Mindfulness

A small-scale study of the effects of teacher work-related stress on the structure of consciousness, and the use of mindfulness in its management

Richard Churches
James Gibbs

Foreword by Gary Nixon

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About the authors

Richard Churches is Principal Adviser for Research and Evidence Based Practice at CfBT Education Trust. He is a Fellow of the RSA and was one of the first 800 teachers identified as outstanding, as part of the Advanced Skills Teacher programme which aimed to identify the top 4,000 teachers in England. Richard has worked in a wide range of countries, including Abu Dhabi, Bahrain, Dubai, Egypt, England, the Irish Republic, India, Ireland, Italy, the Netherlands, Northern Ireland, Jordan, Malaysia, Oman, Pakistan, Qatar, Saudi Arabia, Scotland, Wales, South Africa and the United States of America. His doctoral research, awarded the Pearson Education Prize at the University of Surrey Business School doctoral conference in 2011, uses the Phenomenology of Consciousness Inventory to explore the effects of charismatic leadership oratory.

James Gibbs is a mindfulness teacher for children and adults, a secondary school maths teacher and a practitioner of mindfulness. He has taught maths to 11–18 year olds in schools in East Sussex, Hampshire, Berkshire, Oxfordshire and Mexico City. He teaches the Mindfulness in Schools Project curriculum to students at Oxford Spires Academy and St Edwards School in Oxford. James also runs mindfulness-based stress reduction courses in London and the south of England, and trains teachers for the *Mindfulness in Schools* project in the UK and internationally. He was trained as a mindfulness teacher at the Centre for Mindfulness Research & Practice, Bangor University, North Wales.

Acknowledgements

We are grateful to Sir Jim Rose and the CfBT Education Trust Education Committee for funding the mindfulness training and this research report. We should also like to thank Sue Croft, Principal of Oxford Spires Academy (a member of CfBT Schools Trust) for initiating the research and Dr Ronald Pekala, Coatesville Veterans Administration Medical Center, Coatesville, Pennsylvania (www.quantifyingconsciousness.com) for his permission to use the Phenomenology of Consciousness Inventory. We are particularly grateful for the commitment shown by the teachers involved in the study who gave up a significant amount of free time to participate in the 10-week training programme and research activities.

Foreword

As a Principal Educational Psychologist, one who leads the Specialist Teaching and Applied Psychology Service in Lincolnshire (a large rural local authority in the East Midlands region of England) and as a practitioner, I am very aware that some academic research can be difficult to understand and even more challenging to apply in a real-life environment. This can be the case particularly when research ventures into the realms of the human consciousness, motives, feelings and internal and external behaviours. This is not the case with this easy-to-access yet rigorous research.

The English education system is currently subject to structural, organisational and curricular change, with teachers and their leaders judged on their organisational outcomes and the performance of their learners. While work-related stress for teachers is not new, there is anecdotal evidence that an increasing number of teachers, and indeed headteachers, are reporting the negative effects of work-based stress more so now than in the recent past, especially in relation to uncertainty and the pace of change. The results of this small-scale study on the effects of teacher work-related stress are fascinating, as there appears to be a clear relationship between the structures of consciousness and the use of mindfulness as a targeted evidence-based intervention to manage these pressures.

The findings confirm previous research data and, in addition, demonstrate that teacher work-related stress results in higher levels of muscle tension, increased levels of negative feelings and reduced levels of positive emotion that, according to both the quantitative and qualitative data, are driven by both anger and fear. The fear element, from an applied psychological perspective, is a new finding in this area of work and is of concern in that, if left unchecked, it could lead to longer-term ill health and most certainly a dip in performance. This in turn can lead to reduced pupil engagement and poor performance in relation to the required age-related outcomes.

That mindfulness is able to counter these effects is an important finding. If we want our teachers, their leaders and the children who attend these learning environments to be happy, healthy, safe, successful and achieving positively then it is of importance that we consider these indicative research findings.

Gary Nixon
Principal Educational Psychologist,
CfBT Education Services, Lincolnshire

Summary of the research and main findings

"At a time when teachers and schools are required to deliver challenging requirements in terms of accountability… and have increased autonomy… the question of how an individual teacher can keep in check the negative effects of high levels of stress is an important one."

Teacher emotional state may affect classroom climate and in turn teacher and school effectiveness. Extended periods of work-related stress may harm a teacher's ability to manage emotions and have a serious impact on staff retention as well as having a wide range of other negative effects such as lowering overall performance. Evidence from other fields, such as sports psychology, suggests that some levels of stress and arousal are necessary for high performance. However, high levels of stress can have a negative effect.

At a time when teachers and schools are increasingly required to deliver challenging requirements in terms of accountability (particularly learning outcomes and examination results) and have increased autonomy to find the answers themselves, the question of how an individual teacher can keep in check the negative effects of high levels of stress is an important one.

Mindfulness, as a meditative approach, has grown significantly in popularity as a means of managing stress and other negative states. However, there has been limited research into its effectiveness with teachers themselves and no peer-reviewed studies in relation to such benefits in an English secondary school context. Previous research has tended to focus mainly on the effects of using mindfulness with children and parents.

This research aimed to measure the effects of training teachers to apply mindfulness to manage work-related stress and to seek the views of teachers about the potential of using mindfulness. Eight participants (six teachers, one teaching assistant and one school counsellor[1]) took part in the study. This included a questionnaire used in clinical and experimental psychology,[2] discussions with teachers and a general questionnaire about their experience.

Despite the small sample, there were a number of significant findings. The results suggest that work-related stress significantly affects the structure of consciousness in teachers. Changes in intensity for muscle tension (arousal) and anger were particularly large. Specifically, teachers experiencing work-related stress have higher levels of muscle tension, increased levels of negative feeling and reduced levels of positive emotion. Changes in the structure of consciousness which are more benign, but which may have negative consequences in combination with the emotional and physical effects described above, include paying less attention to inner experience rather than the outer world. If this is the case, teachers may be losing a degree of self-monitoring and self-regulation, and potentially may lose control more easily. In addition, there are increased amounts of self-talk (the inner conversations that we engage in with ourselves). If that self-talk were negative (as seems likely because of increased levels of negative emotion) such inner dialogue could have an escalating effect on teacher stress. As is discussed later in the report, mindfulness specifically targets negative self-talk (inner conversation that could include negative questions such as *'Why do I always feel unhappy, stressed, depressed, anxious?'*, *'What is wrong with me?'*, *'Why is everyone else's life working out and mine is not?'*).

[1] From this point referred to generically as teachers (all were engaged in direct work with students within the school context and were employees at the same school).
[2] The Phenomenology of Consciousness Inventory (PCI) (Pekala, 1991).

Using mindfulness had a positive impact on the teachers. This was clear in all the evidence from the study. Specifically, following training the application of a mindfulness technique for a short period to manage work-related stress restored all dimensions of consciousness intensity levels to those measured during the baseline control (eyes closed sitting quietly without feeling stressed). In particular, mindfulness stops feelings of anger and over-arousal (in terms of muscle tension) and restores levels of self-talk (the inner dialogue and discussion described above) to normal. Analysis of the relationship between areas of consciousness during this change indicates preliminary evidence of the way in which mindfulness is able to achieve these positive effects.

Discussion with the teachers and information from the general questionnaires suggested that mindfulness training could have benefits in relation to classroom practice by enhancing:

- self-awareness
- self-management
- communication with and working with learners.

In particular, in their discussions with researchers, teachers described how they felt that a newly-found ability to be self-aware acted as a gateway to their ability to manage themselves, which in turn helped them to become better at communicating in the classroom. They also described how the techniques that they had learned during the training could be easily adapted to a wide range of teaching and learner support situations.

1 Introduction

"Many studies and reviews point to negative effects such as absenteeism, reduced morale, lower levels of student satisfaction and consequent reductions in overall teacher performance."

Teacher work-related stress

Early research into stress defined it as a neutral physiological phenomenon (Selye, 1956) and a non-specific response that can stimulate, or threaten an individual, with a distinction made between 'stress' and 'distress' (Selye, 1974). Indeed, stress from the perspective of areas such as sport, for example, has a complex relationship with achievement in which low and high levels of stress are associated with lowered performance, and moderate levels of stress with high performance (for a discussion, see Graham-Jones and Hardy, 1990).

Recently, the term stress has become more frequently associated with negative effects such as overwork or pressure caused by compulsion. In relation to education research, Kyriacou defines teacher stress in the following way:

'... the experience by teachers of unpleasant, negative emotions, such as anger, anxiety, tension, frustration, depression, resulting from some aspect of their work as a teacher.' (Kyriacou, 2001: 28)

The negative effects of work-related stress on teacher and school leader performance are well established. Many studies and reviews point to negative effects such as absenteeism, reduced morale, lower teaching quality, lower levels of student satisfaction and consequent reductions in overall teacher performance (see for examples Akhlaq et al., 2010; Cooper and Kelly, 1993; Dunham, 1984; Kyriacou, 1987; 2001; Travers and Cooper, 1996; Wiley, 2000; Wilson, 2002; Wynne et al., 1991).

Kyriacou (2001) suggests five directions for research in this area:

- monitoring the effect of education reforms
- exploring why some teachers are able to maintain positive commitment while others are not
- clarifying the nature of stress
- assessing the effect of intervention strategies
- exploring the impact of teacher-pupil interaction and classroom climate.

In relation to understanding work-related stress, this present study seeks to address, in varying degrees, the last three of these areas while at the same time seeking to explore the wider potential of mindfulness in an education context.

Mindfulness

"…mindfulness forms of meditation have measurable physiological effects and change brain structure"

Mindfulness has gained increasing attention in the last 30 years as a meditative approach (for a discussion, see Schmidt, 2011). This interest has been enhanced by scientific evidence which shows that mindfulness forms of meditation have measurable physiological effects and change brain structure (Hölzel et al., 2008; 2011; Lazar et al., 2005; Ott et al., 2012; Luders et al., 2009; Pagnoni and Cekic, 2007; Vestergaard-Poulsen et al., 2009).[3] Effects can also occur after only a relatively short period of exposure (Davidson et al., 2003; Moyer et al., 2011).

Although mindfulness is widely known as a stress management technique, it is also effective in a range of areas, including coaching and art therapy (Monti et al., 2006; Passmore and Marianetti, 2007). Furthermore, there is evidence to suggest that it may help to enhance multi-tasking in high-stress information environments (Levy et al., 2012). Specifically, Levy and colleagues (2012) showed that participants trained in meditation produced less fragmented work and reported lower negative emotion following work-related task performance as a result of their newly-acquired ability to meditate. Early research found benefits in relation to areas such as stress reduction (Kabat-Zinn and Chapman-Waldrop, 1988) and chronic pain (Kabat-Zinn, 1982; Kabat-Zinn et al., 1985; 1986). In addition, mindfulness has positive effects on adult skills and attitudes such as emotional and social intelligence (Baer, 2003; Davidson and Lutz, 2008; Salmon et al., 2004), intellectual skills and executive function (Jha et al., 2007; Chambers et al., 2008; Zeidan et al., 2010).

