regular school work. The sessions covered a number of different topics including organisation skills, mind mapping, memory skills, critical thinking, teamwork and creative thinking. The sessions were fun and interactive and were designed to reproduce the levels of teacher contact experienced by the students in the mindfulness group. The study skills sessions were delivered over a nine week period and lasted for approximately 40 minutes. The study skills sessions were led by the researcher (i.e. the same person that delivered the .b mindfulness intervention). While it would have been preferable for the program to have been delivered by someone who was not involved in the research this was not possible, due to financial constraints. As in the mindfulness and PMR conditions, a member of school staff accompanied the researcher for each of the nine sessions, and was responsible for classroom management. Again, this ensured that the teaching environment was equivalent in each of the three interventions. The study skills program was designed as an active control to counter any changes that may have occurred in the experimental group as a result of the .b intervention inadvertently containing aspects of pedagogy.

While this research was designed to address limitations that exist in the literature, specifically the absence of equivalent active controls, the design was not without limitations. It would have been preferable if the relaxation control had been delivered by a single individual, expert in PMR and naive to mindfulness, this would have ensured that the relaxation intervention was entirely free of mindfulness. In addition it would have been preferable if the study skills and mindfulness interventions had not been delivered by the researcher, as this would have reduced the possibility of experimenter bias. The researcher acknowledges that this research would have benefited from being conducted as a blind trial, had the resources been available.

4.7. Measures

4.7.1. Wide Range Achievement Test Academic performance was measured using the Wide Range Achievement Test, fourth edition (WRAT4; Wilkinson & Robertson 2006). The WRAT4 comprises four 4 subtests; spelling, maths computation, word reading and sentence comprehension. The spelling subtest assesses a participant's ability to spell and consists of letter writing and word spelling. The first part, letter writing requires the participant to correctly write down 15 letters that are read aloud to them, a point is scored for each correctly written letter. Part two, word spelling, requires the participant to write the correct spelling of an increasingly difficult succession of words read aloud to them. They receive a point for each correctly spelled word. The maths subtest is designed to assess an individual's basic mathematical ability through number identification, counting, problem solving and calculating written mathematical questions. It is made up of two parts; oral maths and math computation. The oral section is administered individually and consists of number counting and problem solving, participants can score a maximum of 15 points. The math computation section consists of 40 increasingly difficult computations and can be administered on an individual or small group basis. Participants are given 15 minutes to complete the test and score a point for each correct computation. The word reading subtest measures a participant's ability to read aloud individually presented orthographic strings. It consists of letter reading and word reading. Part one, letter reading is made up of 15 letters which the participant is instructed to read aloud, a single point is given for each correct answer. Part two, word reading which comprises of 55 increasingly difficult words. Participants are requested to read each word aloud and score one point for each correct response. Testing continues until participants have read all of the test items, or until they make 10 consecutive errors. The sentence comprehension subtest contains 50 items of between one and two sentences. Participants are required to fill in a missing blank within the sentences using one or two words to illustrate their comprehension of the sentence.

This section of the test is administered individually and a point is scored for each correct response given by the participant. The WRAT4 is designed for use with children as young as five years through to adulthood. While each of the subtests (except for reading comprehension) has two parts, the first part is generally designed to be used with younger children, usually those between the ages of five and seven years.

4.7.2. Cognitive and Affective Mindfulness Scale Revised (CAMS-R) Mindfulness was assessed using the Cognitive and Affective Mindfulness Scale Revised (CAMS-R; Feldman, Hayes, Kumar, Greeson, & Laurenceau, 2006; see Appendix C). The CAMS-R is a 12-item inventory designed to measure mindfulness based on the definition by Kabat-Zinn (1994), "awareness that emerges through paying attention on purpose, in the present moment, non-judgementally moment to moment". The authors conceptualised mindfulness as having four separate domains; attention, present focus, awareness and acceptance (non-judgemental). Sample items include "I can tolerate emotional pain" and "I am preoccupied by the past". The scale utilises a four point Likert scale, with responses ranging from 1 - rarely/not at all, to 4 - almost always, with higher scores reflecting greater levels of mindfulness. The scale asserts that individuals have a number of ways of relating to their thoughts and feelings, and asks respondents to rate how each of the included items applies to them. While the scale is designed to assess the different elements of mindfulness it does not measure them separately, but instead produces a single total score. The authors report the internal consistencies of the CAMS-R as ranging from .74 to .80 (Cronbach alpha). Construct validity was supported by positive correlations with wellbeing, cognitive flexibility, clarity of mood; and negative correlations with rumination, worry, depression, anxiety and experiential avoidance (Feldman et al. 2006). The internal reliability for this scale in the present research was acceptable at all 3 time points, pre-post and three month follow-up; ($\alpha = .84$, $\alpha = .74$, $\alpha = .72$) respectively. The CAMS-R was self-administered by each of the participants in this research in the presence of the researcher,

using pencil and paper. The tests are scored by adding each items together, except in the case of items two, six, and seven, which are reverse scored. In the present research however, the tests were scored by adding the data into Microsoft excel and importing them into SPSS where overall scores were calculated. This scale was chosen for two main reasons. Firstly it was developed to measure the concept of mindfulness based on the definition by Kabat-Zinn (1994), the same definition that has been used throughout this thesis. Secondly, it was a relatively brief measure, constructed with simple language, which was felt would be beneficial to the young age of the participants in this study. However, it is worth noting that had an equally reliable scale, that was designed specifically for use with children been available, that would have been the preference.

4.7.3. Warwick-Edinburgh Mental Well-being Scale Wellbeing was measured using the Warwick-Edinburgh Mental Well-being Scale (WEMWBS; Tennant, Hiller, Fishwick, Plat2, Joseph, Weich, Parkinson, Secker & Stewart-Brown 2007; see Appendix D). The WEMWBS is a 14 item scale designed to measure a broad conception of wellbeing including affective emotional aspects and psychological functioning. Sample items include "I've been interested in new things" and "I've been feeling good about myself". The scale utilises a five point Likert scale, ranging from none of the time (1) to all of the time (4), and is scored by summing all the items into a total well-being score (range 14–70). The WEWMBS has been shown to have good validity; internal consistency of .80 (Cronbach alpha) as well as good face validity, it was reported to cover the majority of a range of concepts associated with positive mental health, including positive affect, satisfying interpersonal relationships and positive functioning. In addition this scale also seems less prone to social desirability bias; the correlation between overall score and the impression management sub-scale of the BIDR was lower in comparison to other measures that were tested, (not including the PANAS) (Tennent et al. 2007). Internal reliability for the present research was good at all three time points (α = .83, .89, .92

respectively). The WEWMBS is a self-report measure that is administered in individual format; in the current study in the presence of the researcher. Method of administration is pencil and paper. Overall scores are calculated by adding the score of each individual item. In the case of this research however, tests scores were entered into a spreadsheet in Microsoft excel and then imported into SPSS where overall scores were calculated. The WEWMBS scale is a relatively short scale with 14 items in total, in addition the items are clearly written in a way which is accessible to young people. For these reasons it presented a good choice of instrument to capture wellbeing levels, in the sample used in this research.

4.7.4. Ego-Resilience Scale Resilience was measured using the Ego-Resilience Scale (ER-89; Block & Kremen, 1996). The ER-89 is a 14-item inventory designed to measure ego-resilience and ego-control, (a person's capacity to respond appropriately to situational demands). The scale employs a 4-point Likert scale with responses ranging from 1 – does not apply at all to 4- applies very strongly. High scores reflect high levels of resilience. Sample items include "I enjoy dealing with new and unusual situations" and "I quickly get over and recover from being startles". This measure demonstrates good construct validity against accepted criteria (Block & Kremen 1996: 357). The scale was shown to have good internal reliability at each time point in the current research (α = .78, .76, and .83 respectively). This scale was chosen as a measure of resilience, as it is commonly used to measure an individual's capacity to adjust behaviour and responses to varying situational demands (Tugade & Fredrickson 2004). The method of administration for the ER-89 is pencil and paper. It is a self-report measure that is administered in an individual format. Overall scores are calculated by adding the score of each individual item. In the case of this research however, tests scores were recorded in Microsoft excel and imported into SPSS where overall scores were calculated. This scale was chosen as it was considered brief, as well as accessible for the age of the participants in this thesis.

4.7.5. State and Trait Anxiety Inventory Anxiety was measured using the State-Trait Anxiety Inventory (STAI; Spielberger, Gorsuch, Lushene, Vagg & Jacobs 1983). The STAI is a 40-item measure of trait and state anxiety, which comprises two subscales. The state anxiety scale which assesses the current state of anxiety, and the trait scale which evaluate the relatively stable aspects of anxiety. Sample items for state anxiety include "I am worried" and "I feel calm". Samples items for trait anxiety include "I worry too much over something that doesn't matter" and "I am a steady person". Both sub-scales utilise a four point Likert scale. Responses for the state anxiety scale assess intensity of current feelings and answers range from 1-not at all, to 4- very much so. Responses for the trait anxiety scale assess feelings in general and range from 1- almost never, to 4-almost always. Item scores are added to obtain subtest total scores (scoring is reversed for anxiety-absent items). High scores reflect high levels of anxiety. The STAI has demonstrated good reliability with internal consistency coefficients (Cronbach alpha) ranging from .86 to .95, and test-retest reliability coefficients ranging from .31 to .86 over a two month period (Spielberger et al. 1983). The STAI is a self-report measure that is administered using pencil and paper. In the current study, scores were obtained by recording each item score in Microsoft excel and then importing into SPSS where overall scores were calculated. While this measure is relatively long in comparison to the other psychological measures used in this research, it was felt appropriate for the age of the participants. It is worth noting that while there is a version of STAI which has been specifically designed for use with children the State-Trait Anxiety Inventory for Children (STAI-CH; Spielberger, Gorsuch, Lushene, Vagg & Jacobs 1983), that the adult version would be more appropriate for the age of the participants in this research.

4.7.6. d2 Test of Attention Attention was measured using the d2 Test of Attention (Brickenkamp & Zillmer 1998; see Appendix E). The d2 measures selective and sustained attention and visual scanning speed. The test determines the capacity to focus on a single

stimulus while suppressing awareness to competing distractors. It is a timed, pencil and paper cancellation test consisting of 14 test lines, each containing 47 characters. The 47 characters consist of either the letter 'd' or the letter 'p'. The letters come in a variety of formats; some stand-alone, some have either a single or double dash above them, while others may have a single or double dash below them. There are 16 variations of the two letters in total. Participants are instructed to cross out every letter 'd' that has a double dash, either above or below. The test is scored on two levels; the total number of items scanned minus the error scores and concentration performance. The total number score is a measure of the quantity of work completed after omission and commission errors have been removed. The concentration performance score is calculated from the total number of correct items minus commissions. It is a measure of quality as the score cannot be distorted by a participant's tendency to skip sections of the line. The d2 has demonstrated good reliability with internal consistency coefficients (Cronbach alpha) reaching .90, and test-retest reliability coefficients ranging from .95 to .98 over a period of 23 months (Miller & Cohen 2005).

In each of the three studies and across all measures, test instruments were administered over three time points. The first at baseline, one week before the interventions began. The second, one week after final intervention was delivered and the third, at three months follow up. A follow up test point of three months was included in the design to allow the researcher to check if any benefits observed at Time point 2, directly after the interventions were complete, had been sustained. In addition it also allowed for the detection of any benefits that may not have emerged immediately after completion of the interventions.

4.8. Treatment Fidelity

While this study utilised a standardised measure of mindfulness, which acted as a measure of fidelity regarding the .b mindfulness course and its delivery, a further measure was included: The Mindfulness-based Interventions Teacher Assessment Criteria (MBI: TAC;

Crane, Kuyken, Hastings, Williams, Bartley & Surawy 2013; see Appendix F). The MBI: TAC is a tool that is used to assess a teacher's competence at delivering a mindfulness-based intervention. There are six competence levels; incompetent, the teaching demonstrates an absence of key features, inappropriate performance, or behaviour that is harmful. Beginner, the teaching demonstrates basic building blocks of MBI competence in at least one feature. Advanced beginner, the teaching demonstrates evidence of competence in two key features in each domain, and the participant's emotional and physical safety is well taken care of. Competent, the teaching is competent, with some problems or inconsistencies. Proficient, the teaching demonstrates sustained competence with few or minor problems and/or inconsistencies. Advanced, the teaching is excellent, or very good even in the face of participant difficulties (Crane et al. 2013).

The researcher was observed and competency as a trainer was assessed by the second researcher. This was the same researcher who delivered the PMR intervention, who is also a qualified mindfulness tutor. She was assessed as a proficient teacher, Band 5, 'sustained competence demonstrated with few or minor problems and/or inconsistencies' (MBI: TAC). While instructions on using the MBI: TAC suggest video recording the individual being observed, it was not possible to do this in the school where the study was conducted, which is recognised as a limitation in the use of this tool.

4.9. Procedure

Ethical approval was granted by the Coventry University ethics committee (Appendix C). A Disclosure and Barring Service (DBS) check was completed and granted for each of the three researchers prior to administering measures and delivering the interventions to students.

All participants taking part in the study underwent an initial briefing session by the researcher to explain what the research would entail, this included a brief explanation of the

measures and how they would be administered as well as a more detailed explanation of the three interventions. Students were given an opportunity to ask questions about the research but were not told about the predictions of the study only that the research was designed to explore the effects of different interventions on Year 10 students.

The test battery was delivered in two phases. The first phase, which was delivered to all of the students who participated in the research consisted of the psychometric tests; mindfulness, wellbeing and resilience, and some of the academic tests, the spelling and maths subtests of the WRAT-4. Tests were delivered to the participants in the same groups that they were in for the intervention delivery. The test battery began with the spelling test; the target word was read out loud on its own to begin with, then it was read out loud again, but this time it was incorporated into a sentence. The spelling test was followed by a 15 minute timed maths test. Students were asked to work in silence and remain silent until the test was complete, they were told when the 15-minutes started, when they had just two minutes left, and finally when the testing time was over. Once the maths test was finished, the psychometric tests were then administered to the students. The researcher read out the instructions on how to complete each of the tests. Students were told that if there were any items that they were unsure of they could raise their hand and the researcher would be available to answer any queries during each test. The test were administered one at a time, the next test did not begin until the prior test had been completed by all students. This initial part of the test battery was the same for all students in each of the studies. However, two additional tests were administered to those students who participated in the third study. They completed a further two tests, one to measure anxiety, which was administered directly after the initial three psychometric measures, and one to measure attention, the d2 test of attention which was administered following a short five minute break. Students were informed how to complete the test, as per the d2 Test of Attention manual (Brickenkamp & Zilmer 1998).

In the second phase of the test battery students were administered the word reading and sentence comprehension subtests of the WRAT-4. Students first completed the word reading subtest which was subsequently followed by the comprehension test. Tests were administered by the researcher in a classroom on a one-to-one basis with the students. Test measures were administered over three time points. The first at baseline, one week before the interventions began. The second, one week after the final intervention was delivered and the third, three months after the final intervention was delivered.

The interventions were delivered over a nine week period. They were delivered in the same location each week, a standard tables and chairs classroom, with the same teachers in attendance on each occasion. The mindfulness intervention and the study skills program were delivered by the main researcher in all of sessions in each of the three schools. In the first and second school, (study one and two, the PMR intervention was delivered by a senior lecturer from Coventry University. The researcher was observed delivering the mindfulness intervention on two of the nine weeks, by the senior lecturer, an experienced and trained mindfulness teacher, in two of the three schools (study one and study two).

4.10. Analytic Approach

The analytic approach taken to answer the research question was a 3 x (2) mixed analysis of covariance (ANCOVA). The decision for using this approach, and not a 3 x 3 analysis of variance (ANOVA), was taken on the basis that the principle interest of the research was to determine if mindfulness training would have a significant impact on the various outcomes, in comparison to the comparative interventions at the post test stage, and at three month follow up. ANCOVA corrects for differences at the post-test stage that are due to differences that occur at the pre-test stage. Analysis of covariance was completed on each of the outcome measures of, mindfulness, wellbeing, resilience, maths, spelling, word reading and reading comprehension. The word reading and reading comprehension subtests were

condensed into a single measure of reading comprehension as per instructions in the WRAT 4 manual. The between groups independent variable consisted of the three intervention groups; .b, SS and PMR. The within groups independent variable was the covariate adjusted measure of each outcome measure at Time 2 and Time 3. The covariate was Time 1 (baseline) outcome measure. Initial analyses were conducted with gender as a between subjects factor. However, in all of the analyses gender was not a significant factor, so all subsequent analyses were reported without gender. As ANCOVA was the main analytic method used, the following assumptions were checked as advised by Tabachnick & Fidell (2014); unequal sample sizes, missing data, ratio of cases to independent variable, absence of outliers, absence of multicollinearity, normality of sampling distributions, homogeneity of variance, linearity and finally homogeneity of regression. All preliminary analyses were performed using IBM SPSS Statistics version 24.

During preliminary checks it was noted that in a number of the data sets (study 1: wellbeing, study 2: maths, and study 3: maths and attention) there was a significant interaction between the covariate, (baseline measure scores) and measures at Time 2 and 3, demonstrating a violation of the assumptions of homogeneity of regression, hence in these cases ANCOVA could not be performed. In such cases a 3 x (2) mixed analysis of variance (ANOVA) was used as an alternative method of analysis. The between groups independent variable remained the same; .b, SS and PMR. The within groups independent variable was the difference in scores of each outcome measure, between time 1 and time 2 and between time 1 and time 3.

Each of the three empirical studies encountered missing data. Two techniques were chosen to deal with missing data. For cases that were lost to attrition and not missing at random (NMAR), the technique of listwise deletion was employed, for example, when students had left that particular school or were away from school at the time when measures were collected. In cases where data were missing completely at random (MCAR), for example, if a student had

missed a question in error, the method of multiple imputation was USED. Multiple imputation replaces each missing value with a set of imputed values. Prior to conducting multiple imputation an initial analysis of patterns was performed to determine the percentage of missing data. In each case values were below 0.29, demonstrating a very small percentage of missing data and was well within an acceptable range (Enders 2010). A subsequent Little's MCAR test demonstrated that values were missing completely at random, chi-square = .000, DF = 1565, sig = 1.000. Multiple imputation was performed by imputing missing values across 5 data sets. Each of the data sets were then analysed and the results of each were consolidated into a single result by calculating the mean, variance and confidence interval of each relevant variable. To ensure the results of the imputation were not distorted an empirical check was done using a single imputed data set to check if a simple average of p values from the imputation results was the same as the p value obtained from a F statistic calculator based upon the average of the F statistics. The sample of p values checked using the F statistic calculator were the same as the aggregate p value obtained from the multiple imputation result. The process of imputing the missing cases broadly confirmed the results of the original data, thus to avoid repetition rather than reporting the results of the analysis the data has been uploaded to the CURVE repository at Coventry University.

In each study a partial eta squared value is reported. Partial eta squared is a measure of effect size, which expresses variation in the condition means as a proportion of error variance. The threshold for interpreting effect size are; .01 = a small effect size, .06 = a medium effect size, and .13 = a large effect size (Cohen 1988). The reason for including effect sizes in each of the chapters was to assess whether or not there were an association between the experimental condition and outcome measures that is the mindfulness group and academic outcomes.

In addition to ANCOVA correlation analysis were performed on the data in study one, to explore if increased levels of mindfulness brought about through mindfulness training, could

predict improved levels of academic performance, mediated by improved levels of well-being and resilience a number of simple correlations were performed between academic measures; reading comprehension, spelling and maths, and mindfulness, well-being and resilience immediately after and three months following the intervention.

4.11. Summary

This chapter has presented the methodology and methods that were used to answer the research question in this thesis. The next chapter is a presentation of the first of the three empirical study in the thesis.

CHAPTER 5

5. Empirical Study 1

The Impact of Mindfulness Training on School Children's Outcomes

Chapter Overview

This chapter will present the first of three empirical studies that were undertaken as part of this thesis. This first study was carried out on a relatively small number of children in a co-educational school in the West Midlands area to test the first two of the four proposed hypotheses. In this study a quasi-randomized trial was conducted, where school class was the unit of randomisation, to examine the impact of mindfulness training on schoolchildren's academic performance in comparison to controls. Participants (N = 49) underwent one of three, nine week interventions: *.b*, the experimental mindfulness condition, study skills, the first control, or progressive muscle relaxation, the second control. This paper examines the effect of mindfulness training on measures of literacy, mathematics, as well as a number of psychological outcomes; mindfulness, wellbeing, and resilience. Children in the mindfulness group maintained better levels of mindfulness across the duration of the study relative to the study skills group in particular, but the mindfulness training did not appear to impact measures of wellbeing or resilience, and gains in mindfulness were modest at best. However, children in the mindfulness group scored significantly better on measures of reading comprehension in comparison to children in the study skills and progressive muscle relaxation groups, but not on measures of mathematics. The results from this study suggest that children exposed to mindfulness training may show a greater increase in literacy-related skills in comparison to children exposed to a study skills or progressive muscle relaxation program, but that this is unlikely to be explained by mechanisms of improved wellbeing or resilience.

5.1. Introduction

5.1.1. Background

Given that student wellbeing is closely associated with academic outcome (Trockel, Barnes & Egget 2000), it is not surprising that schools are investing in interventions aimed at increasing student wellbeing, in the hope of improving students' academic performance. There is an increasing amount of research emerging concerned with the effects of mindfulness on children and in particular children in school settings. Much of the research taking place is concerned with how feasible it is to deliver mindfulness to children in a school environment as well as the impact it has on children. While each of these factors are important, it is equally important to know how delivering mindfulness to students might differ from delivering other interventions that may be considered equally capable of delivering similar effects. For example, study skills programs that may improve academic performance or relaxation classes that may improve resilience and wellbeing.

5.1.2. Rationale

Schools are increasingly reliant on external organisations to deliver programs in the hope of improving children's resilience and wellbeing (Pennine NHS Trust n.d.). In addition, they face increasing pressure to reach government targets of academic attainment, as well as parental pressure, in terms of league tables determining which schools become popular. The application of mindfulness-based programs in schools is becoming more prevalent as a means of enhancing and protecting children's resilience and well-being, as well as a means of fostering greater academic performance. While there is an emerging body of research demonstrating that mindfulness training can indeed impact children's well-being and academic performance in comparison to controls, there is no published research to date that has tested

the impact of mindfulness on these outcomes while comparing them to other programs that have the potential to achieve the same results.

5.1.3. Aims and hypotheses

The central aims of this study were to evaluate the impact of mindfulness training on schoolchildren's performance on measures of literacy and mathematics, and to understand some of the social, emotional and behavioural factors which may exist between mindfulness training and academic performance. The present study was conducted to test the following two hypotheses.

