

# Relations between socioemotional factors and the results of students in the ConMat test

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**KEY FINDING:** Math anxiety and motivation are closely related to third grade students' math achievement, as measured by the ConMat test.

## 1. Research overview

Math anxiety and motivation have been found to be closely related to students' math achievement in standardized tests (Ashcraft & Krause, 2007; Suinn, Taylor & Edwards, 1988). Here, we investigated whether these relations would be found when relating students' math attitudes to their result in the ConMat test, a competency-based test developed by Innovamat. Additionally, we investigated whether children show different levels of math anxiety depending on their gender. The study was conducted in Catalonia (Spain) with 370 third grade students from 10 schools. All schools signed a data sharing agreement with Innovamat and all participants included in the analysis had a signed consent form from their families agreeing to participate in the study.

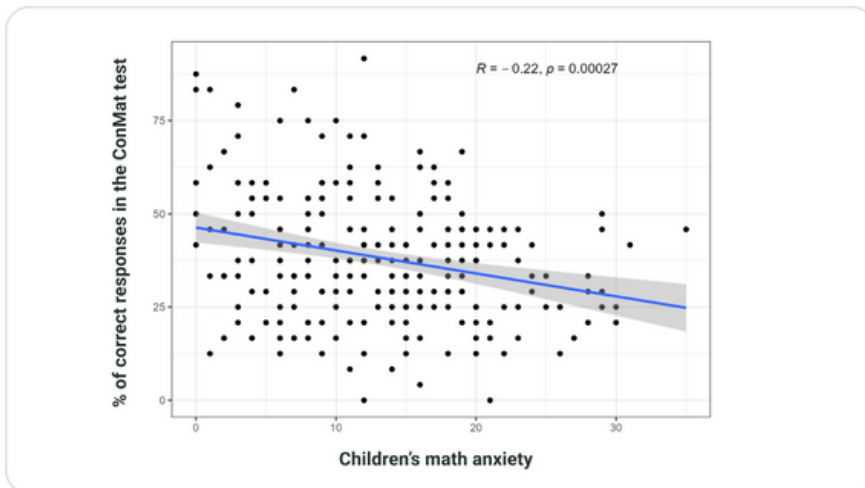
## 2. Measures of interest

To measure students' math anxiety, we translated into Catalan the "modified Abbreviated Math Anxiety Scale" (mAMAS), which is a short math anxiety measurement scale adapted for primary school children. This test has been validated on several occasions (Carey et al., 2017; Caviola et al., 2017) and is regularly used in school research. To measure students' math motivation, we adapted the Primary School Mathematics Motivation Scale (PSMMS) which was developed by Ersoy & Oksuz (2015). We developed an abbreviated version of the PSMMS with 25 items divided into six groups: intrinsic value, resistance to anxiety, self-regulation, relevance, self-efficacy and utility value. Most of these dimensions (except for relevance) were chosen to match the MMQ questionnaire (Fiorella et al., 2021).

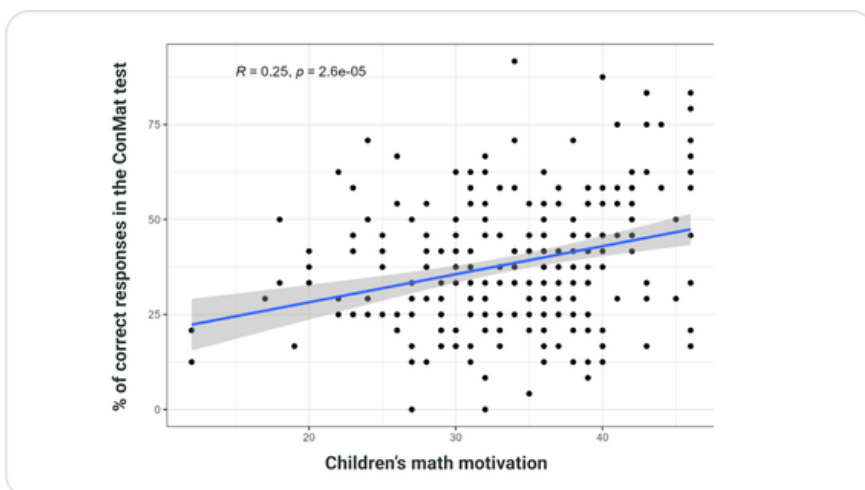
Finally, to measure math achievement, we analyzed the results of students in the ConMat test, which they completed at the end of the academic year of 2023. The ConMat test is a reference assessment developed by Innovamat that is inspired by the theoretical framework of TIMSS (Trends in International Mathematics and Science Study), which distinguishes between content and processes. In this case, the content questions were organized in two types: concepts (facts, vocabulary, etc.) and procedures (operations, visualization of constructions, use of measuring instruments, reading graphs, etc.). In turn, process questions were organized in four categories: problem-solving, reasoning and proof, connections and communication, and representation.

