

Case study 1: An Evidence-based practice review report.

Theme: School/Setting Based Interventions for Social, Emotional and Mental Health.

How effective are mandala interventions at reducing test anxiety in school age children?

Summary

Evidence suggests that students are experiencing increasing levels of anxiety which impede their ability to learn and flourish in education (Merikangas et al., 2010). In particular, test anxiety is becoming an increasing concern for many pupils (Ergene, 2003). Test anxiety is characterised by negative thoughts and feelings towards test-taking situations. Pupils experiencing test anxiety may feel emotions such as tension, stress and worry. With the expectations of schools to provide social, emotional and mental health (SEMH) support for children and young people (CYP; DfE, 2014), this review explored the effectiveness of mandala interventions at reducing test anxiety.

Interventions refer to brief mindfulness-based activities involving pupils drawing or colouring mandalas. A total of five studies were identified and critically appraised in this review. Effect sizes were calculated, showing small and medium size effects. Given the simplicity and feasibility, mandala interventions hold promise as a viable method for reducing test anxiety in children. Future research may wish to address the limitations discussed in this review. For instance, participants in the included studies were aged between nine and fourteen years, therefore, further research is needed to explore whether similar effects are found in older children who experience more regular testing.

Introduction

Test Anxiety

It is believed that school-related stressors such as increased academic pressures and high-stakes testing contribute to the increasing prevalence of anxiety in CYP (Pope, 2010). One form of anxiety that is predicted to rise is test anxiety; this can be defined as a mixture of state anxiety, the perceived threat before a test, and the worry of performance-evaluative situations (Lowe et al., 2008). This differs from general anxiety, which can be referred to as an unpleasant emotional state without a specific object (Reber, 1995, as cited in Putwain, 2008). Test anxiety is a multifaceted construct consisting of cognitive, emotional, behavioural and physiological components (Sarason, 1984). In the literature, test anxiety has been conceptualised in three different ways: as a personality trait, an emotional state and comparable to a clinical disorder (Putwain, 2008). Additionally,

Putwain and Daly (2014) found that in their sample of 2,345 secondary school students, 16% of participants reported themselves to be highly test anxious. This is concerning as high levels of test anxiety can negatively affect student performance on state-

Critical Review of the Evidence

Literature Search

A systematic literature search was conducted on 22nd January 2021. The search terms and databases used can be found in Table 1. Due to the exceptionally large number of results on PsycINFO (n > 18,000), a filter was applied to include only those that had the search terms in the abstract. The search yielded a total of 63 results, of which 16 were duplicates. All duplicates and a further 42 results were removed after the title and abstracts were screened according to the inclusion and exclusion criteria (see Table 2). A total of 6 journal articles and theses were read in full, and one was excluded with rationale. A list of the studies excluded at the abstract and full article reading stage can be found in Appendix A. The flow chart below (Figure 1) outlines the systematic searching process. A total of 5 studies were included in this review (see Table 3). These are described in further detail in Appendix B.

Table 3

List of studies included in the review

Included studies

adapted (see Appendix D) and used to critically appraise the
methodological quality

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All studies used various methods to induce test anxiety, contributing to a higher WoE A score. Three studies introduced a test within the method (Carsley et al., 2015; Carsley & Heath, 2018; Carsley & Heath, 2019), and one study used deception (Morrell, 2018) to induce test anxiety. In contrast, the Campbell (2012) study took place two weeks prior to the Florida Comprehensive Assessment Test (FCAT), and participants were not subject to researcher-led methods to induce anxiety.

Intervention

Given the brief nature of the mandala intervention, four of the studies took no longer than an hour in total (Carsley et al., 2015; Morrell, 2018; Carsley & Heath, 2018; Carsley & Heath, 2019), and one study was conducted over the course of four weeks (Campbell, 2012). In all studies participants engaged in a mandala intervention for 10 – 15 minutes, however, the nature of the interventions varied slightly. Participants in Campbell (2012) were briefly taught about mandalas, which were referred to as any art form executed within a circular shape (Henderson et al., 2007). They created their own mandalas by drawing a circle and filling it in with as much detail as they liked. It could be said that this task lacked the structured component required for the task to be mindful (Greenberg & Harris, 2012). As the intervention activity in Campbell (2012) was described clearly, and examples of paperwork was

score was given for

. In the remaining studies (Carsley et al., 2015; Morrell, 2018; Carsley & Heath, 2018; Carsley & Heath, 2019), participants coloured structured mandalas for 10 – 15 minutes. Morrell (2018) and Carsley et al. (2016) provided clear instructions and an example of the

structured mandala that was supplied, resulting in a high WoE C score for

In all studies, the intervention was delivered by the researchers in schools, resulting in a medium WoE C . The studies did not receive a high score as the interventions were not delivered by school staff; having school staff deliver the intervention could have further increased the external validity of the findings.