Types of meditation

Meditation is widely considered to have healing, therapeutic and spiritual effects (Mishara and Schwartz, 2011). Mindfulness is, however, only one type of meditation. Ospina and colleagues (2007; 2008), for example, in an analysis of over one hundred clinical trials, have identified seven types of meditative practice:

- **Mantra meditation** – repetition of a sound, word or symbol
- **Mindfulness meditation** – the cultivation of awareness with non-judgmental acceptance and attention to the present moment in time
- **Qigong** – variations in breathing combined with a variety of physical exercises in order to increase 'life flow' energy
- **Tai chi** – meditation through soft, flowing movement and postures
- **Yoga** – the combination of body posture and breathing techniques
- **Miscellaneous meditation practices** – approaches which combine techniques without emphasising any particular one
- **Undefined meditation practices** – approaches not defined with clarity in papers

[2] Lazar and colleagues (2005) found increased cortical thickness in Buddhist meditation practitioners. Pagnoni and Cekic (2007) found differences in grey matter volume in Zen meditation practitioners. Hölzel and colleagues (2008) and Vestergaard-Poulsen and colleagues (2009) found grey matter concentration differences in relation to Vipassana and Tibetan forms of mindfulness meditation respectively. Luders and colleagues (2009) found similar changes with practitioners from a range of traditions.

Barendregt (2012) sums up the specific process of mindfulness as follows:

'One of the beautiful mental factors is mindfulness. During mindfulness one observes the input from the senses in a non-reactive way. This sometimes may happen to us while window-shopping... we may look in a manner that is 'observing', but not 'reacting'... It is something that happens naturally every now and then, but it also can be trained to make its occurrence intentionally more frequent.' (Barendregt, 2012: 200)

The concept of mindfulness as it was explained to teachers on the programme

The 'doing mode of mind'

The mind is an excellent problem-solver, helping us to find our way around, develop agricultural and economic systems, invent innovative and useful technology, and put men into space. The 'doing mode of mind' is expert at narrowing the gap between where we are and where we want to be, as we strive to bring an idea, a decision or a goal into reality. As essential as this is, we also tend to apply this state of mind to our emotional and mental difficulties in life. For example, if we do not feel happy, we will usually do everything we can to narrow the gap between not feeling happy and being happy. The difficulty with this approach is that in order to narrow this gap, we tend to focus on it, and why it exists in the first place. We might find ourselves asking questions such as *'Why do I always feel unhappy, stressed, depressed, anxious?'*, *'What is wrong with me?'*, *'Why is everyone else's life working out and mine is not?'* Alternatively, we may have internal dialogue (self-talk), such as *'It's not fair'* or *'I should not be feeling like this'*.

The more we focus on what we perceive to be wrong with us, the more we have the tendency to over-think (ruminate), bringing up old memories and regrets and generate further feelings of unhappiness and negativity. Instead of closing the gap, we have become 'stuck' in the gap and are likely to make things worse.

The 'being mode of mind'

Fortunately, with practice, we can become more aware of when we are slipping into rumination, and thus prevent this vicious cycle of negative thinking from spiralling downward into even more negative thoughts and feelings. Through mindfulness training, we can learn to relate to our thoughts differently, by becoming increasingly aware that we are thinking and noticing what we are thinking about, without getting lost in those thoughts.

'This form of pure awareness allows you to experience the world directly. It's bigger than thinking. It's unclouded by your thoughts, feelings and emotions. It's like a high mountain – a vantage point – from which you can see everything for many miles around.' (Williams and Penman, 2011: 31).

We have generally been trained through our education system to spend most of our time thinking about and analysing our experience (in the 'doing mode of mind') so it really is no wonder that we apply these skills to our everyday life. The 'being mode of mind' is quite simply a shift in perspective, a way of seeing things as they actually are rather than having them distorted through over-thinking, over-analysing and over-judging. Mindfulness is one way to shift into the 'being mode', to start to see the world as it actually is rather than as we have been trained to see it.

'Mindful awareness – or mindfulness – spontaneously arises out of this Being mode when we learn to pay attention, on purpose, in the present moment, without judgment, to things as they actually are.' (Williams and Penman, 2011: 35).

2 What the literature says about the use of mindfulness in education

"a concept every school administrator should understand and practise"

(Hoy et al., 2006).

A search of the three largest education databases identified 118 peer-reviewed articles with the word 'mindfulness' in either the title or the abstract. The search used the ProQuest Dialog Platform to review the Australian Education Index (1977 – current), British Education Index (1975 – current) and the Education Resources Information Center (ERIC) (1966 – current). Following a reading of the initially-identified group of papers, 24 were found to contain research evidence from a school-related education context, or presented a perspective on the use of mindfulness with children or teachers and/or in schools.

Gaps in the current research, in an education context

One study looked specifically at the use of mindfulness with primary school teachers to reduce stress (Gold et al., 2010) and another explored the relationship between effective school administration and mindfulness in a middle school context (Hoy et al., 2006). No previous peer-reviewed studies had researched the use of mindfulness to help secondary school teachers manage work-related stress, suggesting that the present research study had the potential to fill an important gap in the research. Furthermore, most previous studies that have included a quantitative assessment of change have used instruments specifically designed to look at the areas claimed as being the focus for mindfulness. It is therefore debatable as to whether these represent a truly independent measure of change, particular where these have high face validity (i.e. where it is clear to participants what they are being assessed against). This contributed to the decision to use an independent valid and reliable measure of change in consciousness and conscious experience (the Phenomenology of Consciousness Inventory (PCI) (Pekala, 1991; Pekala and Kumar, 2007) in combination with qualitative evidence from the teachers.

The education-related evidence from the review

In relation to teacher stress, Gold and colleagues (2010) studied the use of mindfulness-based stress reduction with primary school teachers and showed statistically significant improvements in levels of anxiety, depression and stress. They suggest that mindfulness could be a cost-effective approach to reducing teacher stress and burnout. Hoy and colleagues, in a study involving middle school teachers, suggest that mindfulness can enhance school faculty trust and argue that mindfulness is 'a concept every school administrator should understand and practise' (Hoy et al., 2006: 236).

The majority of studies carried out have focused on adolescents with special educational needs, challenging behaviour or psychiatric conditions. Mindfulness has been shown to have positive effects with adolescents with ADHD (van de Weijer-Bergsma et al., 2012; Singh et al., 2010) and their parents (van der Oord, 2012), disturbed adolescents with HIV/AIDS (Sinha and Kumar, 2010) and psychiatric populations (Brown et al., 2011; Biegel et al., 2009). Benefits have also been shown for disruptive children and their parents (Dumas, 2005; Eyberg and Grahman-Pole, 2005), in relation to the Prader-Ellis syndrome eating disorder (Singh et al., 2008), in the control of aggression in Aspergers adolescents (Singh et al., 2011) and with children in need (including those on the child protection register) (Coholic, 2011). Such evidence has led some (such as Davis (2012)) to propose that mindfulness should be considered for inclusion in educational psychology practice generally.

Wider applications with positive effects have included using the approach with elementary students in order to improve attention (Napoli et al., 2005), with low-attaining adolescents in Hong Kong (Lau and Hue, 2011), in outdoor education (Frauman, 2010), in urban school populations (Mendelson et al., 2010) and to enhance the teaching of communication and emotional intelligence in schools (Huston, 2010).

Rempel (2012) suggests that mindfulness could be deployed to enhance student learning in all situations, with Orr (2002) proposing it as a means of promoting 'anti-oppressive pedagogy'. It has also been suggested that mindfulness might be useful in enhancing the effectiveness of education researchers (Conklin, 2009), to specifically enhance English teaching (Kroll, 2008) and to develop teachers' ability to carry out effective classroom management (Thomas, 2008).

All studies included in the analysis were either positive about the use of mindfulness in education or could point to positive indicators of effectiveness (either qualitative or quantitative). Weare (2012) has also published a review of literature that indicates only positive effects. This contains a wider number of references than those we found in the three main education databases. Weare's paper presents additional supportive evidence in relation to areas such as the development of emotional well-being, learning, mental and physical health and social and emotional learning.

3 Research design and methods used

"…results from the PCI questionnaire provide a valid and reliable way to explore people's subjective experience and can assess… whether experiences represent an altered state of consciousness"

Two systematic literature reviews that bring together evidence in relation to children and young adults have taken place using the main psychology databases. These indicate that mindfulness has no reported negative side effects (see Burke, 2009; Harnett and Dawe, 2012). Both the reviews are, however, critical of the robustness of methodologies used to explore mindfulness. Burke argues that methods need to be adopted which allow for replication and comparison studies, while Harnett and Dawe (2012) note that no studies have yet investigated the 'mechanisms of change'. Although the present study can only generate preliminary evidence, because of the small sample, with a clearly defined intervention and use of a recognised clinical questionnaire, a well-designed study could show if a valid and reliable approach would be worth scaling up for replication within a large randomised controlled trial. In the light of this, we used the Phenomenology of Consciousness Inventory (PCI) to quantify changes in participants' conscious experience and describe in detail the content of the training the teachers received.

Previous research has used questionnaires such as the Exceptional Experiences Questionnaire (EEQ) and the Freiburg Mindfulness Inventory (FMI) (see Hinterberger et al., 2012 for discussion). Arguably, the PCI has advantages over other questionnaires because of its ability to measure ordinary experience of consciousness with participants and use this as a control condition. This is the first time that the PCI has been specifically used to study the effects of this particular kind of mindfulness although there have been other studies involving meditation and meditation techniques related to mindfulness (Johnson, 2011; Pekala et al., 1988/89; Ventatesh et al., 1997).

Johnson (2011) used the PCI to study the effects of a Zen meditation technique with 14 females and two males. There were statistically significant increases in intensity levels for joy, altered meaning (the extent to which experiences feel transcendent or spiritual), altered awareness, altered body image, altered perception, altered experience and positive affect. Venkatesh and colleagues in an earlier study (Ventatesh et al., 1997) involving 12 experienced Kundalina (Chakra) meditators, also found statistically significant increases in altered meaning and joy and as well as altered time sense and altered state.

The Phenomenology of Consciousness Inventory (PCI)

The Phenomenology of Consciousness Inventory (PCI) is a 53-item questionnaire, used in both clinical practice and research into first-person experience of consciousness (Pekala, 1991; 2007). Over the past 30 years more than 100 peer-reviewed journal articles cite the use of the PCI questionnaire to explore the structure of conscious awareness in areas such as hypnosis, meditation, epilepsy, fire-walking, eating disorders, shamanic states, religious experience and everyday experiences such as sitting quietly with your eyes open or closed (the two standard baseline control conditions). In relation to the measurement of changes in the intensity of conscious experience, the PCI assesses 12 major dimensions with four of these further subdivided into 14 minor dimensions. Appendix A contains a detailed description of the major and minor dimensions.

