

Reducing maths anxiety before exams:  
why different regulations lead to the  
same results.

*“What you fear most of all is-fear.”*  
— J.K. Rowling





## About the research + gap

Teachers have to consider cognitive and emotional development

(Federal State Educational Standard)

Maths Anxiety and Maths achievement

$r = -.28, p < .05$  (meta-analysis, Barosso et al., 2020);

$r = -.42, p < .05$  (Owens et al., 2012)

**Gap:** Crisis of replication: a real problem or something else? (Schmidt and Oh, 2016)

Programme for International Students Assessment (2016)



61% **worry** about getting bad grades in math

30% feel **nervous** during solving maths task

33% feel **tense** doing homework

59% think that **maths is difficult**



## Theories

According to **Processing Efficient theory**, feelings of excitement (anxiety) when performing various tasks reduce the working memory capacity available for solving (Eysenck & Calvo, 1992). Individuals with a high level of maths anxiety are susceptible to anxious thoughts about the upcoming maths test, which in turn reduces the amount of working memory needed to solve the given task and leads to lower performance.

Another theory, **Attention Deficit Theory** (Ashcraft & Moore, 2009), postulates that anxiety affects the ability to allocate attention and cognitive resources to perform tasks. It suggests that anxiety impairs inhibition: anxious individuals are more likely to be distracted by stimuli that are irrelevant to task performance, whether those stimuli are external (i.e., common distractions) or internal (i.e., anxious thoughts, reflections, etc.), which also leads to lower academic performance.

# Methods to reduce anxiety

## Expressive writing



*'Please take the next 7 minutes to write as openly as possible about your thoughts and feelings regarding the math problems you are about to perform...'*

10 min, biology or admission tests, improve from pretest to post test in (1)  $N = 40$ ,  $d = 0.58$ ; (2)  $N = 47$ ,  $d = 0.47$

(Ramirez and Beilock, 2011)

## Controversial results

Expressive writing did not yield significant effects on depressive symptoms (meta-analysis, Reinhold, Bürkner and Holling, 2018)

A mediation analysis indicated that EW reduced learning gains by increasing children's anxiety during the lesson, thereby suggesting that EW functioned quite differently from its use in older youth and adults (Meshina and Richland, 2020)

**Successful replication** (7 min, maths, Cohen's  $d$  for control HMA (22) vs. EW HMA (22) equals .79): Park et al., 2014)

**Failed replication** (Stage 1: 26 vs 26; Stage 2: 66 vs 66; effect size=0; Camerer et al., 2018)

# Methods to reduce anxiety

## Reappraisal

*The goal of this research is to examine how physiological arousal during a test correlates with performance.*

'If you find yourself feeling anxious, simply remind yourself that your arousal could be helping you do well.'

(Jamieson, Mendes, Blackstock and Schmader, 2010)

## Positive attitudes via CBT

Reappraisal is related to anxiety symptom improvement with Cognitive Behavioral Therapy and is not proxy to third variable.

(systematic review, Smits et al., 2012)

Positive interpretation bias predicted more positive self-perception of social performance and reduced underestimations of performance.

(Mesghina and Richland, 2020)

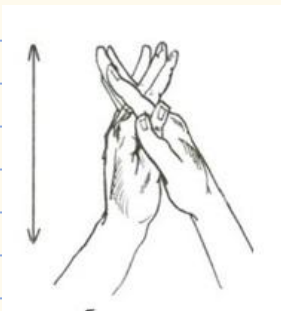
## Successful replication

Reappraising stress led to less math evaluation anxiety, lower threat appraisals, more adaptive neuroendocrine responses (lower cortisol and higher testosterone levels on testing days relative to baseline), and higher scores on exam (Jamieson et al., 2022)

# Methods to reduce anxiety

## Physical exercises

Short exercises to make a break



(Bildanova, Biserova and Shagivalieva, 2015)

Mostly positive effect  
but it depends

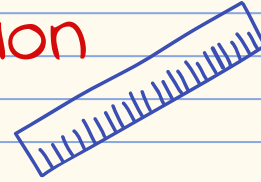
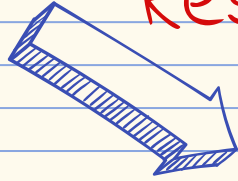
**Unifying theory:** the theory that exercise training recruits a process which confers enduring resilience to stress.