1. Exposing Year 10, students to mindfulness training, will significantly increase levels of mindfulness, wellbeing and resilience, relative to active control groups receiving either study skills training or progressive muscle relaxation sessions.

2. Exposing year 10, students to mindfulness training will significantly impact academic performance, specifically by increasing scores on measures of reading, reading comprehension, spelling and maths computation, relative to active control groups receiving either study skills training or progressive muscle relaxation sessions.

A further consideration of the research was to determine whether any findings that occurred as a result of the study were primarily due to the mindfulness intervention, and not a result of other consequential factors, such as children receiving extra attention in the classroom or experiencing mindfulness as a form of relaxation. Therefore, the design of this study included two active controls, thus allowing for comparisons to be made between the experimental .b group, and the control groups, progressive muscle relaxation and study skills. It was anticipated that those children who received the mindfulness intervention would show

significantly greater improvement in academic achievement compared to those children who had received either the relaxation or study skills intervention.

5.2. Method

Each of the three empirical studies in this thesis used the same design, interventions, measures (with the exception of study three which used a further two measures), testing procedure and statistical approach. Consequently rather than repeat the method section in each of the empirical studies and risk repetition, the reader is instead referred to Chapter four for a full and detailed description of the methods used. However, since the participants that were used in each study are unique to that particular study, a detailed description of the participants is provided.

5.2.1. Participants

The research in study one was conducted in a large co-educational school, with a capacity of 1445, but with a slightly higher intake of 1525 students. The school was located in the North East of Coventry. The school achieved academy status in 2013. The last Ofsted report, 2016 reported the school as good. The majority of the school's students were white British, with English as their first language. With respect to special educational needs, the number of students on SEN support at the time of data collection was above the national average. The number of students in receipt of free school meals was below the national average. Students typically entered this school with average attainment and left with higher than average attainment.

An initial 60 students were recruited to the present study, however, 10 were lost to attrition just prior to the study commencing, and one case could not be used due to missing

values missing not at random (MNAR). Forty-nine, (29 male and 20 female), Year 10 pupils, participated from a co-educational state secondary school. The average age of participants was 14 years and six months (SD 3.59). Participants were allocated to the intervention groups at class level, using cluster allocation: twenty participants were allocated to the mindfulness intervention, fourteen were allocated to the PMR intervention, while the remaining fifteen were allocated to the SS intervention.

5.3. Results

Correlation analyses, analysis of variance and analysis of covariance.

5.3.1. Observations on variance differences

Post hoc inspection of standard deviations in the tables indicate that the groups were not always equivalent in terms of their degree of variability around the means. In certain instances this may be indicative of complex classroom and student dynamics in the groups. For example, the mindfulness data that are reported in Table 5.1. indicate that the standard deviation of all time points for mindfulness in the PMR group were consistently higher than the standard deviations in the other two groups. This was a trend that was also evident in the wellbeing and resilience data.

In addition, standard deviations for all time points for reading comprehension (see Table 5.1.) in the .b group were consistently higher than the standard deviations in the PMR and SS groups, again a trend which was apparent in the spelling and maths data. This could be an indication that students in this group have a wider range of ability than in the other two groups; for example, children in the .b group had less academic ability at Time 1 compared to those in the PMR and SS groups but made the most progress at Time 2 and Time 3.

Table 5.1. Descriptive statistics on measures by group at pre, post and follow-up (standard deviations in parentheses). (N = 49)

Outcome		.b experimental group (n = 20)		SS control group (n = 15)		PMR control group (n = 14)	
Mindfulness	Pre	33.59	(4.72)	31.08	(6.60)	27.82	(7.59)
	Post	34.12	(3.48)	29.92	(4.19)	28.15	(7.22)
	Follow-up	33.65	(3.16)	30.77	(4.66)	27.00	(6.00)
Resilience	Pre	39.12	(3.28)	39.85	(5.01)	35.69	(8.84)
	Post	40.41	(5.55)	38.38	(6.25)	37.69	(6.61)
	Follow-up	40.94	(5.31)	36.77	(6.39)	37.38	(7.97)
Wellbeing	Pre	48.88	(6.35)	44.77	(5.36)	43.00	(10.50)
	Post	50.59	(9.72)	42.54	(6.77)	46.38	(10.37)
	Follow-up	50.76	(7.97)	43.15	(10.17)	41.46	(13.16)
Reading Comp'	Pre	82.59	(18.39	87.54	(11.57)	90.00	(16.29)
	Post	90.06	(15.50)	88.62	(10.34)	88.92	(11.55)
	Follow-up	91.82	(14.96)	91.54	(10.25)	94.46	(11.84)
Spelling	Pre	39.00	(5.88)	40.54	(3.50)	40.69	(4.19)
	Post	40.12	(6.51)	40.46	(4.63)	41.08	(3.84)
	Follow-up	40.29	(4.27)	40.15	(4.52)	41.38	(5.06)
Maths	Pre	33.76	(5.76)	34.69	(3.79)	33.38	(3.12)
	Post	34.71	(5.22)	35.08	(3.62)	34.62	(2.69)
	Follow-up	34.47	(4.87)	34.38	(4.01)	35.23	(4.04)

5.3.2. Preliminary analysis

Prior to performing correlation analysis, checks were made to ensure the data met with assumptions of linearity and homoscedasticity.

As ANCOVA was the main analytic method used for analysis, the following assumptions were checked as advised by Tabachnick & Fidell (2014); unequal sample sizes, missing data, ratio of cases to independent variable, absence of outliers, absence of multicollinearity, normality of sampling distributions, homogeneity of variance, linearity and finally homogeneity of regression. Having noted here which assumptions were always checked it will only be reported which breaches of assumptions occurred. All preliminary analyses were performed using IBM SPSS Statistics version 24.

5.3.2.1. Checks on assumptions

Unequal sample sizes. The default analysis for the ANCOVA estimates the type 3 sums of squares. This is the appropriate form of mean estimation advocated by Tabachnick & Fidell (2014) and Overall & Spiegel (1969) for the correction of unequal sample sizes for experimental design.

Missing data. Two techniques were chosen to deal with missing data. The method of listwise deletion was chosen for cases that were not missing at random (NMAR) but lost to attrition, while multiple imputation was chosen for cases that were missing completely at random (MCAR).

An initial analysis of patterns was performed to determine the percentage of missing data, values = 0.29, demonstrating a very small percentage which is within an acceptable range (Enders 2010). A subsequent Little's MCAR test demonstrated that values were missing completely at random, chi-square = .000, DF = 1565, sig = 1.000. Multiple imputation was performed by imputing missing values across five data sets. Each of the data sets were then analysed and the results of each were consolidated into a single result by calculating the mean, variance and confidence interval of each relevant variable.

The process of imputing the missing cases should broadly have confirmed the results of the original data, however, in this case the data became distorted as a result of multiple imputation. Therefore rather than report the imputed data in the thesis, a decision was taken instead to place the original data in CURVE; Coventry Universities repository.

For all analyses that were done using ANCOVA the same breaches of assumptions occurred, and in each case the same process was applied to deal with them. Thus to avoid repetition breaches of assumptions shall only be reported this once.

Homogeneity of regression. There was a significant interaction between the covariate, (baseline wellbeing scores) and wellbeing at Time 2 and 3 demonstrating a violation of the assumptions of homogeneity of regression, hence ANCOVA could not be performed on the wellbeing measure so an analysis of variance (ANOVA) was done as an alternative.

5.3.3. Correlation analysis

To explore if increased levels of mindfulness brought about through mindfulness training could predict improved levels of academic performance through an association of improved levels of well-being and resilience, a number of simple correlations were performed between academic measures; reading comprehension, spelling and maths, and mindfulness, well-being and resilience immediately after and three months following the intervention.

No significant relationships were found between mindfulness, well-being and resilience and academic measures at time 2 or 3 (see Table 5.2 and 5.3).

Table 5.2. Pearson correlations coefficients between Time 2 mindfulness, well-being and resilience with Time 2 academic performance measures (N = 49)

Measures	T2 Mindfulness	T2 Well-being	T2 Resilience
T2 Well-being			
Correlation	.703**	...	
Sig.(2-tailed)	.000		
T2 Resilience			
Correlation	.691**	.676**	…
Sig.(2-tailed)	.000	.000	
T2 Read Comp'			
Correlation	.122	.037	.116
Sig. (2-tailed)	.407	.804	.428
T2 Spelling			
Correlation	.017	-.079	-.007
Sig. (2-tailed)	.910	.598	.963
T2 Math			
Correlation	-.117	-.114	.069
Sig. (2-tailed)	.429	.446	.638

Table 5.3. Pearson correlations coefficients between Time 3 mindfulness, well-being and resilience with Time 3 academic performance measures (N = 49)

Measures	T3 Mindfulness	T3 Well-being	T3 Resilience
T3 Well-being			
Correlation	.598**	...	
Sig.(2-tailed)	.000		
T3 Resilience			
Correlation	.458**	.449**	…
Sig.(2-tailed)	.001	.001	
T3 Read Comp			
Correlation	-.047	-.035	-.045
Sig. (2-tailed)	.747	.813	.760
T3 Spelling			
Correlation	.030	-.016	-.138
Sig. (2-tailed)	.837	.913	.350
T3 Math			
Correlation	-.069	-.005	.172
Sig. (2-tailed)	.639	.974	.241

5.3.4. Main analysis

5.3.4.1. Mindfulness analysis

A 2 (time) x 3 (group) mixed analysis of covariance was conducted on mindfulness scores to compare the experimental group .b with the two active control groups, SS and PMR. Time 1 mindfulness scores made a significant contribution as a covariate for Time 2 and 3 mindfulness scores, (F (1, 42) = 44.59, $p < .001$), with a large effect size (partial $\eta^2 = .515$.)

There was a significant main effect of group on mindfulness (F (2, 42) = 4.23, $p = .021$), with a large effect size (partial $\eta^2 = .168$), after controlling for Time 1 mindfulness scores (baseline). The adjusted marginal means, with 95% confidence interval, illustrate that the highest mean scores were in the .b group (see table 5.4). A simple contrasts analysis illustrated that individuals in the PMR groups outperformed those in the SS group; contrast estimate -2.27, $p = .042$, 95% CI (-4.44, -.09), contrast estimate -3.25, $p = .009$, 95% CI (-5.68, -.86), respectively.

There was no significant main effect of time (F (1, 42) = .319, p = .575), with a small effect size (partial η^2 = .008), or group by time interaction effect on mindfulness (F (2, 45) = 1.51, p = .233), with a medium effect size (partial η^2 = .067), (see Figure 5.1. and Table 5.4.).

Table 5.4. Mean scores and standard deviations of mindfulness by group at Time 2 and 3. (N = 49)

	Time 2				Time 3			
	95% Confidence Interval				*95% Confidence Interval*			
Group	M	SD	*Lower Bound*	*Upper Bound*	M	SD	*Lower Bound*	*Upper Bound*
.b	32.86	.88	31.038	34.64	32.17	.86	30.38	33.96
SS	29.67	.95	27.77	31.58	30.83	.95	28.91	32.74
PMR	29.95	1.06	27.82	32.09	28.58	1.06	26.44	30.72
Covariates appearing in the model are evaluated at the following values: T1 Mindfulness = 31.1739								

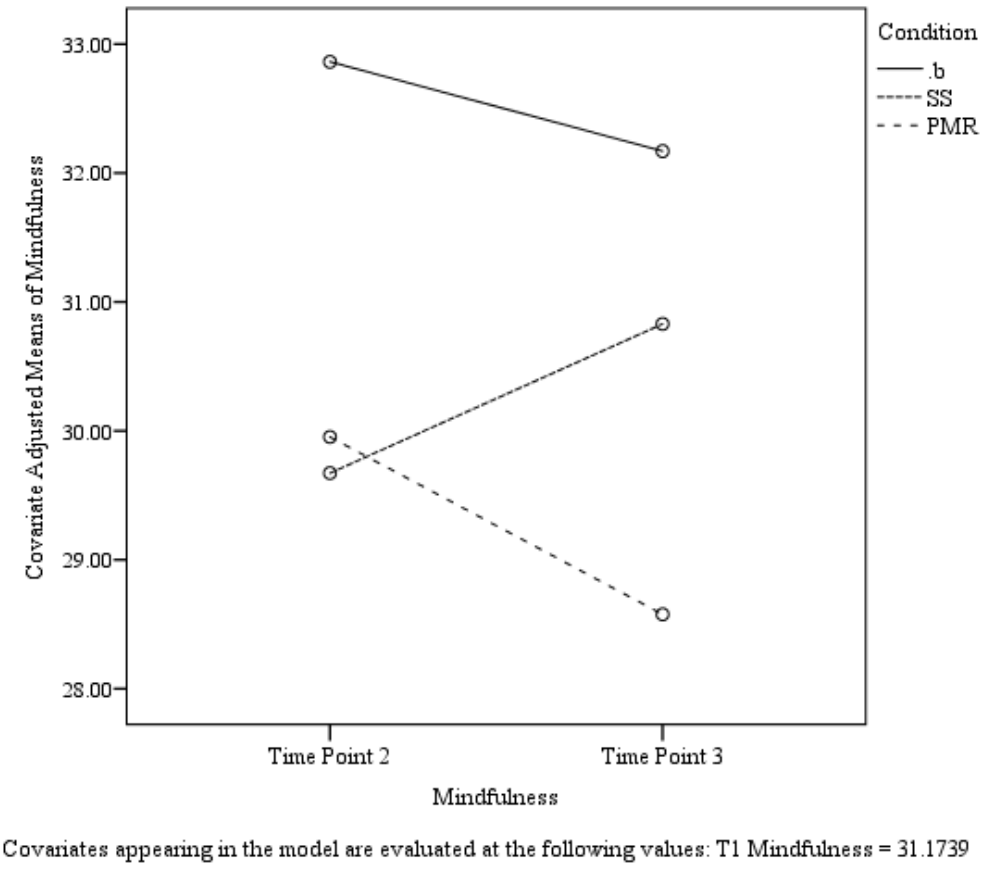


Figure 5.1. Mean scores of mindfulness by group at Time 2 and 3. (N = 49)

5.3.4.2. Resilience analysis

A 2 x 3 mixed analysis of covariance was performed on resilience scores to compare the .b group with the PMR and SS groups, using Time 1 resilience scores (baseline) as the covariate, (F (1, 45) = 21.617, p < .001), with a large effect size (partial η^2 = .324).

After controlling for baseline resilience scores, there was no significant main effect of group (F (2, 45) = 2.37, p = .105), with medium effect size (η^2 = .095). The adjusted marginal means, as displayed in, with 95% confidence interval illustrate that the highest scores were in the .b group. The lowest scores were in the SS group, with the PMR group falling in the middle. In addition there was no main effect of time (F (1, 45) = .847, p = .362), with a small effect size (partial η^2 = .018), or group x time interaction effect (F (2, 45) = .496, p = .612), with a small effect size (partial η^2 = .022). (See Table 5.5.).

Table 5.5. Mean scores and standard deviations of resilience by group at Time 2 and 3. (N = 49)

	Time 2				Time 3			
			95% Confidence Interval				*95% Confidence Interval*	
Group	M	SD	*Lower Bound*	*Upper Bound*	M	SD	*Lower Bound*	*Upper Bound*
.b	40.01	1.13	37.73	42.29	40.11	1.17	37.74	42.48
SS	37.48	1.31	34.84	40.12	35.92	1.36	33.18	38.66
PMR	38.62	1.37	35.86	41.38	38.22	1.42	35.36	41.08

Covariates appearing in the model are evaluated at the following values: T1 Resilience = 38.0408

5.3.4.3. Reading Comprehension analysis

A 2 x 3 mixed analysis of covariance was used to compare reading comprehension scores in the .b group with the PMR and SS groups. Baseline reading comprehension scores made a significant contribution as a covariate for Time 2 and 3 reading comprehension scores, (F (1,45) = 200.40, p < .001), with a large effect size (partial η^2 = .817).

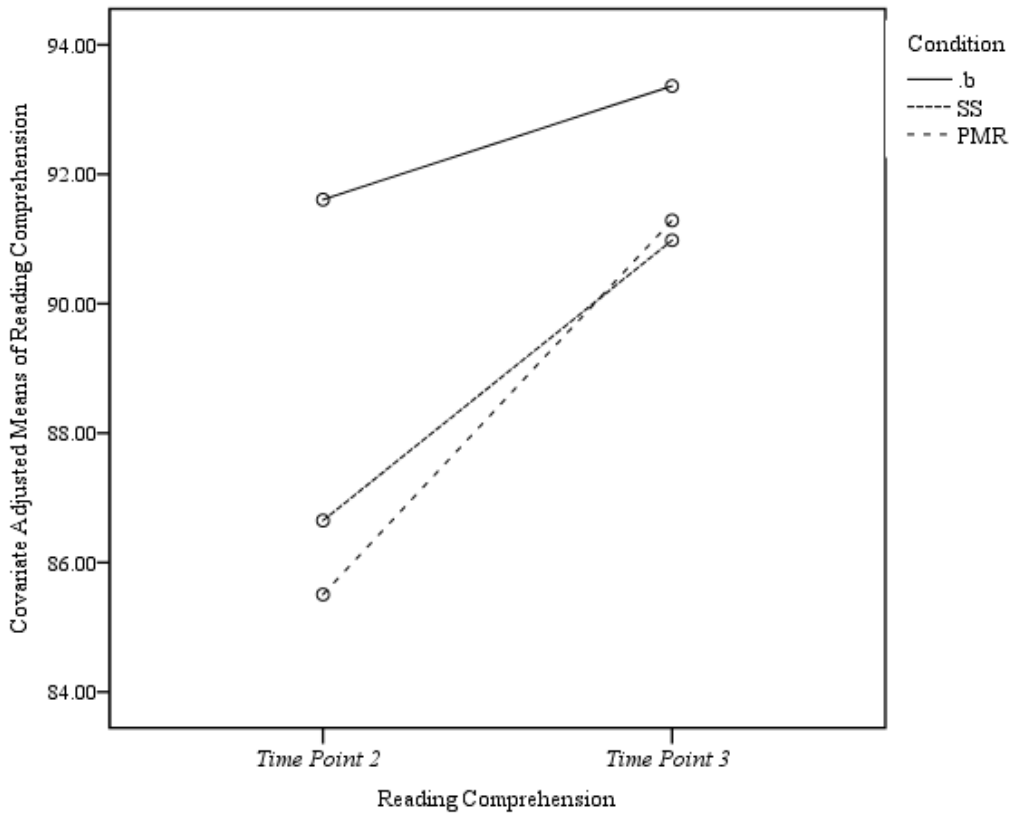
There was a significant effect of group on reading comprehension after controlling for Time 1 (baseline), reading comprehension scores (F (2, 45) = 3.34, p = .044), with a large effect size (partial η^2 = .130). The adjusted marginal means, with 95% confidence interval illustrate that the highest scores were in the .b group, with comparisons showing that the .b group did significantly better on reading comprehension than both the PMR and SS groups. A simple contrasts analysis of the two active controls illustrates that individuals in the SS group outperformed those in the PMR group; -3.67, p = .041, 95% CI (-7.19, -.15), contrast estimate = -4.09, p = .029, 95% CI (-7.74, -.44), respectively.

There was no significant main effect of time (F (1, 45) = .683, p = .413), with a small effect size (partial η^2 = .015), or group by time interaction effect on reading comprehension (F (2, 45) = 109, p = .344), with a small to medium effect size (partial η^2 = .046), which is illustrated in Figure 5.2. and shown in Table 5.6.

Table 5.6. Mean scores and standard deviations of reading comprehension by group at Time 2 and 3. (N = 49)

	Time 2				Time 3			
			95% Confidence Interval				*95% Confidence Interval*	
Group	M	SD	*Lower Bound*	*Upper Bound*	M	SD	*Lower Bound*	*Upper Bound*
.b	91.61	1.53	88.53	94.69	93.36	1.38	90.59	96.14
SS	86.65	1.75	83.12	90.18	90.98	1.58	87.79	94.17
PMR	85.51	1.83	81.81	89.20	91.29	1.66	87.95	94.62

Covariates appearing in the model are evaluated at the following values: T1 Reading Comprehension = 85.3061



Covariates appearing in the model are evaluated at the following values: T1 Reading Comprehension = 85.3061

Figure 5.2. Mean scores of reading comprehension by group at Time 2 and 3. (N = 49)

5.3.4.4. Spelling analysis

A 2 x 3 mixed analysis of covariance was conducted on spelling scores to compare the experimental group, .b with the two active control groups, PMR and SS. Pre-test spelling scores were used as the covariate and made a significant contribution, (F (1, 44) = 32.13, p < .001), with a large effect size (partial η^2 = . 422).

There was no significant main effect of group (F (2, 44) = .527, p = .594), with a small effect size (partial η^2 = .023) on spelling scores. The adjusted marginal means, illustrate that the highest scores were in the .b group, the lowest scores were in the SS group, with the PMR group falling in the middle. There was no main effect of time (F (2, 44) = .515, p = .601), with

a small effect size (partial η^2 = .023), or group by time interaction effect (F (1, 44) = .469, p = .497), with a small effect size (partial η^2 = .011), (shown in Table 5.7).

Table 5.7. Mean scores and standard deviations of spelling by group at Time 2 and 3 (N = 49)

	Time 2				Time 3			
			95% Confidence Interval				*95% Confidence Interval*	
Group	M	SD	*Lower Bound*	*Upper Bound*	M	SD	*Lower Bound*	*Upper Bound*
.b	40.69	.761	39.16	42.22	40.69	1.41	37.84	43.54
SS	39.96	.906	38.13	41.79	39.85	1.63	36.46	43.24
PMR	40.27	.909	38.44	42.10	38.24	1.69	34.83	41.64

Covariates appearing in the model are evaluated at the following values: T1 Spelling = 39.9167

5.3.4.5. Maths analysis

A 2 x 3 mixed analysis of covariance was performed on maths. Baseline maths scores made a significant contribution as a covariate for Time 2 and Time 3 maths scores, (F (1, 44) = 62.83, p < .001), with a large effect size (partial η^2 = .588).

After controlling for maths at Time 1 (baseline), there was no significant main effect of group (F (2, 44) = 032, p = .726). The effect size of the between groups difference was small (partial η^2 = .014). The adjusted marginal means, with 95% confidence interval illustrate that the highest scores were in the PMR group. The lowest scores were in the .b group, with the SS group falling in the middle.

There was no significant main effect time (F (1, 44) = .023, p = .879), with a small effect size (partial η^2 = .001), or group by time interaction effect (F (2, 44) = .537, p = .588), with a small effect size (partial η^2 = .024) (see Table 5.8).