PCI and assessments of altered state of consciousness

In recent years there has been a substantial cross-disciplinary re-emergence of interest in altered states of consciousness and their relationship to areas such as psychology (with particular reference to hypnosis), neuroscience, art, music, dance and shamanic states (see Cardeña and Winkelman, 2011). The results from the PCI questionnaire provide a valid and reliable way to explore people's subjective experience and can assess whether experiences represent an altered state of consciousness according to two theoretical positions.

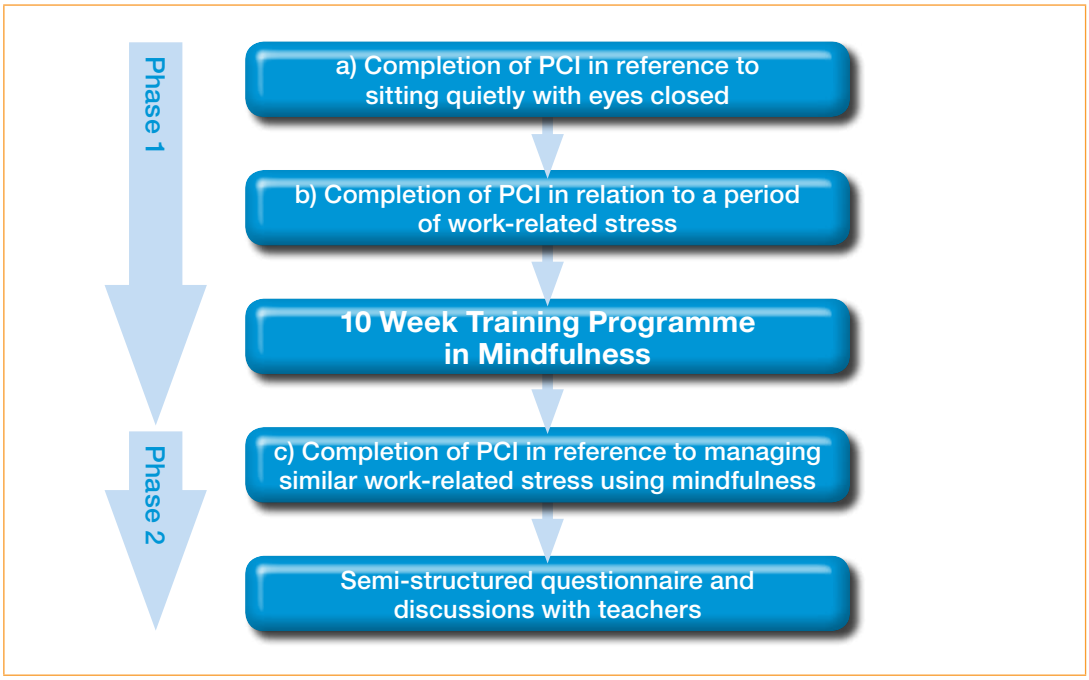
Singer and Izard thought that altered state is characterised by significant changes in the intensity of consciousness (for Izard, emotions and bonding between aspects of consciousness, in particular) (see Singer, 1977; Izard, 1977). In contrast, Tart thought that altered state is the result of changes in the overall pattern of consciousness and therefore in the relationship between areas of conscious experience (Tart, 1972). In relation to Tart's definition, statistically significant change in overall pattern when the 12 PCI dimensions are compared between research conditions is considered to represent an altered state of consciousness (see for discussion Pekala, 1991; Pekala and Kumar, 2007).

There is a peer-reviewed, journal-published precedent for using the PCI with a small sample size. Rock and Beischel (2008) used the PCI in a preliminary within-subject controlled study of the subjective experience of seven mediums while carrying out discarnate reading and found significant results. Recognising that the same caution should apply to the interpretation of results in this present study, the research aim in using the PCI was to establish if there was sufficient evidence to justify a larger future study in this area.

The two research phases

Eight people (six females, two males[4]) took part in the present mindfulness research. Six were classroom teachers, one a school counsellor and one a teaching assistant. All participants were directly engaged in working with children in the school on a daily basis.

Figure 1: Research design



[4] Mean age: 45.88; Standard deviation: 14.25; Skew: -0.07; Kurtosis: -0.08.

Participants completed the PCI questionnaire on two occasions prior to the training, to provide (see Figure 1):

a) a baseline assessment of conscious experience while sitting quietly with eyes closed for three minutes[5] (in a non-stressed frame of mind) as a control condition

b) an assessment of the conscious experience while attempting to deal with work-related stress (eyes closed) without training for three minutes.[6]

Following the completion of the mindfulness training there was a further completion of the questionnaire:

c) teachers completed the questionnaire again to measure their conscious experience managing work-related stress (eyes closed) after three minutes using a mindfulness technique (eyes closed) of their own choice.

Phase 2 of the research consisted of the collection of qualitative data. This included a semi-structured questionnaire and a focus group discussion session.

As is noted in the literature review (above), no previous peer-reviewed studies have looked at mindfulness as a stress management approach with English secondary school teachers (below is a description of the specific school context in this research).

Oxford Spires Academy (descriptions from the most recent Ofsted report)

'This academy serves a diverse community in East Oxford and opened in January 2011, replacing the Oxford School. There are 799 students on roll, 209 of whom attend the sixth form. An above-average proportion of students come from minority ethnic backgrounds. About half the students speak English as an additional language. The proportion of disabled students and those who have special educational needs is approximately one quarter of those on roll. The proportion of students who are known to be eligible for free school meals is above average.'

In relation to leadership in the school the report noted:

'The improvements in GCSE examinations, soon after the academy opened, reflect the robust action, appropriate interventions and raised expectations from senior leaders and staff to improve teaching and learning. This culture of high expectations has continued to have a positive impact on students' progress.'

Prior attainment was described as follows:

'Students enter the academy with attainment that is well below average.'

Ofsted, May 2012

[5] Previous PCI research indicates that the questionnaire has reliability for assessing phenomenological state within a 2–4 minute time period (see Pekala, 1991).
[6] For practical reasons (the questionnaire has 53 items and takes 5–15 minutes to complete), none of the questionnaire completions took place while teaching but at a time when teachers were able to confirm that they were, nonetheless, experiencing the states described. However, research shows the PCI also has reliability retrospectively after an event (for example, in its use to measure near-death experiences (Pekala, 1991)).

4 The training programme

"In total, teachers received approximately 24 hours of training contact time."

Mindfulness-Based Stress Reduction

A Mindfulness-Based Stress Reduction programme was developed in the late 1970s and early 1980s, as a secular, eight-week, nine-session programme and was taught in the Stress Reduction Clinic at the University of Massachusetts Medical Center[7] (see Kabat- Zinn, 1982; 1990; 1993; Kabat-Zinn et al., 1985; 1986; Kabat-Zinn and Chapman-Waldrop, 1988; Miller et al., 1995).

The course above included various mindfulness meditations and mindful movement, as well as explaining the causes of stress and how to develop better communication skills, particularly in stressful situations. It aimed to enhance the well-being of patients who were suffering from a wide variety of conditions such as stress, anxiety, chronic pain and illness. The success of the clinic led to Jon Kabat-Zinn writing the book *Full catastrophe living* (Kabat-Zinn, 1990). This created significant interest in mindfulness-based approaches. Many thousands of people internationally have now attended the course and developments of it, such as Mindfulness-Based Cognitive Therapy. Mindfulness teachers are required to have considerable experience in practising mindfulness themselves and to have undergone a rigorous and professional training route (for example, those offered at the University of Oxford, Bangor University and the University of Exeter).[8]

The mindfulness programme at Oxford Spires Academy

The course delivered as part of this research took place on eight Mondays after school from 3.20 to 5 pm. This is slightly shorter than the usual 2–2.5 hour Mindfulness-Based Stress Reduction sessions. As most teaching staff work in the evenings, it was reasonable not to over-extend them at the end of a school day. There was also a four-hour, half-day retreat scheduled for a Saturday morning at the end of the programme. In total, teachers received approximately 24 hours of training contact time.

The trainer guided each of the exercises (such as the body scan, mindfulness of breathing, breathing space and mindful movement), inviting participants to move their attention to different parts of the body and to their breathing, noticing any sensations that they could feel and to do their best to sustain their attention there. They received suggestions as to how they could work with drowsiness, discomfort, distractions and a wandering mind. After each exercise, the trainer asked participants to describe what they noticed from doing the exercises, initially in small groups and then as a bigger group, with further questioning, to facilitate a sense of the group learning from one another's insights and experiences. The trainer then facilitated a summary of key learning points from the discussions.

In later sessions, the training included information about the physiology of stress, reactions to difficult situations and responding to those situations differently using mindfulness. The training also included staying aware and balanced when confronted by a difficult situation.

[7] At that point, the programme name was the Stress Reduction and Relaxation Program.
[8] James Gibbs, co-author of this report and a trainer and practitioner, delivered the training in the present study. Richard Churches is not a mindfulness trainer; he conducted the quantitative data analysis and research interview with the teachers.

Mindfulness of the breath

By constantly returning the wandering mind to the breath, we can gradually begin to train it to stay in the present moment and not to keep getting lost in regrets from the past or worries about the future. This can allow us to regain a sense of perspective, a sense of balance and perhaps even a sense of acceptance around the situations that arise in our life.

You may like to set an alarm clock for 10 minutes or more.

1. Start by sitting upright in a chair. Your feet should be apart and resting on the floor, your hands resting on your legs or in your lap. Eyes can be closed or, if preferred, open – but with your gaze lowered and unfocused ahead of you.
2. Bring your attention to the feet, perhaps noticing any tingling, any sensations of contact between the feet and the floor – really explore these sensations for a minute or so. Then shift your attention to the sensations of sitting on the chair, noticing the weight of the body on your sitting bones. Take a few minutes to move your attention to the back, the front of the body, the hands and arms, then to the neck and head, noticing whatever sensations are present.
3. Become aware of the breath as it moves in and out of the abdomen. Notice the changing pattern of sensations as you breathe in and as you breathe out, perhaps noticing the sensations as your skin stretches or you can feel your clothing against the body.
4. At times, you may become aware that the mind has wandered off and that you are thinking about something else. That is okay, this is just what minds do! Notice what you were thinking about and then firmly but gently escort your attention back to the breath and to the sensations in the abdomen.
5. It is likely that the mind will wander many times and so this offers us an opportunity to 'wake up' many times, to become conscious again, and to return our attention to the breath over and over, repeatedly.