Measures

All studies measured test anxiety at pre and post using self-report measures. Campbell (2012) used the 30-item (CTAS; Wren & Benson, 2004). The reliability of the CTAS was reported in the paper to be 0.92, however, test-retest reliability was not provided, resulting in WoE A penalties. Campbell (2012) also gathered qualitative data in the form of meeting observation notes. However, given that this review is exploring the effectiveness of colouring mandalas, only data from the CTAS was considered. The remaining studies used the State-Trait Anxiety Inventory for Children State form (STAIC-S; Spielberger et al., 1973).

All studies varied with how much information they reported regarding the reliability of the measures. For example, two studies (Carsley & Heath, 2018; Carsley & Heath, 2019) used multiple measures, and although they reported the internal consistency reliability and test-retest reliability of the STAIC and their mindfulness attention measure, they did not include information about the test-retest reliability of their third measure. Additionally, none of the

studies reported information relating to the criterion-related validity or construct validity, resulting in further WoE A penalties.

Participants in four of the studies (Carsley et al., 2015; Carsley & Heath, 2018; Carsley & Heath, 2019; Morrell, 2018) completed the post-intervention measure immediately after the intervention, resulting in a high WoE C rating

The Campbell (2012) study did not complete the post-test until one week after the participants had completed the FCAT, therefore, it is likely that participants felt a sense of relief and naturally experienced less anxiety than they did prior to the test. Additionally, circumstances could have arisen that would have obscured the impact of the intervention. This delayed measurement was a clear limitation of the study design, and led to a low WoE C score for

Outcomes

The effect sizes calculated for all the studies was the standardised mean d . d descriptors were used to describe the effect sizes (see Table 5). Calculated effect sizes are provided in Table 6.

Effect sizes for studies with an RCT design were calculated by inputting the

Collaboration online calculator (Wilson, n.d.). As Campbell (2012) used a quasi-experimental design with one group, the effect size was calculated by subtracting the pre-group mean from the post-group mean and dividing by the SD at pre (Becker, 1988).

scores after the intervention. It should be noted that the study took place in a

Three studies reported a significant decrease in test anxiety following the mandala intervention (Carsley et al., 2015; Carsley & Heath, 2018; Carsley & Heath, 2019), and these resulted in

Table 5

Descriptors for Cohen's d (Cohen, 1992)

Effect Size	Descriptor
0.8	Large
0.5	Medium
0.2	Small

Table 6:

mandala colouring (Duong et al., 2018; Noor et al., 2017; Van Der Venet & Serice, 2012), these have primarily focused on adult participants, and therefore findings cannot be extrapolated to children. This review therefore aimed to provide a comprehensive overview of the effectiveness of mandala interventions in school age children. To ensure that the search was as comprehensive as possible, this review included both peer reviewed articles and unpublished theses. Including peer reviewed articles provides the assurance that the articles have been subject to scientific rigour by trained researchers. Although this level of quality assurance is not something that unpublished theses are subjected to, it was deemed that their inclusion in this review reduced the risk of publication bias, and provided valuable empirical data which assisted in exploring the review question.

A limitation of this review is that the included studies did not report including participants with anxiety disorders, or participants from a range of diverse backgrounds. As such, the findings of this review may not generalise to these populations. Caution must be taken in using the results to draw wide conclusions about how

mandala interventions are effective for students who are preparing to take more formal examinations such as A-Levels.

All studies used self-report m

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*Psychology R.32 841.92 reW*nBT/F2 12 Tf1 0 0 1 227.57 362.69 Tm0 g0 G[()do.89*

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Marques, S. C., Pais-Ribeiro, J. L., & Lopez, S. J. (2011). The role of positive psychology constructs in predicting mental health and academic achievement in children and adolescents: A two-year longitudinal study. *Journal of Happiness Studies*, 12(6), 1049-1062.

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McDonald, A. S. (2001). The prevalence and effects of test anxiety in school children. *Educational psychology*, 21(1), 89-101.

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Moon, M. D. (2019). Triangulation: A method to increase validity, reliability, and legitimation in clinical research. *Journal of Emergency Nursing*, 45(1), 103-105

Morrell, M. E. (2018). *Test anxiety reduction through brief mindfulness meditation and mandala coloring: School-based mindfulness interventions for urban youth* (Order No. 10934041). Available from ProQuest Central; ProQuest Dissertations & Theses Global.

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von der Embse, N., Jester, D., Roy, D., & Post, J. (2018). Test anxiety effects, predictors, and correlates: A 30-year meta-analytic review. *Journal of Affective Disorders*, 227, 483-493.