Table 5.8. Mean scores and standard deviations of maths by group at Time 2 and 3. (N = 49)

	Time 2				Time 3			
			95% Confidence Interval				*95% Confidence Interval*	
Group	M	SD	*Lower Bound*	*Upper Bound*	M	SD	*Lower Bound*	*Upper Bound*
.b	34.31	.63	33.03	35.58	34.76	.70	33.34	36.17
SS	34.79	.76	33.26	36.31	34.08	.84	32.39	35.77
PMR	34.85	.76	33.32	36.37	35.34	.84	33.66	37.03

Covariates appearing in the model are evaluated at the following values: T1 Maths = 33.9167

5.3.4.6. Wellbeing analysis

A 2 x 3 mixed analysis of variance (ANOVA) was used as an alternative method of analysis for wellbeing, as a breach of assumptions occurred in the data (see checks on assumptions earlier on in the chapter). The between groups independent variable consisted of the three intervention groups; .b, SS and PMR. The within groups independent variable was the difference in scores of wellbeing between Time 1 and Time 2 and between Time 1 and Time 3. Analyses were performed using IBM SPSS Statistics version 24.

The difference between Time 1 and Time 2, and Time 1 and Time 3 wellbeing scores was not significantly different between groups (F (2, 43) = .910, p = .410). The effect size of the between groups difference was small to medium (partial η^2 = .041). The marginal means, with 95% confidence interval illustrate that the highest scores were in the .b group. The lowest scores were in the SS group, with the PMR group falling in the middle.

There was no significant main effect of Time (different scores at Time 1 and Time 2, and Time 1 and Time 3), (F (1, 43) = .481, p = .492), with a small effect size (partial η^2 = .011), or group x Time interaction effect on wellbeing (different scores at Time 1 and Time 2 and Time 1 and Time 3), (F (2, 43) = 2.42, p = .101), with a medium effect size (partial η^2 = .101) (shown in Table 5.9).

Table 5.9. Mean scores and standard deviations of wellbeing difference scores by group at Time 2 and 3 (N = 49)

	Time 2				Time 3			
			95% Confidence Interval				*95% Confidence Interval*	
Group	M	SD	*Lower Bound*	*Upper Bound*	M	SD	*Lower Bound*	*Upper Bound*
.b	1.58	1.79	-2.03	5.19	2.32	2.76	-3.26	7.89
SS	-3.14	2.09	-7.35	1.06	-1.57	3.22	-8.07	4.92
PMR	3.39	2.16	-.98	7.75	-1.54	3.34	-8.28	5.20

5.4. Discussion

The key findings from the current study were that those students in the mindfulness group showed statistically significant differences in reading comprehension scores at Time 2 and Time 3 after controlling for individual differences in reading comprehension scores at Time 1. In addition, mindfulness was positively related to improved levels of wellbeing and resilience, as well as improved scores on spelling.

This study was conducted to explore the impact of mindfulness training on schoolchildren's academic performance. It was hypothesised that teaching mindfulness skills to schoolchildren in an inclusive classroom environment would increase levels of mindfulness, wellbeing and resilience. As well as impact on academic performance, that is an improvement on scores of spelling, maths computation, word reading and reading comprehension (i.e. positively impacting performance on academic tasks).

There was a significant difference between the experimental and control groups on self-reported levels of mindfulness, with a large effect However, although the difference was statistically significant it was small. Furthermore, at 3 month follow-up levels had reverted back to baseline. The sample size in this study was small (N=47), which may have been a factor in the statistically significant but small p value (.021). Had the sample been larger it is certain, given the large effect size (η^2 = .168) that the p value would have been smaller.

There were no statistically significant differences between the 3 groups on measures of resilience, however there was a large effect. The large effect size may indicate that a larger sample size may have reached statistical significance, although it may equally be due to error. Students in the .b and PMR groups showed a marginal improvement in scores following the interventions, while those in the SS group did not. Similarly the 3 groups did not differ significantly on measures of wellbeing, with a medium effect size. Although again children in the .b and PMR groups both experienced an improvement in scores at Time 2, while those in the SS group experienced a decline.

In line with our hypothesis, participants in the .b group scored significantly better on measures of reading comprehension (a composite score of the word reading and sentence comprehension task), compared to those in the SS and PMR groups. The effect size for this measure was large proving limited support for the notion that changes in mindfulness may potentially result in changes in academic outcomes. Scores continued to improve at three months follow up. While children in the SS group did better than those in the PMR group, both groups experienced a decline in scores at Time 2. However, by Time 3 the scores in both groups had not only returned to baseline but had improved beyond it. The decrease in scores at Time 2 by both control groups was not anticipated, there was an expectation of some improvement in all three groups as a result of the learning that had occurred during the academic year. There is no clear reason for the decline in scores and we can only speculate that they may be a result of Time 2 measures being taken prior to the Christmas break, a time when possibly the students had switched off academically in readiness for the holidays. Although if that were the case, we may have expected the same pattern in all three groups. Each of the groups showed an increase in scores from baseline, which would be expected as a result of maturation. However, while the improvements in reading comprehension in the SS and PMR groups are similar, the improvement in the .b group is considerably larger. We might reason that the improvements

are due to students learning to focus their attention as a result of the mindfulness training to an extent that it was possible to positively impact on their scores.

The groups did not differ significantly on measures of spelling, and there was a small effect size. However, children in the .b group experienced the highest score improvements, which were maintained at Time 3. Children in the PMR group also experienced improvements at Time 2, although these were not maintained at Time 3 and fell marginally below baseline. Children in the SS group experienced a decline in scores at Time 2, which continued to decline at Time 3. Similarly, there were no significant differences between the groups on maths scores, and again a small effect size. Children in the PMR and SS groups experienced a marginal improvement in scores at Time 2, with the biggest being achieved by those in the PMR group. Improvements were maintained at follow up by the PMR group, but had dropped below baseline for the SS group. For the first time the .b group had a decline in scores between baseline and follow up, although an improvement above baseline was seen by Time 3.

Research demonstrates that student wellbeing is closely associated with academic outcome (Trockel, Barnes & Egget 2000). This thesis predicted that an increase in scores of well-being and resilience would facilitate improvements on measures of academic performance. While a significant difference that was seen between the groups on reading comprehension scores, the results of a correlation analysis, demonstrated that improved scores on reading comprehension were not related to scores on measures of wellbeing or resilience.

As a final note it is worth mentioning that while previous research has demonstrated gender differences in regards to academic performance among schoolchildren; males outperform females in mathematics (Robinson & Lubienski 2011), while females outperform males in literacy (Broecke & Hamed 2008). We did not find any gender differences in the data in this study. However, future research should consider the effects of delivering mindfulness to an all-female cohort to examine any differences that may occur.

5.4.1. Conclusion

To summarise, this study has demonstrated that training 14 and 15 Year old schoolchildren in mindfulness has a statistically significant, but very modest impact on levels of mindfulness. Furthermore we also found that mindfulness training had a significant effect on reading comprehension outcomes, although the mechanism by which we expected this impact to occur was not supported by the data from this study. A larger-scale replication of the study reported in this chapter is required, and this is reported in Chapter six.

CHAPTER 6

6. Empirical Study 2

The Effect of Mindfulness Training on Female Children's Psychological and Academic Outcomes in Comparison to Controls.

Chapter Overview

This chapter will present the second empirical study of the thesis. While this study addressed the same hypotheses as study one, it differed in two key ways. Firstly it was conducted on an all-female sample, secondly the sample size was considerably larger. In order to examine the impact of mindfulness training on Year 10 children's social, emotional and academic outcomes, a quasi-randomised trial was conducted on 150 female students. Participants were randomly allocated, by class, to one of three nine week intervention conditions: a mindfulness training program, a progressive muscle relaxation program or a study skills program. The study assessed whether the children in the mindfulness group would show greater improvements on psychological measures of mindfulness, wellbeing and resilience as well as improvements on academic measures of reading, reading comprehension, spelling and maths computation. The results showed only significant differences between the three groups in relation to reading comprehension outcomes, but in this case this was attributable to superior performance by the group who received study skills training.

6.1. Introduction

6.1.1. *Background*

In this study the participating school was an all-female school. This offers the project the opportunity to assess the impact of the mindfulness training programme in an alternative learning environment. Male and female schoolchildren experience the same educational

environment differently, as well as learning and behaving differently in the classroom (Trockel, Barnes & Egget 2000). What is more, co-educational schools affect children differently than single-sex schools, with the biggest differences occurring in females (Lee & Bryk, 1986). Girls who are taught in a co-educational environment are more likely to underperform in comparison to girls who are taught in a single-sex setting. Boys on the other hand, tend to excel regardless of whether they are taught in a single-sex or co-educational environments (Francis & Skelton 2005). Furthermore, girls in co-educational schools report feeling intimidated and less capable than their male counterparts in subjects such as maths and science, areas that are stereotypically thought of as being male-dominated (Gillibrand, Robinson, Brawn & Osborn 1999). Research investigating the influence of a study partners' gender in student learning outcomes for Year 10 female physics students, found that females did better in an all-female environment than in mixed gender classes (Harskamp, Ding & Suhre 2008). Coincidently, a study conducted in 2012 revealed that almost 50% of co-educational schools in England did not have any females studying physics at A-level (Institute of Physics 2012). In contrast, single-sex environments provide girls with the opportunity to succeed (Lee & Bryk, 1986); females perform better when surrounded by other females in comparison to being surrounded by males, an effect that is not replicated when males are surrounded by other males or consequently females (Lu & Anderson 2013).

As well as the school environment impacting educational outcomes, research demonstrates that it also has an effect on wellbeing and resilience, both of which are important factors in relation to children's academic outcomes (Brutsaert & Van Houtte 2002). High levels of wellbeing and resilience in childhood have been associated with lower levels of mental health issues in adolescents (Mguni, Bacon & Brown 2012), and have been closely associated with positive academic performance (Trockel, Barnes & Egget 2000). Girls in single-sex

schools and classes do better in terms of wellbeing and resilience in comparison to those who are taught in co-educational environments. Conversely, boys are not affected by their teaching environment, and do just as well in a co-educational environment as they do in a single-sex one (Brutsaert & Van Houtte 2002). Possible reasons for this are that females are more inclined than males to need acceptance and security in interpersonal relationships and those who view themselves as well integrated exhibit better levels of wellbeing (Francis & Skelton 2005). The presence of boys in a co-educational environment results in a more competitive atmosphere (Francis & Skelton 2005). Research suggests that females prefer to learn in a collaborative, reflective way, while males typically prefer a more competitive environment. Consequently, girls are left feeling less comfortable which has a negative impact on school outcomes (Francis & Skelton 2005). Single-sex schools may provide girls with an environment that has less affiliation-achievement conflict and more opportunities for integration (Belfi, Goos, De Fraine & Van Damme 2012).

As the research suggests that single-sex schools, by their very nature, may already be at an advantage in respect of student wellbeing, resilience and academic performance, it would therefore seem reasonable to expect that delivering mindfulness to a single-sex, female cohort may offer further improvements in relation to student's social, emotional and academic outcomes. While research has established that mindfulness interventions work equally well for both male and female students in an academic environment (Anglin, Pirson & Langor 2008), it is less clear what the impact of teaching mindfulness to female students in a single-sex setting would achieve.

6.1.2. Rationale

There is an increasingly large number of studies examining the impact of mindfulness on male and female schoolchildren's outcomes. There are fewer studies, however, looking at the effect of delivering mindfulness to single-sex cohorts. Since many studies have reported on

the issue of gender differences in an educational context, we thought it timely to examine the impact of mindfulness on females in a single-sex environment. To our knowledge, there is no published research to date that has tested the impact of mindfulness on females in a single-sex sample, whilst comparing them to other females undergoing similar programs that have the potential to achieve the same results.

6.1.3. Aims and hypotheses

The aims of this study were to evaluate the impact of mindfulness on female schoolchildren's performance on measures of literacy and mathematics, and to understand some of the social, emotional and behavioural factors which may exist between mindfulness training and academic performance. This study was conducted to test the following hypotheses.

Exposing Year 10, female students in a single-sex environment to mindfulness training, will significantly increase levels of mindfulness, wellbeing and resilience, relative to active control groups receiving either study skills training or progressive muscle relaxation sessions.

Exposing year 10, female students to mindfulness training will significantly impact academic performance, specifically by increasing scores on measures of reading, reading comprehension, spelling and maths computation, relative to active control groups receiving either study skills training or progressive muscle relaxation sessions..

Similarly to the previous study, a focus of this study was to determine whether any findings that occurred as a result of the research were principally as a result of the mindfulness training, and not due to any other factors, such as children experiencing mindfulness as a form of relaxation or receiving extra attention from teaching staff in the classroom. Therefore, this study was conducted as a comparison study which included two active controls; a relaxation intervention, and a study skills class. It was anticipated that those children who received the

mindfulness intervention would show significantly greater improvement in academic achievement compared to those in the active control groups.

6.2. Method

As was stated at the beginning of the previous chapter, each of the three empirical studies in this thesis used the same design, interventions, measures (with the exception of study three which used a further two measures), testing procedure and statistical approach. Consequently rather than repeat the method section in each of the empirical studies and risk repetition, the reader is instead referred to Chapter four for a full and detailed description of the methods used. However, since the participants that were used in each study are unique to that particular study, a detailed description of the participants is provided.

Participants were allocated to the intervention groups using cluster allocation, see chapter 4 for more details. Forty-one participants were allocated to the mindfulness condition, fifty-eight were allocated to the PMR condition, while the remaining thirty-six were allocated to the SS condition.

6.2.1. Participants

Study two was carried out in an all-female state school, which was located on the Southwest side of Coventry. This was a large school with a capacity of 1356 students. However, when the research was conducted the school was under in terms of intake, with approximately 997 students on the register. This school was an academy, having converted in 2011. Its last Ofsted report in the same year judged it to be a good school. The majority of students were from white British backgrounds with English as a first language, although there were a higher than national average number of students at this school whose second language

was English. The number of students in receipt of SEN support was on par with the national average, as was the number of students eligible for free school meals. While students entered this school with attainment falling below the national average, they left with attainment in line with the national average.

An initial one hundred and fifty students were recruited to the study of which fifteen were lost to attrition. Three students moved to a different school, one suffered long term illness, five were lost at follow up, while a further six data sets could not be used due to missing values missing not at random (MNAR). One hundred and thirty five female Year 10 pupils between the ages of 14 and 15 years, mean age 14 years and 6 months (SD 3.49), were recruited from a single sex state secondary school. Participants were allocated to the intervention groups at class level, using cluster allocation: forty one participants were allocated to the mindfulness intervention, thirty six were allocated to the PMR intervention, while the remaining fifty eight were allocated to the SS intervention.

6.3. Results

Correlation analyses, analysis of variance and analysis of covariance.

6.3.1. Observations on variance differences

Post hoc inspection of standard deviations for all time points for mindfulness in all three groups were consistently equivalent, indicating very little difference between the groups in regards to levels of mindfulness (Table 6.1). This is a trend which is evident in each of the other five output measures, demonstrating little variability across the groups.

Table 6.1. Descriptive statistics on measures by group at pre, post and follow-up (standard deviations in parentheses). (N = 135)

Outcome		.b experimental group (n = 41)		SS control group (n = 58)		PMR control group (n = 36)	
Mindfulness	Pre	33.17	(5.10)	32.21	(4.92)	32.33	(4.88)
	Post	32.81	(4.78)	31.92	(5.21)	31.79	(4.52)
	Follow-up	31.96	(5.12)	31.24	(5.31)	31.51	(5.53)
Resilience	Pre	38.78	(5.80)	38.83	(5.92)	37.47	(5.80)
	Post	39.75	(5.61)	38.16	(5.86)	37.42	(6.46)
	Follow-up	39.07	(6.41)	38.74	(6.21)	38.57	(7.01)
Wellbeing	Pre	48.05	(7.62)	47.83	(7.70)	47.35	(8.02)
	Post	50.49	(8.15)	46.10	(8.53)	47.36	(8.07)
	Follow-up	48.88	(7.96)	47.35	(10.50)	48.43	(10.94)
Reading Comp'	Pre	82.64	(13.04)	85.70	(14.81)	86.40	(14.90)
	Post	87.16	(11.12)	90.61	(12.77)	87.95	(13.59)
	Follow-up	88.94	(10.18)	92.70	(12.70)	88.76	(13.86)
Spelling	Pre	39.16	(6.18)	40.06	(6.75)	38.83	(5.23)
	Post	41.80	(6.21)	42.82	(6.09)	40.79	(7.41)
	Follow-up	41.74	(4.59)	42.55	(5.65)	40.98	(5.45)
Maths	Pre	36.61	(6.92)	38.31	(5.60)	38.00	(4.58)
	Post	39.09	(4.65)	38.80	(5.60)	38.41	(5.39)
	Follow-up	39.75	(5.26)	40.34	(5.91)	39.50	(5.32)

6.3.2. Preliminary analysis

Prior to performing correlation analyses, checks were made to ensure the data met with assumptions of linearity and homoscedasticity.

As ANCOVA was the main analytic method used for analysis, the following assumptions were checked as advised by Tabachnick & Fidell (2014); unequal sample sizes, missing data, ratio of cases to independent variable, absence of outliers, absence of multicollinearity, normality of sampling distributions, homogeneity of variance, linearity and finally homogeneity of regression. Having noted here which assumptions were always checked, it will only be reported which breaches of assumptions occurred. All preliminary analyses were performed using IBM SPSS Statistics version 24.

6.3.2.1. Checks on assumptions

Unequal sample sizes. The default analysis for the ANCOVA estimates the type 3 sums of squares. This is the appropriate form of mean estimation advocated by Tabachnick & Fidell (2014) and Overall & Spiegel (1969) for the correction of unequal sample sizes for experimental design.

Missing data. Two techniques were chosen to deal with missing data. The method of listwise deletion was chosen for cases that were not missing at random (NMAR) but lost to attrition, while multiple imputation was chosen for cases that were missing completely at random (MCAR).

An initial analysis of patterns was performed to determine the percentage of missing data, values = 0.29, demonstrating a very small percentage which is within an acceptable range of missingness (Enders 2010). A subsequent Little's MCAR test demonstrated that values were missing completely at random, chi-square = .000, DF = 1565, sig = 1.000. Multiple imputation was performed by imputing missing values across five data sets. Each of the data sets were then analysed and the results of each were consolidated into a single result by calculating the mean, variance and confidence interval of each relevant variable.

The process of imputing the missing cases should broadly have confirmed the results of the original data, however, in this case the data became distorted as a result of multiple imputation. Therefore, rather than report the imputed data in the thesis, a decision was taken instead to place the original data in CURVE; Coventry Universities repository.

For all analyses that were done using ANCOVA the same breaches of assumptions occurred, and in each case the same process was applied to deal with them. Thus, to avoid repetition breaches of assumptions shall only be reported this once.

Homogeneity of regression. There was a significant interaction between the covariate, (baseline maths scores) and maths at time 2 and 3 demonstrating a violation of the

assumptions of homogeneity of regression, hence ANCOVA could not be performed on the maths measure so an analysis of variance (ANOVA) was done as an alternative.

6.3.3. Correlation analysis

In order to assess whether increased levels of mindfulness as a result of mindfulness training might be associated with levels of academic performance, through an association of improved levels of well-being and resilience, a number of zero order correlations were performed between academic measures of reading comprehension, spelling and maths, and the concurrent measures of mindfulness, well-being and resilience immediately after the interventions and three months following.

No significant relationships were found between mindfulness, well-being and resilience and academic measures at Time 2 or 3 (see Table 6.2 and 6.3).

Table 6.2. Pearson correlations coefficients between Time 2 mindfulness, well-being and resilience with Time 2 academic performance measures (N = 135)

Measures	T2 Mindfulness	T2 Well-being	T2 Resilience
T2 Well-being			
Correlation	.685**	...	
Sig.(2-tailed)	.000		
T2 Resilience			
Correlation	.553**	.676**	…
Sig.(2-tailed)	.000	.000	
T2 Read Comp'			
Correlation	.551	-.053	.125
Sig. (2-tailed)	.135	.545	.147
T2 Spelling			
Correlation	-.019	-.077	.023
Sig. (2-tailed)	.830	.378	.795
T2 Math			
Correlation	.064	.006	.090
Sig. (2-tailed)	.469	.941	.301

Table 6.3. Pearson correlations coefficients between Time 3 mindfulness, well-being and resilience with Time 3 academic performance measures (N = 135)

Measures	T3 Mindfulness	T3 Well-being	T3 Resilience
T3 Well-being			
Correlation	.684**	...	
Sig.(2-tailed)	.000		
T3 Resilience			
Correlation	.516**	.761**	…
Sig.(2-tailed)	.000	.000	
T3 Read Comp			
Correlation	-.015	-.033	.080
Sig. (2-tailed)	.861	.707	.358
T3 Spelling			
Correlation	-.012	-.081	-.028
Sig. (2-tailed)	.868	.353	.745
T3 Math			
Correlation	.062	.015	.098
Sig. (2-tailed)	.475	.863	.257

6.3.4. Main Analysis

6.3.4.1. Mindfulness analysis

A 2 (time) x 3 (group) mixed analysis of covariance was performed on mindfulness. The between groups independent variable consisted of the three intervention groups; .b, SS and PMR. Time 1 mindfulness scores made a significant contribution as a covariate for Time 2 and 3 mindfulness scores, (F (1, 130) = 59.23, $p < .001$), with a large effect size (partial $\eta^2 = .313$).

There was no significant main effect of group (F (2, 130) = .121, $p = .886$), with a small effect size (partial $\eta^2 = .002$) on mindfulness scores. The adjusted marginal means, with 95% confidence interval illustrate that the highest scores were in the .b group. The lowest scores were in the PMR group, with the SS group falling in the middle. There was no main effect of time (F (1,130) = .040, $p = .842$), with a small effect (partial $\eta^2 =$. <.001), or group by time interaction effect on mindfulness scores (F (2, 130) =.210, $p = .811$), with a small effect size (partial $\eta^{2 =}$ .003), (shown in Table 6.4).

Table 6.4. Mean scores and standard deviations of mindfulness by group at Time 2 and 3.(N = 135)

	Time 2				Time 3			
			95% Confidence Interval				*95% Confidence Interval*	
Group	M	SD	*Lower Bound*	*Upper Bound*	M	SD	*Lower Bound*	*Upper Bound*
.b	32.56	.66	31.23	33.87	31.73	.74	30.27	33.19
SS	32.10	.55	31.01	33.20	31.41	.61	30.20	32.62
PMR	31.92	.70	30.53	33.30	31.64	.78	30.11	33.17

Covariates appearing in the model are evaluated at the following values: T1 Mindfulness = 32.57

6.3.4.2. Wellbeing analysis

A 2 x 3 mixed analysis of covariance was performed on wellbeing. The between groups independent variable consisted of the 3 intervention groups; .b, SS and PMR. Time 1 wellbeing scores made a significant contribution as a covariate for Time 2 and 3 wellbeing scores, (F (1, 131) = 82.46, $p < .001$), with a large effect size (partial $\eta^2 = .386$).

