

Examining the Roles of Fluency, Working Memory, and Pressure in Math Anxiety and Math Performance

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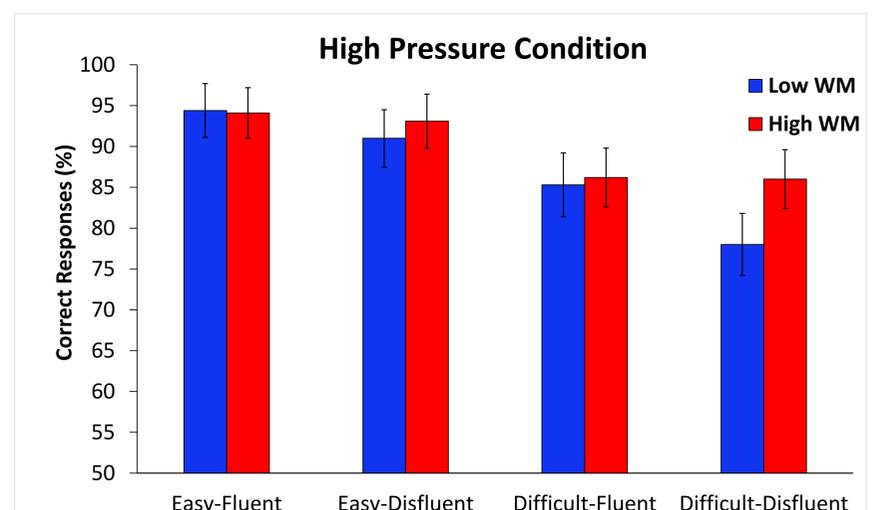
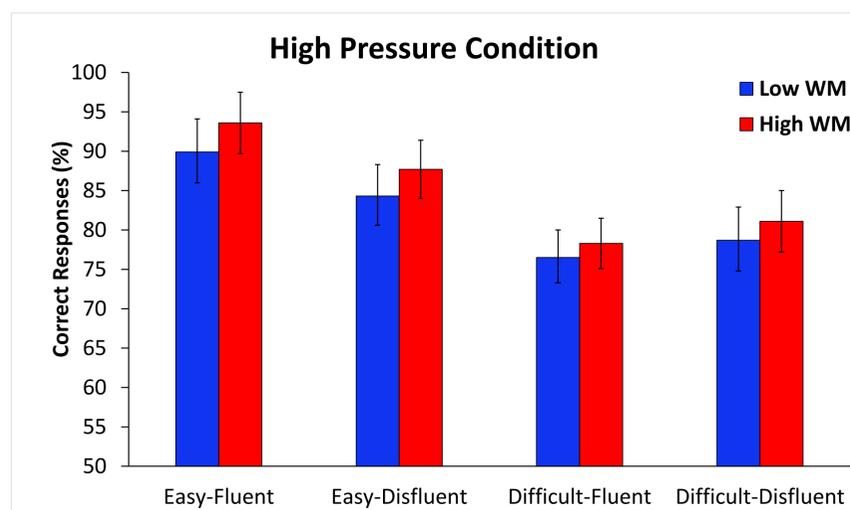
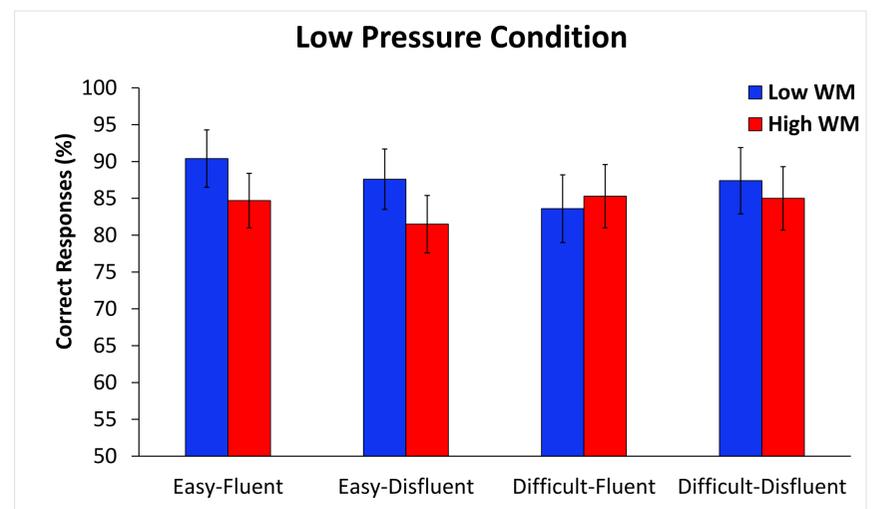
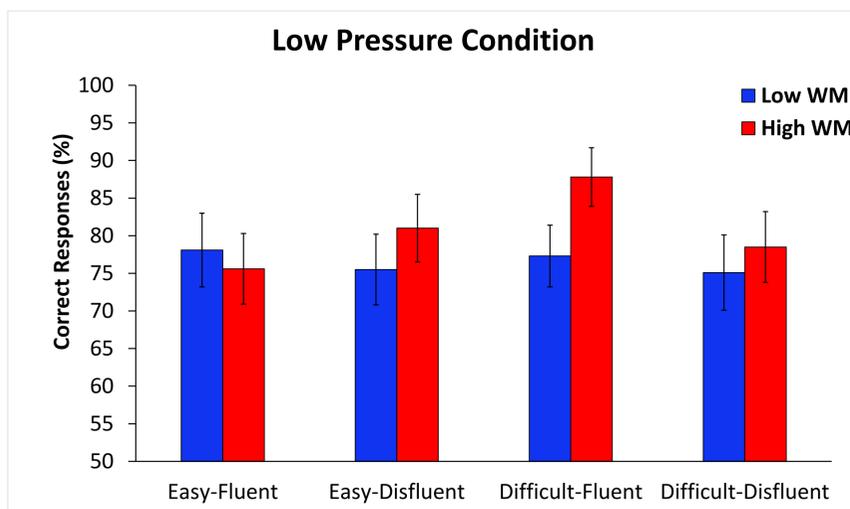
Overview

