



## The neuroscience of directed attention in education

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*A review of the neurological basis on which we should promote directed attention and teach mindfulness and stress management in education.*

### Introduction

Professionally I am an art teacher but I have always been interested in evidence for approaching the education of students in ways that will support their mental wellness. With an important role in pastoral care, I decided to further my research around the neurological evidence to support mindfulness as a means to promote cognitive and emotional growth. I attended a neuroscience of mindfulness lecture with Dr Elena Antonova (Brunel University) in which we explored anti-correlated brain networks, emotional reactivity vs emotion regulation, neural dynamics of practice, neuroplasticity, hippocampal neurogenesis and understanding fMRI brain activity scan results. I also undertook mindfulness training and Yale's Science of Wellbeing course, and have reviewed some of the important literature in this area.

### Background

Mental wellness is not simply the absence of mental illness. In the past two decades particularly mental well-being has been a key focus in education. It is documented that 50% of mental health problems are established by the age of 14 and 75% by the age of 24 (Kessler et al, 2005). Fifty years ago the average first onset of depression was around 30, now it is below 15 (Seligman, 2011). With arguably and measurably improved wealth, purchasing power, women's rights, equality, entertainment and global connectivity, happiness has not followed a similar trajectory. It therefore falls on education to approach the topic of mental wellness provision with urgency, careful consideration and intention to ease suffering, support all, and ensure that mental health services are appropriate. Ultimately schools need to take a serious role in identifying needs, building support networks, and combating tendencies towards self-harm, depression, anxiety, alcohol and drug misuse, and suicide. Public Health England is committed to understanding evidence from published literature to determine which approaches are effective, with interventions categorised into preventing behavioural problems; preventing emotional problems; promoting resilience; or promoting subjective wellbeing' (Public Health England, 2019). Critically it is important that schools understand how best to approach and implement mental health strategies with proven success.

### Mindfulness and Directed Attention

There is much misunderstanding of the term mindfulness. Possibly the most widespread is that it requires a quiet mind, which is certainly not the case. Some feel its value is not always recorded with methodological rigour and strong theoretical foundation. But when considered as clear focus and directed attention, the absence of this being mind-wandering, there is clear evidence in observational studies in laboratory settings. Directed attention is not the same as critical thinking and following instructions, which may be typically regarded as positive teaching methods. The aim of teaching mindfulness in education is to develop students' ability to foster a growth mindset, to learn about the brain and how to maintain directed attention like a spotlight on your chosen focal point, or anchor (Mrazek, 2017). Moreover to move away from seeing our thoughts as true and permanent, with the actual nature of thoughts largely being ephemeral, inaccurate and unfixed. These are not lessons that can be learned via a single lecture. They are skills to be developed over time, with encouragement, support, engaging with specialists in the field, and maintaining a schedule of practice until it becomes ingrained.

The disruptive effects of mind-wandering have a clear impact not only on the working memory capacity but also attention, perceptual nuance and task focus (McLean et al, 2010; Tang et al, 2007). As teachers we may often tell our students to pay attention, but do we necessarily teach them about how this can be better achieved. Whilst the effects of this are measurable in academic terms I wanted to explore whether the disruptive impact of mind-wandering could also impact on mood. Research by Mrzak et al (2013) certainly suggests that this is the case and numerous studies demonstrate that mindfulness reduces negativity, stress and anxiety (Broderick & Metz, 2009; Elder et al, 2011; Kuyken et al (2013). A significant amount of research has shown that one's personal beliefs about their ability and their cognitive capacity can affect their academic success; that this mindset can be restricted by beliefs that ability is fixed or genetically determined (Chiu, Hong & Dweck, 1997; Dweck, Chiu & Hong, 1995). Growth mindset is the belief that we can determine our own potential and can develop this – that it is not fixed but flexible. (Dweck, 2006; Dweck, 1995). There is evidence to suggest that teenagers may find mindfulness training particularly helpful because they have strong metacognitive skills (Mrazek et al, 2019).

In the research of Mrazek et al (2019) lessons were presented to teach anchoring, focusing and releasing. Anchoring was defined as deciding where you focus, and focusing was defined as directing your attention to a specific thing. Releasing was defined as letting something go by not giving it any more attention. In the teaching of anchoring, focusing and releasing, students have the best foundations for a growth mindset, Mrazek argues, due to their motivation to train this ability.

With the current global rates of mental illness I wanted to further the depth of my research, looking at neurological studies of anatomical MRI images to establish and understand more about the difference in grey-matter morphometry between meditators and non-meditators. Changes in the hippocampus and insula are significant in regard to learning, memory, emotion and awareness. These neurological changes must be objectively measurable rather than recording a subjective sense of wellbeing, perceived stress or anxiety. Notably, major depression and post-traumatic stress disorder (PTSD) are associated with decreased density or volume of the hippocampus, involved in the modulation of cortisol arousal and responsiveness (Newberg & Iversen, 2003).

Without going into too much scientific detail, during an 8-week period of mindfulness-based stress reduction (MBSR), fMRI scans measuring and mapping the brains activity showed increased grey matter concentration.



Reading about the norepinephrine system and neuroplasticity highlights the very real changes that can be made to regions of the brain through focused attention practice – such as one would experience in sport or learning a musical instrument. Through being given the right tools to train to slow and focus the attention, repetition of this can lead to it positively affecting well-being, with scientific and grey-matter morphological evidence that it relates to parts of the brain associated with mental health.

In addition to clinical interventions, MBSR training developed by Kabat-Zinn (1990) has attracted a great deal of attention in education with schools investigating the potential advantages to students both in terms of their attention regulation, and their well-being. Evidence from studies, specifically the Penn Resiliency Program in America and Strath Haven Positive Psychology Project, Australia, highlight increased engagement in school and student enjoyment, with a positive psychology program which improved curiosity, creativity and a desire to learn (Seligman, 2011). Significantly empathy, cooperation, assertiveness and self-control were all notably improved in those who completed the Penn Resiliency Program, as were health-related behaviours with fewer visits to a GP, or symptoms of illness and better exercise practice. It was documented in meta-analysis that both at the time and up to two years later, those who took the program showed increased optimism, reduced anxiety and depression.



Seligman (2011) argues that the aim of wealth should not be to blindly produce a higher gross domestic product (GDP) but to produce more well-being. General well-being – positive emotion, engagement at work, positive relationships, and a life full of meaning – is now quantifiable and it complements GDP. Seligman concurs with Mrazek that it is key to essentially teach 'tools of the mind' in order to allow executive function to take over. This involves thinking about how we distract our focus or attention, how we process thoughts via the focus we give them, how we recall, and our ability to adjust plans in light of supplementary information (Seligman, 2011).

### For consideration

In the next stage of this project, I am keen to:

- Work with a target group of students to research the extent to which they have previously been exposed to mindfulness/anchored attention practice. Work with students through modules and encourage feedback.
- Develop an evidence-based mindfulness education model using best practice from examples in national and international schools and universities.
- Work to develop strategies for improved student access to mindfulness training.

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