At the end of each session, the trainer set a home practice and often read a poem as additional inspiration. The usual amount of time suggested for home practice each day is 45 minutes, but again, taking into account the busy evenings that teaching staff tend to have, 30 minutes each day was the guide. Teachers also received a workbook at the start of the course with detailed home practice instructions and a CD of guided mindfulness meditations.

The half-day, four-hour retreat took place after the eight sessions had finished. This was due to time constraints over a holiday period, which extended the research period to 10 weeks. Usually, the programme is an eight-week one, including the retreat. The retreat took place in silence as the trainer guided the group sequentially through all of the mindfulness exercises covered on the course.

Breathing space

It is often the case that when we need mindfulness the most, perhaps in times of anger or stress, we completely forget that we have the ability to shift into a different state of mind in order to become less reactive and more responsive. The 'breathing space' is probably the easiest and quickest technique taught on the mindfulness course but remembering to use it is the key. In the classroom, you might like to use it both as a way to diffuse a situation that could easily escalate and as a way to transition between lessons, taking a few moments to shift mental gear before the next class arrives.

Step 1
Intentionally bring your awareness to how you are doing right now. What thoughts are going through your mind? How are you feeling? What body sensations do you notice as you quickly scan your whole body? At all times just notice what is present right now, in this moment, without getting yourself caught up in the usual stories and dramas, and without trying to change anything.

Step 2
Focus your attention on the physical sensations of the breath in the abdomen area, noticing the expanding and contracting of the abdomen, the stretching of the skin and the movement of clothing. Just allow the breath to anchor your awareness into the present moment – if you notice that you have started thinking about something else, then escort your attention back to the breath, firmly but gently and patiently.

Step 3
Now expand your attention to include a sense of the whole body, whether standing or sitting, as if the whole body was breathing. Notice any areas of discomfort or tension, and gently breathe into and out of these areas, with a sense of letting go as you do so. When you are ready, return to what you were doing, perhaps with a different way of looking at things.

Key learning outcomes for the programme were:

- how to step out of 'automatic pilot', to live life with more awareness
- how the way we handle 'stressors' in life determines how healthy we are in body and mind
- how to train the mind to pay attention, not wander and not be so distracted
- how to stay in the present moment by paying attention to the breath and body
- how to recognise the way in which the mind constantly judges experience as pleasant or unpleasant, or neither, and how our feelings and behaviour automatically follow these judgements accordingly
- exploring the physiology of stress (fight or flight)
- how to respond wisely instead of reacting habitually to situations
- how to remain aware and balanced in stressful communications
- how to integrate mindfulness practice into everyday life
- identification of lifestyle choices that are nourishing or depleting.

Routine activity

Choose an everyday activity from the list below, and try to pay attention to it with real care, while you are doing it. Notice carefully the sights, sounds, tastes, smells and sensations as you undertake the activity. Just be aware of what you are doing, as you are doing it – if you notice that your mind has wandered then escort it back again, gently, patiently and kindly. Often we drift into 'automatic pilot' with these habitual activities that we have done so many times before. This exercise gives us more chances to 'wake up' and become more consciously aware. Routine activities that you may like to be mindful while doing could include:

- brushing your teeth
- getting dressed
- showering
- drinking tea, coffee, juice
- eating breakfast
- walking to the bus stop, or to work
- or any other daily activity that you can think of.

5 Research questions

We designed two sets of research questions to address the aims of the research and two different methodologies used in the two research phases.

Research questions – Phase 1

- What dimensions of consciousness appear affected by work-related stress?
- What effect does mindfulness have on the structure of consciousness when used to manage teacher work-related stress?

Research questions – Phase 2

- What are English secondary school teacher perceptions in relation to the use of mindfulness as a tool to manage work-related stress?
- Do teachers see wider potential uses for mindfulness in the English secondary school context, and if so, what are these?

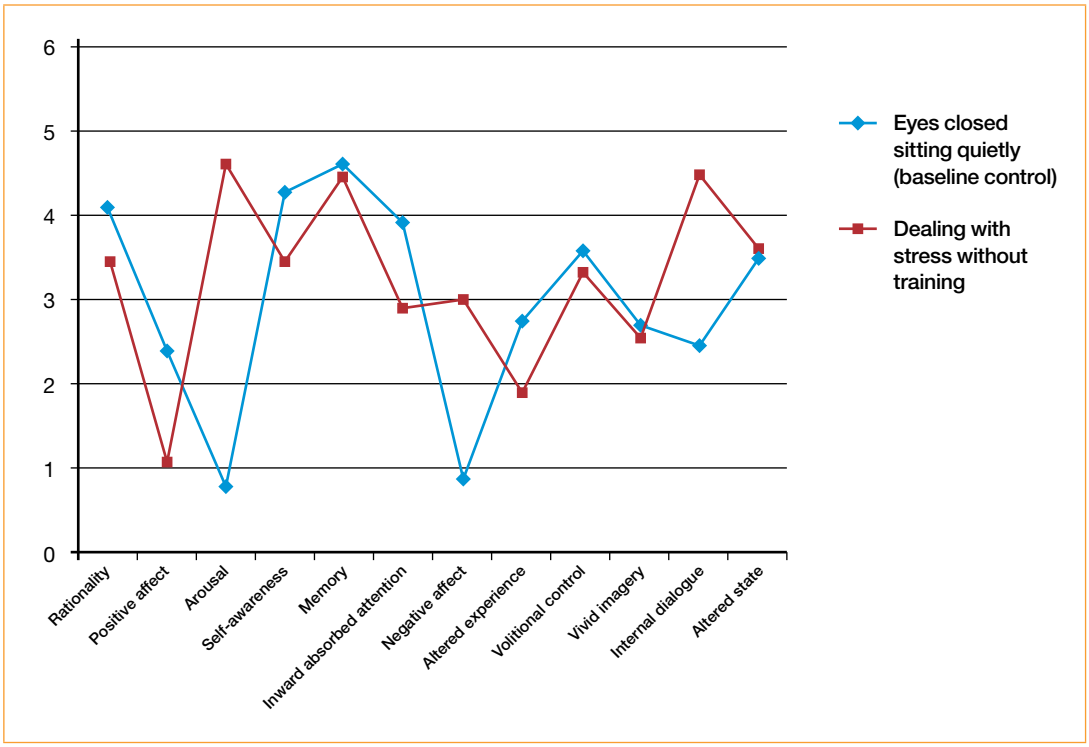
"…there were significant changes to intensity levels in six out of the 12 major dinensions"

6 Changes in the structure of consciousness during stress and during the relief of stress with mindfulness – quantitative evidence

How stress affects consciousness in teachers – baseline assessments

Figure 2 (below) shows the PCI major dimension intensity levels for the baseline ordinary state of consciousness (eyes closed sitting quietly) and unmanaged teacher work-related stress. With such a small sample size (n = 8), it was not expected that results would achieve levels of statistical significance. However, there were significant changes to intensity levels in six out of the 12 major dimensions when teachers were experiencing work-related stress and in four out of the 14 minor dimensions. (Figure 3, page 20, illustrates the minor dimension intensity levels.)[9]

Figure 2: Changes in intensity levels for the 12 PCI major dimensions during work-related stress (eyes closed) compared to an ordinary baseline state of consciousness (eyes closed sitting quietly)



In relation to the PCI major dimensions, tests indicated that the following four higher levels of intensity were statistically significant[10] in the stressed state: arousal, negative affect, internal dialogue and altered experience. Such a combination of effects (muscle tension, negative feeling, self-talk and an altered sense of reality) are clearly changes that most individuals would find unpleasant and, bearing in mind the need to maintain a positive emotional climate while teaching and think clearly, are likely to affect performance negatively.

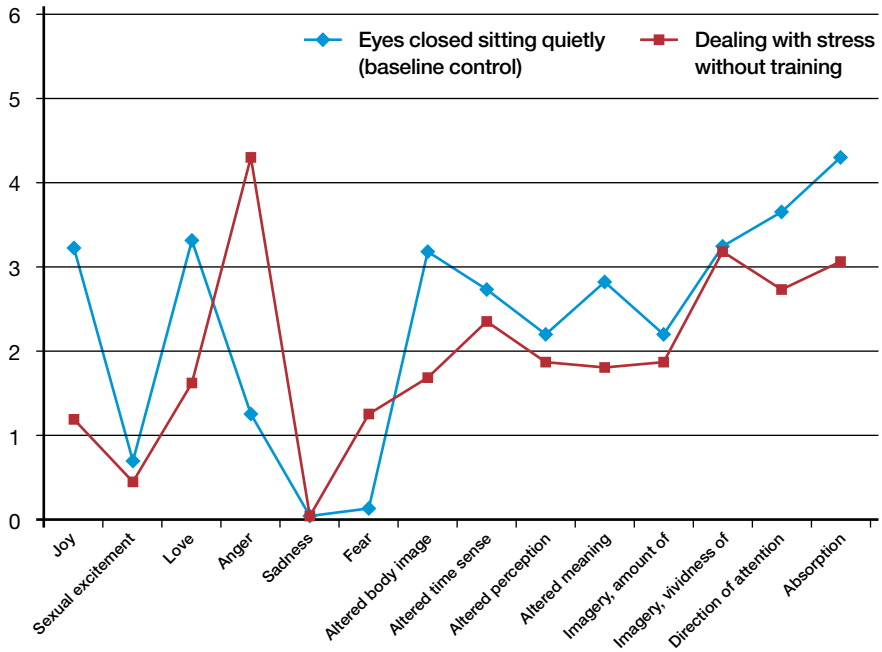
[9] Full results tables are in Appendices B and C. Graphs illustrating 95% confidence intervals for dimensions with one or more statistically-significant change are in Appendix D.

[10] SPSS Related-Samples Wilcoxon Signed Rank Test. Level of alpha $p < 0.05$ ($p = 0.05$ is a five-in-one-hundred probability that the results were arrived at by chance, the minimum level usually considered statistically significant).

"Mindfulness restored the intensity levels for all major dinension areas of consciousness."

Two major dimensions had a statistically-significant lower level of intensity: inward absorbed attention and positive affect. Thus, when experiencing stress, teachers become less attentive to their internal state of mind and are measurably less positive in relation to the feelings that they experience.

Figure 3: Changes in intensity levels for the 12 PCI minor dimensions during work-related stress compared to an ordinary baseline state of consciousness



One minor intensity score, anger, was significantly higher during stress. There were lower levels of intensity for three minor dimensions: joy, love and altered body image.