(Salmon, 2001)

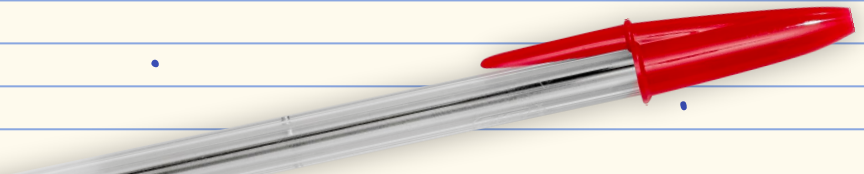
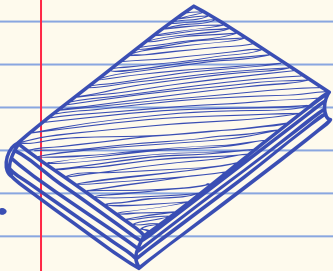
**Interventions of varying intensity** may lead to a reduction in anxiety symptoms.

(Pascoe et al., 2020)

# Research Question

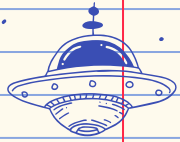


Which regulation is the most effective to regulate anxiety before math exam?

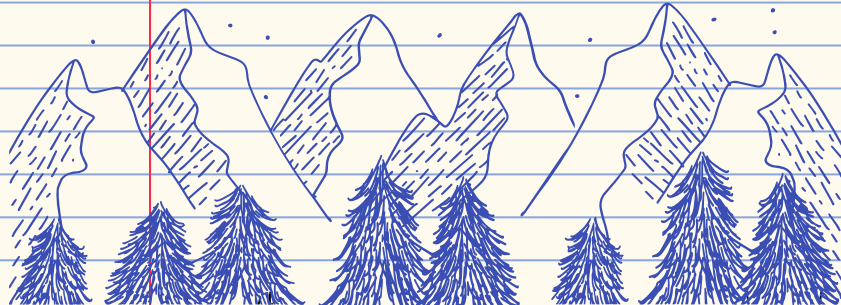




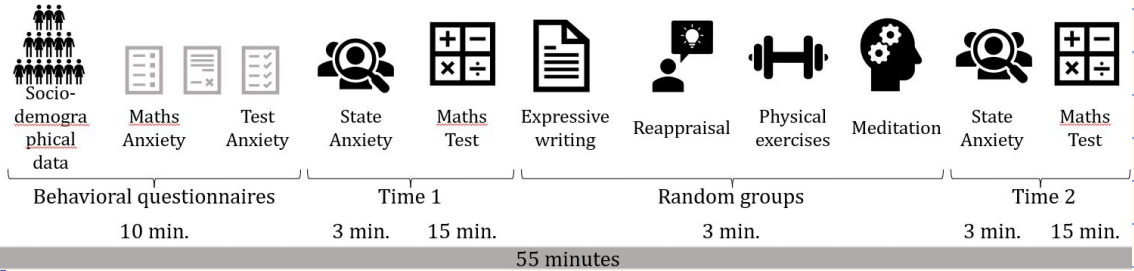
Research



Participant



# Methods



Expressive writing  
(Ramirez and Beilock, 2011)

Reappraisal  
(Jamieson, Mendes, Blackstock and Schmader, 2010)

Short physical Exercises  
(Bildanova, Biserova, Shagivalieva, 2015)

# Conclusion & Limitation

High Stakes

High-stress situation creates worries about the situation and its consequences that compete for the working memory (WM) normally available for performance. Consequently, the performance of individuals who rely most heavily on WM for successful execution (i.e., higher-WM individuals) is most likely to decline when the pressure is on (Beilock, 2008)

Perception

The perception of the test situation did not directly predict the test results, but it served as a moderator for the indirect effect of test anxiety on test results  
(Leiner, Scherndl and Ortner, 2018)

online

Did the participants actually perform the regulation?



The results shed a light on effectiveness and replicability of existing emotional regulations approaches. Additionally, it will contribute to the development and search for new effective methods of education process individualization.

