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Dominique Giambalvo
Northeastern Illinois University

Afifa Ahmed
Northeastern Illinois University

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Exploring the Role of Gender and Cognitive Reflection on Children's Mathematical Equivalence Understanding

Dominique Giambalvo, Afifa Ahmed

Psychology Department

This study will examine the roles of gender, anxiety, and cognitive reflection in children's mathematical learning. We conducted an online pretest-math instruction-posttest protocol with 67 participants, 35 males, and 32 females, for children 7-11 years old. Videotaped instruction emphasized the principle of making both sides of an equation the same amount to solve problems like $3+4+5= _ +5$. We measured two components of mathematical equivalence knowledge: (1) procedure knowledge indexed by the children's ability to solve math equations and (2) conceptual knowledge indexed by their ability to identify and define the equal sign. We also measured children's math anxiety and cognitive reflection. We hypothesize: (1) males will outperform females in solving problems before instruction, (2) females will outperform males in conceptual understanding of mathematical equivalence, (3) females will benefit more from instruction, (4) math anxiety in females will be higher in females than that in males and negatively correlated with learning, and (5) children with higher cognitive reflection will have a better understanding of mathematical equivalence at pretest and learn more from instruction than children with lower cognitive reflection. Results will improve our understanding of how children's gender, anxiety, and cognitive reflection contribute to mathematical understanding and learning.