

Attention modifications after mindfulness training in adolescents



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Mindfulness-based Interventions

➔ Mindfulness is the practice of focusing attention in the **present moment**, with a **kind and accepting** attitude (Kabat-Zinn, 1994)

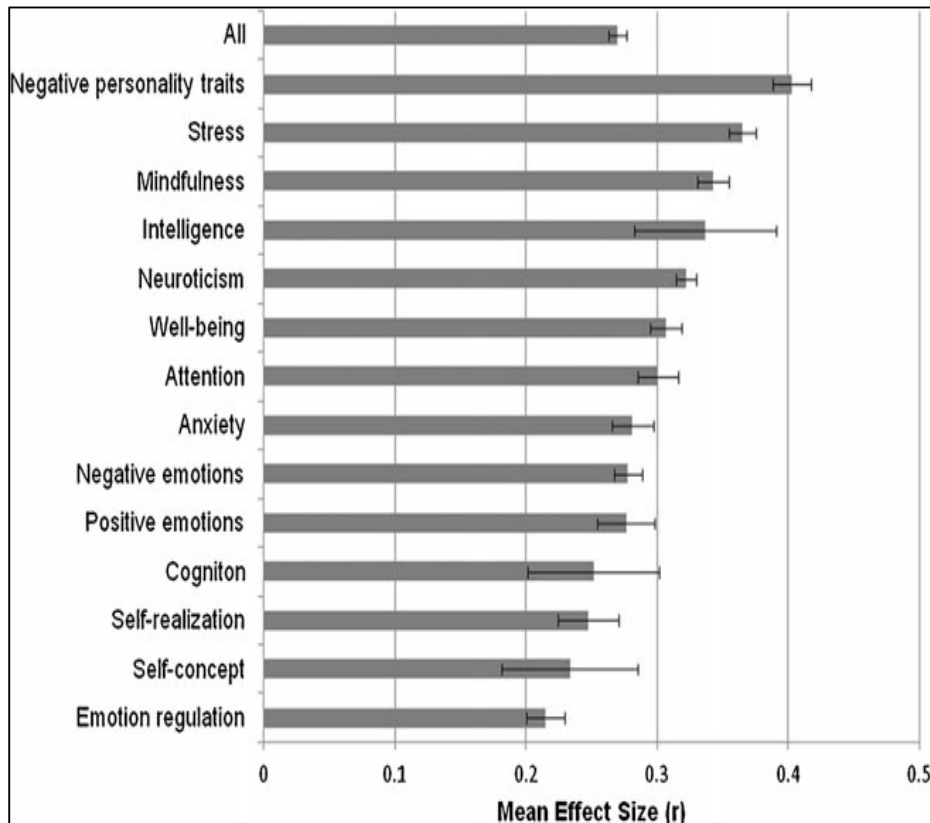


Figure taken from:
Eberth & Sedlmeier. (2012). The Effects of Mindfulness Meditation: A Meta-Analysis. *Mindfulness*, 3, 174–189.

Meta-analysis includes 38 studies of mindfulness meditation using the inclusion criteria:

- (1) a mindfulness meditation treatment
- (2) the existence of an inactive control group
- (3) a population of non-clinical adults
- (4) the investigation of psychological measures
- (5) assessed at temporal distance from a meditation session
- (6) the availability of sufficient data to calculate effect sizes

School-based Mindfulness Curricula

➤ There are a lot of programmes available:

- Mindfulness voor jongeren (*Mindfulness for Adolescents: Dewulf, 2009*)
- Learning to BREATHE (L2B: *Broderick, 2009*)
- .b Courses (MiSP: *Burnett & Cullen, 2007*)
- Mindful Schools (*Grossman & Shankman, 2007*)
- MindUp (*The Hawn Foundation, 2011*)
- Still Quiet Place (*Saltzman, 2010*)
- Stressed Teens (*Biegel, 2004*)
- Wellness Works in School (*Kinder Associates, 2002*)

➤ With many encouraging, behavioural findings

- **High acceptability** across various school populations (MiSP: *Kuyken et al., 2013*)
- **Increases in well-being** (MiSP: *Huppert & Johnson, 2010*)
- **Reductions in stress** (L2B: *Broderick & Metz, 2009*)
- **Improved sustained attention** on D2 Test, subjective happiness, and behaviour for adolescents with externalising disorders (MBCT: *Bogels et al., 2008*)
- **Improved Global Assessment of Functioning** scores (MBSR-Teens: *Biegel et al., 2009*)