After controlling for baseline wellbeing scores there was no significant main effect of group (F (2, 131) = 2.08, p = .129), with a small effect size (partial η^2 = .031). The adjusted marginal means, with 95% confidence interval illustrate that the highest scores were in the .b group. The lowest scores were in the SS group, with the PMR group falling in the middle. There was no main effect of time (F (1, 131) = 1.82, p = .179), with a small effect size (partial η^2 = .014), or group by time interaction effect on wellbeing scores (F (2, 131) = 2.54, p = .083), with a small effect size (partial η^2 = .037), (shown in Table 6.5).

Table 6.5. Mean scores and standard deviations of wellbeing by group at Time 2 and 3. (N = 135)

	Time 2				Time 3			
			95% Confidence Interval				*95% Confidence Interval*	
Group	M	SD	*Lower Bound*	*Upper Bound*	M	SD	*Lower Bound*	*Upper Bound*
.b	50.27	1.07	48.15	52.39	48.66	1.28	46.12	51.19
SS	46.03	0.90	44.25	47.82	47.31	1.08	45.17	49.44
PMR	47.70	1.14	45.44	49.96	48.79	1.37	46.08	51.50

Covariates appearing in the model are evaluated at the following values: T1 Wellbeing = 47.76

6.3.4.3. *Resilience analysis*

A 2 x 3 mixed analysis of covariance was performed on resilience. The between groups independent variable consisted of the three intervention groups; .b, SS and PMR. Time 1 resilience scores made a significant contribution as a covariate for Time 2 and 3 resilience scores, (F (1, 129) = 150.95, p < .001), with a large effect size (partial η^2 = .539).

There was no significant main effect of group (F (2, 129) = .648, p = .525), with a small effect size (partial η^2 = .010). The adjusted marginal means, with 95% confidence interval illustrate that the highest scores were in the .b group. The lowest scores were in the PMR group, with the SS group falling in the middle. There was no main effect of time (F (1, 129) = .87, p = .353), with a small effect size (partial η^2 = .007), or group by time interaction effect on resilience scores (F (2, 129) = .77, p = .175), with a small effect size (partial η^2 = .027), (shown in Table 6.6).

Table 6.6. Mean scores and standard deviations of resilience by group at Time 2 and 3. (N = 135)

	Time 2				Time 3			
			95% Confidence Interval				*95% Confidence Interval*	
Group	M	SD	*Lower Bound*	*Upper Bound*	M	SD	*Lower Bound*	*Upper Bound*
.b	39.49	.68	38.13	40.84	38.80	.74	37.33	40.27
SS	37.97	.58	36.82	39.11	38.48	.63	37.29	39.73
PMR	37.92	.74	36.45	39.39	39.17	.81	37.57	40.77

Covariates appearing in the model are evaluated at the following values: T1 Resilience = 38.41

6.3.4.4. Reading Comprehension analysis

A 2 x 3 mixed analysis of covariance was performed on reading comprehension. The between groups independent variable consisted of the three intervention groups; .b, SS and PMR. Time 1 reading comprehension scores made a significant contribution as a covariate for Time 2 and 3 reading comprehension scores, (F (1,131) = 421.04, p < .001), with a large effect size (partial η^2 = .763).

There was a significant, medium effect of group on reading comprehension scores (F (2, 131) = 4.55, p = .012, partial η^2 = .065). The adjusted marginal means, with 95% confidence interval illustrate that the highest scores were in the SS group, with post hoc analysis indicating that the SS group did significantly better on reading comprehension than both the .b and PMR groups. A simple contrasts analysis of the .b and PMR group illustrated that individuals in the mindfulness groups outperformed those in the PMR group; contrast estimate 1.39, p = .254, 95% CI (-1.01, 3.78), contrast estimate .2.39, p = .080, 95% CI (-5.08, .29), respectively.

There was no significant main effect of time (F (1, 131) = 2.82, p = .096), with a small effect size (partial η^2 = .021), or group by time interaction effect on reading scores (F (2, 131) = 377, p = .686), with a small effect size (partial η^2 = .006), (illustrated in Figure 6.1 and shown in Table 6.7).

Table 6.7. Mean scores and standard deviations of reading comprehension by group at Time 2 and 3. (N = 135)

	Time 2				Time 3			
			95% Confidence Interval				*95% Confidence Interval*	
Group	M	SD	*Lower Bound*	*Upper Bound*	M	SD	*Lower Bound*	*Upper Bound*
.b	88.91	1.01	86.91	90.91	90.59	1.12	88.36	92.81
SS	90.07	.845	88.40	91.74	92.20	.942	90.33	94.06
PMR	86.91	1.07	84.79	89.04	87.79	1.20	85.43	90.16

Covariates appearing in the model are evaluated at the following values: T1 reading comprehension = 84.98

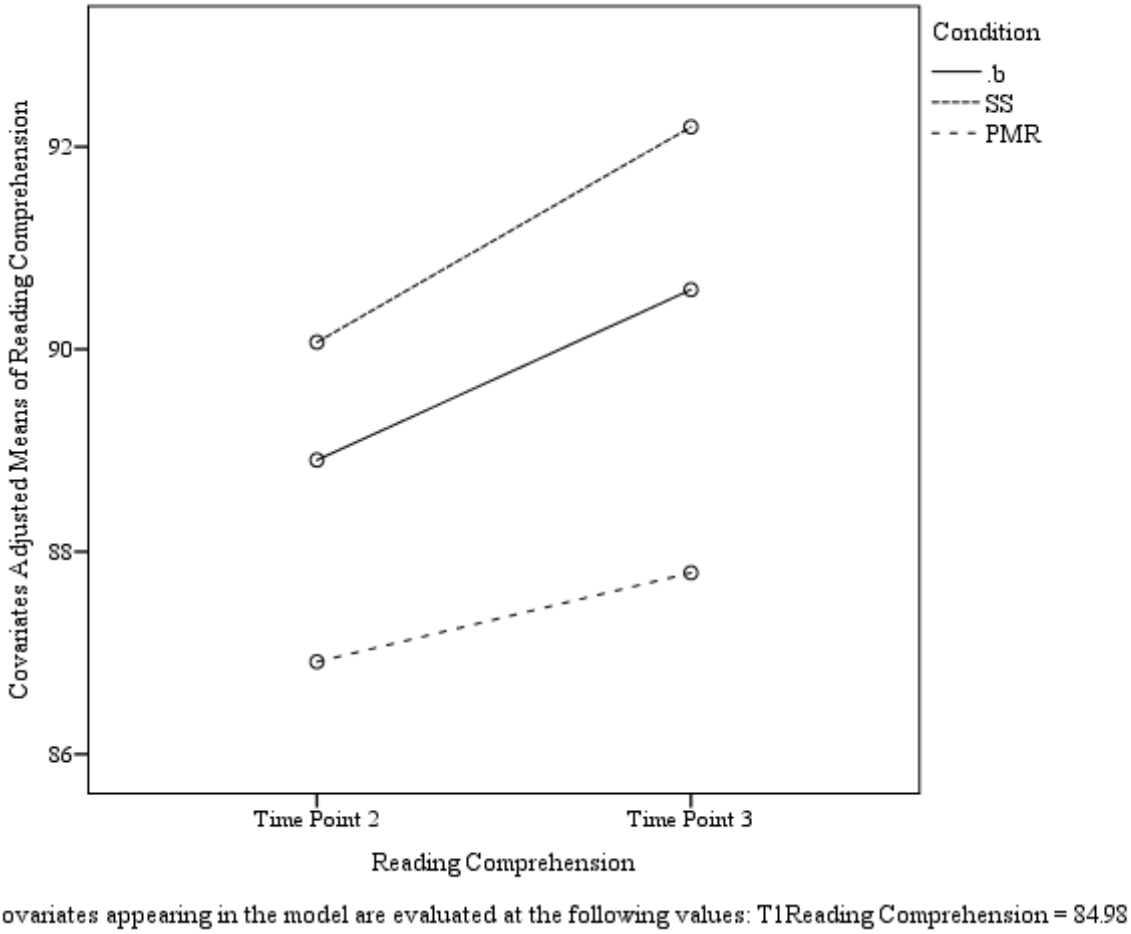


Figure 6.1. Mean scores of reading comprehension by group at Time 2 and 3. (N = 135)

6.3.4.7. Spelling analysis

A 2 x 3 mixed analysis of covariance was performed on spelling. The between groups independent variable consisted of the three intervention groups; .b, SS and PMR. Time 1

spelling scores made a significant contribution as a covariate for Time 2 and 3 spelling scores, (F (1, 129) = 288.06, p < .001), with a large effect size (partial η^2 = .691).

After controlling for baseline spelling scores, there was no significant main effect of group (F (2, 129) = .786 p = .458), with a small effect size (partial η^2 = .012). The adjusted marginal means, with 95% confidence interval illustrate that the highest scores were in the .b and SS groups. The lowest scores were in the PMR group. There was no significant main effect of time (F (1, 129) = 1.240, p = .268), with a small effect size (partial η^2 = .010), or group by time interaction on reading comprehension scores (F (2, 129) = .184, p = .832), with a small effect size (partial η^2 = .003), (shown in Table 6.8).

Table 6.8. Mean scores and standard deviations of spelling by group at Time 2 and 3. (N = 135)

	Time 2				Time 3			
			95% Confidence Interval				*95% Confidence Interval*	
Group	M	SD	*Lower Bound*	*Upper Bound*	M	SD	*Lower Bound*	*Upper Bound*
.b	42.21	.670	40.89	43.54	42.10	.484	41.14	43.06
SS	42.21	.570	40.08	43.34	41.93	.412	41.12	42.75
PMR	41.21	.725	39.78	42.65	41.48	.524	40.44	42.52

Covariates appearing in the model are evaluated at the following values: T1 Spelling = 39.68

6.3.4.8. Maths Analysis

A 2 x 3 mixed analysis of variance (ANOVA) was used as an alternative method of analysis for maths, as a breach of assumptions occurred in the data (see checks on assumptions earlier on in the chapter). The between groups independent variable consisted of the three intervention groups; .b, SS and PMR. The within groups independent variable was the difference in scores of wellbeing between Time 1 and Time 2 and between Time 1 and Time 3. Analyses were performed using IBM SPSS Statistics version 24.

The difference between Time 1 and Time 2, and Time 1 and Time 3 maths scores was not significantly different between groups (F (2, 130) = 2.426, p = .092), with a small effect

size (partial η^2 = .036). The marginal means, with 95% confidence interval illustrate that the highest scores were in the .b. group. The lowest scores were in the SS group, with the PMR group falling in the middle.

There was a significant main effect of Time (different scores at Time 1 and Time 2, and Time 1 and Time 3) (F (1, 130) = 11.510, p = .001), with a medium effect size (partial η^2 = .081), but there was no significant group by time interaction effect on maths scores (F (2, 130) = 1.080, p = .343), with a small effect size (partial $\eta^{2 =}$ .016), (shown in Table 6.9).

Table 6.9. Mean scores and standard deviations of maths difference scores by group at Time 2 and 3. (N = 135)

	Time 2				Time 3			
			95% Confidence Interval				*95% Confidence Interval*	
Group	M	SD	*Lower Bound*	*Upper Bound*	M	SD	*Lower Bound*	*Upper Bound*
.b	2.463	.712	1.055	3.871	3.122	.625	1.886	4.358
SS	.439	.604	-.756	1.633	2.000	.530	.952	3.048
PMR	.686	.770	-.838	2.210	1.457	.676	.120	2.794

6.4. Discussion

The main finding from this study was that female schoolchildren who received a nine week mindfulness training program did not score significantly different on psychological measures of mindfulness, well-being, resilience, or measures of academic performance compared to those children who were exposed to either a relaxation intervention or a study skills program. However, children who were exposed to the study skills program did significantly better on reading comprehension, in comparison to controls.

This study was conducted to explore the impact of mindfulness on school children's academic performance in an all-female school setting. More specifically, it was conducted to assess whether teaching mindfulness to Year 10 schoolchildren would result in increased levels of mindfulness, well-being and resilience, as well as improved academic performance in comparison to controls.

Self-reported levels of mindfulness did not differ significantly between the experimental and active control groups, with a small effect size. Participants in the SS and PMR groups experienced a decline between pre-and post-test scores, while those in the .b group remained marginally stable. By follow up however, scores in the experimental group also showed a decline. Although it is interesting, that while participants in the control groups experienced a decline in mindfulness scores, those in the experimental group did not. This suggests that while the intervention may not have improved scores on levels of mindfulness, it did not affect them adversely, in addition it may have offered some element of protection. (Broderick 2009).

Protective factors function to foster resilience, when children experience difficulties they become vulnerable to maladaptive behaviour, to adjust adequately they need to have protective factors in place (Luthar, Sawyer & Brown 2006). Year 10 arguably, is a demanding period in many young people's lives as it marks the beginning of GCSE's. Children in the .b group may have experienced the same level of pressure associated with this challenging time, however, participating in mindfulness may have protected them from the decline experienced by those students in the control groups. However, it should be remembered that these differences between groups were not statistically significant.

Similar to the mindfulness scores, levels of well-being did not differ significantly between the experimental and control groups, with a small effect size. Children in the SS group experienced a decline in scores, while those in the .b and the PMR groups, showed an improvement in levels of wellbeing. These findings provide evidence that a relaxation program has the same potential to elicit improvements in schoolchildren's levels of well-being as mindfulness. However, the improvement in scores were not maintained at follow-up, which suggest that while both the relaxation and mindfulness programs were beneficial to children, the benefits were only apparent whilst the children were engaged in the programs. Likewise,

there were no differences between the 3 groups on self-reported measures of resilience, with a small effect size. Participants in the mindfulness group showed a marginal improvement in scores, although they had returned to baseline at follow up. While participants in both of the control groups showed a decline at time 2, by time 3 the levels had risen slightly above baseline.

The lack of any significant findings on any of the psychological measures shows that mindfulness is no more beneficial in improving levels of well-being and resilience than a relaxation or a study skills program. Furthermore, any perceived benefits of mindfulness are likely to be either a product of relaxation, which is produced when students are able to disengage from the normal school routine; or equally likely an effect of engaging with the trainers (researchers) and receiving positive attention.

There was a significant difference between the groups on measures of reading comprehension with a medium effect, although not in the direction that was anticipated. Students in the SS group showed the highest improvement in reading comprehension scores, followed by those in the .b and PMR groups respectively. All three groups scored above baseline with improvements being maintained at three month follow up. While we would anticipate all groups to experience and maintain an improvement in scores as a result of maturation and learning across the academic year, we had not anticipated that the greatest benefit would be in the SS group. We might reason that the improvements are due to the students engaging in the material presented to them in the SS program to such an extent that it was possible to positively impact on scores.

There were no significant differences between the experimental and control groups in student's maths scores, with small effect sizes. However, all three of the groups showed an improvement in scores between time 1 and time 2, with the scores in all three groups continuing to rise at time 3. Similarly there were no differences statistically in spelling scores, with a small effect size. A slight improvement in scores was seen in all three groups, with participants in

the SS and .b groups showing a similar level of attainment, which was marginally above those in the PMR group.

The lack of any significant differences in students' academic performance is likely for the reason, as the research shows (Harskamp, Ding & Suhre 2008), that these students were, as a result of their single-sex learning environment, already at an advantage in terms of academic performance, and that the mindfulness training offered no further 'value added' benefits. This would also account for the lack of a significant difference between the groups in regards to psychological outcomes. The student's current teaching environment may already have been providing an atmosphere that was supportive to their wellbeing and resilience. The general improvement in academic performance that was seen in all 3 groups on measures of reading comprehension, spelling and maths was anticipated and is the result of students learning across the academic year, as well as maturation.

6.4.1. Conclusion

In summary this study has shown that exposing Year 10 schoolchildren to a nine week mindfulness training program does not significantly benefit the psychological wellbeing, resilience or mindfulness of female students at a single sex school, nor is there evidence that such training benefits their academic outcomes.

CHAPTER 7

7. Empirical Study 3

The Impact of Mindfulness Training on the Psychological and Academic Outcomes of a Group of Children Experiencing Educational Challenges.

Chapter Overview

This chapter will present the third empirical study of the thesis. Like the previous two studies this study was designed to test whether a nine week mindfulness programme could benefit children's mindfulness, wellbeing and resilience, as well as their basic skills, relative to two active control groups. In addition, this final study considered the impact of the training on the children's attention, and the children participating in this study represented children who experienced special educational needs within a mainstream school setting. Seventeen Year 10 pupils were randomly allocated by class, to one of three, nine week interventions: a mindfulness training program, a progressive muscle relaxation program or a study skills program, as per the earlier studies reported in this thesis. The children were assessed pre, post and three months post-intervention on a number of psychological and educational measures. The study tested the hypothesis that children in the mindfulness condition would show greater improvement on measures of mindfulness, wellbeing and resilience, as well as an improvement on academic measures of reading, reading comprehension, spelling and maths computation. Similar to the previous studies, the study did not find any significant differences between the experimental mindfulness group and the two active controls on any of the measures.

7.1. Introduction

7.1.1. Background

More than 14% of schoolchildren in England have special educational needs (SEN), almost half of which, 49%, are taught in mainstream, state funded, inclusive schools (Office of Statistics 2016). Research shows that children with SEN benefit from being taught in an inclusive environment (Galvan, et al. 2007). A four year study comparing the impact of school type (inclusive or specialist) on children's maths and literacy scores, found that those who attended inclusive schools did better in comparison to those taught in non-inclusive, specialist schools (Peetsma, et al. 2001). Children who are taught inclusively, regardless of having special educational needs or not, are expected to participate in the whole school curriculum. Such expectations are thought to account for the differences in performance (Peetsma et al. 2001) as the same expectations might not exist for children who are taught in specialist schools (Walberg & Paik 2000). Similarly, inclusive education also benefits children without special educational needs in relation to academic performance, and in particular when students with SEN are well supported in the classroom (Demeris, Childs & Jordan 2007). A small study exploring the effects of inclusion on non-SEN children found that maths and literacy scores increased in relation to the number of SEN children being taught in the classroom; the higher the number of SEN children, the bigger the improvement in maths and literacy scores (Demeris, Childs & Jordan 2007).

Research has demonstrated that academic performance can be influenced by a number of social and emotional factors including emotional and behavioural regulation, problem solving, empathy and the ability to get on with peers and teaching staff (Durlack, Weissberg, Dymnicki, Taylor & Schellinger 2011). As well as inclusion impacting on children's academic performance, it also has an effect on social, emotional and behavioural outcomes (Galvan, et al. 2007). Many children with special educational needs experience anxiety and low self-esteem as a result of feeling isolated (Hedges & Woon 2010). Inclusive education provides children with an opportunity to socialise and make friends in an environment that models

positive social and behavioural skills (Galvan, et al. 2007). Furthermore, it is not just those with special educational needs that benefit, inclusion in mainstream education models acceptance and diversity (Galvan, Jenne, Lemus, Morgan & Perez 2007). Research shows that children who attend inclusive schools are likely to be less prejudiced, more tolerant, and have greater respect for diversity, irrespective of whether they have a special educational need or not (Staub & Peck 1994).

As the research shows, a considerable proportion of schoolchildren in mainstream education have special educational needs. The challenge that schools face is not only to provide an inclusive environment for all children, regardless of whether they have a SEN or not, but also to provide an environment that promotes academic achievement, as well as fostering social and emotional learning. Consequently, schools are adopting various approaches to achieve these precise objectives. Existing research suggests that the application of mindfulness approaches in educational settings are beneficial to children (Napoli et al. 2005). Furthermore there is evidence to suggest that mindfulness-based interventions are equally capable of impacting academic, social and emotional outcomes in children with special educational needs, as they are in children without (Singh 2005; Benn et al. 2012; Worth 2013). However, these studies that have previously demonstrated effectiveness have been based on methodological approaches that are not ideal. They have either not used control groups (Singh 2005; Worth 2013), or where they have been used, only waitlist control has been adopted (Benn et al. 2012).

7.1.2. Rationale

There is a growing number of studies exploring the impact of mindfulness-based interventions on the academic outcomes of children with special educational needs and an

equivalent number exploring its impact on those without. There are however, few studies that have looked at the impact of mindfulness on schoolchildren's academic performance when it is delivered in an inclusive environment. To the best of the researcher's knowledge, there is no published research to date that has explored the impact of a mindfulness-based intervention on schoolchildren's outcomes in an inclusive setting. Moreover, and again to the best of the researchers knowledge, there is no published research that has conducted this type of research using equivalent active controls.

7.1.3. Aims and hypotheses

The aims of this study were to evaluate the impact of mindfulness training on schoolchildren's performance on measures of literacy and mathematics and to understand some of the social, emotional and behavioural factors which may exist between mindfulness training and academic performance. This study was conducted to test the following hypotheses.

1. Exposing Year 10, students in an inclusive environment to mindfulness training, will significantly increase levels of mindfulness, wellbeing and resilience, relative to active control groups receiving either study skills training or progressive muscle relaxation sessions.

2. Exposing year 10, students to mindfulness training will significantly impact academic performance, specifically by increasing scores on measures of reading, reading comprehension, spelling and maths computation, relative to active control groups receiving either study skills training or progressive muscle relaxation sessions.

3. Exposing Year 10, students to mindfulness training will lead to significantly increased levels of attention, relative to active control groups receiving either study skills training or progressive muscle relaxation sessions.

4. Exposing Year 10, students to mindfulness training will lead to significantly reduced levels of anxiety, relative to active control groups receiving either study skills training or progressive muscle relaxation sessions.

Similar to Study one and two, a further focus of this study was to determine whether any findings that occurred were in fact a result of the mindfulness training, and not due to any other related factors, such as students feeling more relaxed due to participating in the mindfulness intervention, or feeling more confident and encouraged as a result of receiving extra attention from staff. Consequently, this study was designed as a comparison study which included two active controls: one was a relaxation intervention; progressive muscle relaxation (PMR), and the other being a study skills class (SS). It was predicted that those children who received the mindfulness intervention would show significantly greater improvement on the psychological and academic measures compared to those in the active control groups.