Math anxiety is a pervasive problem that negatively impacts math performance and yields negative math attitudes. Math anxiety ties up working memory capacity, thereby disrupting the cognitive resources necessary for math performance (Beilock, 2008). This study investigated the previously unstudied influence of fluency on math performance, math anxiety, and working memory. Fluency is defined as the ease by which items are cognitively processed (Oppenheimer, 2008). We used easy (single-digit) and difficult (double-digit) modular arithmetic problems, classified as either fluent [e.g., $44 = 22 \pmod{2}$] or disfluent [e.g., $26 = 11 \pmod{3}$] based on how random the numbers were, to examine how actual problem difficulty would interact with problem fluency to affect performance. We examined math problem solving performance in both high and low pressure conditions to see how problem type (i.e., whether problem difficulty and fluency) would interact with participants' math anxiety and working memory span to affect performance. We collected ease of solving judgments for all problems before participants attempted to solve them. Fluency and difficulty influenced these judgments, indicating participants can attend to both factors. Problem solving was affected by a combination of all factors, suggesting that fluency played a role in math performance, even for those under pressure. Thus, fluency may be a promising factor that both reduces anxiety while increasing performance, possibly creating an immunizing effect that instructors could capitalize on to help math anxious students overcome their anxiety and perform better.

Key Findings

Trial 1

Trial 2



Explanation

- In Trial 1, when both conditions experienced low pressure, those with high WM outperformed low WM participants. In Trial 2, performance was similar for low and high WM individuals when placed under pressure in the high pressure condition.
- Easy and fluent problems were consistently solved at a higher rate than difficult and disfluent problems.

Impact

Increasing fluency decreased anxiety and increased performance, regardless of pre-existing working memory capacity. Thus, fluency manipulations may help address math anxiety.

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