School-based Meta-Analyses

- Zenner, Herrnleben-Kurz, & Walach. (2014). Mindfulness-based interventions in schools – a systematic review and meta-analysis. *Frontiers in Psychology*.
 - Assessed 24 studies, and a total of 1,348 students
 - **Cognitive performance; Hedge's $g = .80$**
 - Stress; Hedge's $g = .39$
 - Resilience; Hedge's $g = .36$
 - Emotional Problems; Hedge's $g = .19$



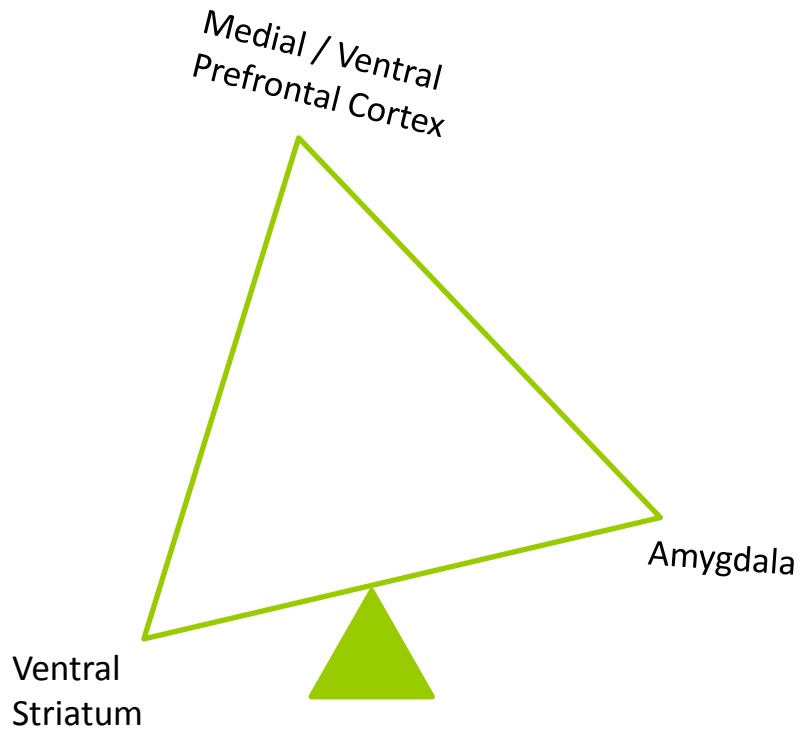
Neurodevelopmental Perspective

- Evidence is promising, but more **interdisciplinary** research needed...
 - Developmental research can integrate our knowledge of stress, reward pathways, social-cognitive mechanisms, and executive functioning (Bradshaw et al., 2012)
- **Mindfulness may encourage frontal maturation** (Hölzel et al., 2007; Grant et al., 2010), and changes to attention and emotion regulation
- Adolescence is as a **late catchment point** for neuro-cognitive interventions within the context of prefrontal development
 - Biased towards the perception of reward (Spear, 2013)
 - Context = Hot Cognitions = Risk Taking! (Gardener & Steinberg, 2005)

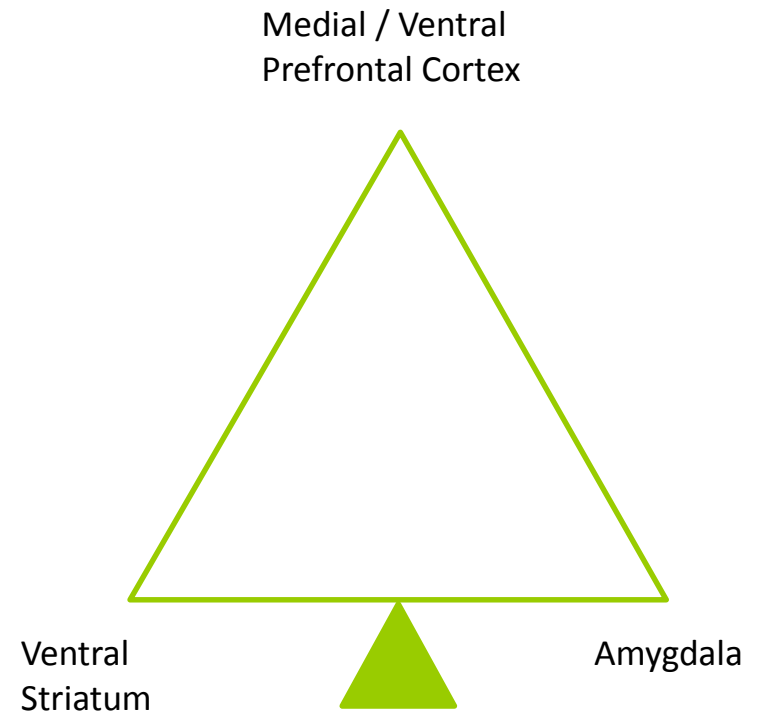


Triadic Model of Motivated Behaviour (Ernst, Pine, & Hardin, 2006)