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Wren, D. G., & Benson, J. (2004). Measuring test anxiety in children: Scale development and internal construct validation. *Anxiety, Stress & Coping*, 17(3), 227-240.

Zeidner, M., & Matthews, G. E. R. A. L. D. (2005). Evaluation anxiety. *Handbook of Competence and Motivation*, 141-163.

Appendices

Appendix A: List of Excluded Studies

Excluded Research	
Reference	Stage of exclusion and exclusion criteria
de Campos, F. V., Antunes, C. F., Damião, E. B. C., Rossato, L. M., & Nascimento, L. C. (2020). Anxiety assessment tools in hospitalized children. <i>Acta Paulista de Enfermagem</i> , 33(5), 1-8.	Abstract screening 3 This study is a review of literature.
Sinha, N. (2017). Gender Differences in Academic Stress and Test Anxiety Among Resilient Adolescents. <i>Indian Journal of Psychological Science</i> , 8(2), 1-11.	Abstract screening 4 This study does not include colouring or drawing mandala as the intervention.
Rose, S. E., & Lomas, M. H. (2020). The Potential of a Mindfulness Based Coloring Intervention to Reduce Test Anxiety in Adolescents. <i>Mind, Brain,</i>	

Appendix B: Mapping the Field

Authors	Participants	Design and groups	Setting	Description of methodology
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distributed consent forms to grade 4, 5 and 6 elementary school students.

**Morrell
(2018)**

Sample size: 43

structured mandalas or colour on a blank sheet.

sampling; letters were sent to parents of students at two elementary schools.

Measure (CMM)

Carsley & Heath (2019)

Sample size: 152
 Mean age = 10.38
 SD = 0.88
 Females: 76
 Males: 76

Randomised control trial
 Groups:
 Mindful = 76
 Control = 76

Central location classrooms. T

Convenience sampling was used to recruit participants; consent forms were distributed to students of public elementary schools in Canada.

Appendix C: Weight of Evidence (WoE)

WoE A: Methodological Quality

This section considers the methodological quality of the studies included in this review. The WoE A judgement was made using an adapted version of the Gersten et al. (2005) protocol (See Appendix D for adaptations and rationale).

The tables below show the criteria used to establish an overall WoE A judgement for the studies. The criteria are based on recommendations from Gersten et al. (2005) protocol which states that for a high rating, the study needs to meet all but one essential criteria, and demonstrate meeting at least 50% of the desirable criteria. Therefore, for the protocol used for coding RCT studies (Carsley et al., 2015; Carsley & Heath, 2018; Carsley & Heath, 2019; Morrell, 2018), the study needed to meet at least 9 out of 10 essential criteria and 4 out of 8 desirable criteria (see Table 7). For the protocol used to code the study by Campbell (2012) which utilised a quasi-experimental design with no control group, the study needed to meet at least 6 out of 7 essential criteria and 3 out of 6 desirable criteria (see Table 8).

WoE A Criteria for Randomised Control Trial Studies:

WoE C: Relevance to the Review Question

This section considers the relevance of the focus of each study to the review question. The coding protocol for WoE C is provided in Table 12 below. The mean score for each category was calculated to provide the overall WoE C rating for each study.

Criteria	WoE C Rating
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Summary of WoE C ratings

Study	WoE C criteria						Overall WoE C
	Location	Age of Participants	Ethnicity of Participants	Intervention Description	Intervention Delivery	Outcome Measure	
	(A)	(B)	(C)	(D)	(E)	(F)	
Campbell (2012)	2	1	1	3	2	1	1.7 (Low)
Carsley, Heath & Fajnerova (2015)	2	3	2	3	2	3	2.5 (Medium)
Morrell (2018)	2	2	2	3	2	3	2.3 (Medium)
Carsley & Heath (2018)	2	3	1	2	2	3	2.2 (Medium)
Carsley & Heath (2019)	2	3	2	2	2	3	2.3 (Medium)

Appendix D: Adaptations to Coding Protocol

The Gersten et al., (2005) coding protocol was adapted to make it more appropriate and tailored for the studies included in this review. A list of the questions which were removed and/or adapted can be found below.

~~Strikethrough~~ is used to indicate the original question and updated questions, along with questions that the author creator, are in bold. Comments and the rationale for changes can be found in square brackets.

Essential Quality Indicators

~~—Was sufficient information provided to determine/confirm whether the participants experienced demonstrated the disability(ies) or difficulties presented?~~ **—Was the sample population appropriate for the research question?**

[This review did not focus on reducing test anxiety in a targeted population. Therefore, this updated question aims to seek whether the study met the inclusion criterion relating to including participants who were of school age]

~~—Were appropriate procedures used to increase the likelihood that relevant characteristics of participants in the sample were comparable across conditions?~~

[This question was removed when coding the study by Campbell (2012) as it used a one group pretest-posttest design. However, for the remaining four RCT studies, this question was kept in.]