### 3. Results

We found a significant negative correlation between math anxiety and math achievement, and a positive correlation between math motivation and math achievement. In general, children performed better at the ConMat test if they reported to have less math anxiety and more motivation towards math.

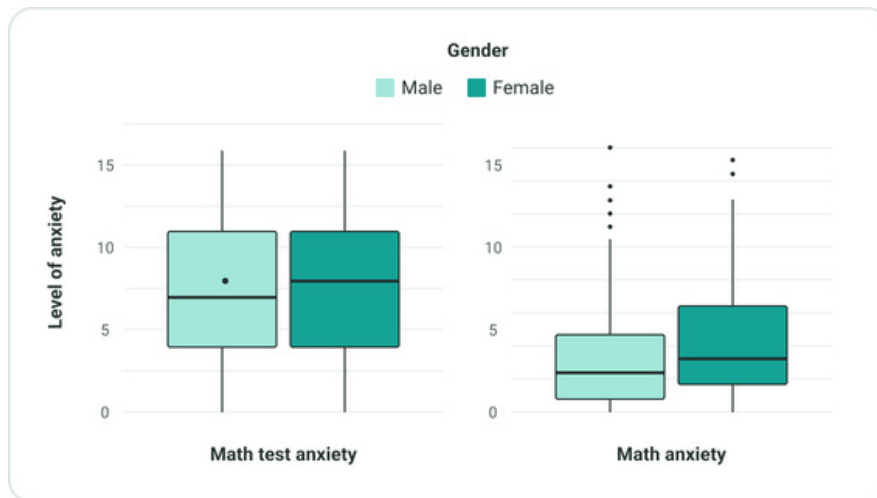


**Figure 1.** Relation between children's math anxiety (x axis) and the percentage of correct responses in the ConMat test (y axis). Each dot represents a student. The blue line represents a linear regression with a 95% of confidence interval. The R value of the text corresponds to the Pearson correlation coefficient, with a p-value lower than 0.05 indicating a significant relation. We found that, as math anxiety increases, the score on the ConMat test decreases.



**Figure 2.** Relation between children's math motivation (x axis) and the percentage of correct answers in the ConMat test (y axis). Each dot represents a student. The blue line represents a linear regression with a 95% of confidence interval. The R value of the text corresponds to the Pearson correlation coefficient, with a p-value lower than 0.05 indicating a significant relation. We found that, as math motivation increases, the score on the ConMat test also increases.

**4. Gender-gap:** the analysis found a significant main effect of gender, with girls showing greater math anxiety than boys. As a potential strategy to remediate this gender-gap, we are currently investigating whether a short intervention that promotes a growth mindset may reduce gender-based differences in math anxiety. See the MAGIC research proposal for more information.



**Figure 3.** Boxplots indicating students' self-reported level of anxiety depending on their gender (Nen = Boy; Nena = Girl). Girls showed significantly greater levels of anxiety than boys both in their anxiety to math tests (left panel) as well as in their anxiety to math in general (right panel).

## References

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