Adolescent



Adult



What we can learn from using ERPs

- Event-Related Potentials (ERPs)
 - **Electrical brain activity** responding to a specific stimulus
 - Can be **measured portably** using laptops and an EEG cap, unlike MRI which needs an industrial scanner
 - ERPs are based on 60+ years of research, and can mark specific **indexes of attention functioning**



ERPs of Interest:

N200 (N2) – Negative waveform approx. 200ms after onset of stimulus. N2 is a sensitive marker of **target detection and response inhibition**.

P300 (P3b) – Positive waveform after 300ms. Index of information processing, and can indicate the **cognitive load** necessary to process a target within a visual task.

N200 and frontal brain regions

- ▶ Brefczynski-Lewis, Lutz, Schaefer, Levinson, and Davidson (2007)
 - ▶ Meditation practice was associated with an **inverse-U of frontal brain activity**, particularly prefrontal cortex and ACC when regulating attention and emotion regulation
- ▶ N200 believed to be generated in ACC (Ladouceur, Dahl, & Carter, 2004), an area targeted by mindfulness practice and known to be still developing into early adulthood (Luna et al., 2001)
 - ▶ These links are all theoretical however, as **no-one has tested and published neuroscientific work on mindfulness training with young people...**

ERP Theory Predictions

Taken from:

Sanger, K., & Dorjee, D. (2015.) Mindfulness training for adolescents: A neurodevelopmental perspective on investigating modifications in attention and emotion regulation using event-related brain potentials. *Cognitive, Affective, & Behavioral Neuroscience*, 1-16.

Event-Related Potential	Definition	Experimental Paradigm / Task	Adolescent Patterns	Adult Patterns	Predictions for mindfulness training
Visual N200	<p>The visual N2 is a negative deflection with frontal/ central distribution, and it signals task-specific inhibition (Falkenstein et al., 1999) and conflict monitoring (Ladouceur et al., 2007). The N2 can also be detected at occipital sites (Fabiani et al., 2000).</p>	<ul style="list-style-type: none"> • Inhibition or detection task • Stroop test (Stroop, 1935) • Go, no-go task (Donders, 1969) • D2 (Brickenkamp, 1962) • Attention Network Test, conflict-monitoring task (Fan et al., 2002) • Odd-ball paradigms 	<ul style="list-style-type: none"> • Ladouceur, Dahl, & Carter (2007) mapped out N2 development in conflict monitoring tasks. They found more negative amplitudes in older adolescents and adults compared to younger teens during incongruent trials. This suggests more efficient and mature processing in older adolescents, comparable to adult levels. 	<ul style="list-style-type: none"> • Moore et al. (2012) – more negative N2 response after mindfulness training in the Stroop task. This modulation has also been linked to reduced P3 positivity, suggesting that stronger inhibition reduces the cost of attentional resources on goal-irrelevant stimuli. 	<ul style="list-style-type: none"> • More negative N2 reflecting more mature processing • Possible links between N2 modulation and well-being since better inhibition has partially mediated increased well being in adults (Sauer, Walach, & Kohls, 2011).

.b Foundations Curriculum

Week 1	<ul style="list-style-type: none">•Orientation: Introduction to Mindfulness•Sarah Silverton and Kevanne Sanger
Week 2	<ul style="list-style-type: none">•.b Foundations•School teacher
Week 3	<ul style="list-style-type: none">•.b Foundations•School teacher
Week 4	<ul style="list-style-type: none">•.b Foundations•School teacher
Week 5	<ul style="list-style-type: none">•.b Foundations•School teacher
Week 6	<ul style="list-style-type: none">•.b Foundations•School teacher
Week 7	<ul style="list-style-type: none">•.b Foundations•School teacher
Week 8	<ul style="list-style-type: none">•.b Foundations•School teacher
Week 9	<ul style="list-style-type: none">•.b Foundations•School teacher