The effects of using mindfulness to manage work-related stress

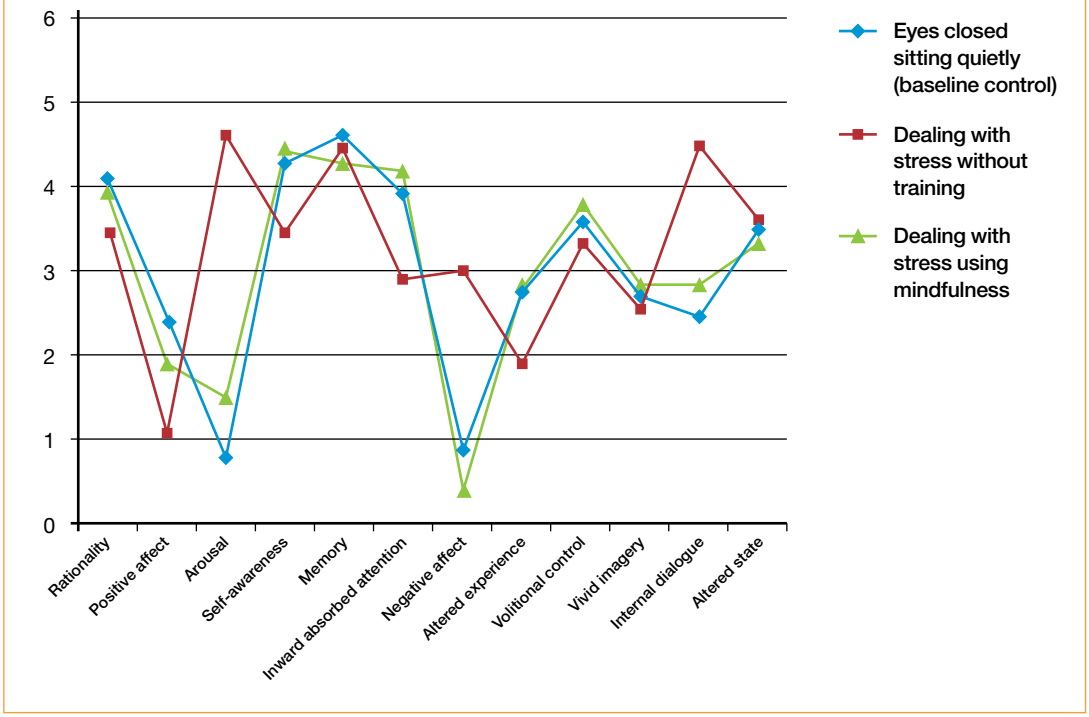
Following the mindfulness training described above, teachers completed the PCI again following a period in which they experienced similar levels and types of stress, but then used a mindfulness technique of their own choice to manage that stress.

Figure 4 (below) illustrates the intensity levels for the 12 PCI major dimension for the two baseline conditions discussed above (eyes closed sitting quietly (control); work-related stress), with the addition of the results for managing stress using mindfulness.

Figure 5 (page 22) shows the intensity levels for the 14 minor dimensions. These results suggest[11] that mindfulness could be effective in helping teachers to become more in control of their emotions and calmer in difficult situations. In particular, mindfulness appears to remove feelings of anger and restore normal levels of self-talk. Evidence from the teacher interviews and discussions (see section 7, below) confirmed that this was indeed the case.

[11] Full results tables are in Appendices B and C. Graphs illustrating 95% confidence intervals for dimensions with one or more statistically-significant change are in Appendix D.

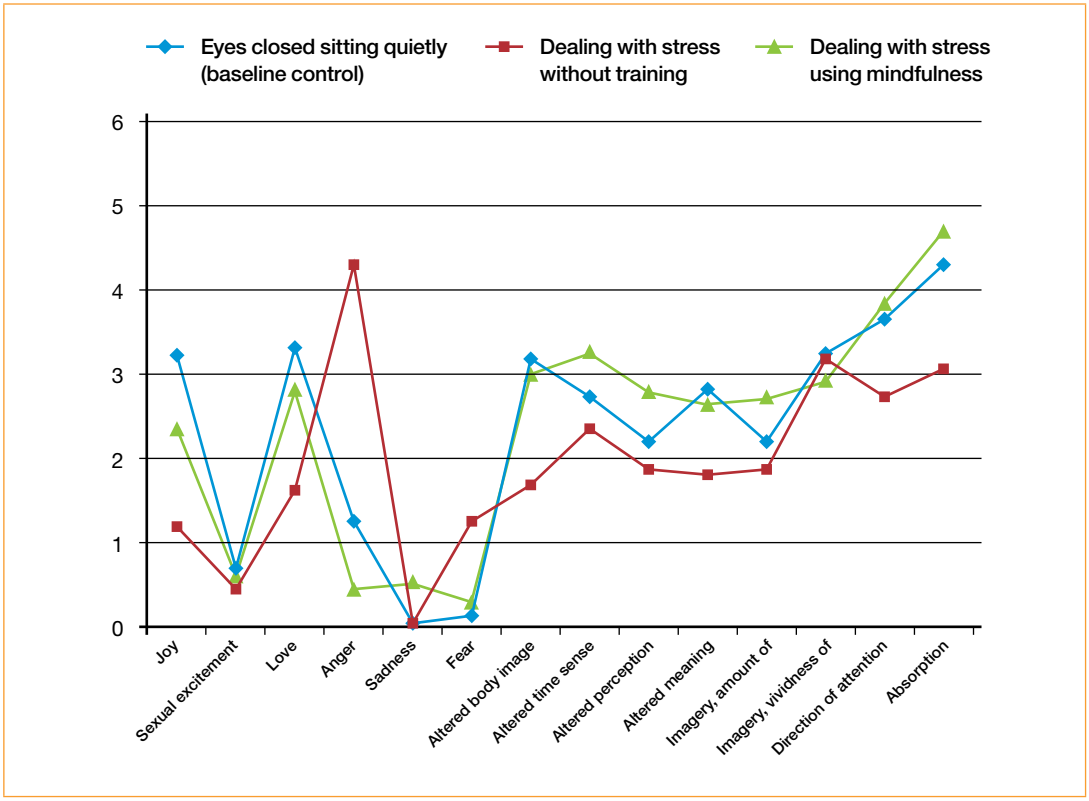
Figure 4: Major dimension intensity levels for all three conditions in the present study



Tests comparing unmanaged stress before training with the management of stress using mindfulness indicated that there had been the following changes in intensity. There were significantly higher levels of inward absorbed attention and of both minor dimensions contributing to this (direction of attention and absorption). There were also higher levels of altered experience (in particular, the reversal of previously reduced body image scores) and a new altered sense of time. In addition, there was a significantly lower level of arousal. The changes in intensity for arousal (subjective tension) and anger are particularly large and noteworthy. Confidence interval data (see Appendix D) illustrate the extent of this change.[12]

[12] Confidence intervals provide a measure of whether results would be likely to replicate, and therefore how generalisable the results are. In this case, the 95% confidence interval data for arousal suggested that this change in intensity would occur in at least 95 out of 100 repeated studies.

Figure 5: Minor dimension intensity levels for all three conditions in the present study



7 The effectiveness of mindfulness when applied in the classroom – qualitative evidence

"Teachers reported a number of benefits in relation to classroom practice"

After the training and retreat (and following completion of their third PCI), all the teachers completed semi-structured questionnaires. There was also a group discussion and interview with teachers. Teachers described their experience of using mindfulness in relation to working in the classroom and to everyday life, and in terms of their reflections on the usefulness of mindfulness for teachers generally.

In school

Classroom practice

In their responses to the semi-structured questionnaire, teachers pointed to a number of benefits in relation to classroom practice. These relate to three areas:

- self-awareness
- self-management
- communication and working with learners.

In discussion with the teachers, it was clear that these areas were interdependent but that self-awareness acted as a gateway to the other processes, in the classroom context. Thus the teachers described how mindfulness not only provided them with approaches that enabled greater self-awareness but then, once they were aware, offered them a wide range of approaches which they could then decide to apply to their own self-management (Figure 8). This combination of awareness and choice of action in turn created the conditions where they were able to communicate more effectively and work more effectively with learners.

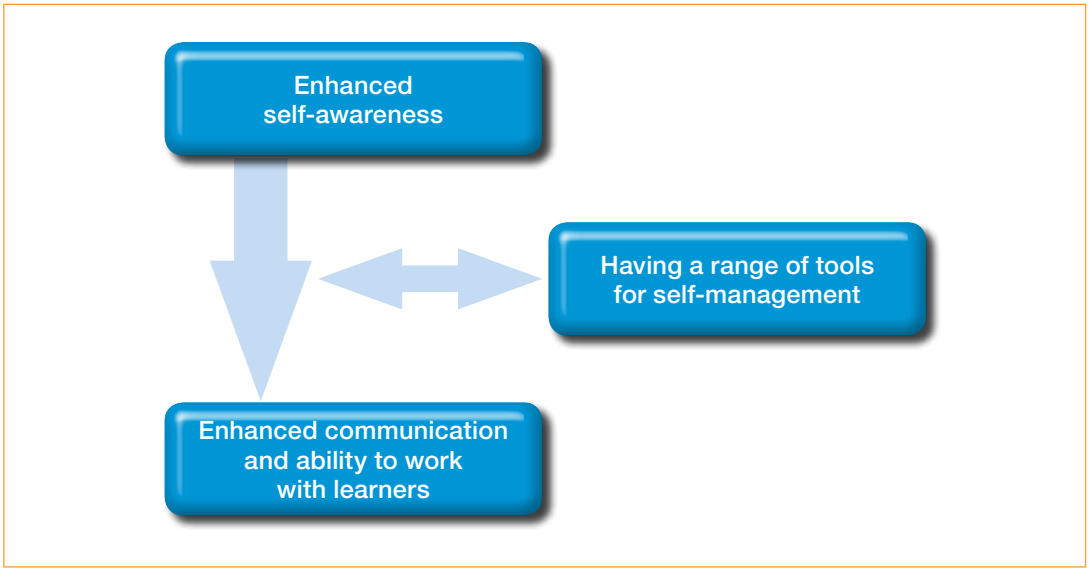
The ability to ground themselves in the moment, notice their physiology (heart rate etc.), emotions and thinking and therefore consciously intervene to prevent themselves continuing on 'auto pilot' was central to the process, in the view of the teachers. As one teacher put it:

'I can then transition into where I am and how I am about to do it.'

In relation to **self-awareness**, the teachers described how they felt a more heightened sense of time consciousness and a greater awareness of their emotional state, and consequently the ability to be accepting of it. For example, they described how they were now more aware of 'reactive' moments and were more reflective as potentially stressful situations began to arise and develop. Teachers also described how they felt enhanced motivation and were much more aware of what stressed them. One teacher described how they were better able to 'choose their battles' and prioritise.

A number of benefits were clear in relation to enhanced **self-management**. Teachers felt that they were able to be calmer in a wide range of classroom situations and were more able to listen effectively. One teacher described how mindfulness had helped during transitions within lessons, and in the space between one class and another, by giving them the ability to leave behind what had happened before. Several described that they were better able to focus and avoid distracting behaviours (both their own and those of their students) because of the ability to bring themselves back into 'the now'. In particular, several pointed to the use of breathing and stance to help manage 'the now' and any stress that might be occurring within it.