7.2. Method

As was stated in previous chapters, each of the three empirical studies in this thesis used the same design, interventions, measures (with the exception of this study which used a further two measures), testing procedure and statistical approach. Consequently rather than repeat the method section in each of the empirical studies and risk repetition, the reader is instead referred to Chapter four for a full and detailed description of the methods used. However, since the

participants that were used in each study are unique to that particular study, a detailed description of the participants is provided.

7.2.1. Participants

Study three was conducted in a co-educational state school, situated in the Southwest area of Coventry. This was a relatively small school in comparison to the schools used in the first and second study, with an average intake of 600. The school acquired academy status in 2011 following an Ofsted inspection, where it was deemed to be a good school. The school demographic was mainly white British heritage students for whom English was their first language. In regards to academic standards, students entered this school with attainment below the national average, but by the time they left they had usually attained the national average. In regards to special educational needs the number of students receiving SEN support was above average, 19% in comparison with the national average of 14% (DfE 2016).

Students with special educational needs (SEN) are classified as belonging to one of the following categories. *SEN Support,* children in this category receive extra or different help which is in addition to that which is already provided as part of the school's usual curriculum. Children who are classified as *SEN support* do not have a statement or education, health and care plan (EHC); but may have been brought to the schools attention either by the school special educational needs co-ordinator (SENCO) or from other outside agencies. Children who are classified as Statement of special educational needs (statement) or Education, Health and Care (EHC) Plan, have either a statement or EHC plan when a formal assessment has been made. A document is in place that sets out the child's need and the extra help they should receive (DfE 2016: 4).

An initial thirty students were recruited to the study, of which thirteen were lost due to attrition. That is, two students moved to a different school, five were unavailable for testing at follow up, while a further six cases could not be used due to missing values missing not at random (MNAR). Consequently, the final sample analysed comprised 17, five male and 12 female, Year 10 students, between the ages of 14 and 15 years, recruited from a co-educational state secondary school. The average age of participants was 14 years and 4 months (SD 3.25). Participants were allocated to the intervention groups at class level, using cluster allocation: six participants were allocated to the mindfulness condition, six were allocated to the PMR condition, with the remaining five allocated to the SS condition.

Of the 17 children whose data was included in this study, seven were classified as having special educational needs (SEN). Of these seven children, three were further classified as either '*statement of special educational needs'* or '*Education, Health and care plan' (EHC),* indicating that they had been formally assessed as SEN. The remaining four children were classified as SEN support. That is, that while they not did not have a *statement* or an *Education, Health and care plan* (EHC), they did receive extra help that was different from the usual curriculum. For more details regarding how children with SEN are classified please refer to Chapter four.

7.3. Results

Correlation analyses, analysis of variance and analysis of covariance.

7.3.1. Observations on variance differences

Post hoc inspection of standard deviations in the tables indicate that the groups were not always equivalent in terms of their degree of variability around the means. For example, the wellbeing data that are reported in Table 7.1., indicate that the standard deviation of all time points for wellbeing in the SS group were consistently higher than the standard deviations in

the other two groups. This can also be seen in the trait anxiety data (Table 7.3), as well as the attention data (Table 7.4). In contrast the spelling data in table 7.2 demonstrate that the standard deviation of all time points for spelling data was lower for the SS group in comparison to the other two groups. This could be an indication that students in this group differ more psychologically than participants in the other groups; for example, children in the .b group had the highest levels of wellbeing at time 1 compared to those in the PMR and SS groups but made the most progress at time 2 and time 3.

Table 7.1. Descriptive statistics on measures by group (standard deviations in parentheses). (N = 17)

Outcome		.b experimental group (n = 6)		SS control group (n = 5)		PMR control group (n = 6)	
Mindfulness	Pre	32.17	(6.08)	25.80	(6.57)	27.33	(3.98)
	Post	35.67	(4.63)	29.60	(3.64)	28.33	(3.33)
	Follow-up	34.33	(4.84)	27.00	(6.21)	30.17	(4.31)
Resilience	Pre	39.33	(99.03)	33.80	(6.83)	35.00	(6.99)
	Post	40.17	(7.89)	41.40	(6.73)	34.00	(7.72)
	Follow-up	39.55	(6.14)	35.80	(8.92)	35.83	(9.34)
Wellbeing	Pre	50.83	(9.34)	45.40	(12.88)	43.17	(5.91)
	Post	55.50	(4.51)	45.80	(11.37)	46.33	(9.44)
	Follow-up	54.67	(7.20)	46.40	(10.43)	47.33	(10.10)
Read Comp'	Pre	87.17	(22.73)	86.40	(9.40)	77.50	(19.26)
	Post	96.00	(21.97)	91.80	(14.32)	90.17	(22.75)
	Follow-up	99.50	(17.99)	95.00	(14.35)	92.50	(22.47)
Spelling	Pre	38.67	(8.47)	37.80	(7.10)	40.50	(7.18)
	Post	39.83	(8.64)	39.20	(5.76)	39.83	(6.88)
	Follow-up	40.50	(8.940	41.20	(5.93)	40.67	(6.35)
Maths	Pre	38.67	(4.32)	32.20	(6.72)	39.00	(5.96)
	Post	40.00	(1.10)	33.20	(5.76)	38.17	(6.15)
	Follow-up	40.17	(6.21)	31.00	(5.75)	39.00	(6.90)
Anxiety	Pre	34.17	(12.77)	44.00	(15.02)	48.83	(9.64)
	Post	34.17	(8.52)	42.40	(10.69)	45.17	(6.05)
	Follow-up	35.83	(11.05)	44.40	(14.59)	42.17	(9.75)
Attention	Pre	188.50	(31.16)	135.20	(65.62)	192.00	(41.13)

Post	222.17	(48.14)	170.40	(74.85)	234.83	(57.29)
Follow-up	231.33	(33.27)	150.00	(99.37)	250.17	(52.38)

7.3.2. Preliminary analysis

Prior to performing correlation analysis, checks were made to ensure the data met with assumptions of linearity and homoscedasticity.

As ANCOVA was the main analytic method used for analysis, the following assumptions were checked as advised by Tabachnick & Fidell (2014); unequal sample sizes, missing data, ratio of cases to independent variable, absence of outliers, absence of multicollinearity, normality of sampling distributions, homogeneity of variance, linearity and finally homogeneity of regression. Having noted here which assumptions were always checked it will only be reported which breaches of assumptions occurred. All preliminary analyses were performed using IBM SPSS Statistics version 24.

7.3.2.1. Checks on assumptions

Unequal sample sizes. The default analysis for the ANCOVA estimates the type 3 sums of squares. This is the appropriate form of mean estimation advocated by Tabachnick & Fidell (2014) and Overall & Spiegel (1969) for the correction of unequal sample sizes for experimental design.

Missing data. The only missing data that occurred in this study were data that were lost to attrition and not missing at random (NMAR), hence a method of listwise deletion was employed for this data.

For all analyses that were done using ANCOVA the same breaches of assumptions occurred, and in each case the same process was applied to deal with them. Thus to avoid repetition breaches of assumptions shall only be reported this once.

Homogeneity of regression. There was a significant interaction between the covariate, (baseline maths scores) and maths at time 2 and 3 demonstrating a violation of the assumptions of homogeneity of regression, and in addition between the covariate, (baseline concentration scores) and concentration at Time 2 and Time 3. Hence ANCOVA could not be performed on the maths and concentration measures so an analysis of variance (ANOVA) was done as an alternative.

7.3.3. Correlation analysis

To explore if increased levels of mindfulness brought about through mindfulness training, could predict improved levels of attention and academic performance, through an association of improved levels of well-being and resilience, as well as reduced levels of anxiety, a number of simple correlations were performed between academic measures; reading comprehension, spelling and maths, and mindfulness, well-being and resilience immediately after and three months following the intervention.

There was a significant correlation between mindfulness and maths at time 3, indicating that as levels of mindfulness improve so to do maths scores.

We did not find any further significant relationships between mindfulness, well-being, resilience and anxiety, or attention and academic measures at Time 2 or Time 3 (see Table 7.2 and 7.3).

Table 7.2. Pearson correlations coefficients between Time 2 mindfulness, well-being and resilience with Time 2 academic performance measures (N = 17)

Measures	T2 Mindfulness	T2 Well-being	T2 Resilience	T2 Anxiety	T2 Attention
T2 Well-being					
Correlation	.767**	...			
Sig.(2-tailed)	.000				
T2 Resilience					
Correlation	.587**	.647**	…		
Sig.(2-tailed)	.013	.005			
T2 Anxiety					
Correlation	-.557*	-.627**	-.361	…	

Sig.(2-tailed)	.020	.007	.155		
T2 Attention					
Correlation	.245	.398	-.039	-.095	…
Sig.(2-tailed)	.343	.114	.881	.716	
T2 Read Comp'					
Correlation	-.008	.158	.136	-.449	.042
Sig.(2-tailed)	.975	.545	.603	.071	.872
T2 Spelling					
Correlation	-.028	.157	.015	-.457	.261
Sig.(2-tailed)	.915	.548	.953	.065	.312
T2 Math					
Correlation	.185	.300	-.119	-.183	.474
Sig.(2-tailed)	.476	.242	.655	.481	.054

Table 7.3. Pearson correlations coefficients between Time 3 mindfulness, well-being and resilience with Time 3 academic performance measures (N = 17)

Measures	T3 Mindfulness	T3 Well-being	T3 Resilience	T3 Anxiety	T3 Attention
T3 Well-being					
Correlation	.859**	...			
Sig.(2-tailed)	.000				
T3 Resilience					
Correlation	.797**	.909**	…		
Sig.(2-tailed)	.000	.000			
T3 Anxiety					
Correlation	-.672**	-.797**	-.842**	…	
Sig.(2-tailed)	.003	.000	.000		
T3 Attention					
Correlation	.429	.317	.131	-.150	…
Sig.(2-tailed)	.086	.215	.616	.567	
T3 Read Comp'					
Correlation	.083	.169	.146	-.246	.068
Sig.(2-tailed)	.752	.516	.576	.341	.795
T3 Spelling					
Correlation	-.075	.166	.122	-.321	.176
Sig.(2-tailed)	.776	.525	.640	.210	.500
T3 Math					
Correlation	.590*	.428	.290	-.332	.424
Sig.(2-tailed)	.013	.086	.258	.193	.090

7.3.4. Main analysis

7.3.4.1. Mindfulness analysis

A 2 (time) x 3 (group) mixed analysis of covariance was performed on mindfulness scores to compare the experimental group .b with the two control groups, SS and PMR. Time

1 mindfulness scores made a significant contribution as a covariate for Time 2 and 3 mindfulness scores, (F (1, 13) = 34.235, p < .001), with a large effect size (partial η^2 = .725).

After controlling for baseline mindfulness scores, there was no significant main effect of group (F (2, 13) = 2.112, p = .161), with a large effect size (partial η^2 = .245). The adjusted marginal means, with 95% confidence interval illustrate that the highest scores were in the .b group. The lowest scores were in the PMR group, with the SS group falling in the middle. In addition there was no main effect of time (F (1, 13) = .179, p = .679), with a small effect size (partial η^2 = .014), or group by time interaction effect on mindfulness scores (F (2, 13) = 2.09, p = .162), with a large effect size (partial η^2 = .244), (see Table 7.4).

Table 7.4. Mean scores and standard deviations of mindfulness by group at Time 2 and 3. (N = 17)

	Time 2				Time 3			
			95% Confidence Interval				*95% Confidence Interval*	
Group	M	SD	*Lower Bound*	*Upper Bound*	M	SD	*Lower Bound*	*Upper Bound*
.b	33.486	.899	31.544	35.428	31.964	1.613	28.479	35.449
SS	31.299	.948	29.252	33.347	28.846	1.700	25.173	32.520
PMR	29.098	.838	27.288	30.098	30.998	1.503	27.749	34.246

Covariates appearing in the model are evaluated at the following values: T1 Mindfulness = 28.59

7.3.4.2. Wellbeing analysis

A 2 (time) x 3 (group) mixed analysis of covariance was performed on wellbeing scores to compare the experimental group .b with the two control groups, SS and PMR. Time 1 wellbeing scores made a significant contribution as a covariate for Time 2 and 3 wellbeing scores, (F (1, 13) = 7.10, p .019), with a large effect size (partial η^2 = .353).

There was no significant main effect of group (F (2, 13) = .964, p = .407), with a large effect size (partial η^2 = .130) on wellbeing scores. The adjusted marginal means, illustrate that the highest scores were in the .b group. The lowest scores were in the SS group, with the PMR group falling in the middle. There was no main effect of time (F (1, 13) = .011, p = .916), with

a small effect size (partial $\eta^2 = .001$), or group by time interaction effect on wellbeing scores (F (2, 13) = .180, p = .837), with a small effect size (partial $\eta^2 = .027$), shown in Table 7.5.

Table 7.5. Mean scores and standard deviations of wellbeing by group at Time 2 and 3. (N = 17)

	Time 2				Time 3			
			95% Confidence Interval				*95% Confidence Interval*	
Group	M	SD	*Lower Bound*	*Upper Bound*	M	SD	*Lower Bound*	*Upper Bound*
.b	53.250	3.157	46.429	60.070	52.319	3.390	44.995	59.642
SS	46.391	3.325	39.207	53.574	47.016	3.570	39.303	54.729
PMR	48.092	3.107	41.378	54.805	49.168	3.336	41.960	56.376

Covariates appearing in the model are evaluated at the following values: T1 Wellbeing = 46.53

7.3.4.3. Resilience analysis

A 2 (time) x 3 (group) mixed analysis of covariance was performed on resilience scores to compare the experimental group .b with the two control groups, SS and PMR. Time 1 resilience scores made a significant contribution as a covariate for Time 2 and 3 resilience scores, (F (1, 13) = 43.66, $p < .001$), with a large effect size (partial $\eta^2 = .771$).

After controlling for resilience at Time 1 (baseline), there was no significant main effect of group (F (2, 13) = 2.31, p = .138), with a large effect size (partial $\eta^2 = .262$). The adjusted marginal means, with 95% confidence interval illustrate that the highest scores were in the SS group. The lowest scores were in the PMR group, with the .b group falling in the middle. There was no significant main effect of time (F (1, 13) = .389, p = .544), with a small effect size (partial $\eta^2 = .029$), or group by time interaction effect on resilience scores (F (2, 13) = 2.585, p = .113), with a large effect size (partial $\eta^2 = .285$) (see Table 7.6).

Table 7.6. Mean scores and standard deviations of resilience by group at Time 2 and 3. (N = 17)

	Time 2				Time 3			
			95% Confidence Interval				*95% Confidence Interval*	
Group	M	SD	*Lower Bound*	*Upper Bound*	M	SD	*Lower Bound*	*Upper Bound*
.b	37.601	1.803	33.77	41.496	36.210	2.053	31.775	40.645
SS	43.331	1.940	39.141	47.522	37.900	2.209	33.128	42.673
PMR	34.956	1.750	31.175	38.737	36.873	1.993	32.567	41.179

Covariates appearing in the model are evaluated at the following values: T1 Resilience = 36.18

7.3.4.4. Reading Comprehension analysis

A 2 (time) x 3 (group) mixed analysis of covariance was performed on reading comprehension scores to compare the experimental group .b with the two control groups, SS and PMR. Time 1 reading comprehension scores made a significant contribution as a covariate for Time 2 and 3 reading comprehension scores, (F (1, 13) = 126.84, $p < .001$), with a large effect size (partial $\eta^2 = .907$).

After the adjustment by the covariate of reading comprehension at Time 1 (baseline), there was no significant main effect of group (F (2, 13) = 1.618, $p = .236$), with a large effect size (partial $\eta^2 = .199$). The adjusted marginal means, with 95% confidence interval illustrate that the highest scores were in the PMR group. The lowest scores were in the SS group, with the .b group falling in the middle. There was no main effect of time (F (1, 13) = 3.92, $p = .069$), with a large effect size (partial $\eta^2 = .232$), or group by time interaction effect on reading comprehension scores (F (2, 13) = .382, $p = .690$), with a medium effect size (partial $\eta^2 = .055$), (see Table 7.7).

Table 7.7. Mean scores and standard deviations of reading comprehension by group at Time 2 and 3. (N = 17)

	Time 2				Time 3			
			95% Confidence Interval				*95% Confidence Interval*	
Group	M	SD	*Lower Bound*	*Upper Bound*	M	SD	*Lower Bound*	*Upper Bound*
.b	92.204	2.802	86.151	98.256	95.982	2.520	90.538	101.427
SS	88.804	3.057	82.200	95.408	92.224	2.750	86.283	98.165
PMR	96.460	2.841	90.322	102.597	98.331	2.556	92.810	103.853

Covariates appearing in the model are evaluated at the following values: T1 Reading Comprehension = 83.53

7.3.4.5. Spelling analysis

A 2 (time) x 3 (group) mixed analysis of covariance was performed on spelling scores to compare the experimental group .b with the two control groups, SS and PMR. Time 1 spelling scores made a significant contribution as a covariate for Time 2 and 3 spelling scores, (F (1, 13) = 44.17, $p < .001$), with a large effect size (partial $\eta^2 = .773$).

There was no significant main effect of group on spelling scores (F (2, 13) = .530, p = .601), with a medium effect size (partial $\eta^2 = .075$). The adjusted marginal means, with 95% confidence interval illustrate that the highest scores were in the SS group. The lowest scores were in the PMR group, with the .b group falling in the middle. In addition there was no main effect of time (F (1, 13) = 2.55, p = .134), with a large effect size (partial $\eta^2 = .164$), or group by time interaction effect on spelling scores (F (2, 13) = .366, p = .700), with a medium effect size (partial $\eta^2 = .053$), (see Table 7.8).

Table 7.8. Mean scores and standard deviations of spelling by group at Time 2 and 3. (N = 17)

	Time 2				Time 3			
			95% Confidence Interval				*95% Confidence Interval*	
Group	M	SD	*Lower Bound*	*Upper Bound*	M	SD	*Lower Bound*	*Upper Bound*
.b	40.179	1.187	37.614	42.743	40.803	1.815	36.882	44.724
SS	40.309	1.306	37.488	43.130	42.173	1.997	37.859	46.487
PMR	38.564	1.195	35.982	41.146	39.553	1.828	35.604	43.502

Covariates appearing in the model are evaluated at the following values: T1 Spelling = 39.06

7.3.4.6. Maths Analysis

A 2 x 3 mixed analysis of variance (ANOVA) was used as an alternative method of analysis for maths, as a breach of assumptions occurred in the data (see checks on assumptions earlier on in the Chapter). The between groups independent variable consisted of the three intervention groups; .b, SS and PMR. The within groups independent variable was the difference in scores of maths between Time 1 and Time 2 and between Time 1 and Time 3. Analyses were performed using IBM SPSS Statistics version 24.

The difference between Time 1 and Time 2, and Time 1 and Time 3 maths scores was not significantly different between groups (F (2, 14) = .339, p = .718), with a small effect size (partial η^2 = .046). The marginal means, with 95% confidence interval illustrate that the highest scores were in the .b group. The lowest scores were in the PMR group, with the SS group falling in the middle.

There was no significant main effect of time (different scores at Time 1 and Time 2, and Time 1 and Time 3) (F (1, 14) = .194, p = .666), with a small effect size (partial η^2 = .014), or group by time interaction effect on maths scores (F (2, 14) = .974, p = .402), with a medium to large effect size (partial $\eta^{2 =}$ .122), (shown in Table 7.9).

Table 7.9. Mean scores and standard deviations of maths difference scores by group at Time 2 and 3. (N = 17)

	Time 2				Time 3			
			95% Confidence Interval				*95% Confidence Interval*	
Group	M	SD	*Lower Bound*	*Upper Bound*	M	SD	*Lower Bound*	*Upper Bound*
.b	1.33	1.95	-2.85	5.52	1.50	1.71	-2.17	5.17
SS	1.00	2.14	-3.59	5.59	-1.20	1.88	-5.22	2.82
PMR	-8.33	1.95	-5.02	3.35	2.22	1.71	-3.67	3.67

7.3.4.7. State anxiety analysis

A 2 (time) x 3 (group) mixed analysis of covariance was performed on state anxiety scores to compare the experimental group .b with the two control groups, SS and PMR. Time 1 state anxiety scores made a significant contribution as a covariate for Time 2 and 3 state anxiety scores, (F (1, 13) = 15.16, p .002), with a large effect size (partial η^2 = .538).

After controlling for baseline state anxiety scores, there was no significant main effect of group (F (2, 13) = 2.35 p = .135), with a large effect size (partial η^2 = .265). The adjusted marginal means, with 95% confidence interval illustrate that the highest scores were in the SS group. The lowest scores were in the .b group, with the PMR group falling in the middle. In addition there was no main effect of time (F (1, 13) = .125, p = .729), with a small effect size (partial η^2 = .010), or group by time interaction effect on state anxiety scores (F (2, 13) = .230, p = .798), with a small effect size (partial η^2 = .034), (shown in Table 7.10).

Table 7.10. Mean scores and standard deviations of state anxiety by group at Time 2 and 3. (N = 17)

	Time 2				Time 3			
			95% Confidence Interval				*95% Confidence Interval*	
Group	M	SD	*Lower Bound*	*Upper Bound*	M	SD	*Lower Bound*	*Upper Bound*
.b	34.161	2.869	27.964	40.359	34.327	3.015	27.813	40.840
SS	42.612	3.024	36.080	49.144	40.266	3.178	33.401	47.131
PMR	39.828	2.940	33.477	46.180	36.451	3.090	29.776	43.127

Covariates appearing in the model are evaluated at the following values: T1 State Anxiety = 41.53

7.3.4.8. Trait anxiety analysis

A 2 (time) x 3 (group) mixed analysis of covariance was performed on trait anxiety scores to compare the experimental group .b with the 2 control groups, SS and PMR. Time 1 trait anxiety scores made a significant contribution as a covariate for Time 2 and 3 trait anxiety scores, (F (1, 13) = 16.461, p < .001), with a large effect size (partial η^2 = .559).

After the adjustment by the covariate of trait anxiety, there was no significant main effect of group (F (2, 13) = .243, p = .788), with a small effect size (partial η^2 = .036). The adjusted marginal means, with 95% confidence interval illustrate that the lowest scores were in the .b group. The highest scores were in the PMR group, with the SS group falling in the middle. There was no main effect of time (F (1, 13) = .331, p = .575), with a small effect size (partial η^2 = .025), or group by time interaction effect on trait anxiety scores (F (2, 13) = 1.10, p = .362), with a large effect size (partial η^2 = .145), (shown in Table 7.11).