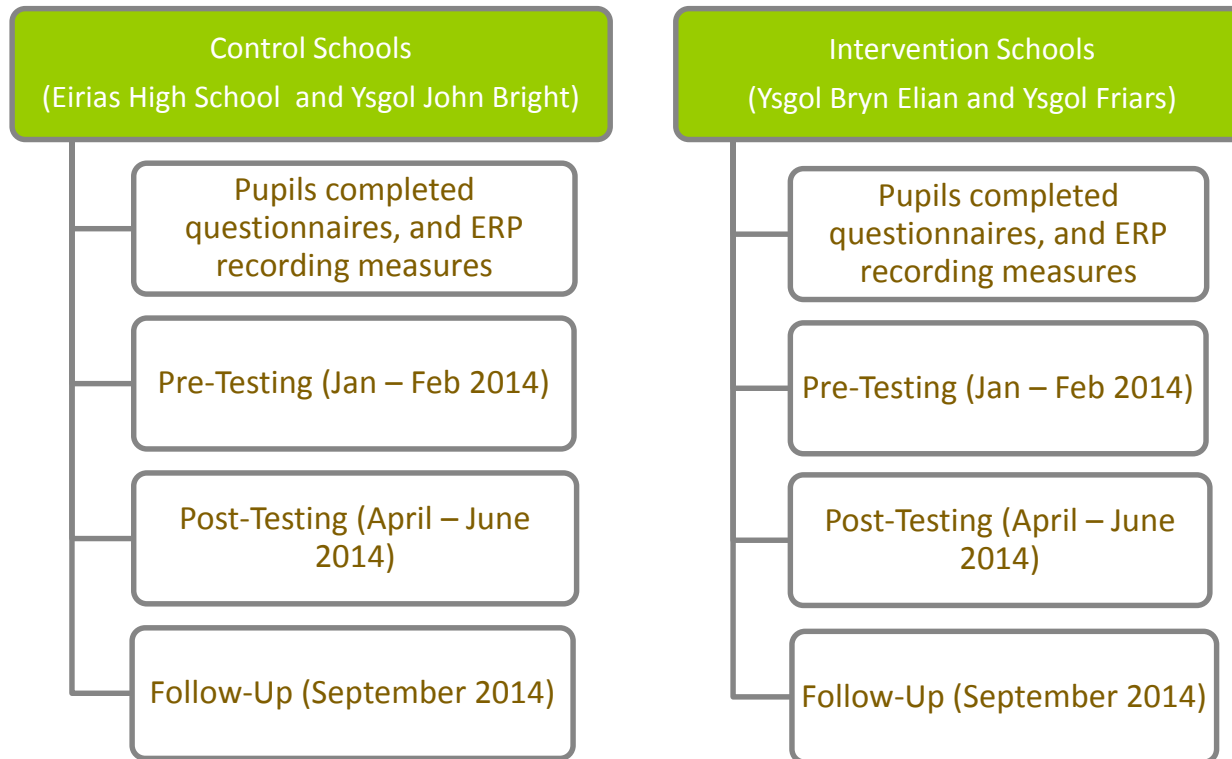
.b Foundations was designed by the Mindfulness in Schools Project (MiSP) group, specifically for adults and educators. It combines **Mindfulness-Based Stress Reduction** (MBSR: Kabat-Zinn, 1990) with '**Finding Peace in a Frantic World**' (Williams & Penman, 2011).

The **formal 8-week .b Foundations** course introduces all the core elements of MBSR, but with shorter practices, less enquiry, and more real-life examples.

The course has been **designed by teachers**, so comes with PowerPoint presentations, handbooks, worksheets, and practice CDs.

Longitudinal Project Design

Study design used by Sanger and Dorjee at the Centre for Mindfulness Research and Practice



Participating teachers were trained in .b Foundations curriculum delivery
The aim was to make the programme self-sustaining

Student feedback on practicing mindfulness

It has made me realise just how stressed I allow myself to become.

The skills I have gained are valuable as I can use them outside of the classroom.

It's amazing. It helps me to calm down in stressful and aggressive situations. Moreover, it helps me to understand more on how to focus the mind on the present.

It is very good for young people. Despite the fact that I have found it difficult to fit in, I have found it a useful resource in times of self-doubt.

It stops me from letting my mind do the weird squiggly things that it does.

I found out that this was a completely new experience to me and it was quite helpful over all. It helps me to focus more on things and get rid of stress.

At first I didn't think I would find it interesting and useful. But it was quite interesting and it has helped me to focus on the present and stop thinking too far ahead.

Thank you to my collaborators

➤ **Supervisor**

Dr. Dusana Dorjee

➤ **Colleagues**

Rebekah Kaunhoven and Shelby DeMeulenaere

➤ **Mindfulness trainers**

Sarah Silverton, Jo Bentley, and Eluned Gold

➤ **School staff and students**



Thank you for listening

Any Questions?