Thinking Your Problems Away

Impact of an affective & metacognitive maths intervention on primary school pupils

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Rationale

The importance of good quality mathematics education is key to economic success at a national level (Maughan & Cooper, 2010) and positively associated with adult social economic status (Ritchie & Bates, 2013).

Two causal factors may hinder mathematics performance (Hart et al, 2015): information processing (e.g. long term memory and retrieval; number sense; spatial visualisation) and affective components (e.g. beliefs; attitudes; emotions).

Metacognitive aspects, such as the self-regulatory skills of self-questioning, self-monitoring and self-checking, have also been linked to enhanced mathematics performance (Montague, 2007)

Limited research has been done in the UK looking at addressing the affective factors which impact on maths performance in younger pupils.

This study sought answers to the following research questions:

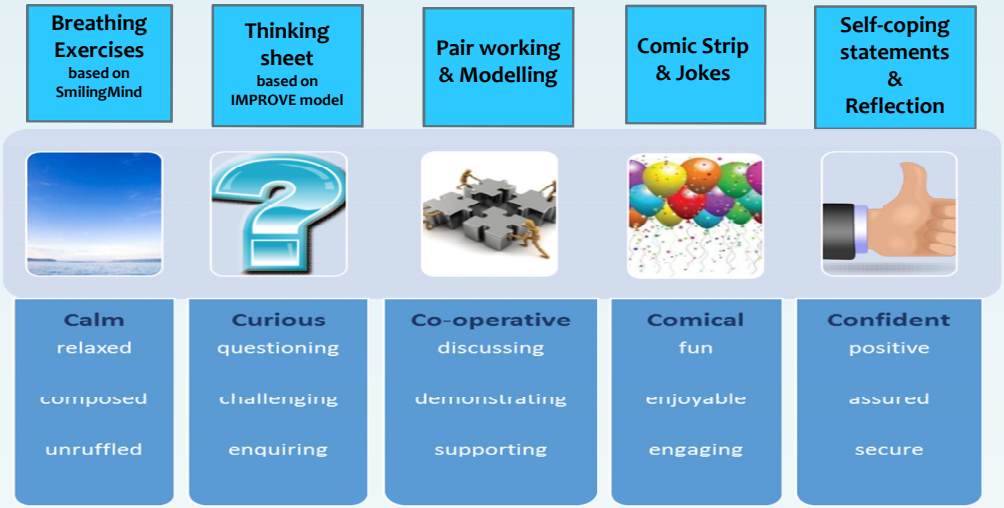
RQ 1.What is the impact of a multi-dimensional metacognitive and affective intervention on: (a) maths performance (b) maths anxiety (c) maths self-concept; (d) self-regulated behaviour in maths

RQ 2. To what extent are the factors being investigated contributing to the explanation of variance in maths anxiety and maths performance?

Analysis

Mixed Analysis of Variance (ANOVA) : to assess the impact of the intervention.

Regression Analysis: to identify factors explaining the variance in maths anxiety and performance.



Participants

This study involved pupils in Year 4 from eight primary schools across the a Local Authority in SE England.

- 144 pupils (matched on demographics, performance and anxiety level) randomly allocated to either the intervention group or the waiting list control group.
- 12 intervention groups in total, with each group supported by a Teaching Assistant over the four week period intervention.
- Each intervention group made up of six pupils with a mixture of below average and average ability.

Measures

Access Mathematics Test (AMT; McCarty, 2008).

Classroom Behavioural Rating Scale (CBRS; Matthews, Ponitz, & Morrison, 2009)

Self-Talk Questionnaire (Lee, McDonough, & Bird, 2014).

Self Concept in Maths (SCM; Roebers et al., 2012); Maths Self Concept Questionnaire (MSCQ; OECD, 2005)

Math Anxiety Questionnaire (MAQ; OECD, 2005); Scale for Mathematics Anxiety in class and in tests subscales (SMA; Cavanaugh & Sparrow, 2010).

Results

RQ1a : Math Performance: Pupils in the Intervention Group performed significantly better than the pupils in the Control Waiting List Group when retested after the intervention period.

RQ1b: Maths Anxiety: There was not a significant difference in maths anxiety after the intervention period.

RQ1c: Self Regulated Behaviours: A significant impact on increasing some elements of self-regulated behaviours (strategising and focusing) but not in other self-regulated behaviours (self-managing; self-correcting; persevering) .

RQ1d: Maths Self-Concept: No significant impact overall. However, boys in the intervention group reported significantly higher mathematics self-concept compared to males in the control group.

RQ2 In this study:

45% of maths anxiety is explained by performance, maths self-concept and self-talk behaviours**.**

17% of maths performance is explained by self-regulated behaviours, maths self-concept and maths anxiety.

Implications

- Reciprocal links between maths performance, anxiety, self-concept and self-regulated behaviour supported in younger pupils. Early intervention is therefore required.
- Interventions to support emotional aspects of learning potentially require long term involvement to have impact.
- Raises the possibility of further research into and development of interventions which can enhance the “cognitive” and “emotional” dimensions of learning.
- Usefulness of models (e.g.IMPROVE; Mevarech & Kramarski, 1997) to support self-regulated behaviours in maths is indicated.
- Importance of developing self-concept as a means of reducing maths anxiety, particularly with respect to girls.
- Mathematics anxiety is likely to be predicted by lower math performance, than vice-versa.
- Development of TA skills to support multidimensional interventions could be considered in order to promote a higher level of instructional skills and enhanced learning.

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