Table 7.11. Mean scores and standard deviations of trait anxiety by group at Time 2 and 3. (N = 17)

	Time 2				Time 3			
			95% Confidence Interval				*95% Confidence Interval*	
Group	M	SD	*Lower Bound*	*Upper Bound*	M	SD	*Lower Bound*	*Upper Bound*
.b	39.010	2.368	33.894	44.127	40.875	4.050	32.127	49.624
SS	41.450	2.398	36.270	46.630	43.297	4.100	34.440	52.155
PMR	41.615	2.308	36.628	46.601	38.044	3.946	29.518	46.569

Covariates appearing in the model are evaluated at the following values: T1 Trait Anxiety = 42.24

7.3.4.9. Attention Analysis

A 2 x 3 mixed analysis of variance (ANOVA) was used as an alternative method of analysis for attention, as a breach of assumptions occurred in the data (see checks on assumptions earlier on in the Chapter). The between groups independent variable consisted of the 3 intervention groups; .b, SS and PMR. The within groups independent variable was the difference in scores of attention between Time 1 and Time 2 and between Time 1 and Time 3. Analyses were performed using IBM SPSS Statistics version 24.

The difference between Time 1 and Time 2, and Time 1 and Time 3 attention scores did not differ significantly between groups (F (2, 14) = .400, p = .678), with a medium effect size (partial η^2 = .054). The marginal means, as displayed in Table 6.34, with 95% confidence interval illustrate that the highest scores were in the PMR group. The lowest scores were in the SS group, with the .b group falling in the middle.

There was no significant main effect of time on attention scores (different scores at Time 1 and Time 2, and Time 1 and Time 3) (F (1, 14) = .008, p = .932), with a small effect size (partial η^2 = .001), or group by time interaction effect (F (2, 14) = 467, p = .636), with a medium effect size (partial $\eta^{2 =}$ .063), (shown in Table 7.12).

Table 7.12. Mean scores and standard deviations of attention difference scores by group at Time 2 and 3. (N = 17)

	Time 2				Time 3			
			95% Confidence Interval				*95% Confidence Interval*	
Group	M	SD	*Lower Bound*	*Upper Bound*	M	SD	*Lower Bound*	*Upper Bound*
.b	33.67	12.58	6.68	60.66	42.83	30.45	-22.47	108.14
SS	35.20	13.79	5.63	64.77	14.80	33.38	-56.74	86.34
PMR	42.83	12.58	15.84	69.82	58.17	30.45	-7.14	123.47

7.4. Discussion

The main finding from this study was that children who were exposed to a nine week mindfulness training program did not score significantly different on measures of academic performance and psychological measures, in comparison to those children who were exposed to a nine week active control.

This study was conducted to explore the impact of mindfulness training on schoolchildren's academic performance, in a school that had a higher than average number of students with special educational needs. This study predicted that mindfulness training would increase children's levels of mindfulness, resilience, wellbeing, have a positive impact on academic performance, lower levels of anxiety, and improve levels of attention, relative to controls.

There were no differences in self-reported levels of mindfulness between the experimental group and controls, although there was a large effect size. The sample size in this study was small (N=17), the large effect size may indicate that a larger sample size may have reached statistical significance, although equally it may have been due to error.

However, in line with our hypothesis, children in the mindfulness group experienced the biggest improvements which although were not maintained at Time 3, were still considerably above baseline. Students in the SS group demonstrated a similar pattern, although scores had more or less returned to baseline by three month follow up. Conversely, for those children in the PMR group, a decline in scores were seen at Time 2, followed by an increase at Time 3. The lack of a significant effect in the experimental group is surprising as there is an expectation that teaching mindfulness to students would result in an improvement in mindfulness scores. However, it is likely that the lack of a significant effect is due to the small number of participants in the study (N=17). The actual power of the study was only .06. Power analysis based on an actual eta squared of .245 using the conventional criteria of power set at .80 demonstrated that a sample size of N= 975 would have been needed. Therefore, future studies would need to recruit numbers in or around this region.

Similar to the mindfulness results, students in the experimental group did not experience a significant increase in wellbeing following the nine week mindfulness program, although they did experience the biggest improvements in scores, in addition there was a large effect size, which may indicate that a larger sample may have reached statistical significance. While improvements were not maintained at follow up, they did remain above baseline. Similarly, participants in the SS and PMR groups also experienced an improvement in scores between Time 1 and 2, although in each of these groups the scores were maintained and continued to rise at Time 3. Of the two controls, those in the PMR group demonstrated the biggest improvements, which might be considered expected; of the two interventions PMR

may be anticipated as having the greatest potential to elicit some form of relaxation that has a positive effect on wellbeing. These results suggest that mindfulness training is no more effective than PMR or SS in improving well-being amongst schoolchildren.

Like wellbeing and mindfulness, the groups did not differ significantly on measures of resilience, although there was a large effect size, indicating that a larger sample size may have reached statistical significance. However, unlike mindfulness and wellbeing, children in the study skills group demonstrated the biggest improvements between Time 1 and 2, however, by time 3 the scores had more or less returned to baseline. A similar pattern was seen in the mindfulness group; students demonstrated a marginal increase in scores at Time 2, however, by Time 3 they had essentially returned to baseline. These results suggest that while both the mindfulness and SS programs were beneficial to students, the benefits were only evident while students were engaged in the programs. Students in the PMR group showed the least improvement at Time 2 and in fact showed a decline in scores, although by Time 3 the scores began to improve. The improvement in resilience in the SS group was an unexpected finding which was not anticipated. We may have considered PMR as equally likely of improving resilience as mindfulness, again as mentioned earlier due to its relaxation potential. However, it is difficult to conceive how SS would have such an improving effect. We can only speculate that the SS program is having a positive impact on student's perception of their academic capability which at some level is influencing resilience. Again, this is only speculation and would require further investigation.

An improvement in reading comprehension was seen across all three groups between Time 1 and 2, and again between Time 2 and 3**.** The effect size for reading comprehension was large, which may indicate that a larger sample may have reached statistical significance. These findings would be anticipated as a result of maturation and learning across the academic year, regardless of children being exposed to the interventions. The biggest improvements in reading

comprehension, although not statistically significant, were seen in the PMR group, which were not only maintained at Time 3, but continued to rise. The same trend was seen in the mindfulness and the SS groups, with improvements continuing to rise by Time 3. Once more these findings were not anticipated, as we might have expected that out of the two active controls, that the SS program would have a greater potential to elicit educational improvements.

Like reading comprehension, the groups did not differ significantly on measures of spelling, with a medium effect size. The biggest improvements between Time 1 and 2 were seen in the SS group with students in the mindfulness group scoring equally well. While improvements were maintained and continued to rise for both groups, those in the SS program experienced the most sizable and sustained improvements, indicating that SS had a greater overall effect on spelling than mindfulness. Similar to spelling, there were no differences, statistically between the groups on maths scores, with a small effect size. Although in line with our hypothesis, students in the mindfulness group experienced the biggest improvements between Time 1 and 2, improvements which were maintained and continued to improve at Time 3. Improvements were also seen by those in the PMR group, and again maintained at time 3, while those in the SS groups demonstrated a decline in scores from Time 1 to Time 2, which continued at Time 3. It is worth noting that like reading comprehension, an improvement in spelling and maths scores across all three groups was anticipated as a result of learning and maturation across the school year.

Self-reported levels of state anxiety did not differ significantly between the experimental and active control groups, although the large effect size that was observed (η^2 = .265), indicates that a larger sample may potentially have reached statistical significance. However, in line with the study hypothesis, the biggest difference in scores were seen in the experimental group, which demonstrated a decline in levels of state anxiety between Time 1 and 2 below baseline. The lowered levels were more or less maintained at Time 3, with students

experiencing a moderate increase in scores. Students in the PMR group also demonstrated a decline in levels of anxiety between Time 1 and 2, a decline which was sustained and continued to fall by Time 3. In contrast, participants in the SS group experienced an increase in levels of state anxiety at Time 2, although by Time 3 levels had stabilised, and were in fact lower than they had been at baseline. These findings were not unexpected as it was anticipated that those in the mindfulness and PMR groups would experience a drop in levels of anxiety following engagement in the interventions by Time 2. What was unexpected though, was that it was the PMR intervention that continued to provide benefits to the students three months after the program had ended, while the mindfulness benefits were only effective when participants were engaged in the 9-week program. Furthermore, it is not clear why those in the SS group had an increase in anxiety scores, further research would be required to understand this further.

Like state anxiety, self-reported levels of trait anxiety did not differ significantly between the three groups, with a small effect size. Again, like state anxiety the biggest improvement in levels of trait anxiety at Time 2 were seen in the .b group, however, while they were still below baseline by 3 month follow up, they had begun to rise. Demonstrating once again that mindfulness is most beneficial in regards to anxiety levels, when children are exposed to the nine week training program. Similarly, those in the PMR group experienced a decline at Time 2 which was maintained and continued to fall at Time 3, demonstrating the immediate and long term benefits of PMR on anxiety. While levels of trait anxiety did not increase in the SS group, as they had done for state anxiety levels, they none the less followed a similar pattern, by declining marginally at Time 2, but increased considerably by Time 3 above baseline.

There were no significant differences in levels of attention between the groups, with a medium effect size. The biggest improvements were seen in the PMR group, with increases maintained at three month follow up. Those in the mindfulness group demonstrated the lowest

improvement at Time 2, although by Time 3 levels of attention were continuing to rise. Participants in the SS group did show improved levels of attention at Time 2, but they were not maintained at Time 3 and had in fact dropped considerably below baseline. These findings demonstrate that there were no real performance differences between the students regardless of which intervention they were exposed too.

7.4.1. Conclusion

To summarise, this study has shown that exposing Year 10 schoolchildren to a nine week mindfulness training program does not significantly impact on any of the following psychological measures; mindfulness, resilience, wellbeing or anxiety. In addition, it does not significantly impact on measures of reading, reading comprehension, spelling or maths computation. However, mindfulness training was associated with improved levels of mindfulness and wellbeing as well as lower levels of anxiety. Furthermore it was also associated with improved maths scores. A further discussion of these findings and their implications is discussed in detail in Chapter eight.

7.4.2. Summary

This chapter presented the final empirical study that was part of this thesis. The next chapter is the final chapter which summarises the findings from each of the three empirical studies and provides a general discussion based on each of them.

CHAPTER 8

8. Discussion

Chapter Overview

The overarching aim of this thesis was to evaluate the impact of mindfulness training on schoolchildren's performance on the basic skills of literacy and mathematics, and to understand some of the social, emotional and behavioural factors that may exist between mindfulness training and academic performance. In order to meet this aim, three separate empirical studies were conducted in a number of schools in the West Midlands region. This final chapter will summarise the findings from each of the three studies, present a general discussion based on these findings, address limitations of the research and highlight possible directions for future research.

8.1. Summary of Key Findings

As noted in Chapter 1, although interest in using mindfulness-based interventions for children and adolescents is growing, there have been few studies that have examined the impact of mindfulness training in schools in relation to academic performance. Thus, this thesis sought to explore the impact of mindfulness on schoolchildren's academic performance, proposing four specific hypotheses.

1. Teaching mindfulness to Year 10 schoolchildren in an inclusive school environment will lead to significantly increased levels of mindfulness, and subsequently increased levels of resilience and wellbeing, compared to children who receive alternative treatments as controls (PMR and SS).

2. Teaching mindfulness to Year 10 schoolchildren in an inclusive school environment will have a significant impact on academic outcomes, specifically measures of reading, reading comprehension, spelling and maths computation, compared to children who receive alternative treatments as controls (PMR and SS).
3. Teaching mindfulness to Year 10 schoolchildren in an inclusive school environment will lead to significantly increased levels of attention compared to children who receive alternative treatments as controls (PMR and SS).
4. Teaching mindfulness to Year 10 schoolchildren in an inclusive school environment will lead to significantly reduced levels of anxiety compared to children who receive alternative treatments as controls (PMR and SS).

8.1.1. Study one key findings

Study one was conducted in a coeducational school, and aimed to test hypotheses one and two; that teaching mindfulness to schoolchildren would result in increased levels of mindfulness, resilience and wellbeing, and improved academic performance in comparison to children who receive alternative interventions. The key findings from this study were that participants in the mindfulness group showed statistically significant differences in word reading and reading comprehension scores at post-test after controlling for individual differences in baseline abilities at pre-test, in comparison to controls. In addition, participants in the mindfulness group scored significantly better at post-test on measures of mindfulness in comparison to those in the PMR and SS groups (after controlling for baseline scores), however, the degree of improvement was extremely small and was therefore unlikely to be educationally meaningful.

8.1.2. Study two key findings

Study two was conducted in an all-female school, to test the same two hypotheses as the previous study; that teaching mindfulness to schoolchildren would result in improved psychological and academic performance relative to controls. The main finding from this study was that children who were exposed to a 9-week mindfulness training program did not score significantly differently on psychological measures, or measures of academic performance, in comparison to those children who were exposed to a 9-week active control. However, what was observed, was that children who were exposed to the study skills program did significantly better on word reading and reading comprehension in comparison to those children in the experimental and other control group.

8.1.3. Study three key findings

Study three was conducted in a co-educational school that had a higher than average number of students with special educational needs, to test the same hypotheses as study one and two; that mindfulness training would result in improved academic outcomes and improved psychological function. In addition, this study also tested hypotheses three and four; training would also result in improved attention and reduced levels of anxiety. The main finding from this study was that children who were exposed to mindfulness training did not score significantly differently to controls on any of the measures of psychological function, academic performance or attention.

8.2. General discussion

Taken together the results of these three studies provides evidence that a nine-week mindfulness training programme delivered in schools may not significantly impact Year 10 schoolchildren's levels of well-being and resilience, nor did it significantly reduce anxiety,

improve attention or impact overall academic performance. Each of the outcomes measures is explored in more detail below.

8.2.1. What was the impact of the .b training on Year 10 children's self-reported mindfulness?

Overall this thesis did not find any evidence to support the claim that teaching mindfulness skills to schoolchildren results in increased levels of mindfulness. A significant improvement after training was seen in those children in the experimental group in study one (Chapter 5) only. However, the improvements, although statistically significant, were of limited practical significance. The lack of a significant relationship between training and increased mindfulness levels is unexpected and not in line with previous research (Huppert & Johnson 2010; Semple et al 2010). There may perhaps be a number of possible reasons why this research failed to detect any changes in student's levels of mindfulness.

This study employed the CAMS-R measure of mindfulness as it was considered valid for the purpose of this research (see Chapter 4 for an in-depth discussion). It is worth noting however, that this instrument was designed with the intention of measuring a type of mindfulness that the authors felt could be used as a treatment for depression (Hayes & Feldman 2004, p.260). It was designed for adults with mental health issues and not a as general measurement of mindfulness, and especially not so in children. Consequently, it is likely that children, as a result of immaturity, do not have the level of mindfulness that can be captured by this measure. Hence a more child-friendly measure, may have resulted in a stronger observed effect. While there was a scale available, which was designed specifically for use with children; the Mindful Attention Awareness Scale for Adolescents (MAAS-A) (Brown &

Ryan 2011), at the design phase of this research. It was not considered as robust as the CAMS-R. (Park 2013).

A further reason for the lack of a significant effect in the mindfulness group is 'beginner mind'. That is, participants are thought to have an initial decline in levels of mindfulness following training, which is a result of realising that they are not very mindful. However, once they establish a regular mindfulness practice, self-reported levels of mindfulness increase (Hennelly 2011). However, this explanation is not consistent with the literature, which reports significant changes in naive meditators following a short period of training (Wenk-Somaz 2005).

Again these results are not in keeping with previous research, which has shown an increase in student's levels of mindfulness following a mindfulness program (Hennelly 2011). There is an expectation that being exposed to mindfulness training would result in increased levels of mindfulness. Research shows that just eight weeks of mindfulness participation is enough to impact levels of mindfulness (Brown et al. 2007).

Worth mentioning is that while the participants in this study were not a conscript sample, participation was on a voluntary basis, this may not have been enough to motivate them to engage in mindfulness training. Students may have been encouraged to participate in the research in an attempt to escape 'school as usual'. Or in study two, where the whole year group were involved in the study, participation may have been motivated by what students deemed to be the best of the two bad choices, be involved in the research, or alternatively, attend small classes of 'school as usual'. While students may have been motivated to participate in the research, they may not have been motivated to engage in the training, and consequently increase their levels of mindfulness. This may differ in adult volunteers where participation is likely to be motivated by a desire to engage in mindfulness training, and increase levels of mindfulness.

8.2.2. What was the impact of mindfulness training on wellbeing and resilience?

There was no evidence in any of the three studies undertaken as part of this thesis to support the first hypothesis, that mindfulness training increases wellbeing and resilience amongst children and adolescents. Prior research in this age group has produced some mixed results. While some studies have demonstrated that it is effective in promoting wellbeing (Schonert-Reichl, 2010, 2015; Kuyken 2013; Lau 2011), others have failed to detect any differences at all following mindfulness training (Huppert 2010; Campbell, 2015; Viafora 2015). The absence of a significant results may have been because, similar to mindfulness, wellbeing was measured using a self-report instrument. There is a chance that this measure may not have been adequate to measure children's levels of wellbeing. However, the scale that was used, the Warwick-Edinburgh Mental Wellbeing Scale (WEWMBS), is a relatively short scale with 14-items in total. The items are clearly written in a way that is accessible to young people (Kuyken et al. 2013). In addition, students were given the opportunity to clarify any questions that they may not have understood.

Similarly, the previously conducted research on resilience is also mixed. While research examining the impact of mindfulness on resilience in 14 and 15-year olds failed to detect any significant changes (Huppert 2010), other research, with children and adolescents between the ages of 11 and 17-years, observed significant changes following training (Hennelly 2011). Again, resilience was assessed in this thesis using a self-report measure, the Ego Resilience Scale (ER-89. Similar to the measure used for resilience, this is a straightforward, relatively simple measure that has been used with children in other research (Hennelly 2011).

8.2.3. What was the impact of mindfulness training on Year 10 pupils' self-reported anxiety levels?

There was no evidence from the final study in this thesis that the nine-week mindfulness training programme used here has the potential to reduce student anxiety levels. Like wellbeing and resilience, previous research on this topic has resulted in mixed findings. While a number of studies have demonstrated that mindfulness may have the potential to reduce anxiety (Lier & Diaz 2010; Sbinga, 2013; Ricarte, 2015), other studies have failed to detect any changes (Lee & Semple 2008; Mendelson 2010; Britton 2014; Bei 2013). Again, it is possible that the use of a self-report measure may not have been adequate to measure anxiety in this age group. However, this would seem to be unlikely, as the measure used, the State-Trait Anxiety Inventory (STAI), although a relatively long scale (40-items) in comparison to the other measures used in this research, is a straightforward instrument, which is considered accessible for children of this age (15-years). In addition, two of the studies which reported a significant difference in levels of anxiety used the STAI (Lier & Diaz 2010; Ricarte, 2015)

In the majority of cases, students across all three treatment groups experienced a degree of improvement in levels of mindfulness, wellbeing and resilience, and a reduction in levels of anxiety, in each of the three studies. This is evidence that mindfulness is not specifically impacting these outcomes, but that its impact looks very similar to that achieved by the alternative treatment groups. This suggests that the previously reported significant effects of mindfulness training may, in fact, merely be the result of relaxation that occurs during mindfulness training, or the result of students receiving extra attention from staff, rather than being evidence of a specific effect of increased mindfulness.

8.2.4. What was the impact on academic performance?

Studies one and two both demonstrated a statistical improvement in reading comprehension scores (a composite score of the word reading and sentence comprehension task), although the latter was in the direction of the SS intervention and not the .b program. There were no statistically significant improvements in the third study.

It was proposed in Chapter 3 that mindfulness training would increase levels of mindfulness, which in turn would improve levels of wellbeing and resilience, which in turn would improve academic performance. It could be reasoned that the small difference between the experimental group and controls in mindfulness scores, had impacted reading comprehension scores. However, as was mentioned earlier, although the difference was statistically significant it was so small that it is unlikely to account for any changes in reading comprehension. Furthermore, the results of a correlation analysis, confirmed that this was unlikely to be the case, since there was no correlation between mindfulness scores and reading comprehension scores.

While we would expect to see an improvement in students' reading and mathematical ability scores in each of the groups over time, as a result of maturation and learning across the academic year, we had not expected students in the SS group from the second study (Chapter 6), to demonstrate the best outcomes. A potential reason for the improvements, may be due to the students engaging in the material presented to them in the SS program to such an extent that it was possible to positively impact on scores, or that they saw the relevance of the content of this training to aspects of their learning in lessons.

The sample of students in this study were from an all-female school that was supportive of its student's achievement. The students demonstrated relatively good levels of well-being, going into this study, and it's likely that there wasn't much room for them to improve, or a

need for them to value the mindfulness, or relaxation interventions that were delivered. It's likely that the academic emphasis of this school, coupled with the children's good levels of wellbeing at the start of the study, in addition to of the benefits of a single- sex school environment, resulted in the children really engaging with the study skills program and getting some value added benefits that were needed in this particular sample.

There was no evidence in any of the three studies to support the research hypothesis, that mindfulness training improves scores on spelling and mathematical computation. While improvements were seen in the experimental groups for both outcomes, they were equally evident in the two control groups. Again, this pattern of results is consistent with the suggestion that mindfulness may be no more beneficial for children than a relaxation or study skills program would be.

These findings are not in line with the literature reviewed in Chapter 3. Previous studies have reported significant improvements in academic achievement in children following mindfulness training ((Beauchemin et al 2008; Shoval 2011). Research examining the effects of mindfulness on academic performance in young people with learning difficulties, found an improvement in scores following training (Beauchemin et al. 2008). However, owing to the fact that the sample from that study were classed as special educational needs the results are not necessarily comparable to the studies reported in this thesis, although the students in Chapter 7 were drawn from a school with higher than normal levels of SEND.

Also worth mentioning is that while previous research has demonstrated gender differences in regards to academic performance among schoolchildren; males outperform females in mathematics (Robinson & Lubienski 2011), while females outperform males in literacy (Broecke & Hamed 2008). We did not observe any gender differences in either of the two studies (study one and three) in this thesis.

8.2.5. What was the impact of the mindfulness intervention on Year 10 children's attention?

The final study in this thesis did not find any evidence to support claims that mindfulness training improves children's attention (hypothesis 4). What is more, while improvements in attention were observed across all the three treatment groups, the lowest improvements were seen in the experimental (mindfulness) group. This is not consistent with previous research on attention reported in Chapter 2. These earlier studies (Van den Hurk 2010; Jha et al. 2007) had demonstrated that mindfulness could improve individuals' ability to focus and sustain their attention. In addition mindfulness also appeared to have the potential to improve an individual's ability to inhibit automatic responding (Moore & Malinowski 2009). Participants in previous work have also showed improved capability in supressing interfering information in the Stroop task, in comparison to controls following mindfulness training (Wenk-Somaz 2005).