Figure 8: The relationship between self-awareness, self-management and enhanced communication as described by the teachers



Typical comments included the following:

'It has helped me personally during transitions – from periods within a class or from one class to another. Being able to leave what happened previously – not allowing it to affect what happens next.'

'I am more aware if something small stresses me, and can choose not to get involved in the stress. Instead, I more often choose to be happy.'

'I now have more control over my sense of involvement in stressful situations, and an ability to withdraw and detach myself from certain aspects of situations.'

Having greater self-awareness and the ability for self-management also appeared to have helped the teachers with their skills in relation to **communication and working with learners**. Teachers described how they were now more able to encourage students, to be more aware of their thoughts and actions, as well being better able to help students who were in distress. They suggested this was because of a developed ability to pay attention to their learners' state. Some described how they were now better at paying attention to individual needs rather than just group needs.

One teacher said:

'With students, it has encouraged me to encourage them to be more aware of their actions and thoughts to gain better outcomes in their lives. In the school work environment, I am more aware of myself, of what stresses me, what my responses are and am able to be aware of what motivates me.'

"Surprisingly, there were no negative comments about the investment in time that the intervention required, presumably because all the teachers were so positive about the benefits."

In addition to gaining communication skills and understanding the emotions of learners better, a number of the teachers were able to describe how they were beginning to apply mindfulness to their teaching practice in terms of subject knowledge transfer – in particular, encouraging learners to be focused and mindful in their exploration of the detail of subject knowledge. Some teachers also said that they were much more aware of how focused the attention of their learners was and felt more able to ensure that this was the case.

Most and least useful parts of the training programme

The questionnaire asked teachers which elements of the training they found **most and least useful**. The most useful components were felt to be the breathing space exercise, the body scan[13] and the opportunity to talk about and share experiences in a group.

Teachers also appreciated the chance for self-reflection, the opportunity to explore 'how the mind works' and being able to spend time on the exercises without feeling guilty about 'doing nothing'. Half of the teachers could not identify any element of the training that they thought was not useful in some way. Others suggested that least useful elements were the paired discussion about stressful situations, mindful movement (as one teacher found it easier to be mindful while not moving) and sitting (due to falling asleep). One teacher found the initial session difficult, until the particular approaches to thinking and feeling had become familiar; another found the repetition of techniques least enjoyable but understood why it was necessary.

Benefits to teachers generally

All teachers thought that the training could be helpful for teachers in general. One teacher suggested that the training could enable all teachers to be more effective both professionally and personally; another that being more self-aware could help teachers to share ideas more easily with one another. Other identified benefits included:

- understanding the importance of self-awareness and being able to be conscious of thoughts, feelings and actions
- learning to be more attentive to mood and mood changes
- the ability to let go of trivial things
- having time to contemplate and engage in personal introspection and 'give time over to yourself'.

Sustainability of the learning in practice

During the discussion, all the teachers could describe how they had been able to continue to apply mindfulness to their practice in a sustainable way. Most described how they were using adapted approaches in the moment and for short periods, as compared to using an extended approach such as the body scan that was more time consuming. For example, several had found that they could carry out 'mini' body scans and that this was an effective means of self-management in a range of situations. The teachers had all found opportunities to adapt and apply the approaches, both in their classroom practice and daily approach. One teacher described how, although she held very different spiritual beliefs to the Buddhist tradition, from which the approaches derive, she was nonetheless able to separate this from the effectiveness of the tools and approaches.

[13] The body scan involves lying on the floor on your back with eyes closed and systematically (for 15–45 minutes) becoming aware of feelings and sensations in all parts of the body from the feet up.

Outside school

Wider benefits in everyday life

We asked the teachers if there had been any wider benefit in relation to their life outside school. They pointed to how they now had a more enhanced awareness of the present and were able to avoid dwelling too much on the past or future. Again, they pointed to an enhanced ability to pay attention and be more self-aware, resulting in their being better able to manage stressful situations. In addition, they described how they were calmer, more aware of reactive moments and able to correct mistakes more quickly; and were much less likely to react immediately.

Some described how they now had 'a place they could go to in themselves' and could withdraw and detach themselves. This, in combination with more awareness of others and their own feelings, meant that they could choose not to get involved in the stress if something stressed them. This description in particular seems to align with the possible evidence in the quantitative data suggesting that the stressed state was still present but that the teachers were observing this with another layer of consciousness, in which they had reduced the intensity levels associated with the stressed experience.

8 Underlying mechanisms enabling mindfulness to relieve stress – preliminary observations and implications for designing shorter training programmes

Harnett and Dawe (2012) point out that little evidence exists to explain the mechanism by which mindfulness is able to have the positive effects frequently described in studies and by practitioners.

Because certain forms of analysis, when applied to PCI results, can assess underlying relationships that may be outside of the awareness of an individual, it is arguable that they can expose hidden mechanisms. This is important because such results could help to design new interventions or hone interventions to be more efficient while remaining focused for maximum impact. For example, bearing in mind the amount of time it takes to learn mindfulness (currently a 9–10 week programme), it might be possible to use pattern analysis of PCI results to determine what a shorter programme should focus on by identifying what may be the 'active ingredients' of a mindfulness programme.

We therefore compared the relationships between the major dimensions of consciousness measured by the PCI. Firstly, we did this to see if the detail of relationships between pairs of dimensions[14] [15] might help to expose the key mechanisms at work and point to the most useful components of mindfulness from a teacher training perspective (the 'active ingredients', as it were); and secondly, to explore if stress and mindfulness (when used to manage stress) generate an altered state of consciousness, according to Tart's theories (Tart, 1972)[16] and whether the results might therefore be able to add to the theoretical debate about the nature of mindfulness.

Before explaining the results, we should point out that such analysis requires caution in its interpretation because this particular use of such data[17] is likely to be unstable where there are fewer than 30 participants. However, the findings do add weight to an argument for a larger-scale study.

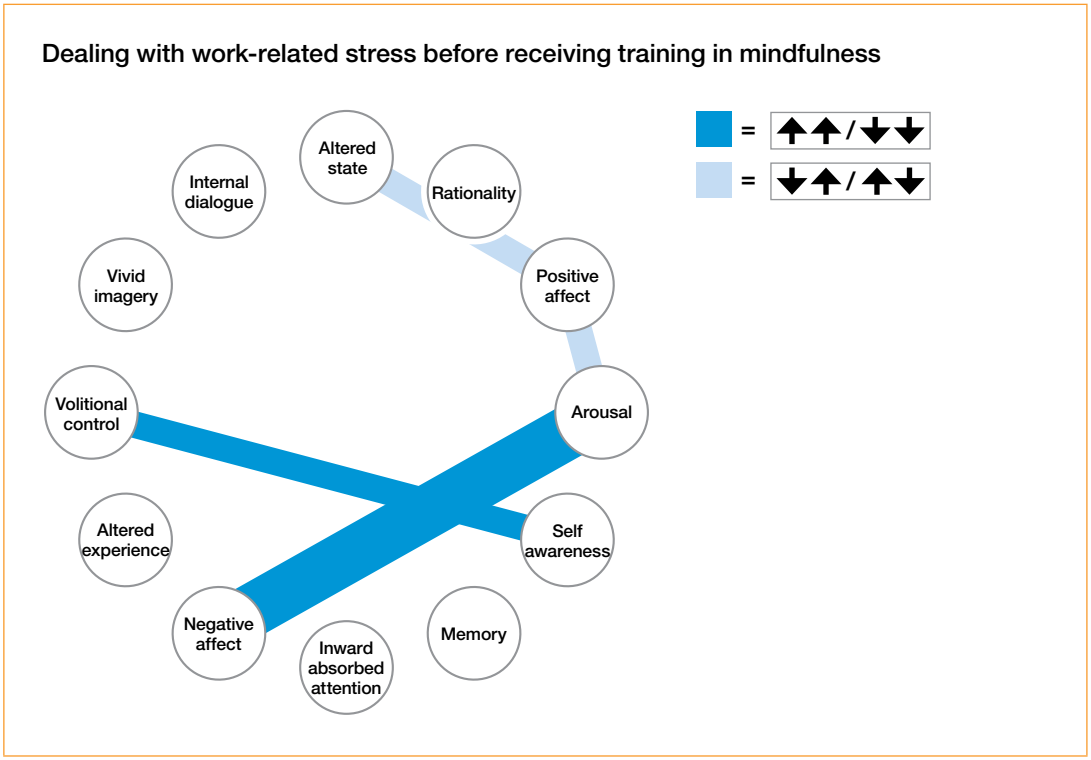
The active ingredients of mindfulness when applied to managing teacher work-related stress: preliminary speculations

Mapping the underlying pattern for each of the experiences in the study suggests that stress prevents areas of consciousness working together effectively compared to normal consciousness (specifically, eight areas of consciousness were functioning together during the control ('eyes closed sitting quietly' experience) compared to only four during stress).

In the diagrams below (see Figures 6 and 7), the thickness of the line indicates how strongly areas of consciousness were working together. A dark line shows a relationship increasing (or decreasing) at the same time;[18] a light line shows functioning that is in opposition (increasing or decreasing in opposite directions).[19] For example during stress, as altered state increases so positive feelings decline and vice versa ([🡻🡹/🡹🡻]), whereas as arousal (muscle tension) increases or declines so does the amount of negative feeling ([🡹🡹/🡻🡻]).