~~—Was sufficient information given characterizing the interventionists teachers provided? Did it indicate whether they were comparable across conditions?~~

[This question was removed as it was deemed inappropriate considering the mandala interventions can be implemented without the need for additional training]

Was there a clear method to induce and assess test anxiety?

[As test anxiety is context-specific, this question was included to ascertain whether test anxiety was likely experienced by participants during the experiment]

~~— Was the fidelity of implementation described and assessed? **Was the delivery of the intervention clearly described?**~~

[As mindful colouring is typically a short mindfulness-based task, this question elicits whether the methods can be easily implemented by staff in a school setting]

~~— Was the nature of services provided in comparison conditions described?~~

[This question was removed when coding the study by Campbell (2012) as it used a one group pretest-posttest design. However, for the remaining four RCT studies, this question was kept in.]

~~Was data available on attrition rates among intervention samples? Was severe overall attrition documented? If so, is attrition comparable across samples? Is overall attrition less than 30%? **Is overall attrition less than 30%?**~~

[The last question was deemed the most appropriate for these studies considering the brief nature of the tasks]

~~Were data collectors and/or scorers blind to study conditions and equally (un)familiar to examinees across study conditions?~~

[This question was removed when coding the study by Campbell (2012) as it used a one group pretest-posttest design. However, for the remaining four RCT studies, this question was kept in.]

~~— Were outcomes for capturing the intervention's effect measured beyond an immediate post-test?~~

[As test anxiety is related to testing situations (von der Embse et al. (2018), it was deemed that this question was not appropriate. As test anxiety is likely to have naturally reduced after the testing experience, the information gathered from a repeated measure beyond the immediate post-test may not necessarily reflect the impact of intervention.]

~~— Was any documentation of the nature of instruction or series provided in comparison conditions?~~

[This question was removed when coding the study by Campbell (2012) as it used a one group pretest-posttest design. However, for the remaining four RCT studies, this question was kept in.]

~~— Did the research report include actual audio or videotape excerpts that capture the nature of the intervention? **Did the research report include actual audio or videotape excerpts or examples of paperwork that capture the nature of the intervention?**~~

[Examples of paperwork were deemed appropriate ways to document the nature of the mandala interventions]

N/A

Unknown/Unable to Code

Did the study provide not only internal consistency reliability but also test-retest reliability and interrater reliability (when appropriate) for outcome measures?

Yes

No

N/A

Unknown/Unable to Code

Was evidence of the criterion-related validity and construct validity of the measures provided?

Yes

No

N/A

Unknown/Unable to Code

Did the research team assess not only surface features of fidelity implementation (e.g., number of minutes allocated to the intervention or teacher/interventionist following procedures specified), but also examine quality of implementation?

Yes

No

N/A

Unknown/Unable to Code

Did the research report include actual audio or videotape excerpts or examples of work that capture the nature of the intervention?

Yes

No

N/A

Unknown/Unable to Code

Were results presented in a clear, coherent fashion?

Study: Carsley, D., Heath, N. L., & Fajnerova, S. (2015). Effectiveness of a classroom mindfulness coloring activity for test anxiety in children. *Journal of Applied School Psychology, 31*(3), 239-255.

Essential Quality Indicators

Quality Indicators for Describing Participants

Was the sample population appropriate for the research question(s)?

Yes

No

N/A

Unknown/Unable to Code

Were appropriate procedures used to increase the likelihood that relevant characteristics of participants in the sample were comparable across conditions?

Yes

No

N/A

Unknown/Unable to Code

Quality Indicators for Implementation of the Intervention and Description of Comparison Conditions

Was there a clear method to induce and assess test anxiety?

Yes

No

N/A

Unknown/Unable to Code

Was the intervention clearly described and specified?

Yes

No

N/A

Unknown/Unable to Code

Was the delivery of the intervention clearly described?

Yes

No

N/A

Unknown/Unable to Code

Was the nature of services provided in comparison conditions described?

Yes

No

N/A

Unknown/Unable to Code

Quality Indicators for Outcome Measures

Were multiple measures used to provide an appropriate balance between measures closely aligned with the intervention and measures of generalized performance?

Yes

No

N/A

Unknown/Unable to Code

Were outcomes for capturing the interventions effect measured at the appropriate times?

Yes

No

N/A

Unknown/Unable to Code

Quality Indicators for Data Analysis

Yes

No

N/A

Were results presented in a clear, coherent fashion?

Yes

No

N/A

Unknown/Unable to Code

Total number of essential quality indicators: 9 out of 10

Total number of desirable quality indicators: 3 out of 8

Overall Rating of Evidence: 3 2 1 0