The absence of any significant findings on levels of attention in this study could have been due to a number of reason. To assess attention, this study utilised the d2 Test of attention, which measures selective and focused attention. Previous studies that have demonstrated a significant increase in participant's attention, have either used a different measure of attention; the attention network test (ANT) (Van Den Hurk 2007), or have measured other aspects of attention, (Wenk-Somaz 2005).

A further reason for a lack of significant findings on levels of attention in this study, could be that the participants in this study, did not engage in home practice, and thus did not engage in an adequate amount of mindfulness to engender change. Research demonstrates a positive correlation between the amount of time spent meditating and the impact it has on attentional control (Valentine & Sweet 1999; Moore & Malinowski 2008). However, in contrast other studies have shown that even a small amount of time spent meditating, is enough

to affect change (Wenk-Somaz 2005). A further, potential reason for the lack of any observed effects, could also be a result of the very limited group size of the study, and so caution should be exercised when interpreting the lack of a significant result for this outcome.

In summary, the lack of an increase in levels of mindfulness in the experimental group, in two out of three studies included in this research, has made it difficult to draw conclusions on the effects of mindfulness training and the outcome measures used in this research. Nonetheless, taking together the findings from the three research studies, these results suggest that nine-weeks of mindfulness training is no more effective in improving schoolchildren's psychological and academic outcomes than a relaxation or study skill intervention is. The key finding in this thesis is that across the three studies there was no real difference between the three treatment groups, and that it is therefore possible that the effects that have been attributed to mindfulness, are more likely to have been a product of either relaxation, or increased positive contact with educators.

The findings of this research are not in line with the existing literature on this subject, although it should be noted that there is a publication bias in psychology towards papers that report significant (as opposed to null) effects. However, studies that have previously demonstrated the apparent effectiveness of mindfulness training have been based on methodological approaches that are not optimal. That is, they have either not used control groups, or where they have been used, the control has either been a waitlist control or business-as-usual control.

Furthermore the results of these studies do not support the proposed theoretical framework, put forward in Chapter three. However, the correlation analyses that were performed in each of the three studies in this research showed that there are some relationships between mindfulness, wellbeing and resilience. Moreover, in each of the three studies those participants in the experimental (mindfulness) group, consistently showed the greatest

improvements in the outcome measures in the majority of cases. For example, in study one participants in the .b group showed the most improvement on five out of six outcomes; in study two, they showed the most improvement on three out of six outcomes; while in study three the .b group showed the most improvement on seven out of the nine outcomes. These results suggest that mindfulness may be efficacious, but that training mindfulness short term does not necessarily result in increased mindfulness scores. Mindfulness is a difficult concept, and not easy to learn. It is not something that can be learnt effectively over a relatively short intervention period. Thus, short mindfulness courses are likely only going to induce relaxation effects and, or, make students feel better because of receiving extra positive contact from teaching staff. What is needed, is longer term (i.e. a year or more) interventions where mindfulness is embedded across the year, which would allow researchers to see, if it can achieve some sort of impact. There could still be benefits from teaching mindfulness to children, but the programmes commonly delivered are likely too short to assert the type of change theorised in this and other research (see Chapter 3).

Before considering the conclusions that can be drawn from the findings of this thesis, it is important to acknowledge that the lack of impact of the mindfulness intervention on participant's levels of mindfulness, has made it difficult to address the original research questions. However, before any conclusions can be drawn it is important to consider the strengths and limitations of the research first.

8.3. Strengths of the research

This thesis has advanced our knowledge and understanding of using mindfulness interventions with children in schools. This research is the first to look at academic outcomes and wellbeing and resilience outcomes in a single study, where active controls were used

instead of business as usual or wait list controls. In addition, it is the first study to simultaneously look at these variables in addition to attention and anxiety in a single, well controlled design. Furthermore, this research is the first to apply this design to examine the effectiveness of mindfulness training in the context of a single sex school environment, where we would expect wellbeing and academic outcomes to be strong to start off with. Finally, this was the first research to apply a robust design to a study of children who were lower attaining, and examine their anxiety and attention in relation to academic outcomes.

A strong point of this thesis is the use of a systematic review, which was carried out to determine how mindfulness is affecting children and adolescents. It provides a valuable contribution to the literature on the effects of mindfulness training on this age group.

The inclusion of two active controls in the design of the research reported in this thesis is a further strength. Each of the active controls provided a rigorous alternative to the experimental condition. PMR provided a relaxation intervention which allowed us to examine the possible side effect of relaxation that might have occurred in the experimental group as an artefact of the .b intervention. The study skills condition provided an environment that allowed students to receive extra attention from staff, thus allowing us to also consider that as a possible reason for changes in the experimental group. Thus, conclusions can be drawn about the effectiveness of a nine-week, school-based mindfulness intervention in comparison to other programs that may be equally capable of affecting similar changes. A further strength of this research, also in regards to the design, is the inclusion of a delayed post-test to look for incubation effects of mindfulness as well as maintenance of any benefits was a further strength of this research.

A further strength of the research studies conducted as part of this thesis was the inclusion of a standardised measure of academic performance as an outcome variable. While other studies have purported to measure academic performance, they have relied on school reports and exam scores as a measure of improvement. While this may demonstrate change, it is not as reliable as a specific measure designed to assess basic aspects of literacy and mathematical computation. Furthermore, the inclusion of standardised measures enables future replication of the research.

8.4. Limitations

In addition to acknowledging the strengths of the research it is equally important to recognise that there were also a number of limitations.

There were a number of limitations related to the design of the research. While this was a randomised control study, randomisation occurred at class level and not at participant level. Although cluster randomisation is useful for group level interventions, especially in situations where randomisation at the individual level is not possible, as in this study, it is not as robust as randomisation at participant level. In addition, although this study incorporated a delayed follow-up, it was three months after the interventions had finished. In retrospect a longer follow-up period of possibly six months would have allowed for longer to establish the long term effects of the mindfulness training.

The absence of a no treatment control was also a limitation in this research. The inclusion of a no treatment control group would have allowed for comparisons to be made, between children who were exposed to the three interventions with those who attended school as usual. However, this was not feasible as the inclusion of a fourth group in the studies would have reduced the size of treatment groups' further, reducing statistical power. Moreover, there were some ethical issues which would have been raised by the inclusion of a 'no treatment'

group. All the controls used in this study were expected to provide participants with some degree of educational benefit to overcome the ethical issues associated with untreated control groups.

A weakness of the research was the reliance on self-reported measures. Self-report measures were used to assess mindfulness, wellbeing, resilience and anxiety. However, self-report measures have been criticised for their susceptibility to participant bias. Such biases include social desirability, demand characteristics as well as distortions regarding how past experience is remembered (Stone 2000). However, because mindfulness, wellbeing, resilience and anxiety are understood as internal, psychological processes, they are not readily available for external observation. Moreover, even if they were it is likely that other methods, for example, interviewing, might result in the same biases. Thus, while a lack of experimental and peer-report methods is acknowledged as a limitation of the studies in this thesis, it should also be noted that self-report is regarded as an appropriate method of assessment for psychological constructs (Gilbert & Gilbert 2003).

The role of the researcher as practitioner in the delivery of both the mindfulness and study skills interventions, as well as administrator of outcome measures, was also a likely limitation of the study. The researcher is a qualified instructor of mindfulness and .b, and has delivered mindfulness prior to the commencement of this research. The study skills program however, was developed specifically as an active control for this study, and thus was delivered for the first time to the participants in this study. So while the intention was to deliver both programs equivalently, due to the novelty of the study skills program it is difficult to ascertain if that was the case. In addition, because the researcher delivered both interventions and measures, there is a likely possibility of demand characteristics from the participants. A blind experiment, where the person delivering the treatments is naive to the design and predictions of the research study, would have been a more optimal alternative.

A further weakness in regards to the delivery of the interventions was the use of two different individuals to deliver the relaxation program. In this sense, it would have been preferable to use the same person to deliver the PMR intervention across all three studies. However, due to time constraints imposed by the schools, as well as the individuals own time constraints, this was not an option. Thus to ensure equivalence across all three studies the second researcher was instructed in the delivery of the PMR program by the lead researcher as the previous researcher had been. In addition the new researcher met with the previous researcher to clarify they had the same understanding of how the program should be delivered. In addition to this, the mindfulness program that was delivered in this research was only 9-weeks in duration. It is arguable therefore that there may have been greater effects had it lasted longer. Furthermore the studies may have been more authentic if the interventions had been delivered by school staff. However, because of restrictions associated with delivering .b this was not possible in this case.

A further limitation was in relation to the sample that was used in this research. The size of the sample in the third study was very small (n = 17), which results in less confidence in the conclusions about the results of the mindfulness intervention in this particular study. A further limitation of the sample was the possibility of carryover effects, that is, the chance that students in the experimental groups might influence those in the control groups and vice versa. Since the experimental and controls groups were all located in the same school for each of the three studies this is a possibility. A further limitation in regards to the sample, is that they are all from the same geographic region, which limits the generalisability of the findings from this research.

8.5. Future research

While a number of limitations have been acknowledged, they can be seen as representing guidance and an agenda for future research in this area. By addressing these

limitations, other researchers may be able to provide further clarity regarding the current study's findings, as well as increase knowledge on the relationship between mindfulness, academic performance and social emotional learning among children and adolescents. Thus a number of recommendations are made for future directions.

Future studies where possible should utilise a larger sample size, drawn across a number of schools, as this would increase the validity of findings among mindfulness research and increase generalizability of the current findings. Future research could investigate mindfulness, wellbeing, resilience and anxiety using methods other than self-report, for example, observer report or stress markers, rather than relying mainly on self-report measures, this would likely offer further support and validation to the findings of the current studies. While self-report methods are used in this thesis, findings are limited to those factors that are consciously available. In addition, an increase in the follow-up period from three months to six, would allow assessment of the long-term effects of a mindfulness program. While an increase in the duration of the mindfulness intervention may allow children to establish a routine, which make affect outcomes.

Furthermore, the data could be analysed through multi-level modelling techniques. This would better accommodate cluster analysis, which is a convenient design to use in schools where classes are already intact, as well as a way of easily dealing with missing data, which is inherent in this sample group (Singer & Willett 2003). Finally, future research may also consider examining the mediating effect of wellbeing and resilience on academic outcomes more directly, using a mediation analysis model.

Finally, future research would benefit from interventions being delivered by trainers from the school who are blind to the research design.

8.6. Implications for practise in education

Mindfulness interventions have demonstrated efficacy in a number of studies with children and adolescents. In addition these interventions are well tolerated by students, easy to deliver and can reach a relatively high number of students in a short time; most mindfulness interventions are delivered on a weekly basis for somewhere in the region of a forty-five minutes to an hour. This makes mindfulness an attractive solution for schools looking to implement an intervention that can help children deal with mental health issues, improve well-being and build resilience, as well as improving academic performance. However, based on the findings of this research, mindfulness did not reduce anxiety, nor did it increase well-being or resilience, it is important to recognise that while mindfulness may be a useful skill for children and young people to learn, it may not necessarily equip them with all the necessary tools to deal with the increasingly difficult mental health issues that many young people face today. There is no suggestion that mindfulness training is not an effective intervention in the treatment of mental health issues, the research (Segal, Williams and Teasdale 2002; Williams and Kuyken 2012; Langer et al 2012) clearly demonstrates that this is not the case. However, we question the feasibility of teaching it to children in a school environment as the only solution to the mental health issues that young people are currently facing. While mindfulness can form part of an intervention designed to deal with student well-being and resilience, it should only be regarded as part of the solution.

A final point worthy of mention is the inability of the mindfulness intervention to increase participant's levels of mindfulness in two of the three studies included in the thesis. If schools should decide to introduce mindfulness to their students, it may serve more beneficial if it is delivered on a daily basis, rather than once a week. This might benefit students in two ways. Firstly, it may remove the stigma of mindfulness meditation; it becomes the norm, and everyone is doing it, thus students may be more likely to engage. Secondly, daily exposure to

mindfulness removes the need for students to practise at home, which may increase levels of mindfulness.

8.7. Conclusion

This thesis has addressed a gap in the literature by conducting a study that included two active controls, and in particular one that includes characteristics that are similar in some respects to mindfulness training (i.e. progressive muscle relaxation). This allowed for comparisons to be made across the interventions and examine whether any changes which were observed were as a result of the mindfulness intervention, or were potentially due to other variables. It is concluded that previously observed mindfulness effects may well be attributable to concurrent and incidental effects of relaxation and increased staff attention rather than mindfulness per se. Moreover, a nine-week mindfulness intervention was unable to impact the children's levels of mindfulness in an educationally meaningful way relative to controls participating in alternative interventions. Only reading comprehension was observed to improve in the mindfulness group in one of the three studies reported. The theorised mechanism by which mindfulness is believed to impact academic outcomes (i.e. by increasing wellbeing and resilience) was not supported by the data from this thesis, and needs further study using even more robust designs to establish whether there may be any credibility to it for longer term interventions. This is a valuable and original contribution to the study of mindfulness with children and adolescents in an educational context.

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APPENDICES

APPENDIX A

Dear Mr

Coventry University research centre for Psychology, Behaviour and Achievement has as one of its focuses, achievement for children in education, and is particularly interested in achievement for those children who have difficulty engaging. We are running a research project in which schools are being given free access to what is normally an expensive program, (usually in the region of £1000 approx.) in order to evaluate its effectiveness against some more commonly used strategies that assist with stress, anxiety and concentration. We are aware that funding is very tight in education and it is important to know if an intervention which may cost valuable funds is a good use of resources and if it offers any meaningful benefits.

The program is called .b (pronounced dot.be) and has been specially developed by the Mindfulness in Schools Project (website link: http://mindfulnessinschools.org) with the aim of making mindfulness accessible to school children in a simple fun format that fits with the school curriculum. It is used by numerous schools as a tool to help children deal with stress and anxiety in exam situations. We want to see if mindfulness can not only alleviate stress and anxiety but also help children to focus and avoid distraction, especially in those children where attention and concentration are a problem. Mindfulness is a training in paying attention to experience as it happens. It is a rigorously researched treatment for anxiety and depression, which is recommended by the National Institute for Health and Care Excellence (NICE).

I am a qualified .b teacher as well as a mature PhD student and this program is funded by the Centre for Research in Psychology, Behaviour and Achievement at Coventry University under the supervision of Professor Clare Wood as part of a PhD project.

The project will involve delivering the free program alongside 2 other strategies for 30 minutes a week over a 9-week period (see attached appendix for more details). In order to gain meaningful analysis we would be looking to recruit a minimum number of 60 pupils from each school that participates in the project. We are looking to begin delivery of the program in the early weeks of the autumn term and again possibly in early spring as we anticipate high interest in this project. While we appreciate any concerns you may have about fitting the program into an already busy school curriculum, the good news is that the program can be delivered as part of the school curriculum and normally fits quite well into schools PSHE sessions. While the program would normally cost in the region of £1000.00 to buy in, as part of the research project we are able to offer the program completely free of charge.

I would be happy to meet with you in person or via a telephone conversation (07954 370216) to discuss the research further and answer any questions you may have. In the meantime if this is something you are interested in getting involved in please email me to indicate your interest as soon as possible.

Yours Sincerely

Michelle

Michelle De Voy
Coventry University

APPENDIX B

Participant information sheet

To be read by participants as well as their parents /guardians.

This information sheet is to be read by both participants and their parents/guardians. It will provide you with information on the study and what to expect if you decide to take part. As participants in this research are under the age of 18, parental consent must be obtained prior to participation in this study.

Study Title: The Impact of Mindfulness on Children's Academic Achievement.

About this study

Mindfulness means paying attention on purpose to the here and now. Children who are taught mindfulness in the classroom are learning how to pay attention better. Mindfulness is being taught in many schools around the UK to children of all ages. The Mindfulness in schools project (MISP) is a charity who have developed a mindfulness program aimed at introducing mindfulness via the school curriculum to student's age 11 to 18 years of age in a fun and engaging format. The program is called .b (pronounced dot.b). Their webpage address is: Mindfulness In Schools - For the flourishing of young minds, if you go online you can have a look at the work they are doing. The overall aim of this study is to see how mindfulness, (using .b) might affect the academic performance of school children.

Purpose of the study

The overall aim of the study is to assess the impact of mindfulness on children's academic achievement. We want to see if there are any benefits to using mindfulness and if so how they compare to other strategies i.e. study skills and relaxation skills.

Why have I been approached?

We want to see if there are any benefits to using mindfulness on children's wellbeing and academic achievement.

Do I have to take part?

No. Participation is entirely voluntary. If you agree to take part in this study, but feel at any stage that you would like to stop, you are free to do so at any time, and your data will be destroyed. If up to two weeks after the study has taken place you decide you do not want your data to be used in the study, again you are free to withdraw and your data will be destroyed.

What will happen to me if I take part?

You will take part in one of three conditions (which you will be randomly allocated too) so either a mindfulness intervention, a study skills intervention or a relaxation intervention. The mindfulness intervention will introduce you to mindfulness. It is a fun program that has been put together by teachers. The relaxation intervention will teach you how to relax as well as explaining what the benefits of relaxing are. The study skills program will give you some useful strategies to help you with your school work. We think whichever intervention you take part in will be fun and also beneficial.

The sessions will run over 8 weeks and last approximately 30 minutes. They will take place during the school day at your school. They will be delivered to you and your school friends in small groups of 20 students or so. We want to see if taking part in the mindfulness intervention will have any impact on your school work, so we will look at how you read words, spell, understand sentences and work out maths problems. We will do this 3 times; before the interventions start, when they are finished (at the end of the 8 weeks) and again 3 months later.

What are the possible disadvantages of taking part?

I cannot foresee any disadvantages to taking part in this study.

Will my taking part in this study be kept confidential?

Yes. Only I will have access to the raw data. All the consent forms will be stored in a separate, secure (locked) location from the raw data itself. You will only be identified on the interview sheet by your participant code number. I will only retain the raw data for the duration of the PhD (January 2017), after which date it will be destroyed. When the data has been entered into a computer file, your scores and comments will only be associated with your code number and access to the file will be password protected.

What will happen to the results of the research study?

The results will be written up and form part of the thesis for my PhD.

Who is organising and funding the research?

The research is organised by Michelle De Voy who is undertaking research as part of a PhD at Coventry University. The research is funded by Coventry University. This research is not externally funded.

Who has reviewed the research?

The Psychology Department's Ethics Committee has reviewed and approved this study.

Contact for further information

If you have any questions about this study, feel free to contact me or my supervisor:

Michelle De Voy
Coventry University
Dept. Of Health and Life Sciences
Priory Street
Coventry CV1 5FB
Email: voym@coventry.ac.uk

Professor Clare Wood
Coventry University
Dept. Of Health and Life Sciences
Priory Street
Coventry CV1 5FB
Email: Clare.Wood@coventry.ac.uk

APPENDIX C

Informed consent leaflet

Parent/Guardian copy

Please read and sign this consent form. There are two copies, one to be retained by the participant's parents/guardians and one to be retained by the researcher.

Study: The Impact of Mindfulness on school children's Academic Achievement.

This project is part of a study which is interested in how mindfulness might affect school children's academic achievement. We are interested to see if mindfulness has any effect on a child's academic performance. This study will involve children taking part in one of three conditions: a mindfulness intervention, a study skills intervention or a relaxation skills intervention. Data will be kept anonymously by the researcher for a minimum of five years in an encrypted password protected electronic file in compliance with the Data Protection Act. No persons other than the researcher will have access to this data. In the case of a participant choosing to withdraw from the study any data regarding that participant will be destroyed. Please refer to the participant information sheet for the full details of this study.

	Please tick
1. I confirm that I have read and understood the participant information sheet for the above study and have had the opportunity to ask questions.	☐
2. I understand that my child's participation is voluntary and that I am free to withdraw my child from the study at any time without giving a reason.	☐
3. I understand that all the information provided by my child will be treated in confidence and that my child's identity will remain anonymous.	☐

4. I understand that I also have the right to change my mind about my child participating in the study for a period of two weeks after the study has concluded. ☐

5. I agree to my child taking part in this study. ☐

Informed consent leaflet

Name of participant: .....

Name of parent/guardian: .....

Signature of parent/guardian: .....

Date: .....

Name of Researcher:.....

Signature of researcher: .....

Date: .....

Informed consent leaflet

Researchers copy

Please read and sign this consent form. There are two copies, one to be retained by the participant's parents/guardians and one to be retained by the researcher.

Study: The Impact of Mindfulness on school children's Academic Achievement.

This project is part of a study which is interested in how mindfulness might affect school children's academic achievement. We are interested to see if mindfulness has any effect on a child's academic performance. This study will involve children taking part in one of three conditions: a mindfulness intervention, a study skills intervention or a relaxation skills intervention. Data will be kept anonymously by the researcher for a minimum of five years in an encrypted password protected electronic file in compliance with the Data Protection Act. No persons other than the researcher will have access to this data. In the case of a participant choosing to withdraw from the study any data regarding that participant will be destroyed. Please refer to the participant information sheet for the full details of this study.

	Please tick
1. I confirm that I have read and understood the participant information sheet for the above study and have had the opportunity to ask questions.	☐
2. I understand that my child's participation is voluntary and that I am free to withdraw my child from the study at any time without giving a reason.	☐
3. I understand that all the information provided by my child will be treated in confidence and that my child's identity will remain anonymous.	☐

4. I understand that I also have the right to change my mind about my child participating in the study for a period of two weeks after the study has concluded. ☐

5. I agree to my child taking part in this study. ☐

Informed consent leaflet

Name of participant: .....

Name of parent/guardian: .....

Signature of parent/guardian: .....

Date: .....

Name of Researcher:.....

Signature of researcher: .....

Date: .....

APPENDIX D

Debriefing form

The Impact of Mindfulness on Children's Academic Achievement.

Thank you very much for allowing your child to take part in this study, their participation is much appreciated.

The overall purpose of this study is to investigate the effects of mindfulness on children's academic achievement. There has been lots of research which suggests that mindfulness is useful in helping to improve children's attention. This aspect of the study looked at how children with attention and concentration problems including children who may have ADHD responded to mindfulness exercises. In this study we wanted to see how children felt about the mindful exercises in terms of attention and concentration.

If you have any complaints, concerns or questions about this research please feel free to contact myself Michelle De Voy or my supervisor Prof. Clare Wood.