[14] 'Bonding' in relation to Izard's theorising about the nature of altered states of consciousness (Izard, 1977).
[15] This is done by calculating the shared variance between dimensions (r2 x 100) and then graphing only the statistically-significant relationships in a clock-face diagram called a psygram (see Pekala, 1991; Pekala and Kumar, 2007).
[16] The standard way to do this is with the Box Test or Jennrich Test (see discussion in the Limitations section, page 31).
[17] The use of intercorrelation matrices.
[18] Positively correlated
[19] Negatively correlated

Figure 6: Pattern of consciousness during stress showing those dimensions that are functioning together and the strength and direction of that relationship[20]

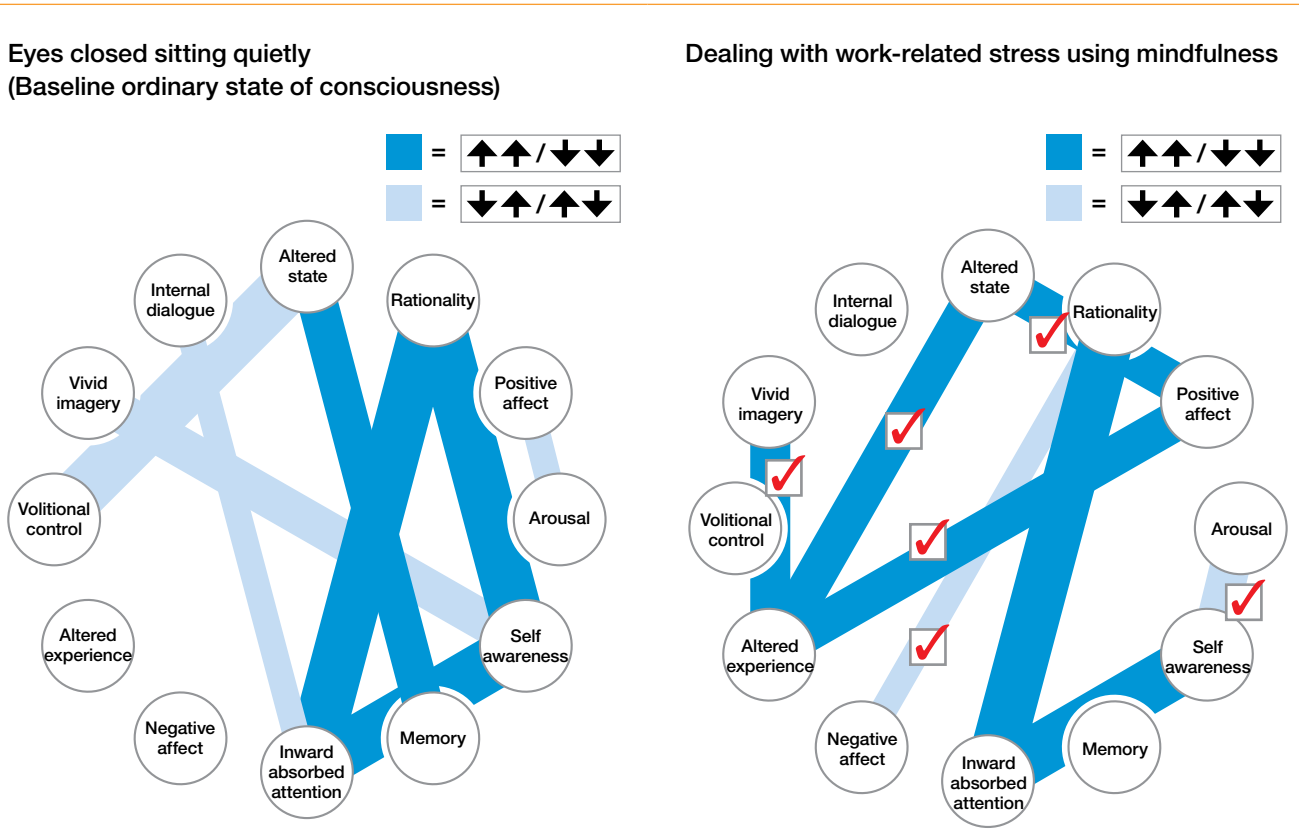


By comparing the pattern map for the control to a map showing stress relieved with mindfulness (Figure 7), the key underlying mechanisms that allow mindfulness to restore normal intensity levels appear to be as follows. In order of strength of relationship these are:

- the creation of a new relationship between muscle tension and self-awareness in which they interact in opposite ways (as one increases so the other decreases and vice-versa) [↓↑/↑↓]
- a similar new relationship between rationality and negative feeling [↓↑/↑↓]
- the creation of mental functioning in which positive feelings and altered state of awareness both increase or decrease together [↑↑/↓↓]
- a new working-together relationship between internal visual imagery and altered experience [↑↑/↓↓]
- a similar relationship between altered state of awareness and altered experience [↑↑/↓↓].

[20] See Table 4 in Appendix C for levels of shared variance.

Figure 7: Patterns of consciousness for the control condition and the relief of stress during mindfulness.[6] New active relationships compared to the control are indicated with a tick ☑



This suggests that the application of mindfulness techniques in a teacher-training context to manage stress should focus on those techniques that emphasise the relief of muscle tension through awareness of physical feelings and well-being, and the use of visualisation and encouragement of rational thinking about situations. This said, a larger study with follow-up research that explores individual techniques would be required to confirm this.

Altered state of consciousness, stress and mindfulness

The standard way to assess whether an altered state of consciousness has occurred (applying Tart's theory) is to use a test that compares all the relationships for the control and the intervention together. When we did this,[21] we found that overall change in the pattern of consciousness during stress was significant compared to a normal state of consciousness. If the same results were replicated in a larger study this would indicate that teachers enter an altered state of consciousness when stressed. This might help to explain why teacher work-related stress can be so destructive professionally, particularly if that state is present for a sustained period. Mindfulness-managed stress also appears to be a very different altered state of consciousness compared to the control, suggesting that the teachers were also in an altered state of consciousness when they were managing stress.

[21] See Table 4 in Appendix C.

9 Conclusions

"…mindfulness training could be a highly effective way of helping teachers to manage work-related stress."

The present study suggests that mindfulness training could be a highly effective way of helping teachers to manage work-related stress. However, it could also be an effective adjunct to teacher training before teachers enter a school, or during school-based initial teacher training, as a potential way of reducing early attrition from the profession. This study not only showed that mindfulness training has a measurable and positive quantitative effect on the structure of consciousness; it also suggests that mindfulness is an approach which is appreciated by teachers and one which they are likely to sustain in their practice once trained.

10 Limitations in the quantitative evidence and technical recommendations for future research

Although the findings in this report are important from a pilot research perspective, the quantitative results are preliminary only, due to the small sample. In particular, the assessment of overall change in pattern effect should be interpreted with most caution as correlation matrices are likely to be unstable below n = 30. This said, for exploratory reasons only, we used the Jennrich Test[22] [23] to carry out a preliminary assessment of overall pattern effect. This suggested that in a larger study, work-related stress might be found to be generating an altered state of consciousness according to Tart's definitions (see Table 3 in the Appendix C) with mindfulness itself also appearing to generate an altered state of consciousness at the pattern level, underpinning the changes that an individual might be aware of. Future researchers intending to investigate altered state of consciousness and teacher work-related stress (using the PCI) should use a minimum sample n > 60, so that the Jennrich Test can be applied with reliability and other PCI methods can be fully applied (such as the mapping of pattern relationships between dimensions using psygrams (see Pekala, 1991; 2007)).

Furthermore, because of time constraints, counterbalancing (the random allocation of the teachers to the order of the conditions) was not feasible and therefore the results may have been subject to 'order effects'. A future larger study should aim to counterbalance the conditions by repeating the control condition at the end of the study (and/or stress condition) and randomly allocating participants to the two (or three) condition orders (see Figure 9).

Figure 9: Suggested counterbalancing for a future large-scale study

Group 1	Group 2	Group 3
Eyes closed (control)	Stress	Stress
Stress	Eyes closed (control)	Mindfulness-managed stress
Mindfulness-managed stress	Mindfulness-managed stress	Eyes closed (control)

More information about the PCI can be found at: www.quantifyingconsciousness.com

[22] To assess the 'significance' of the overall change in pattern between two experiences (and thus altered state of consciousness, as conceptualised by Tart) the Box Test (Box, 1949), preferable for small sample sizes, or the Jennrich Test (Jennrich, 1970) is usually used (see Pekala, 1991).
[23] The Box Test could not be used because there were fewer than two non-singular cell covariance matrices (i.e. more than two levels of the independent variables were singular or shared an excess of 90% or more of the variance they were explaining).

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Appendix A: What is measured by the PCI questionnaire

The Phenomenology of Consciousness Inventory (PCI) assesses 12 **major dimensions** of consciousness, with four of these further subdivided into 14 *minor dimensions*. Intensity levels range from zero to six and are graphed in a variety of ways (usually using line graphs (level or mean difference between experiences) or bar charts).

Rationality assesses clarity of thinking, how distinct an individual's thinking is, whether they found comprehension easy and whether they experienced confusion or difficulty in understanding.

Positive affect has three subdimensions that contribute to this dimension: *joy* (happiness/ecstasy), *sexual excitement* (intensity of sexual feelings) and *love*.

Arousal assesses perception of muscle tension (very tense and tight to not tense and tight).

Self-awareness provides an assessment of how aware of self a person is and if there is any loss of consciousness of self, or loss of an awareness of self.

Memory measures a participant's perception of whether they were able to remember everything they experienced.

Inward absorbed attention consists of two subdimensions: *direction of attention* (which assesses if a subject is directing attention towards the external environment or towards internal subjective experience) and *absorption*, which assesses the extent to which a participant is continually distracted by external stimuli or absorbed in their own world.

Negative affect has three subdimensions: *anger* (being enraged, very angry or upset); *sadness* (feelings of being very, very sad/unhappy) and *fear* (feeling afraid/very frightened/scared).

Altered experience consists of four subdimensions: *altered body image* (extent to which bodily feelings are expanded into the world around); *altered perception* (changes in perception (colour, shape, size and perspective)); *altered time sense* (extent to which perception of the passage of time has altered); and *altered meaning* (extent to which experiences might be called religious, spiritual or transcendent).

Volitional control looks at the extent to which a person's experience was one of complete control (or will) over what they were paying attention to, whether they felt passive and receptive; or whether thoughts and ideas had come to mind without any sense of control.

Visual imagery has two subdimensions that relate to an assessment of the *amount of visual imagery* and the *vividness of the imagery* (clarity, three-dimensionality, vividness compared to reality).

Internal dialogue provides a measure of the extent to which a person is engaging in silent self-talk, or not.

Altered state of awareness assesses the extent to which people perceive themselves as experiencing a very unusual state of awareness or one that is not different to their usual experience.

