

Effects and mechanisms of a deep breathing intervention for test anxiety

An exploratory study on the use of mobile EEG headsets in educational research



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KEY IMPLICATIONS

- Taking deep breaths before a test is a simple intervention that can reduce test anxiety in primary school aged children and improve attentional control/focus.
- Deep breathing has effects reflected in brain activity, which is related to enhanced performance in attentional focus and (timed math fluency) test performance.
- This study breaks new ground in the local educational neuroscience landscape by bringing neuroimaging into schools and demonstrating the feasibility of collecting electroencephalography (EEG) data from children in schools.

BACKGROUND

Test anxiety is a non-trivial issue in schools, especially in high-stakes settings like Singapore. Test anxiety can adversely impact psychological well-being and performance, undermining the validity of academic assessments. Our previous study found that teaching children to take deep breaths before a timed math test reduced feelings of anxiety and enhanced test performance (Khng, 2017). However, we did not find evidence of improved attentional focus,

one of the hypothesized mechanisms for the intervention's effects.

Collecting neuroimaging data during the intervention might elucidate if attentional focus was enhanced at the level of brain functioning and translated into better test performance. However, collecting neuroimaging data from children during school-based tasks or interventions is difficult due to the high costs and physical constraints of conventional clinical-grade equipment. The recent development of low cost, lightweight, wireless, mobile EEG headsets that are quick and easy to set up and reasonably comfortable for children to wear, brings new possibilities to collect ecologically-valid EEG data in-situ, during large-scale, school-based interventions.

FOCUS OF STUDY

The study seeks to clarify the effects and underlying mechanisms of a deep breathing intervention for test anxiety on anxiety reduction, attentional focus, and test performance enhancement in children, and to explore the usability of affordable, consumer-grade, mobile EEG devices for school-based educational neuroscience research.

KEY FINDINGS

Deep breathing reduces test anxiety and improves attentional focus for primary school children. Deep breathing enhances attentional focus at a neural level, which is related to enhanced performance in attentional focus and (timed math fluency) test performance. It is feasible to collect neuroimaging data from children in schools with mobile EEG devices.

SIGNIFICANCE OF FINDINGS

Implications for practice

Schools can teach children deep breathing to be used for their self-regulation of emotions such as test anxiety, as it allows for better attentional focus, which is related to better performance.

Implications for policy and research

The teaching of deep breathing to children as a simple self-regulatory skill can be included as part of education. The insights generated on the use of mobile neuroimaging equipment for research in schools will be valuable in generating future educational neuroscience research.

Proposed Follow-up Activities

Schools can teach children how to practice deep breathing to regulate their emotions.

PARTICIPANTS

Eighty-three Primary Five (P5) and 37 Secondary One (S1) students were involved.

RESEARCH DESIGN

A pilot study was first conducted with P5 students to compare the quality and pattern of EEG data collected by a consumer-grade EEG device against that collected by a clinical-grade device. We compared students' behavioural performance and brain electrical activity during an attentional focus task under a deep breathing instruction/practice condition versus a baseline/control condition. The main study (with P5 and S1 students) compared a deep breathing intervention group versus a control group of students on pre-to-post-test changes in self-reported feelings of anxiety, timed math fluency test performance, self-reported state-of-mind (balance of adaptive and maladaptive thoughts during the math test), and behavioural and EEG measures of attentional focus, under evaluative stress instructions.

REFERENCES

Khng, K. H. (2017). A better state-of-mind: deep breathing reduces state anxiety and enhances test performance through regulating test cognitions in children. *Cognition and Emotion*, 31(7), 1502-1510. doi: 10.1080/02699931.2016.1233095

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