Michelle De Voy
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Prof. Clare Wood
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Further reading

If you are interested further on the subject of mindfulness in schools you may wish to look at the following website: **mindfulnessinschools.org**

In addition if you are interested in further reading you may find the following study which looked at the effects of Mindfulness on children of interest, as well as a review of current research, again looking at some of the effects of Mindfulness on children:

Semple, R. J., Lee. J., Rosa, D. and Miller, L. F. (2010) 'A Randomised Trial of Mindfulness-Based Cognitive Therapy for Children: Promoting Mindful Attention to Enhance Social-Emotional Resiliency in Children'. *Journal of Child and Family Studies* 19 218-229

Burke, C., A. (2010) ‘Mindfulness-based approaches with children and adolescents: A preliminary review of current research in an emergent field’. *Journal of Child and Family Studies 19,* 133-144

Thank you again for allowing your child to take part in this study.

APPENDIX E

Medium to High Risk Research Ethics Approval

Project Title

The Impact of Mindfulness on School Children's Academic Achievement.

Record of Approval

Principal Investigator

I **request an ethics peer review** and confirm that I have answered all relevant questions in this checklist honestly.	X
I confirm that I will carry out the project in the ways described in this checklist. I will immediately suspend research and request new ethical approval if the project subsequently changes the information I have given in this checklist.	X
I confirm that I, and all members of my research team (if any), have read and agreed to abide by the Code of Research Ethics issued by the relevant national learned society.	X
I confirm that I, and all members of my research team (if any), have read and agreed to abide by the University's Research Ethics, Governance and Integrity Framework.	X

Name: Michelle De Voy.....

Date: 08/01/2016.....

Student's Supervisor (if applicable)

I have read this checklist and confirm that it covers all the ethical issues raised by this project fully and frankly. I also confirm that these issues have been discussed with the student and will continue to be reviewed in the course of supervision.

Name: Clare Wood.....

Date: 18/01/2016.....

Reviewer (if applicable)

Date of approval by anonymous reviewer: 22/02/2016

Medium to High Risk Research Ethics Approval Checklist

Project Information

Project Ref	P40657
Full name	Michelle De Voy
Faculty	Faculty of Health and Life Sciences
Department	School of Psychological, Social and Behavioural Sciences
Supervisor	Clare Wood
Module Code	HLSR010
EFAAF Number	
Project title	The Impact of Mindfulness on School Children's Academic Achievement.
Date(s)	24/01/2016 - 01/01/2017
Created	08/01/2016 14:59

Project Summary

Mindfulness meditation was adapted to develop clinical interventions for the alleviation of clinical disorders in adult and child populations (Segal et al 2002, Thompson GauntlettGilbert 2008). Recent research has begun to examine the effects of mindfulness on children in non-clinical settings. A study conducted to assess the effects of mindfulness on symptoms of anxiety, attention and behavioural problems in children observed positive changes post intervention in teacher rated symptoms (Semple et al 2010), suggesting that mindfulness may positively improve attention, anxiety and behaviour.

The aim of the project is to evaluate the impact of mindfulness training in children to establish if there are any benefits on academic achievement. While the results of the afore mentioned
study are encouraging it is difficult to evaluate if positive outcomes are a result of mindfulness training or due to other factor e.g. participants receiving extra attention/relaxation occurring as a side effect of undergoing the mindfulness intervention. Therefore the current study will comprise of 3 interventions; mindfulness, study skills and relaxation, allowing comparisons across all three groups.

Names of Co-Investigators and their organisational affiliation (place of study/employer)	
Is the project self-funded?	YES
Who is funding the project?	PBA
Has the funding been confirmed?	YES
Are you required to use a Professional Code of Ethical Practice appropriate to	NO
Your discipline?	
Have you read the Code?	NO

Project Details

What is the purpose of the project?	To evaluate the impact of training school children in mindfulness on academic achievement. To understand some of the social, emotional and behavioural factors which mediate any relationships between training and achievement.
What are the planned or desired outcomes?	Research suggests, for example, Kuyken 2013, that the use of mindfulness based interventions in a school setting can have a positive impact on social, emotional and cognitive outcomes in school children. However, there is less research examining the impact it may have on academic achievement. The present study is concerned with establishing if there are any benefits for children's in regards to their academic achievement undergoing mindfulness training.

Explain your research design	The study will consist of a qualitative design. There are four outcome measures; resilience, well-being, mindfulness and academic achievement (see section 4 below for specific measures being used). Measures will be collected at three intervals; baseline (prior to the commencement of intervention) post intervention and again 3 months post intervention. Each intervention will be delivered to key stage three students. Each sample group (class) will comprise of between 20 (minimum) and 25 maximum participants. The intervention will last for 8 weeks, with each session lasting for a duration of 30 minutes. The research will be delivered across the entire year group of each school recruited, (Approximately 6 classes) and it is anticipated that there will be 4 schools in total. Each class will be randomly allocated to 1 of the 3 conditions, allowing for random allocation at class level. Quantitative data will be analysed using a 2x3 mancova with baseline scores as the covariate, assuming data meets assumptions, if not then a 3x3 mixed anova. Because random allocation will be occurring at class level and not participant level data will be analysed using multilevel modelling.

Outline the principal methods you will use	This is a randomised controlled trial with three conditions; mindfulness intervention (.b standardised intervention), relaxation condition and a study skills condition, with the latter 2 being designed by the researcher (please see research outline for more details). Assessment will be at baseline (pre-intervention), post intervention and follow up (3 months after baseline). There are 4 outcome measures; resilience: Ego-resilience scale (Block and Kreman 1996), well-being: Warwick- Edinburgh mental well-being scale (Tennant et al 2007), mindfulness: Cognitive and affective mindfulness scale revised (Feldman et al 2006), Wide range achievement test (WRAT4). Recruitment consists of letters (letter of invitation and research outline) to school heads briefly explaining the research and inviting them to take part, both documents will be sent to schools only and not participants or their parents. Participants will be recruited by invitation after the delivery of an introduction to mindfulness session which will be delivered to the whole year group. The research is aimed at key stage 3 children as it was felt this age group would benefit most initially from the intervention.	
Are you proposing to use an external research instrument, validated scale or follow a published research method?		YES
If yes, please give details of what you are using	Ego-resilience scale (Block and Kreman 1996) Warwick- Edinburgh mental wellbeing scale (Tennant et al 2007) Cognitive and affective mindfulness scale revised (Feldman et al 2006) Wide range achievement test (WRAT4) ADDITIONAL PROPOSED MEASURES d2 Measure of Attention (Brickencamp and Zilmer 1998) State Trait Anxiety Inventory (Spielberger, Edwards, Lushene, Montuori and Platzek 1983)	

Will your research involve consulting individuals who support, or literature, websites or similar material which advocates, any of the following: terrorism, armed struggles, or political, religious or other forms of activism considered illegal under UK law?	NO
Are you dealing with Secondary Data? (e.g. sourcing info from websites, historical documents)	YES
Are you dealing with Primary Data involving people? (e.g. interviews,	YES
questionnaires, observations)	
Are you dealing with personal or sensitive data?	YES
Is the project solely desk based? (e.g. involving no laboratory, workshop or off campus work or other activities which pose significant risks to researchers or participants)	NO
Are there any other ethical issues or risks of harm raised by the study that have not been covered by previous questions?	NO
If yes, please give further details	

DBS (Disclosure & Barring Service) formerly CRB (Criminal Records Bureau)

Question			**Yes**	**No**
1	Does the study require DBS (Disclosure & Barring Service) checks?		X	
	If YES, please give details of the serial number, date obtained and expiry date	This has been obtained through the university		
2	If NO, does the study involve direct contact by any member of the research team:			
	a) with children or young people under 18 years of age?			
	b) with adults who have learning difficulties, brain injury, dementia, degenerative neurological disorders?			
	c) with adults who are frail or physically disabled?			
	d) with adults who are living in residential care, social care, nursing homes, re-ablement centres, hospitals or hospices?			
	e) with adults who are in prison, remanded on bail or in custody?			
	If you have answered YES to any of the questions above please explain the nature of that contact and what you will be doing			

External Ethical Review

Question		Yes	No
1	Will this study be submitted for ethical review to an external organisation? (e.g. Another University, Social Care, National Health Service, Ministry of Defence, Police Service and Probation Office)		X
	If YES, name of external organisation		
2	Will this study be reviewed using the IRAS system?		X
3	Has this study previously been reviewed by an external organisation?		X

Confidentiality, security and retention of research data

Question		Yes	No
1	Are there any reasons why you cannot guarantee the full security and confidentiality of any personal or confidential data collected for the study?		X
	If YES, please give an explanation		
2	Is there a significant possibility that any of your participants, and associated persons, could be directly or indirectly identified in the outputs or findings from this study?		X
	If YES, please explain further why this is the case		
3	Is there a significant possibility that a specific organisation or agency or participants could have confidential information identified, as a result of the way you write up the results of the study?		X
	If YES, please explain further why this is the case		
4	Will any members of the research team retain any personal of confidential data at the end of the project, other than in fully anonymised form?		X
	If YES, please explain further why this is the case		
5	Will you or any member of the team intend to make use of any confidential information, knowledge, trade secrets obtained for any other purpose than the research project?		X
	If YES, please explain further why this is the case		
6	Will you be responsible for destroying the data after study completion?	X	

	If NO, please explain how data will be destroyed, when it will be destroyed and by whom	

Participant Information and Informed Consent

Question			Yes	No
1	Will all the participants be fully informed BEFORE the project begins why the study is being conducted and what their participation will involve?		X	
	If NO, please explain why			
2	Will every participant be asked to give written consent to participating in the study, before it begins?		X	
	If NO, please explain how you will get consent from your participants. If not written consent, explain how you will record consent			
3	Will all participants be fully informed about what data will be collected, and what will be done with this data during and after the study?		X	
	If NO, please specify			
4	Will there be audio, video or photographic recording of participants?		X	
	Will explicit consent be sought for recording of participants?		X	
	If NO to explicit consent, please explain how you will gain consent for recording participants			
5	Will every participant understand that they have the right not to take part at any time, and/or withdraw themselves and their data from the study if they wish?		X	
	If NO, please explain why			
6	Will every participant understand that there will be no reasons required or repercussions if they withdraw or remove their data from the study?		X	
	If NO, please explain why			
7	Does the study involve deceiving, or covert observation of, participants?			X
	Will you debrief them at the earliest possible opportunity?			
	If NO to debrief them, please explain why this is necessary			

Risk of harm, potential harm and disclosure of harm

Question			Yes	No
1	Is there any significant risk that the study may lead to physical harm to participants or researchers?			X
	If YES, please explain how you will take steps to reduce or address those risks			
2	Is there any significant risk that the study may lead to psychological or emotional distress to participants?			X
	If YES, please explain how you will take steps to reduce or address those risks			
3	Is there any risk that the study may lead to psychological or emotional distress to researchers?			X
	If YES, please explain how you will take steps to reduce or address those risks			
4	Is there any risk that your study may lead or result in harm to the reputation of participants, researchers, or their employees, or any associated persons or organisations?			X
	If YES, please explain how you will take steps to reduce or address those risks			
5	Is there a risk that the study will lead to participants to disclose evidence of previous criminal offences, or their intention to commit criminal offences?			X
	If YES, please explain how you will take steps to reduce or address those risks			
6	Is there a risk that the study will lead participants to disclose evidence that children or vulnerable adults are being harmed, or at risk or harm?			X
	If YES, please explain how you will take steps to reduce or address those risks			
7	Is there a risk that the study will lead participants to disclose evidence of serious risk of other types of harm?			X
	If YES, please explain how you will take steps to reduce or address those risks			
8	Are you aware of the CU Disclosure protocol?		X	

Payments to participants

Question			Yes	No
1	Do you intend to offer participants cash payments or any kind of inducements, or reward for taking part in your study?			X
	If YES, please explain what kind of payment you will be offering (e.g. prize draw or store vouchers)			
2	Is there any possibility that such payments or inducements will cause participants to consent to risks that they might not otherwise find acceptable?			
3	Is there any possibility that the prospect of payment or inducements will influence the data provided by participants in any way?			
4	Will you inform participants that accepting payments or inducements does not affect their right to withdraw from the study at any time?			

Capacity to give valid consent

Question			Yes	No
1	Do you propose to recruit any participants who are:			
	a) children or young people under 18 years of age?		X	
	b) adults who have learning difficulties, mental health condition, brain injury, advanced dementia, degenerative neurological disorders?			X
	c) adults who are physically disabled?			X
	d) adults who are living in residential care, social care, nursing homes, re-ablement centres, hospitals or hospices?			X
	e) adults who are in prison, remanded on bail or in custody?			X
	If you answer YES to any of the questions please explain how you will overcome any challenges to gaining valid consent	A copy of the participant information sheet will be given to parents/guardians as well as participants. Informed consent will be obtained by participant as well as their parent/guardian.		
2	Do you propose to recruit any participants with possible communication difficulties, including difficulties arising from limited use of knowledge of the English language?			X
	If YES, please explain how you will overcome any challenges to gaining valid consent			

3	Do you propose to recruit any participants who may not be able to understand fully the nature of the study, research and the implications for them of participating in it or cannot provide consent themselves?		X
	If YES, please explain how you will overcome any challenges to gaining valid consent		

Recruiting Participants

Question		**Yes**	**No**
1	Do you propose to recruit any participants who are:		
	a) students or employees of Coventry University or partnering organisation(s)?		X
	If YES, please explain if there is any conflict of interest and how this will be addressed		
	b) employees/staff recruited through other businesses, voluntary or public sector organisations?		X
	If YES, please explain how permission will be gained		
	c) pupils or students recruited through educational institutions (e.g. primary schools, secondary schools, colleges)?	X	
	If YES, please explain how permission will be gained	School heads will be contacted and invited to learn more about the research. If schools are in agreement a mindfulness introduction overiew will be delivered to potential participants. Children will be invited to take part in the study and informed consent will be obtained from participants and parent/guardian.	
	d) clients/volunteers/service users recruited through voluntary public services?		X
	If YES, please explain how permission will be gained		
	e) participants living in residential care, social care, nursing homes, re-ablement centres hospitals or hospices?		X
	If YES, please explain how permission will be gained		
	f) recruited by virtue of their employment in the police or armed forces?		X
	If YES, please explain how permission will be gained		

g) adults who are in prison, remanded on bail or in custody?			X
If YES, please explain how permission will be gained			
h) who may not be able to refuse to participate in the research?			X
If YES, please explain how permission will be gained			

Online and Internet Research

Question			Yes	No
1	Will any part of your study involve collecting data by means of electronic media (e.g. the Internet, e-mail, Facebook, Twitter, online forums, etc.)?			X
	If YES, please explain how you will obtain permission to collect data by this means			
2	Is there a possibility that the study will encourage children under 18 to access inappropriate websites, or correspond with people who pose risk of harm?			X
	If YES, please explain further			
3	Will the study incur any other risks that arise specifically from the use of electronic media?			X
	If YES, please explain further			
4	Will you be using survey collection software (e.g. BoS, File maker)?			X
	If YES, please explain which software			
5	Have you taken necessary precautions for secure data management, in accordance with data protection and CU Policy?		X	
	If NO	please explain why not		
	If YES	Specify location where data will be stored	In a secure database which is password protected, for which only the researcher has access.	
		Planned disposal date	01/01/2022	
		If the research is funded by an external organisation, are there any requirements for storage and disposal?		X
		If YES, please specify details		

Laboratory/Workshops

Question			Yes	No
1	Does any part of the project involve work in a laboratory or workshop which could pose risks to you, researchers or others?			X
	If YES: If you have risk assessments for laboratory or workshop activities you can refer to them here & upload them at the end, or explain in the text box how you will manage those risks			

Research with non-human vertebrates

Question			Yes	No
1	Will any part of the project involve animal habitats or tissues or nonhuman vertebrates?			X
	If YES, please give details			
2	Does the project involve any procedure to the protected animal whilst it is still alive?			
3	Will any part of your project involve the study of animals in their natural habitat?			
	If YES, please give details			
4	Will the project involve the recording of behaviour of animals in a non-natural setting that is outside the control of the researcher?			
	If YES, please give details			
5	Will your field work involve any direct intervention other than recording the behaviour of the animals available for observation?			
	If YES, please give details			
6	Is the species you plan to research endangered, locally rare or part of a sensitive ecosystem protected by legislation?			
	If YES, please give details			
7	Is there any significant possibility that the welfare of the target species of those sharing the local environment/habitat will be detrimentally affected?			
	If YES, please give details			
	Is there any significant possibility that the habitat of the animals will be damaged by the project, such that their health and survival will be endangered?			

8	If YES, please give details			
9	Will project work involve intervention work in a non-natural setting in relation to invertebrate species other than Octopus vulgaris?			
	If YES, please give details			

Blood Sampling / Human Tissue Analysis

Question		**Yes**	**No**
1	Does your study involve collecting or use of human tissues or fluids? (e.g. collecting urine, saliva, blood or use of cell lines, 'dead' blood)		X
	If YES, please give details		
2	If your study involves blood samples or body fluids (e.g. urine, saliva) have you clearly stated in your application that appropriate guidelines are to be followed (e.g. The British Association of Sport and Exercise Science Physiological Testing Guidelines (2007) or equivalent) and that they are in line with the level of risk?		
	If NO, please explain why not		
3	If your study involves human tissue other than blood and saliva, have you clearly stated in your application that appropriate guidelines are to be followed (e.g. The Human Tissues Act, or equivalent) and that they are in line with level of risk?		
	If NO, please explain why not		

Travel

Question		**Yes**	**No**
1	Does any part of the project require data collection off campus? (e.g. work in the field or community)	X	

	If YES: You must consider the potential hazards from off campus activities (e.g. working alone, time of data collection, unfamiliar or hazardous locations, using equipment, the terrain, violence or aggression from others). Outline the precautions that will be taken to manage these risks, AS A MINIMUM this must detail how researchers would summon assistance in an emergency when working off campus. For complex or high risk projects you may wish to complete and upload a separate risk assessment	Data will be collected in a school environment where the researcher will have to sign in and out of the premises. The researcher will take secondary precautions by informing a member of their supervisory team when they are due to collect data and at which site.		
2	Does any part of the project involve the researcher travelling outside the UK (or to very remote UK locations)?			X
	If YES: Please give details of where, when and how you will be travelling. For travel to high risk places you may wish to complete and upload a separate risk assessment			
3	Are all travellers aware of contact numbers for emergency assistance when away (e.g. local emergency assistance, ambulance/local hospital/police, insurance helpline [+44 (0) 2071 737797] and CU's 24/7 emergency line [+44 (0) 2476 888555])?			
4	Are there any travel warnings in place advising against all, or essential only travel to the destination? NOTE: Before travel to countries with 'against all travel', or 'essential only' travel warnings, staff must check with Finance to ensure insurance coverage is not affected. Undergraduate projects in high risk destinations will not be approved			
5	Are there increased risks to health and safety related to the destination? e.g. cultural differences, civil unrest, climate, crime, health outbreaks/concerns, and travel arrangements?			
	If YES, please specify			
6	Do all travelling members of the research team have adequate travel insurance?			
7	Please confirm all travelling researchers have been advised to seek medical advice regarding vaccinations, medical conditions etc., from their GP			

APPENDIX F

DATA EXTRACTION SHEET

1. GENERAL INFORMATION

Title:
Author:
Source and year of publication:
Publication type (e.g. journal article/book chapter):
Reviewer:

2. STUDY CHARACTERISTICS

Aim of study:
Design: RCT / nRCT / Single case design
Method of randomisation:
Unit of allocation:
Method of recruitment:
Study setting:
Notes:

3. PARTICIPANT CHARACTERISTICS

Age:
Gender:
SEN:
Sample size:

Withdrawals/exclusions:
Population descriptors:
Other relevant demographics:
Notes:

4. INTERVENTION

Description of mindfulness intervention:
Intervention timings:
How is the intervention delivered?
Who is delivering the intervention?

Comparator details:
Notes:

5. MEASURES (OUTCOMES)

1st Measure name:
Is the measure validated? YES / NO / UNSURE
What is it measuring?
Who is administering the measure?
Times points measured:
Time points reported:
2nd Measure name:
Is the measure validated? YES / NO / UNSURE
What is it measuring?
Who is administering the measure?

Times points measured:
Time points reported:
3rd Measure name:
Is the measure validated? YES / NO / UNSURE
What is it measuring?
Who is administering the measure?
Times points measured:
Time points reported

6. FINDINGS

Analysis:
Results:
Authors' notes:

Notes:

APPENDIX G

Session	Skills taught	Core practices
1. Introduction to Mindfulness and Playing attention	Directing attention Exploring and investigating sensations of the body and breathing Training the mind to 'aim and sustain' through firm, patient, kind repetition	Aiming and sustaining attention for 2 minutes Counting breaths
2. Taming the animal mind	Cultivating calm Accepting our experience Anchoring the body/FOFBOC	Relaxing and breathing with our experience FOFBOC
3. Recognising Worry	Recognising that the mind plays tricks on us Interpreting and story-telling Ruminating and catastrophizing Coming home to the body/anchoring	Beditation (lying down body-scan)
4. Being Here Now	Stepping out of autopilot Savouring experience Returning to the present moment	Savouring experience Chilli, onion or raisin. Learning to .b
5. Moving Mindfully	Slowing down to take you out of autopilot Moving mindfully Learning to 'flow' or 'be in the zone' Bringing mindfulness into everyday activities	Moving mindful activity
6. Stepping back	Recognising intensity and quality of thought-traffic in your mind. Learning to step back	Thought bus activity
7. Befriending the difficult	Learning about anxiety and stress How stress affects the body and us	Playing shock ball Experiencing anxiety
8. Taking in the good	Learning to be grateful Watching examples of gratitude	Eating a grape with mindfulness and gratitude
9. Pulling it all together	Re-capping on all the sessions that were covered over the course of .b	The .b quiz

APPENDIX H

Overview of PMR

The relaxation intervention was delivered using the Progressive Muscle Relaxation (PMR) technique (Jacobson 1922). This is a method for learning how to monitor tension in each of the specific muscle groups throughout the body by deliberately inducing tension in each group. Tension is then released, with attention paid to the contrast between tension and relaxation. The technique is thought to help individuals bring their nervous system back into balance by producing a relaxation response. The relaxation response is regarded as a mentally active process that leaves the body relaxed, calm, and focused. The PMR technique has been used to alleviate minor stress and anxiety.

APPENDIX I

Session Name	Session Content
1. Introduction	An introduction to the study skills program
2. Learning styles	Learning about the different styles of learning A fun interactive session
3. Critical thinking	Learning about the importance of thinking critically Fun critical thinking exercises
4. & 5. Creative thinking (this session was carried over two weeks)	Learning how to be creative Lego exercise
6.Organisation skills	Learning how to get organised for school and homework
7.Mind mapping	Learning about the benefits of mind mapping Doing mind mapping exercises
8. Memory	Learning about the importance of memory in study skills Memory activity
9. Bringing it all together	The session involved re-capping on all of the previous study skills session