Appendix B: Major and minor dimension intensity levels

Table 1: Major and minor dimension intensity levels for the three conditions in the study

Major dimensions *Minor dimensions*	1 Eyes closed sitting quietly	2 Dealing with stress without training	3 Dealing with stress using mindfulness	Summary of significant changes in intensity ($p < 0.05$)
Rationality	4.08	3.46	3.96	
Positive affect	2.42	1.08	1.92	1-2
Joy	3.25	1.19	2.31	1-2
Sexual excitement	0.69	0.44	0.63	
Love	3.31	1.63	2.81	1-2
Arousal	0.81	4.63	1.50	1-2, 2-3
Self-awareness	4.29	3.46	4.50	
Memory	4.63	4.46	4.29	
Inward absorbed attention	3.93	2.88	4.18	1-2, 2-3
Direction of attention	3.67	2.75	3.83	2-3
Absorption	4.31	3.06	4.69	2-3
Negative affect	0.92	3.04	0.42	1-2
Anger	1.25	4.31	0.44	1-2
Sadness	0.00	0.00	0.56	
Fear	0.13	1.25	0.25	
Altered experience	2.75	1.92	2.91	1-2, 2-3
Altered body image	3.21	1.67	2.96	1-2, 2-3
Altered time sense	2.75	2.38	3.29	2-3
Altered perception	2.21	1.88	2.83	
Altered meaning	2.81	1.81	2.66	
Volitional control	3.58	3.33	3.75	
Vivid imagery	2.72	2.53	2.84	
Imagery, amount of	2.19	1.88	2.75	
Imagery, vividness of	3.25	3.19	2.94	
Internal dialogue	2.50	4.50	2.81	1-2
Altered state	3.50	3.63	3.38	

Appendix C: Test statistics and levels of probability

Table 2: Test statistics[24] and levels of probability[25, 26] for intensity levels (two-tailed)[27]

Major dimensions *Minor dimensions*	Eyes closed sitting quietly vs. stress			Unmanaged stress vs. managed stress with mindfulness			Eyes closed sitting quietly vs. managed stress with mindfulness		
	z	N-Ties	*p*	*z*	N-Ties	*p*	*z*	N-Ties	*p*
Rationality	**-0.77**	**8**	**0.44**	**1.26**	**8**	**0.20**	**1.21**	**7**	**0.22**
Positive affect	**-2.20**	**7**	**0.03***	**1.47**	**8**	**0.14**	**-0.85**	**7**	**0.93**
Joy	-2.39	7	0.02*	1.33	8	0.18	-0.99	8	0.32
Sexual excitement	-0.37	4	0.71	0.54	3	0.59	-0.14	5	0.89
Love	-2.12	7	0.03*	1.52	7	0.13	-0.73	4	0.46
Arousal	**2.53**	**8**	**0.01***	**-2.52**	**8**	**0.01***	**1.80**	**6**	**0.72**
Self-awareness	**-1.18**	**8**	**0.24**	**1.70**	**7**	**0.89**	**0.57**	**8**	**0.57**
Memory	**0.37**	**4**	**0.71**	**-0.91**	**8**	**0.36**	**-0.51**	**7**	**0.61**
Inward absorbed attention	**-2.21**	**6**	**0.03***	**2.38**	**8**	**0.02***	**0.35**	**8**	**0.73**
Direction of attention	-1.55	8	0.12	2.00	6	0.04(7)*	0.14	8	0.89
Absorption	-1.95	7	0.05	2.39	7	0.01	0.85	6	0.39
Negative affect	**-2.24**	**8**	**0.03***	**-2.52**	**8**	**0.01***	**-1.36**	**7**	**0.17**
Anger	2.03	7	0.04*	-2.52	8	0.01*	-1.23	5	0.22
Sadness	0.00	8	1.00	0.00	8	1.000	1.73	3	0.83
Fear	1.89	6	0.06	-1.56	6	0.115	1.00	1	0.31
Altered experience	**-2.04**	**8**	**0.04***	**2.37**	**8**	**0.02***	**0.56**	**8**	**0.57**
Altered body image	-2.21	7	0.03*	2.20	7	0.03*	-0.34	7	0.73
Altered time sense	-1.19	7	0.23	1.20	6	0.04(6)*	0.85	1	0.40
Altered perception	-0.51	7	0.61	1.89	6	0.06	1.48	2	0.14
Altered meaning	-1.82	8	0.07	1.53	7	0.12	-0.35	8	0.73
Volitional control	**-0.70**	**8**	**0.48**	**0.70**	**8**	**0.48**	**0.28**	**8**	**0.78**
Vivid imagery	**-0.42**	**6**	**0.68**	**0.91**	**8**	**0.36**	**0.28**	**4**	**0.78**
Imagery, amount of	-0.42	7	0.67	1.27	7	0.20	1.02	7	0.31
Imagery, vividness of	-0.28	3	0.78	0.32	5	0.75	0.44	8	0.66
Internal dialogue	**2.20**	**8**	**0.03***	**-1.94**	**8**	**0.05**	**0.69**	**5**	**0.49**
Altered state	**0.28**	**8**	**0.78**	**-0.63**	**6**	**0.52**	**-0.56**	**4**	**0.57**

[24] SPSS Related-Samples Wilcoxon Signed Rank Test
[25] * $p < 0.05$
[26] Asymptotic (the test used makes the assumption that as the sample size increases so the distribution will approach normality)
[27] Used when test result could change in either direction, higher or lower

Table 3: Tests comparing the equality of the correlation matrices

	Eyes closed sitting quietly vs. stress			Unmanaged stress vs. managed stress with mindfulness			Eyes closed sitting quietly vs. managed stress with mindfulness		
	x^2	df	*p*	x^2	df	*p*	x^2	df	*p*
Jennrich Test[28]	86.42	66	0.04(7)*	76.51	66	0.18	91.02	66	0.02*

Table 4: Percentage variance in common and direction of correlation (positive or negative) shown in Figures 6 and 7 for statistically significant relationships ($p < 0.05$)

Relationship	Eyes closed sitting quietly (control)	Stress	Mindfulness-managed stress
Rationality/Self-awareness	64		
Rationality/Inward absorbed attention	70		73
Rationality/Negative affect			-55
Positive affect/Arousal	-51	-58	
Positive affect/Altered experience			74
Positive affect/Altered state		-57	69
Arousal/Self-awareness			-74
Arousal/Negative affect		80	
Self-awareness/Vivid imagery	-70		
Self-awareness/Inward absorbed attention	73		50
Self-awareness/Volitional control		52	
Memory/Altered state	55		
Inward absorbed attention/ Internal dialogue	-50		
Altered experience/Altered state			51
Altered experience/Vivid imagery			69
Volitional control/Altered state	-79		

[28] Carried out for preliminary exploration only; see discussion in the Limitations section (page 31).

Appendix D: Confidence intervals

Figure 7: 95% confidence intervals[29] for the 6 out of 12 major dimensions with one or more statistically significant change in intensity ($p < 0.05$)[30]

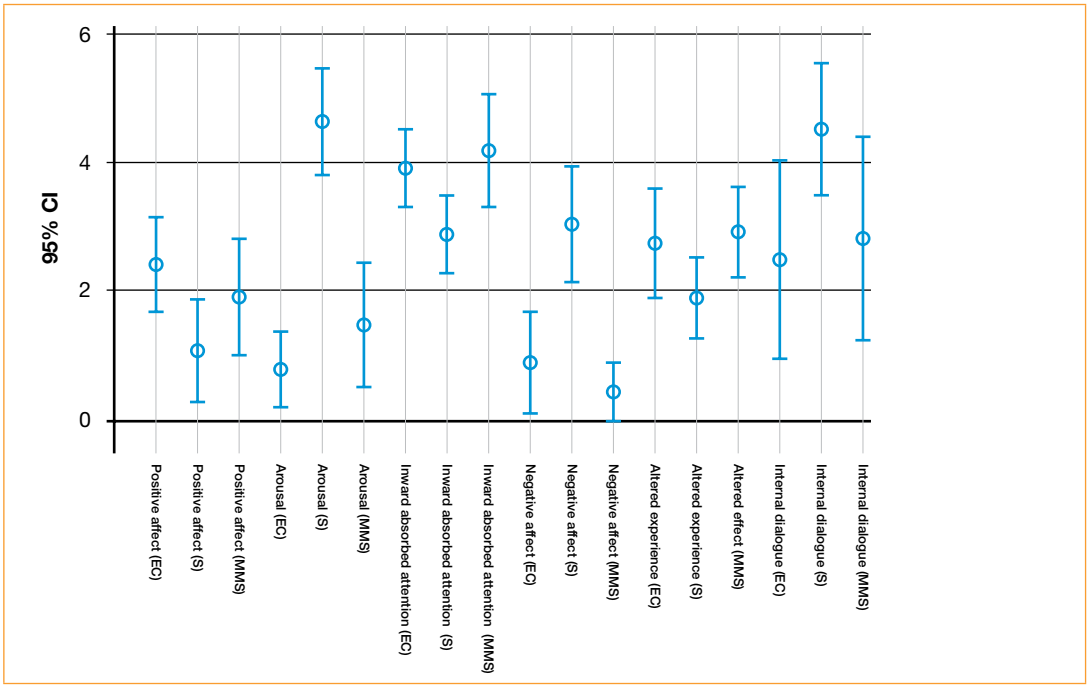
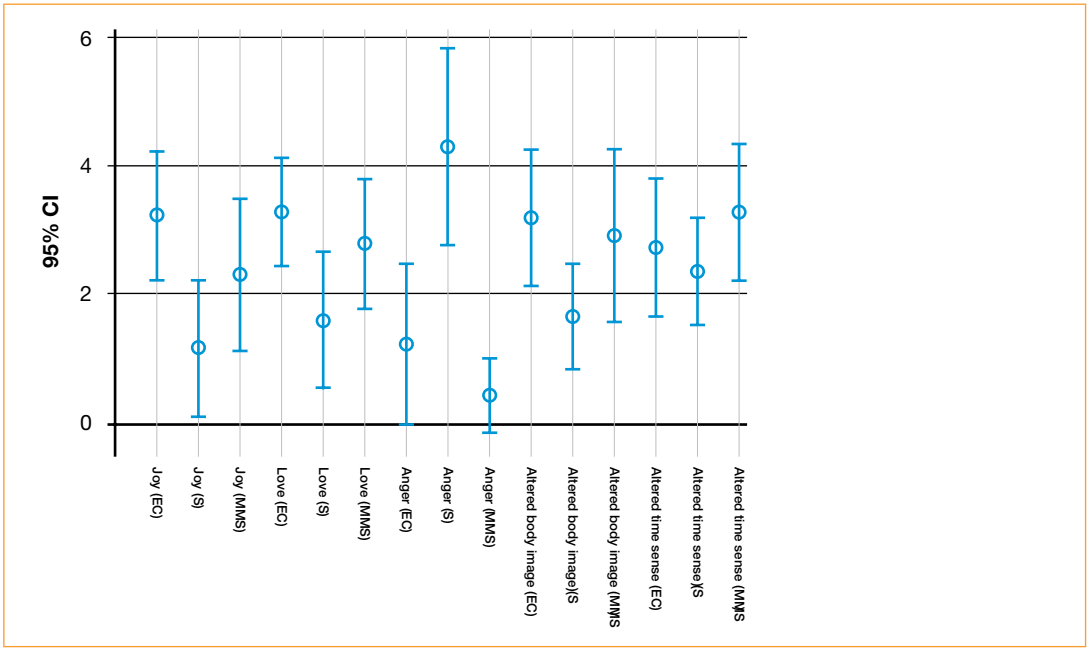


Figure 8: 95% confidence intervals for the 5 out of 14 minor dimensions with one or more statistically significant change in intensity ($p < 0.05$)[20]



[29] The 95% confidence interval shows an estimate of where the mean would be likely to fall in 95 out of 100 repeated studies. A gap between the intervals gives confidence that the data would replicate and be generalisable.
[30] EC = Eyes closed sitting quietly; S = Work-related stress; MMS = Mindfulness-managed stress

CfBT Education Trust
60 Queens Road
Reading
Berkshire
RG1 4BS

Tel: +44 (0)118 902 1000
www.cfbt.com

PMS 6373 07/13 ISBN 978-1-909437-24-1